N62604.AR.001773
NCBC GULFPORT
5090.3a

REVISED APPLICATION FOR RESOURCE CONSERVATION AND RECOVERY ACT RESEARCH, DEVELOPMENT AND DEMONSTRATION PERMIT WITH TRANSMITTAL LETTER NCBC GULFPORT MS

5/9/1986

IDAHO NATIONAL ENGINEERING LABORATORY

INEL
Idaho National Engineering Laboratory

May 9, 1986

Mr. James Scarbrough, Chief
Residuals Management Branch
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, NE
Atlanta, GA 30365

ATTN: Caron Falconer

REVISION AND RESUBMITTAL OF RD&D PERMIT APPLICATION TO REGION IV - JNC-19-86

Dear Mr. Scarbrough:

Enclosed is the revised RD&D permit application for the proposed USAF technology demonstration at Gulfport, Mississippi. The document has been revised to incorporate comments received through your offices. Revisions or changes to the document are as follows:

Executive Summary, Page 2	The criteria to be met in this project is identified as being presented in Appendix A of the application.
	The commitment to furnish Region IV with a copy of the final report has been inserted.
Page 1-1	The duration of the project and quantity of soil to be treated has been changed to 150 days and 11,000 yd^3.
	The goals and criteria for the demonstration have been added.
Page 2-6	Burners for the kiln are identified as natural gas burners.
Page 2-11	Prevention of fugitive emissions from the stack via negative pressure of the system has been clarified.
Page 2-24	Materials other than soil which will be fed to the incinerator are identified.
	Certification of equipment erection and disassembly by a registered professional engineer has been added.

Page 2-26 & 2-28	Footnotes have been added which clarify that a loss of combustion air supply will activate the automatic waste feed shutoff circuit, and that all stack gas monitoring will occur during the test burn.
Page 5-1	General training requirements have been added.
Page 5-18	A description of the scrubber water handling has been added.
Page 5-20	The soil handling has been revised to allow emplacement of the treated soil back on the HO site.
Page 6-1	Sampling and analysis protocol has been specified as SW846 and the dioxin rules.
Page 8-2	Waste handling has been clarified.
Page 8-3	Item 4 - Handling of liquid wastes via land application has been deleted and dischage to the POTW added.
Appendix A	The appendix has been modified to identify and explain the criteria which will be met for this demonstration.

A signed Certification Statement (Executive Summary, p. 4) as well as a Notification of Hazardous Waste Activity Form (Appendix F) with signature of owner and operator will be forwarded to your office within the next two weeks.

Thank you for your cooperation and assistance in helping us submit a complete application. If you have and questions or requests, please call me at FTS: 583-9736.

Very truly yours,

J N Casanova

J. N. Casanova, Program Specialist
Hazardous Waste Programs

lap

cc: J. Cluff, NCBC
J. Lanier, ENSCO
M. Rich, State of Mississippi
Capt. T. L. Stoddart, USAF
J. O. Zane, EG&G Idaho

HQ AFESC

Application for RCRA Research, Development, and Demonstration Permit

Submitted to:

U.S. Environmental Protection Agency
Region IV
Waste Management Division
Residuals Management Branch
345 Courtland Street, N.E.
Atlanta, Georgia

January 21, 1986

Revised: April 2, 1986
May 9, 1986

Prepared by:
EG&G Idaho, Inc.

CONTENTS

APPENDIX

EXECUTIVE SUMMARY

Purpose

The purpose of this document is to provide to the Environmental Protection Agency (EPA), Region IV, Waste Management Division, and other interested agencies as applicable, technical information about the United States Air Force (USAF) Environmental Restoration Program's Research, Test and Evaluation of a selected technology for dioxin destruction at a former Department of Defense (DOD) Herbicide Orange storage site at the Naval Construction Battalion Center, Gulfport, Mississippi. This project is being conducted under the Resource Conservation and Recovery Act (RCRA) of 1976 as amended by the Hazardous and Solid Waste Amendments of 1984. This amendment gives EPA authority to issue Research, Development, and Demonstration (RD&D) permits to aid in the development of safe alternatives to land disposal of hazardous wastes.

Objective

The USAF (Headquarters--Air Force Engineering and Services Center) is requesting from EPA an RD&D permit applicable to the demonstration of the identified technology. This is based on the review and approval of the contents of this document by EPA and local Base Commanders.

Following suspension of the use of Herbicide Orange and subsequent destruction of the entire USAF stockpile (2.22 million gallons) in the 1970s, the USAF implemented a program in 1980 to restore the USAF Herbicide Orange sites to beneficial use. One of the major activities of this program is to field test, demonstrate, and evaluate selected decontamination technologies. Such RD&D activities will be used to determine the feasibility of using the selected technologies for restoration activities.

The technology to be demonstrated is incineration in a multi-unit waste incineration system designed to be moved from site to site to demonstrate the destruction of dioxin and dibenzofurans in soil. The demonstration is to be performed by Ensco Environmental Services at the Naval Construction Battalion Center (NCBC), Gulfport, Mississippi.

The goal of the technology is to reduce contaminants and the levels of those contaminants to criteria as presented in Appendix A, Sampling and Analysis Matrix.

Following completion of the tests and analyses, data will be evaluated for the following:

1. Determining maintainability and reliability of the technology.

2. Determining the best operating conditions for cost-effectiveness.

3. Supporting the delisting petition process through EPA Headquarters, Office of Solid Waste.

The results of the evaluation and all data will be compiled in the final report to be submitted to the USAF by EG&G Idaho, Inc.

The Ensco incineration system is a commercial tecnnology. However, the aforementioned data must be obtained to determine the technical efficiency and cost-effectiveness of using this technology at other DOD installations.

The USAF will inform EPA of preliminary results at the conclusion of the testing. A final report discussing all activities with results and conclusions will be compiled. Copies of the final report will be supplied to EPA Region IV. All inquiries by EPA will be responded to in a timely manner.

Scope

The RCRA Hazardous and Solid Waste Amendments of 1984, Section 214, provide for permits for research, development, and demonstration of innovative, experimental hazardous waste treatment technologies or processes. Requirements for obtaining an RD&D permit are addressed in this document and summarized as follows:

1. Sec. 214(A): The facility is already constructed and will have undergone RCRA trial burns and PCB test burns under the authority of EPA, Region VI. The demonstration at NCBC is scheduled to last less than one year.

2. Sec. 214 (B): The Herbicide Orange site at NCBC will not receive or treat any new hazardous wastes. The technology demonstration will use material only from, and on, the site. The effects of this demonstration on human health and the environment are addressed in this document. An Environmental Assessment has also been prepared to address potential impacts and fulfill requirements of the National Environmental Policy Act.

In addition, the following information is also provided:

1. Signatures of Owner and Operator: A signatory page is provided at the conclusion of this summary.

2. In lieu of published guidance for an RD&D permit application, an assessment of 40 Code of Federal Regulations (CFR) 264 requirements is provided in Appendix B.

3. A photograph of the Ensco mobile incinerator is provided in Appendix C. The original photograph is included with the letter of transmittal for this document.

CERTIFICATION STATEMENT AND SIGNATORIES FOR PERMIT APPLICATION

We certify under penalty of law that this document and all attachments were prepared under our direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner: ______________________________

Naval Construction Battalion Center
Gulfport, MS

Operator: ______________________________

Tyndall Air Force Base
Panama City, FL

Engineering and
Services Laboratory
HQ Air Force Engineering
and Services Center

(To be supplied.)

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

This document is an application for a Research, Development, and Demonstration (RD&D) permit from the Environmental Protection Agency (EPA) Region IV as authorized by the Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments of 1984. The U.S. Air Force (USAF) is requesting the permit to perform a field demonstration for dioxin and dibenzofuran destruction in soil at the Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi.

The technology to be demonstrated is incineration in a mobile incineration system. The purpose of the demonstration is to provide data on the maintainability and reliability of the technology so that cost-effectiveness can be determined for future restoration efforts. To obtain sufficient data to adequately assess the reliability and maintainability of this technology, an operational period of at least 150 days is necessary. This period of time is also necessary to ensure that cost data are representative of field operations. In addition, the system should operate at or near maximum capacity to ensure that the data obtained are representative for any future application. Consideration of reliability, maintainability, and cost is the basis for requiring treatment of approximately 11,000 yd^3 of soil.

The goal of the technology is to reduce the level of total chlorinated dibenzodioxins and dibenzofurans to ≤ 1 part per billion (ppb), and the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) level to <1 ppb. In addition, EP toxic metals and constituents from Appendix VIII of 40 CFR Part 261 have been identified by EPA Headquarters, Office of Solid Waste, Waste Identification Branch, as constituents of concern. The metals and constituents of concern will be analyzed for at the levels identified on the Criteria List in Appendix A, Sampling and Analysis Matrix.

1.2 Background

In April 1970, the Secretaries of Agriculture; Health, Education, and Welfare; and the Interior jointly announced the suspension of certain uses of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). This suspension resulted from published studies indicating that 2,4,5-T was a teratogen. Subsequent studies revealed that the teratogenic effects resulted from a toxic contaminant in the 2,4,5-T, identified as TCDD. Subsequently, the DOD suspended the use of Herbicide Orange (HO), which contained 2,4,5-T. At the time of suspension, the USAF had an inventory of 1.37 million gallons of HO in South Vietnam and 0.85 million gallons at NCBC in Gulfport, Mississippi. In September 1971, the DOD directed that the HO in South Vietnam be returned to the United States and that the entire 2.22 million gallons be disposed of in an environmentally safe and efficient manner. The 1.37 million gallons were moved to Johnston Island, Pacific Ocean, in April 1972. The average concentration of TCDD in the 2.22 million gallon HO stock was about 2 parts per million (ppm), with the total amount of TCDD estimated at 4.44 gallons.

HO is a reddish-brown to tan liquid, soluble in diesel fuel and organic solvents, but insoluble in water. One gallon of HO theoretically contained 4.21 lb of the active ingredient 2,4-D and 4.41 lb of the active ingredient 2,4,5-T. HO was formulated to contain a 50:50 mixture (by weight) of the n-butyl esters of 2,4-D and 2,4,5-T. The percentages of the formulation typically were as follows:

n-butyl ester of 2,4-D	49.49
free acid of 2,4-D	0.13
n-butyl ester of 2,4,5-T	48.75
free acid of 2,4,5-T	1.00
inert ingredients (e.g., butyl alcohol and ester varieties)	0.63

Various disposal techniques for HO were investigated from 1971 to 1974. Destructive techniques investigated at that time included soil biodegradation, high-temperature incineration, deep-well injection, burial in underground nuclear test cavities, sludge burial, and microbial reduction. Techniques used to recover a useful product included activated charcoal filtration, return to manufacturers, fractionation, and chlorinolysis.

Of these techniques, only high-temperature incineration was sufficiently developed to warrant further investigation. The other methods were temporarily rejected because of several considerations, including long lead times for development, inadequate assurance of success, and the lack of industrial interest.

During the summer of 1977, the USAF disposed of the 2.22 million gallon stock of HO by high-temperature incineration at sea. This operation, Project PACER HO, was accomplished under very stringent U.S. EPA ocean-dumping permit requirements.

The Air Force Plan and the EPA permits for the disposal of the herbicide committed the USAF to a follow-up storage site reclamation and environmental monitoring program. The major objectives of this required program were to:

1. Determine the magnitude of HO contamination (TCDD) in and around the former HO test storage sites.

2. Determine the rate of natural degradation for the phenoxy herbicides (2,4-D and 2,4,5-T), their phenolic degradation products, and TCDD in soils of the storage and test sites.

3. Monitor for potential movement of residues from the storage and test sites into adjacent water, sediments, and biological organisms.

4. Recommend managerial techniques for minimizing any impact of the herbicides and dioxin residues on the ecology and human populations near the storage and test sites.

Immediately following the at-sea incineration in 1977, the USAF Occupational and Environmental Health Laboratory (OEHL) initiated site monitoring studies of chemical residues in soil, silt, water, and biological organisms associated with the former HO storage sites at both NCBC and Johnston Island. Results of the NCBC study are presented in Subsection 1.2.3.

The Secretary of the Air Force/Deputy for Environment and Safety (SAF/MIO) requested and received from the Air Force Surgeon General in June 1980 a proposed research protocol to return HO-contaminated sites to full and beneficial use. Based on this research protocol, SAF/MIO recommended that the Engineering Services Laboratory (ESL) of the Air Force Engineering Services Center be designated as the lead laboratory for monitoring and reclamation research. Air Force Deputy Chief of Staff for Engineering/Logistics agreed that the Environics Division of ESL should handle the complex integration of environmental chemistry and control technology required to address the problem. It was noted, however, that the ESL is dedicated to a research mission and not routine field assistance tasks. This required that site monitoring be consolidated within the dioxin research program, rather than in routine analyses, which is the mission of the OEHL. Before initiation of the overall research program, the ESL routed the research requirement through Air Force Deputy Chief of Staff for Research and Development and Air Force Systems Command/Director of Laboratories in the form of a Statement of Operational Need (SON). The validated USAF SON 2-81 directed that

1. A sampling and analysis program be initiated

2. A program to look at methods to destroy dioxin in situ be started, but no full-scale effort take place unless further directed by SAF

3. Progress on assessing long-term breakdown and movement of dioxin be reviewed yearly at the Headquarters AFESC, ESL.

The Environics Division of ESL has monitored the natural degradation of HO at the DOD sites since 1980. In 1984, the Environics Division contracted with EG&G Idaho, Inc., to map the dioxin concentrations at NCBC and Johnston Island, as well as to conduct a hydrogeological study at NCBC. Results of the soil mapping activities will be used in defining the approach for the Research, Test, and Evaluation program to evaluate potential cleanup technologies in the field at NCBC and Johnston Island. The soil mapping and the hydrogeological studies have been completed and the final reports are in preparation by EG&G Idaho.

Field testing of two technologies using thermal desorption/ultraviolet photolysis and an advanced electric arc reactor took place in 1985 under the requirements of the Toxic Substances Control Act (final reports are in preparation by EG&G Idaho). With the enactment of the Hazardous and Solid Waste Amendments of 1984, treatment technologies for dioxin-contaminated wastes became subject to RCRA requirements.

As such, the incineration demonstration at NCBC will occur under the jurisdiction of EPA, Region IV, Atlanta, Georgia. This document has been prepared as an application for issuance of a Research, Development, and Demonstration Permit under Section 214 of the Hazardous and Solid Waste Amendments of 1984.

1.3 Background: Site Description

NCBC is located in Gulfport, Mississippi (Figures 1-1 and 1-2), approximately 2 mi from the Gulf of Mexico, and occupies a land area of several square miles. It is a fenced limited access military installation. NCBC is approximately 20 ft above sea level. The soil is sand to sandy loam, intermixed with some clay.

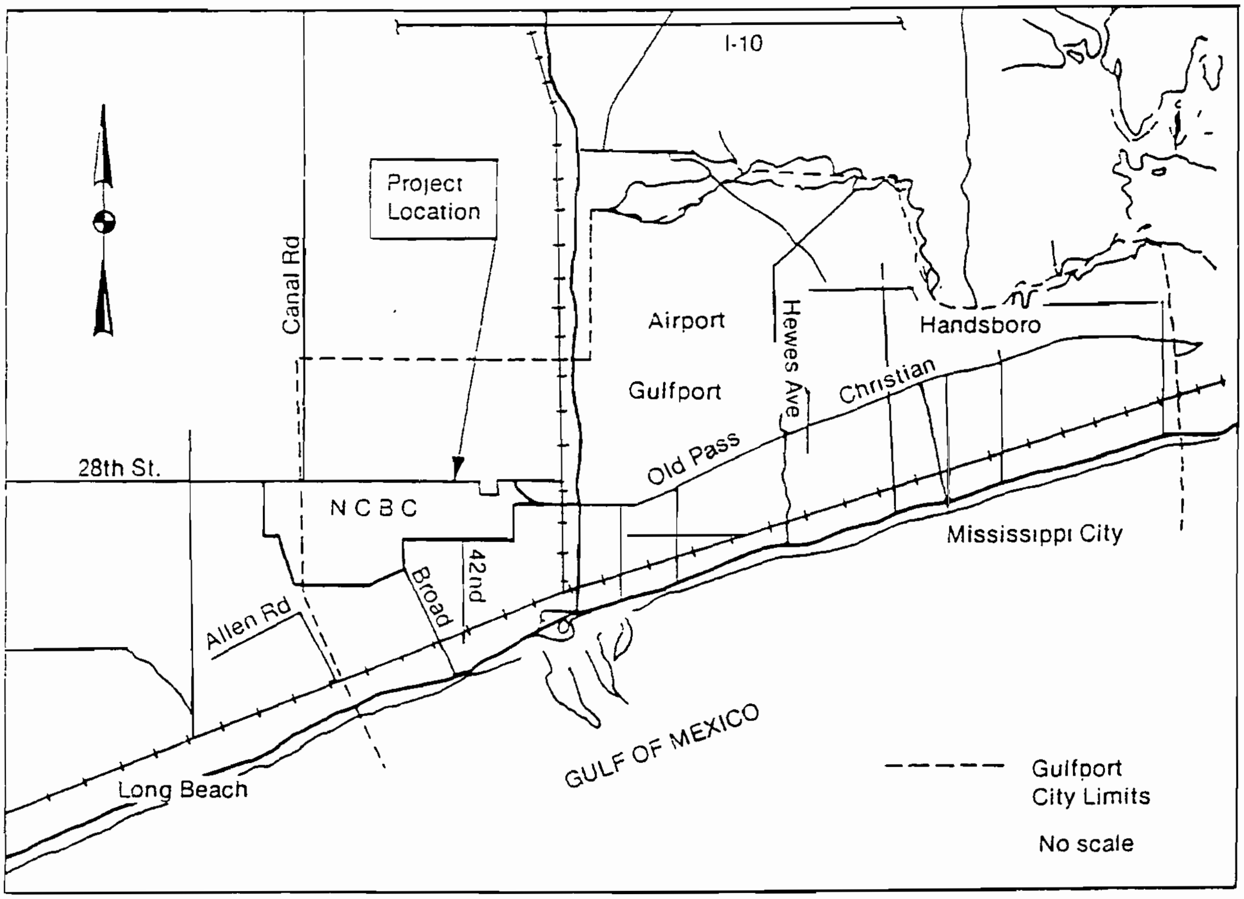


Figure 1-1. Naval Construction Battalion Center Vicinity Map.

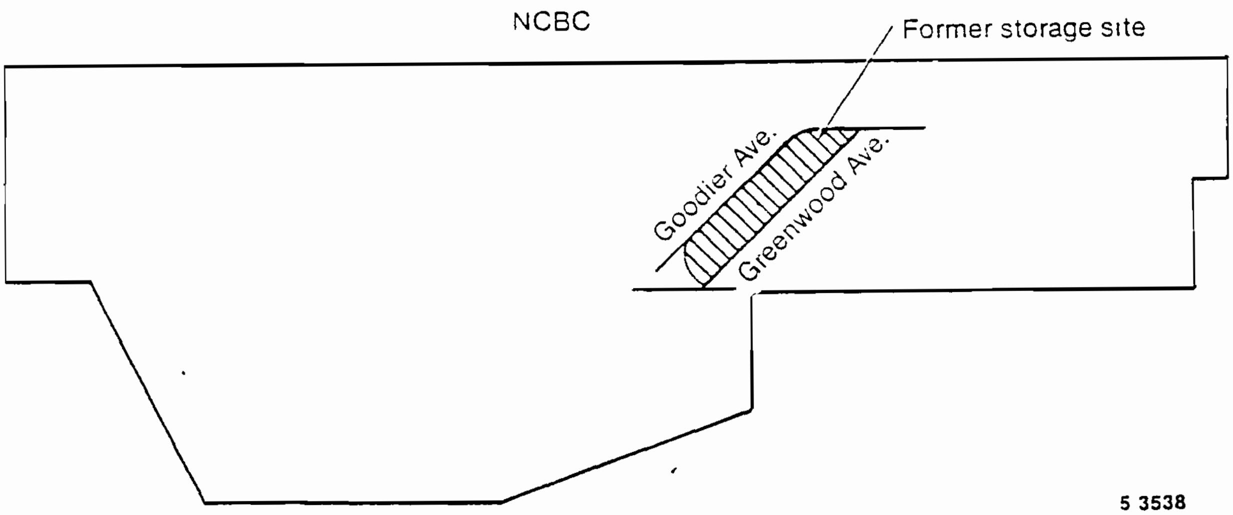


Figure 1-2. NCBC perimeter and location of former Herbicide Orange Storage Site.

Approximately 12 acres at NCBC served as a storage site for the 0.85 million gallons of HO. The fenced site is an area restricted to base personnel; entry is only by authorization of the base commander. The storage site was stabilized with Portland cement approximately 30 years ago. The stabilized soil provided a hardened storage area for heavy supplies and equipment. Over the years, additional fill materials (shell, rock, soil, asphalt, and tar) were added to the storage area, providing a cover of several inches over the cement-stabilized soil. A small quantity of miscellaneous combustible (wooden pallets) and noncombustible (concrete/drums) refuse is present on the storage area.

1.3.1 Meteorological Data

Table 1-1 presents meteorological data applicable to the general Gulfport area. The mean daily temperature ranges from 61 to 78°F, with extremes of 10°F and 104°F. The mean monthly precipitation varies from 2.4 to 7.1 inches, with extremes of 0 inches and 25.2 inches.

1.3.2 Hydrogeological Data

The gulf coastal area has been slowly subsiding for millions of years, forming a trough known as the Gulf Coast geosyncline. As the trough sank, streams emptying into the Gulf of Mexico have kept the trough nearly full by depositing huge quantities of sand, gravel, and mud. These sand and gravel deposits make up the principal aquifers in the Gulfport area (Table 1-2).

Geologic units containing freshwater near Gulfport are of Miocene or younger age (the last 24 million years). These beds are more than 3,000 ft thick (Figure 1-3). There are no thick, consistently traceable clay beds (aquicludes). The sand-and-gravel beds are irregular in thickness and extent. However, some sandy zones (aquifers) can be traced for reasonable distances. All rocks from the base of the Miocene to within 200 ft of the land surface are Miocene and Pliocene. Rocks from near the land surface to about 200 ft are designated Citronelle Formation. On the surface are

TABLE 1-1. METEOROLOGICAL DATA FOR NCBC, GULFPORT, MS.

Prepared by: USAFETAC
April 1982

Station name: Keesler AFB MS
Location: N30.25 W 88.55

AWS CLIMATIC BRIEF

Month	Temperature (°F) Mean Daily Max	Temperature (°F) Mean Daily Min	Temperature (°F) Mean Monthly	Temperature (°F) Extreme Max	Temperature (°F) Extreme Min	Precipitation (in) Monthly Mean	Precipitation (in) Monthly Max	Precipitation (in) Monthly Min	Precipitation (in) Max 24 hrs	Snowfall (in.) Monthly Mean	Snowfall (in.) Monthly Max	Snowfall (in.) Max 24 hrs	Mean Relative humidity (%) LST 04	Mean Relative humidity (%) LST 13	Mean Vapor Pressure (100 Mg)	Mean Dew pt (°F)
Jan	60	44	52	00	10	4 7	11 8	#	6.5	0	#	#	77	64	26	41
Feb	62	47	55	80	15	4 2	11 8	2	4 3	0	3	2a	78	60	29	44
Mar	68	53	61	90	24	6 7	17 1	#	5 7	#	1	1	80	66	40	53
Apr	76	62	69	93	39	4 8	16 7	#	7 0	0	0	0	82	62	.50	56
May	83	68	76	97	48	4 7	12 3	1	5 7	0	0	0a	82	62	.64	66
Jun	88	74	81	101	57	5 2	14 2	#	5 4	0	0	0	80	59	74	70
Jul	90	76	83	101	60	7 1	25 2	4	6.5	0	0	0	85	65	.85	74
Aug	90	75	83	104	62	6 1	12 4	2	3 6	0	0	0	85	64	82	73
Sep	86	72	79	98	45	7 0	18 7	0	10.2	0	0	0	85	64	74	70
Oct	79	61	70	93	36	2 4	10 6	0	3.0	0	0	0	80	57	49	58
Nov	69	51	60	85	25	3 7	11 1	#	5 0	0	0	0	81	60	.38	51
Dec	62	46	54	81	12	4 6	8 8	1	3 0	#	8	8	78	61	.28	44
Ann	78	61	69	104	10	61 3	25 2	0	10 2	#	8	8	81	62	.50	59
Eyr	39	39	39	39	39	39	39	39	39	32	32	32	10	10	10	10

Month	Pressure Altitude (ft) 99 95%	Surface winds PVLG DRCTN (16 pt)	Surface winds Speed Mean (KT)	Surface winds Speed Max (KT) **	Mean cloud cover	Mean number of days occurrence of: Precip (in) ≥ 0.01	Precip (in) ≥ 0 9	Snowfall (in) ≥ 0 1	Snowfall (in) ≥ 1 5	Thunderstorms	Fog VSBY <7	Temperature (°F) Max ≥ 95	Temperature (°F) Max ≥ 90	Temperature (°F) Min ≤ 45	Temperature (°F) Min ≤ 32
Jan	400	N	6	60	7	10	3	#	0	2	17	0	0	17	5
Feb	400	$ N	6	54	6	9	3	#	#	2	13	0	0	12	2
Mar	450	S	7	50	7	10	4	#	0	5	15	0	#	7	1
Apr	350	S	7	61*	6	7	3	0	0	4	11	0	#	1	0
May	350	S	6	58	6	7	3	0	0	6	7	#	1	0	0
Jun	200	S	6	56	5	9	3	0	0	9	4	1	10	0	0
Jul	150	$ S	5	56	6	13	4	0	0	15	5	3	16	0	0
Aug	200	$ S	5	60	6	12	4	0	0	14	6	2	16	0	0
Sep	250	$ N	5	58	6	10	4	0	0	7	8	#	7	0	0
Oct	250	N	5	51*	4	6	2	0	0	2	11	0	#	1	0
Nov	300	$ N	5	47	5	7	2	0	0	2	12	0	0	6	1
Dec	350	N	6	46	6	10	3	#	#	2	15	0	0	15	3
Ann	350	$ N	6	61*	6	110	38	#	#	70	124	6	50	61	12
Eyr	10	10	10	34	10	39	39	32	32	32	32	39	39	39	39

Remarks.

RUSSMO POR:

HOURLY OBS JUN 69 - DEC 70, JAN 73 - MAY 81

DAILY. MAY 42 - MAY 81

Number observed within (1900 - 1979)		May	Jun	Jul	Aug	Sep	Oct	Ann
A/B	60NM	0/0	0/2	1/0	1/3	5/5	0/3	7/13
(A) Hurricanes	120NM	0/0	0/6	2/3	5/6	9/15	1/6	17/36
(B) Tropical storms	240NM	0/3	3/13	4/10	15/15	19/36	5/16	46/93

Note. *Data not available #AMTS < units shown in heading **Max hourly wnd sp class nt $ % calm grtr % pvlg drctn ▲ Based on < full months

CV5 2085

Table 1-2. GEOLOGIC UNITS AND MAJOR AQUIFERS IN MISSISSIPPI

Erathem	System	Series	Group	Geologic unit	Major aquifer
Cenozoic	Quaternary	Holocene and Pleistocene		Undifferentiated alluvium and terrace deposits Mississippi River valley alluvial aquifer	Mississippi River valley alluvial aquifer
		Pleistocene		Loess Terrace deposits, undifferentiated	
	Tertiary	Pliocene		Citronelle Formation Graham Ferry Formation	Citronelle aquifers Miocene aquifer system
		Miocene		Pascagoula Formation Hattiesburg Formation Catahoula Sandstone	Miocene aquifer system
		Oligocene	Vicksburg Group	Byram Formation Bucatunna Clay Member Middle Marl Member Glendon Limestone Member Marianna Limestone Mint Spring Marl Member Forest Hill Sand	Oligocene aquifer system
		Eocene	Jackson Group	Yazoo Clay Moodys Branch Formation	
			Claiborne Group	Cockfield Formation Cook Mountain Formation Sparta Sand Zilpha Clay Winona Sand Tallahatta Formation Neshoba Sand Member Basic City Shale Member Meridian Sand Member	Cockfield aquifer Sparta aquifer system Winona-Tallahatta aquifer Meridian-upper Wilcox aquifer
				Hatchetigbee Formation	Meridian-upper Wilcox aquifer
		Paleocene	Wilcox Group	Tuscahoma Formation Nanafalia Formation Fearn Springs Member	Lower Wilcox aquifer
			Midway Group	Naheola Formation Porters Creek Clay Matthews Landing Marl Member Clayton Formation	Lower Wilcox aquifer
Mesozoic	Cretaceous	Upper Cretaceous	Selma Group	Prairie Bluff Chalk and Owl Creek Formation Ripley Formation Demopolis Chalk Coffee Sand Mooreville Chalk Arcola Limestone Member	Ripley aquifer Coffee Sand aquifer
				Eutaw Formation Tombigbee Sand Member McShan Formation	Eutaw-McShan aquifer
			Tuscaloosa Group	Gordo Formation Coker Formation	Gordo aquifer Coker aquifer Tuscaloosa aquifer system
		Lower Cretaceous		Undifferentiated	Tuscaloosa aquifer system
Paleozoic	Pennsylvania Mississippian Devonian			Undifferentiated	Paleozoic aquifer system

5 3540

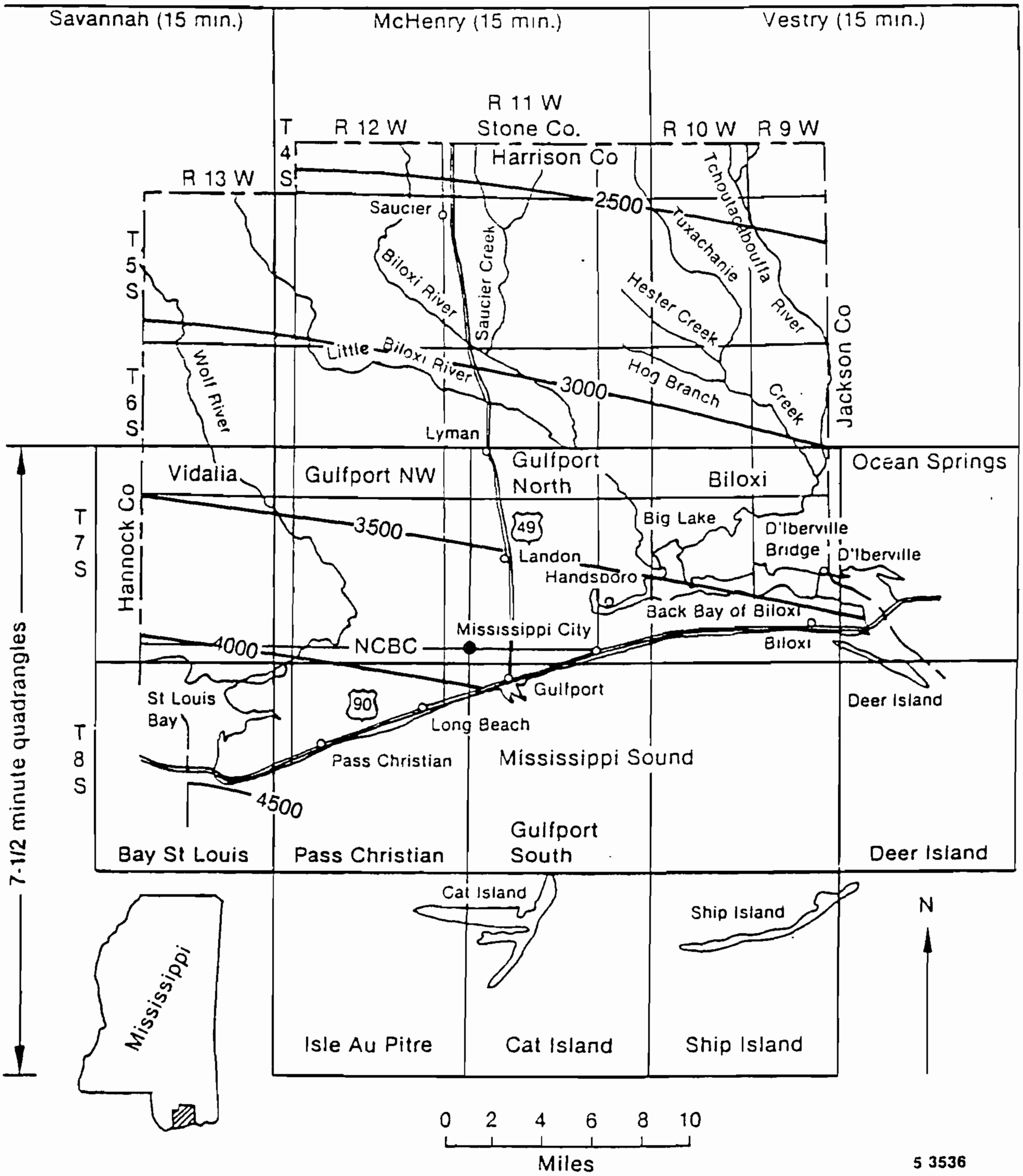


Figure 1-3. Elevation of the base of the Miocene rocks.

terrace, alluvial, and beach deposits. The thickness of these deposits ranges from 10 to about 50 ft.

Aquifers at depths of more than 500 ft contain sufficient artesian pressure to support flowing wells, except where pumping has lowered the head. The main recharge areas are several miles north of Gulfport. Recharge occurs by infiltration of rain that falls on the sandy outcrops. The beds have high transmissivity horizontally and low transmissivity vertically.

Deep wells in the Gulfport area had water levels approximately 100 ft above sea level about 100 years ago. Today, the water levels are at or below sea level. However, there is no evidence of saltwater encroachment as a result of the lowered groundwater levels. In fact, freshwater occurs more than 12 mi offshore (south of Gulfport).

Developed sand zones are generally permeable. For example, deep wells at Gulfport can be pumped at 500 gpm with 25 to 70 ft of drawdown.

The water quality increases with distance from the recharge area and with depth. Most groundwaters near Gulfport are soft and of good quality and contain less than 250 mg/L of dissolved solids. The temperature of the shallow groundwater near Gulfport is usually about 68°F, and the geothermal gradient is about 1°F increase in temperature for every 62 ft of depth. The average annual rainfall at Gulfport is about 60 in. per year.

Rocks beneath NCBC consist of sand, gravel, silt, and clay. They are highly variable in short lateral distances. The water table is shallow, is only 4 to 6 ft below the land surface, and stands about 25 ft above sea level in some areas. Water in the shallow deposits moves southward toward discharge into the Gulf of Mexico. Locally, the groundwater flow direction could vary depending on localized geology, recharge, discharge, and other factors. The flow direction can be determined by shallow wells and carefully measured water levels to give the hydraulic gradient.

Figure 1-4 presents the drainage system from the HO site. This drainage moves from NCBC to the local surface stream, Turkey Creek. Reports of sampling and analysis of this drainage system have been published and indicate that no offsite migration has occurred. Figure 1-5 presents the retention basins constructed during 1980 and the flow within the basin system.

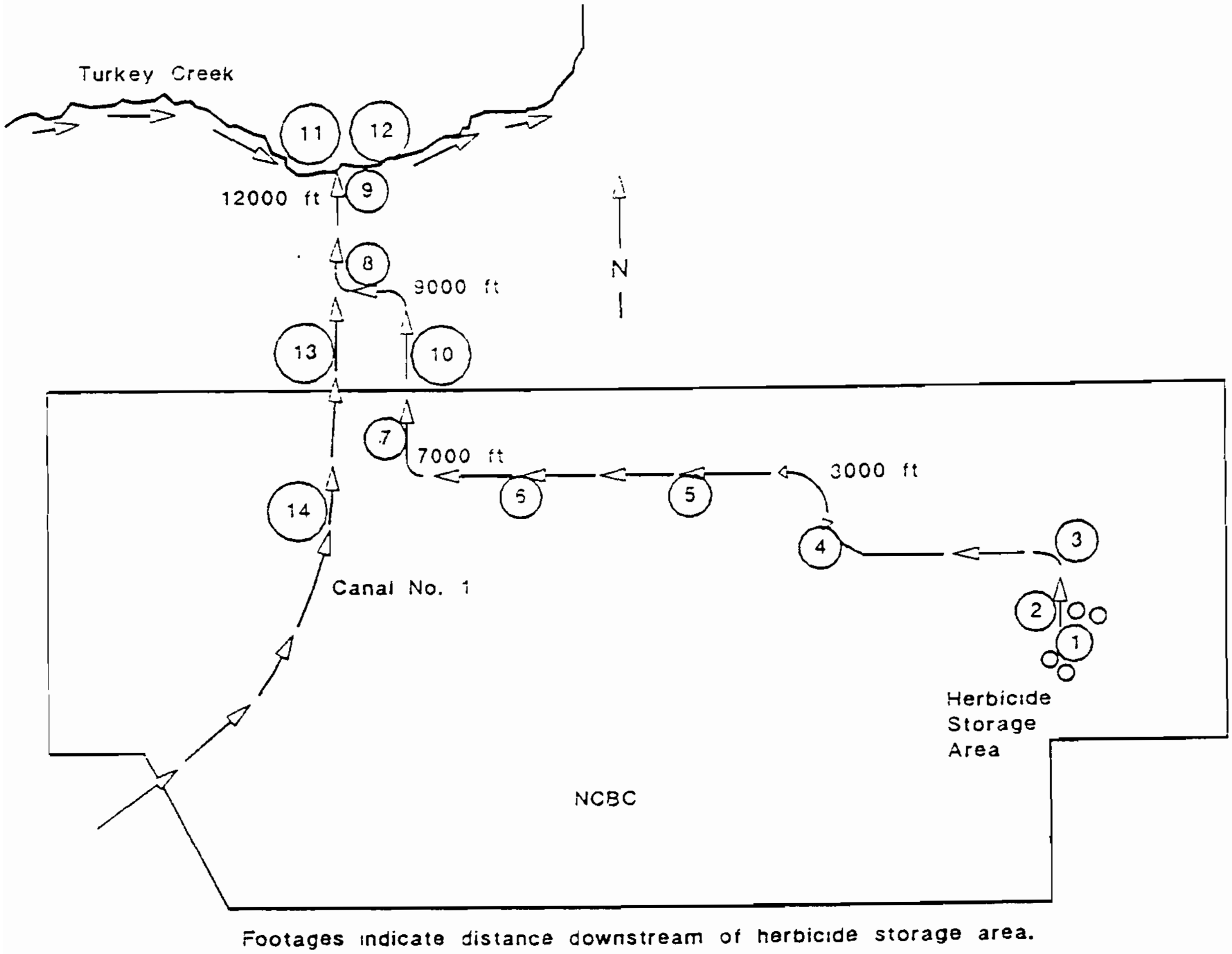
Approximately 12 to 18 acres are considered contaminated with HO and associated TCDD (Figures 1-6, 1-7, and 1-8). During 1980, retention basins were constructed on the storage site to prevent the migration of dioxin-contaminated soils offsite. Currently, the old HO storage site is a restricted area and is not used.

1.3.3 Concentration Plots

Figure 1-9 shows preliminary unvalidated data on concentrations of TCDD in ppb units. These results are currently being validated and a final report compiled by EG&G Idaho. Figure 1-10 indicates the concentrations of TCDD obtained from previous sampling and analysis of soils.

Preliminary evaluations indicate little, if any, horizontal migration of TCDD. Hot spots tend to be localized, although a few previous samples have indicated vertical penetration of the cement-stabilized soil at NCBC.

These concentration plots will aid in determining location and quantities of soil to be removed for the demonstration project.



CV5 2086

Figure 1-4. NCBC drainage system sampling locations.

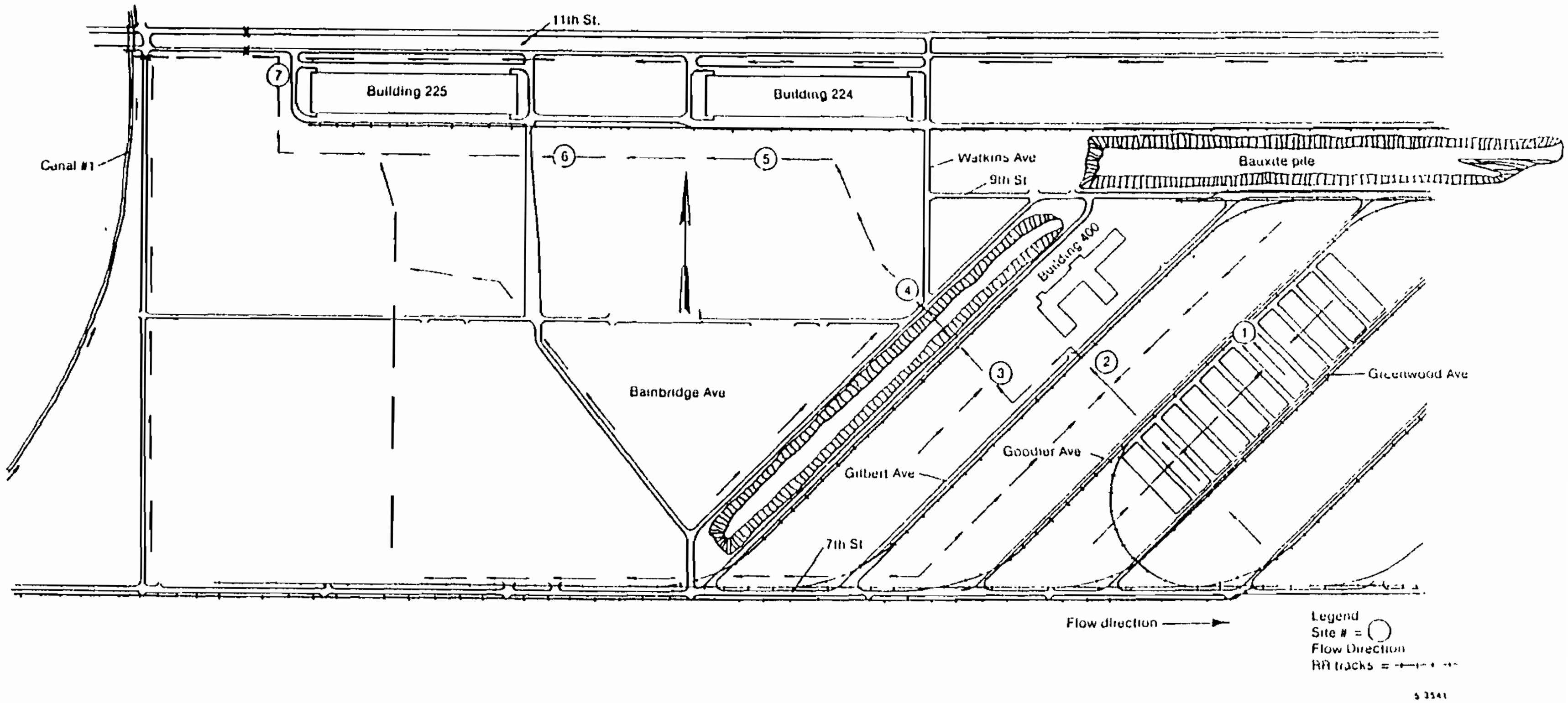


Figure 1-5. Retention basin drainage at NCBC Herbicide Orange storage site.

Figure 1-6. Overview of the NCBC Herbicide Orange site.

Figure 1-7. Composite ground view of NCBC Herbicide Orange Storage Site.

Figure 1-8. Closeup of NCBC Herbicide Orange Storage site.

NCBC - Original

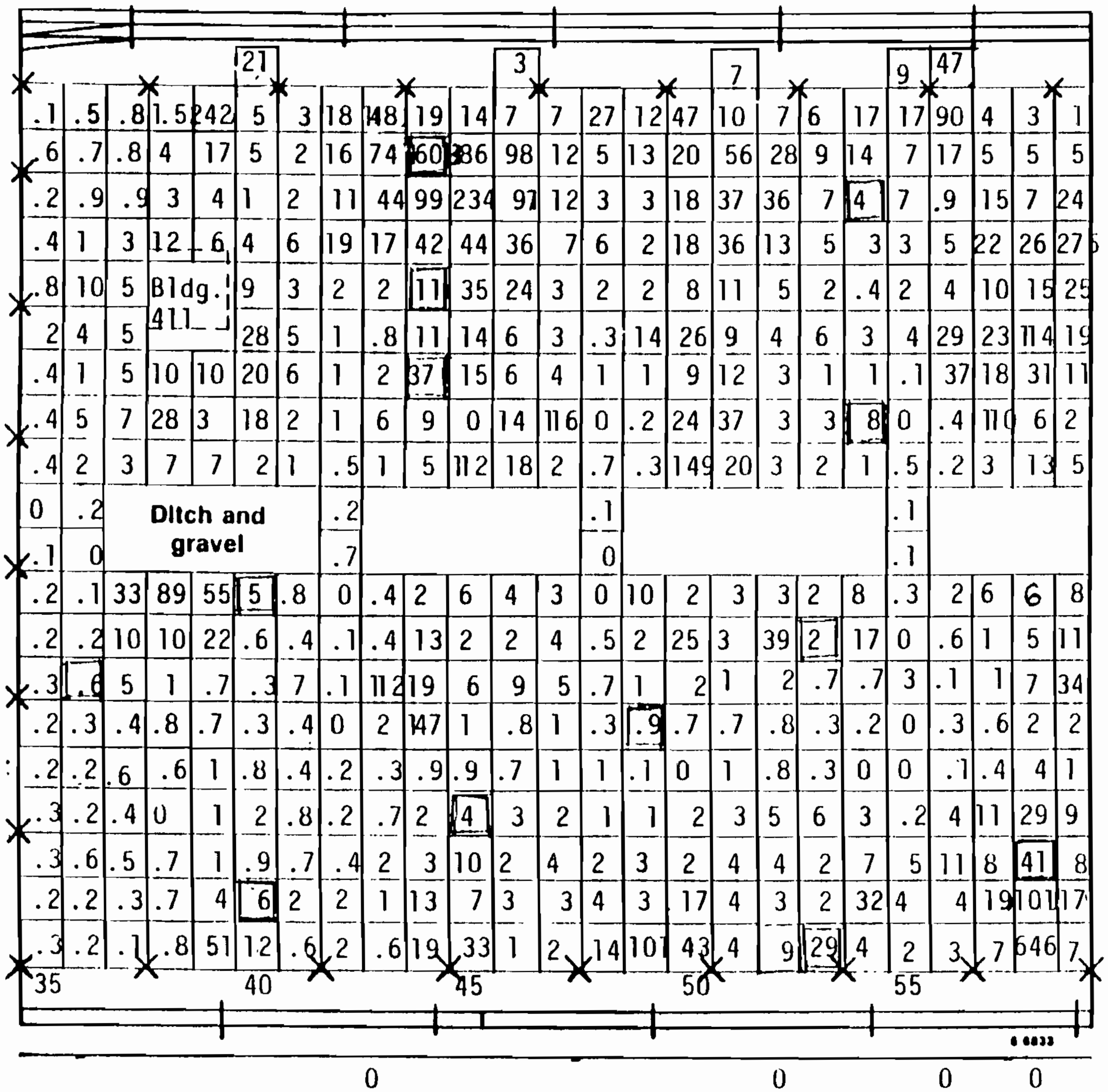


Figure 1-9. TCDD concentration (ppb) at NCBC.

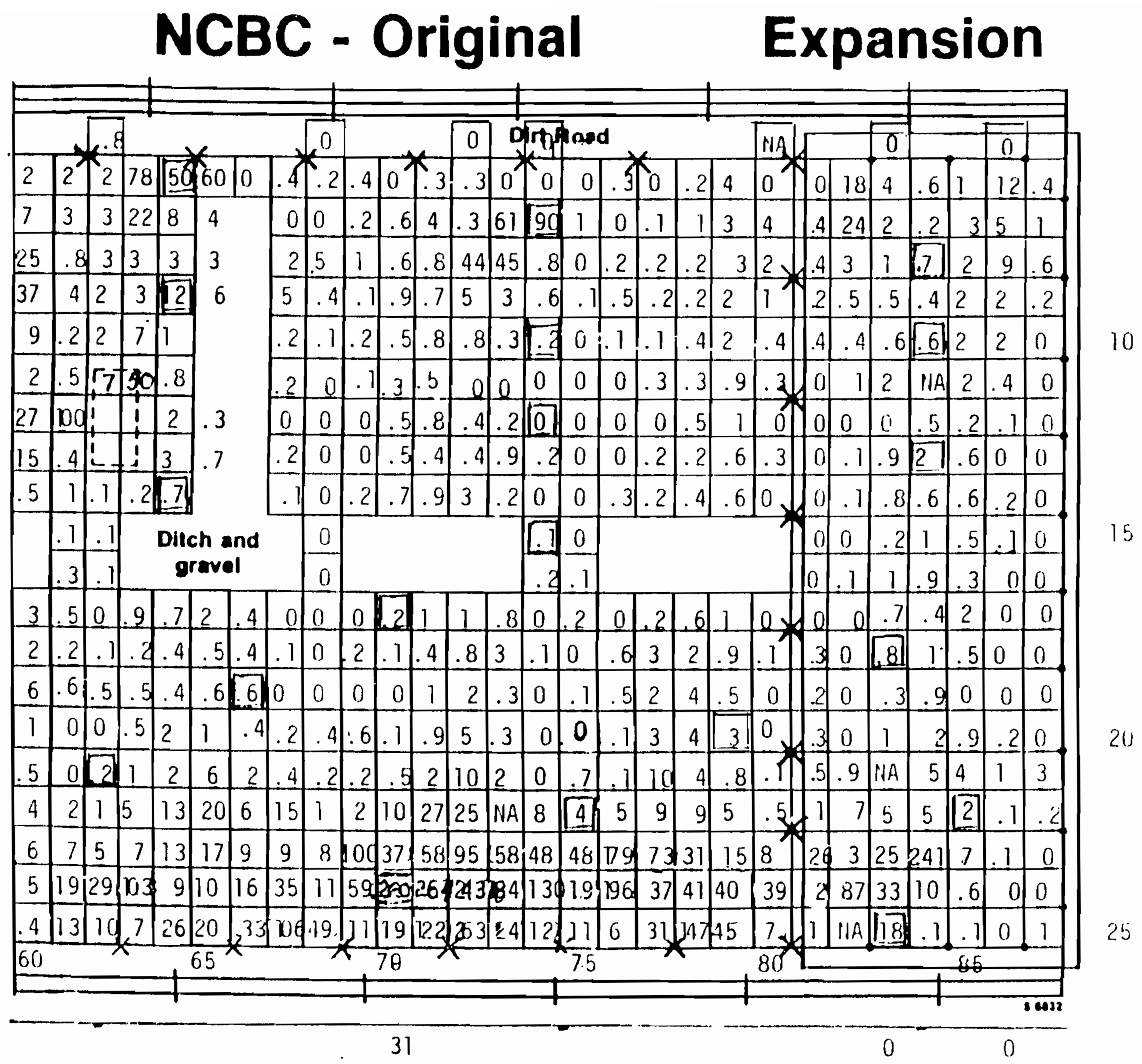


Figure 1-9. TCDD concen' tion (ppb) at NCBC (continued).

NCBC - Expansion East

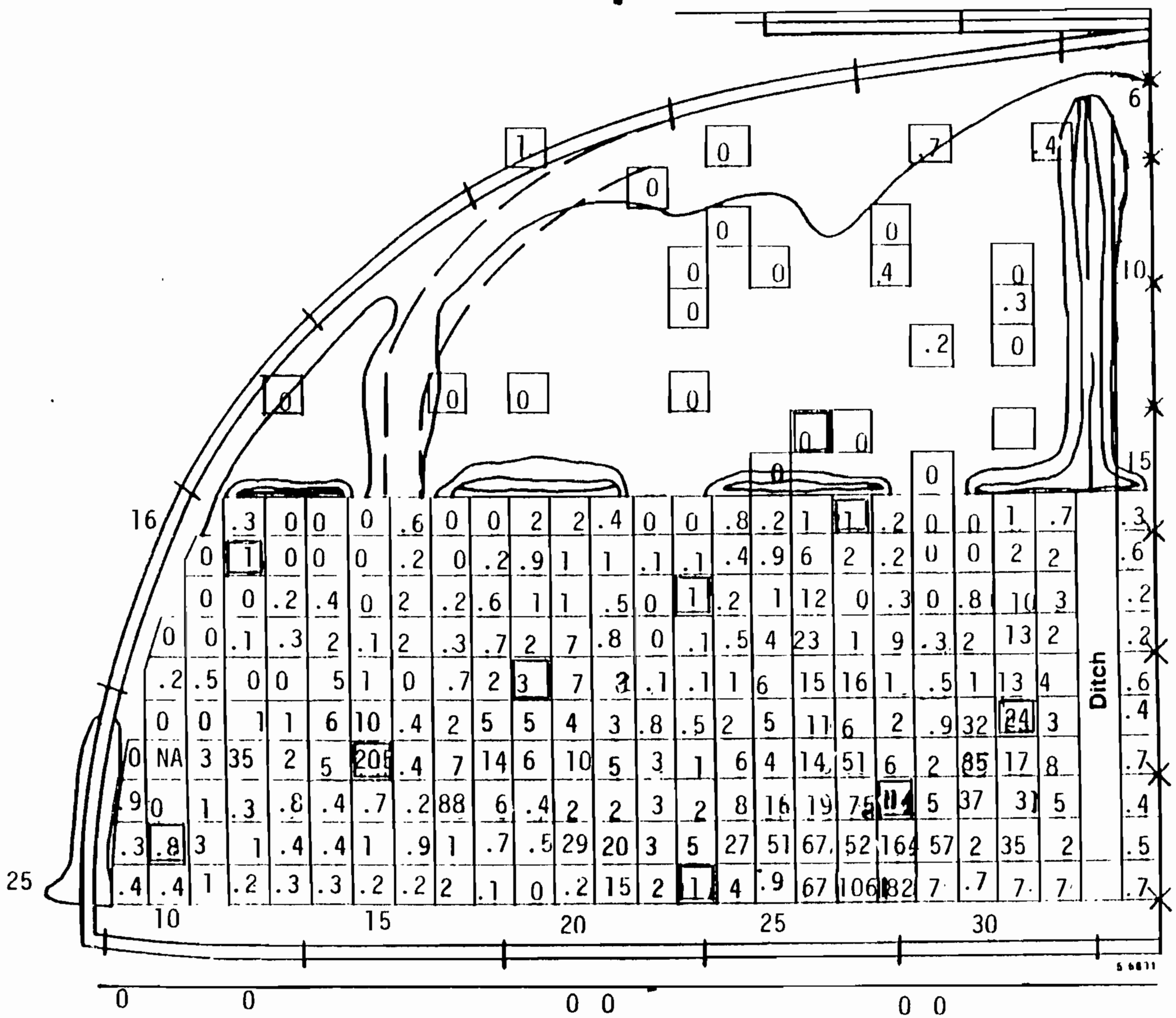


Figure 1-9. TCDD concentration (ppb) at NCBC (continued).

NCBC - Expansion West

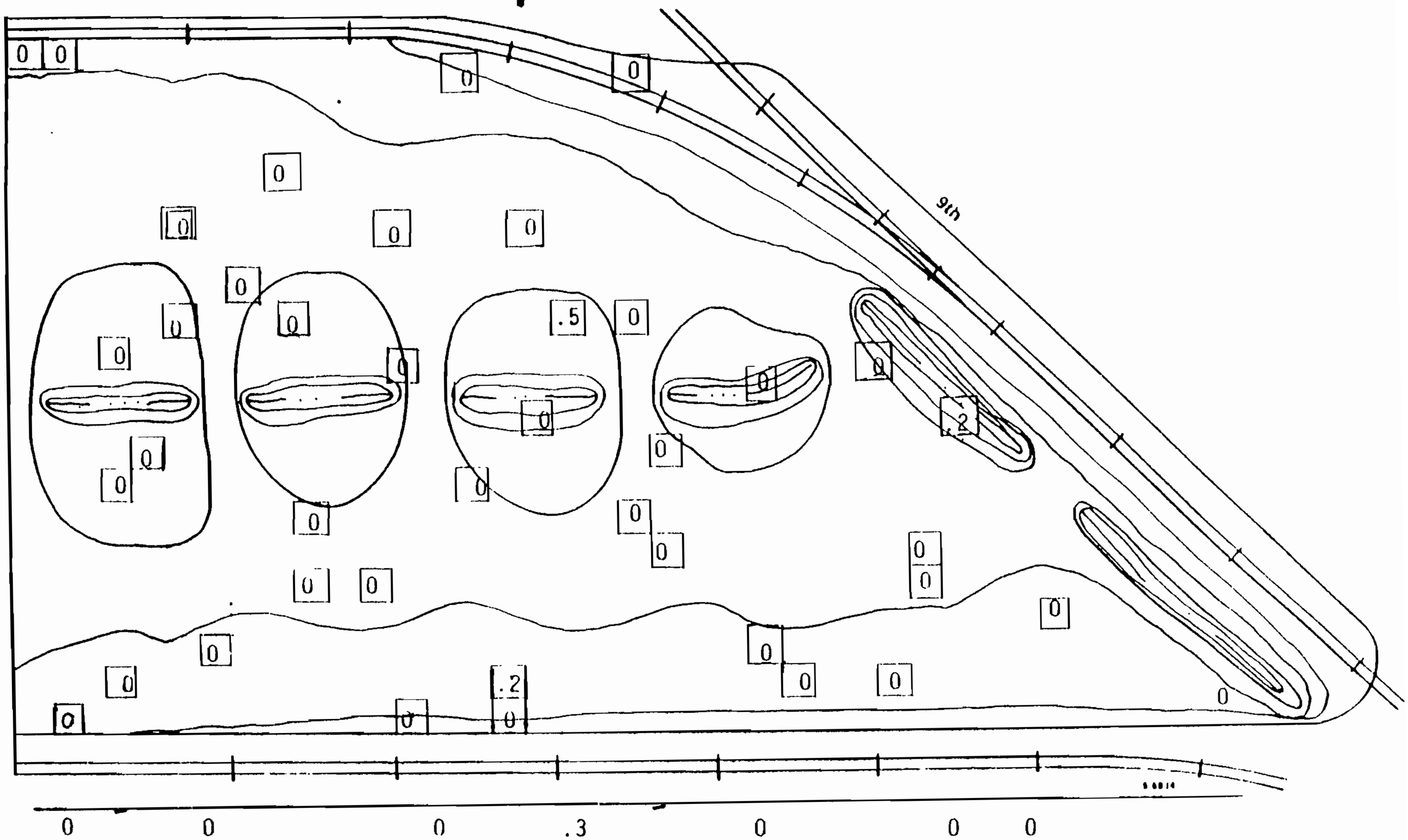


Figure 1-9. TCDD concentration (ppb) at NCBC (continued).

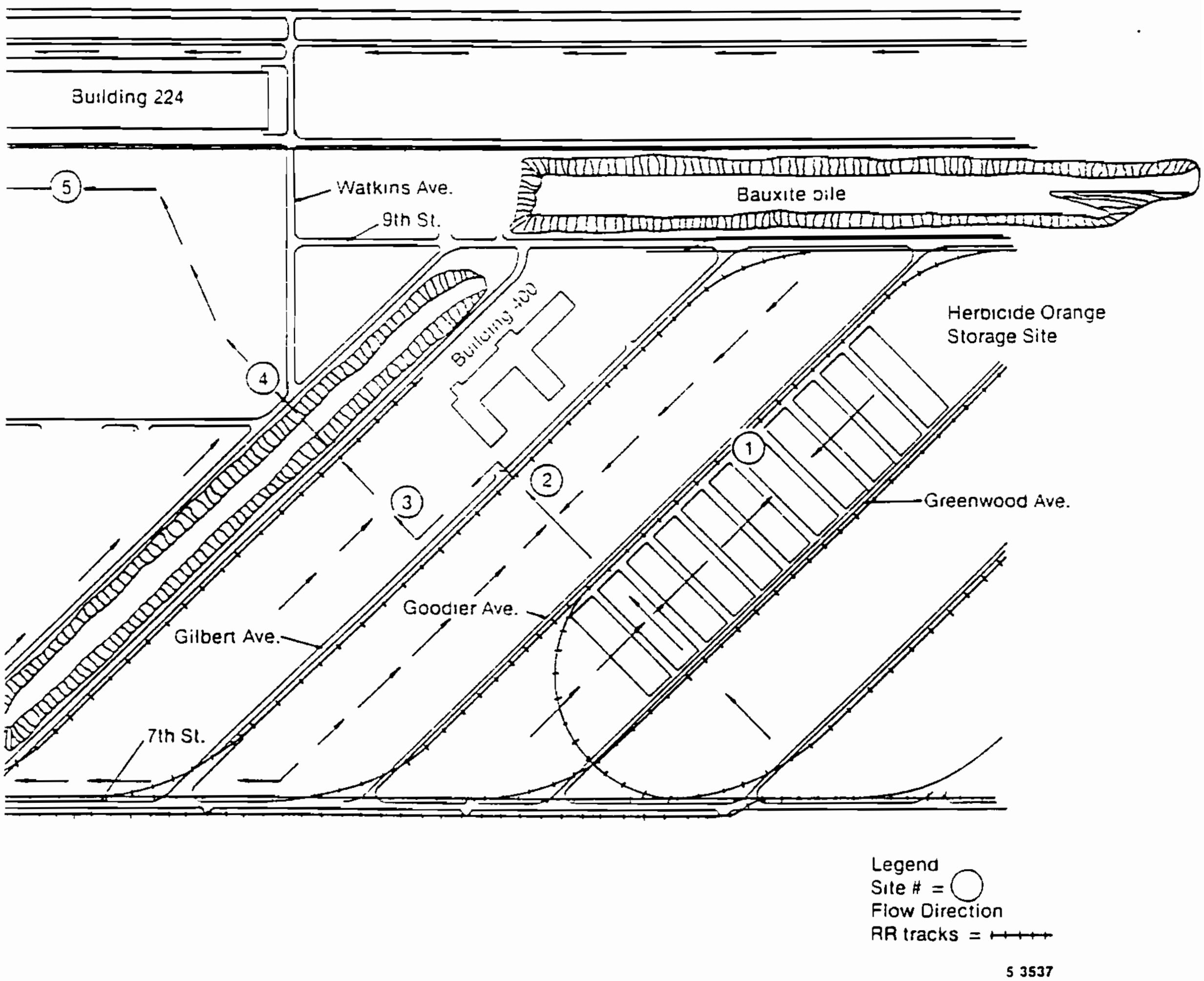


Figure 1-10. Retention basin drainage at NCBC Herbicide Orange storage site.

2. PROCESS DESCRIPTION

2.1 General Description

The Ensco incinerator (Mobile Waste Processor--MWP-2000) is designed and fabricated by the Pyrotech Division of Ensco Environmental Services Company (Ensco) in White Bluff, Tennessee. The MWP-2000 is a modular mobile incinerator system designed to destroy solid, semisolid, and liquid waste contaminated with PCBs. The system can also destroy waste contaminated with 2,3,7,8-TCDD. Before arrival onsite, the MWP-2000 will have undergone PCB test burns and RCRA trial burns for FO-20 through FO-28 wastes. Most of the system components are installed on flatbed trailers to facilitate the movement of the system from site to site to perform onsite cleanup of contaminated soils and other wastes.

Figure 2-1 shows the general arrangement of the system as it will be used at the NCBC. Figure 2-2 is a flow diagram of the system. The principal components of the system are the following:

- o Waste feed system
- o Rotary kiln incinerator
- o Secondary combustion system
- o Air pollution control system
- o Control room and laboratory.

The ancillary components of the system are the following:

- o Waste heat boiler and steam drum
- o Boiler makeup water treatment system
- o Treated soil removal system
- o Effluent neutralization and concentration system
- o Clean fuel holding tanks.

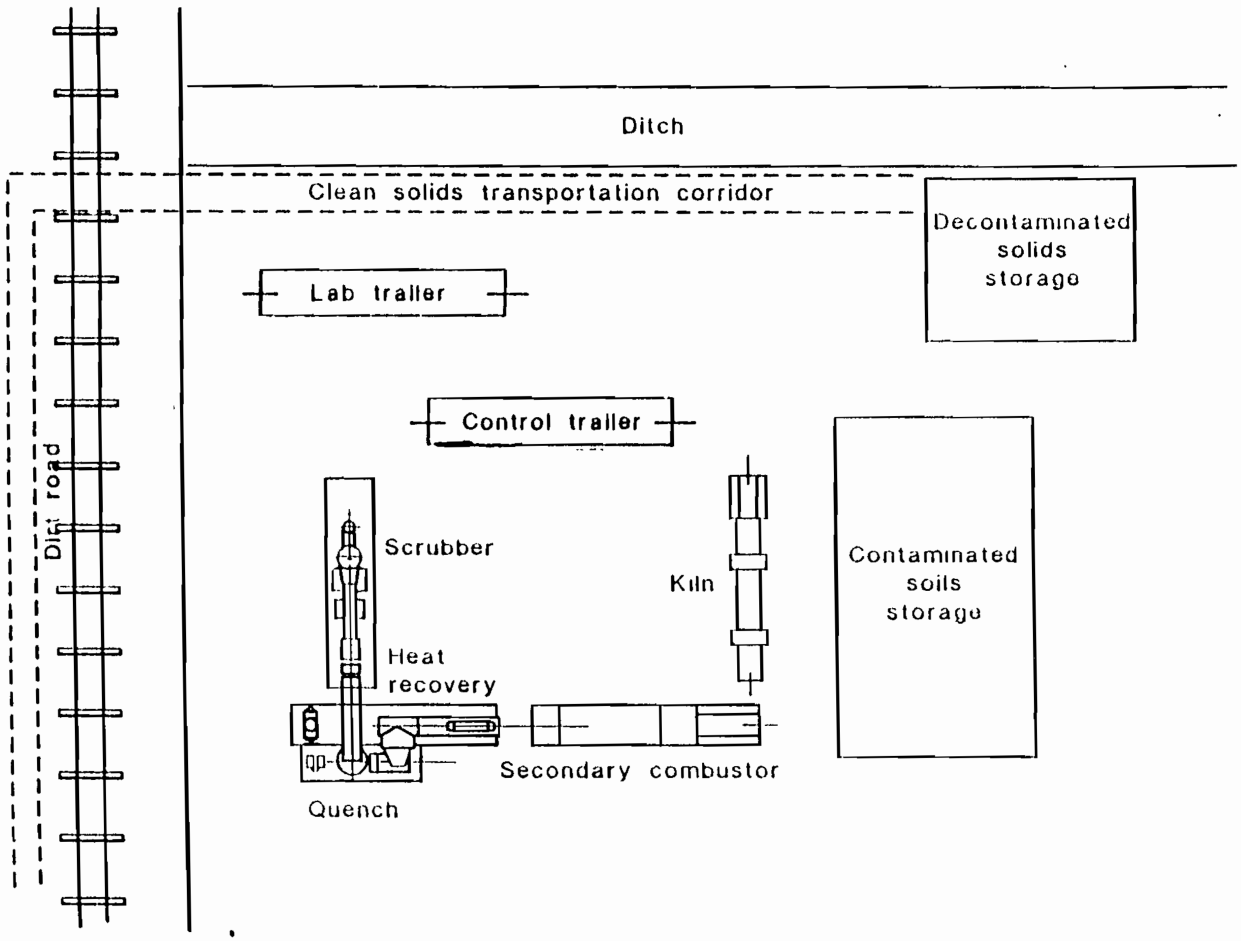


Figure 2-1. Proposed Gulfport MWP-2000 layout.

CV5 2084

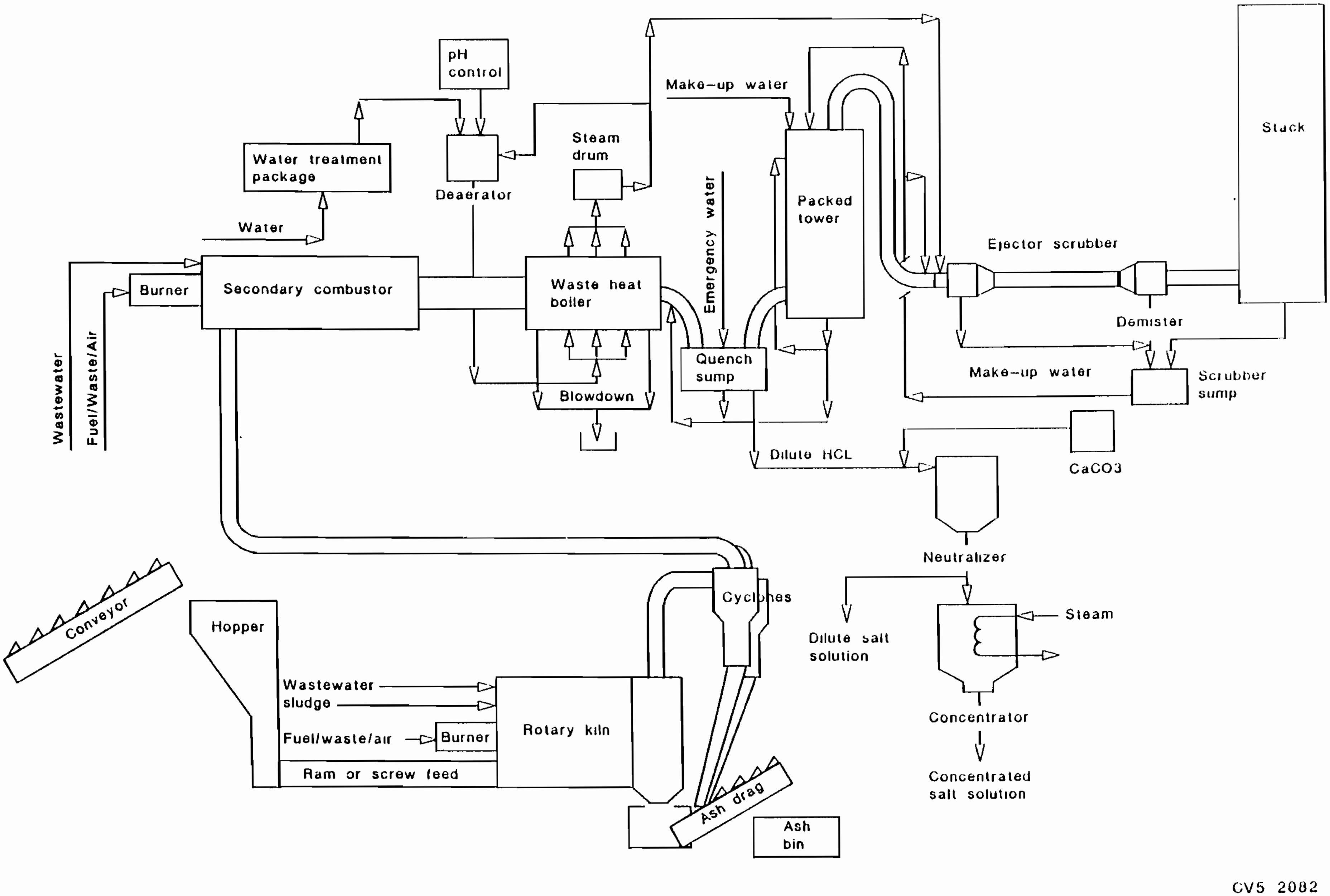


Figure 2-2. Schematic flow diagram of MWP-2000.

The following is a brief description of the process; a detailed description is provided in subsequent sections.

During startup of the process, the unit will be at steady state (1400 to 1600°F) before any contaminated soil is fed to the kiln. Shutdown of the process includes a 1- to 2-day burnout, which would preclude the possibility of contaminated soil being left in the system.

At NCBC, the contaminated soil will be fed into a weighing hopper by a frontend loader. From the weighing hopper, the soil will drop onto a conveyor belt, which in turn drops the soil into a feed hopper. From the feed hopper, the soil will be dropped into either a rotary auger conveyor or a ram feeder that will directly feed the soil into the rotary kiln incinerator. Depending on the physical characteristics of the soil, a shredding or milling device may be used to provide a more uniform size feedstock. (Additional details about soil handling are presented in Subsection 5.2.4.)

The rotary kiln will heat the soil to 1000-1800°F, which will either burn or gasify all combustibles. The treated (incinerated) soil will then exit the rotary kiln and will fall into a water-sealed treated soil quencher. A chain-drag conveyor will, in turn, discharge the soil into a roll-off bin. When the soil cools, the bin will be moved to a clean soil storage area near the kiln (see Figure 2-1). The treated soil will be held for 48 h, pending laboratory verification that criteria listed in Appendix A have been met. Once verification is obtained, the soil will be returned to an area determined to be clean on the HO storage site.

Meanwhile, the off-gas from the rotary kiln is drawn into the secondary combustion chamber (SCC) where it is subjected to temperatures of 2000 to 2400°F in an excess oxygen atmosphere for a minimum of 2.2 s. The SCC ensures complete burning of waste gases.

Gases from the SCC then pass into the waste heat boiler to produce 250-psig steam for use downstream in the ejector scrubber. From the boiler, the gases then pass into the quench sump, which reduces the off-gas temperature for subsequent processing in the packed tower.

The packed tower removes 99% of the HCl gas produced during the combustion process. In the packed tower, the gases flow upward through the tower and are scrubbed by a countercurrent flow of water flowing over "tellerette" shaped packing material.

From the packed tower, the off-gas is drawn into the ejector scrubber. That device, which operates on the principle of an ejection pump, not only provides the prime motive force for moving the off-gases, but also acts to scrub particulates from the off-gas. Steam generated in the waste heat boiler serves as the motive fluid. The clean off-gas then is forced up the 35-ft stack.

2.2 Rotary Kiln

The primary function of the rotary kiln is to burn or gasify all combustible solid waste, including contaminated soils. The kiln is a carbon steel cylinder (6 ft, 7 in. in diameter, 30 ft long) mounted horizontally on a flatbed trailer. The first 10 ft of the kiln, which is the flame zone, is lined with 2-1/4 in. of insulating brick and 6 in. of fire brick. The remaining length of the kiln is lined with 6 in. of fire brick. The resulting interior dimensions are 5 ft, 3-3/4 in. ID for the flame zone and 5 ft 6 in. ID for the remaining length of 30 ft.

A 6-in.-high refractory dam is located at the downstream end of the kiln, and at several locations within the kiln. The purpose of these dams is to increase the residence time of the waste in the kiln.

The residence time of the waste is also a function of the kiln's rotation speed. A hydraulically controlled trunnion mechanism controls the kiln rotation between 1.5 to 4 rpm. An electric motor drives the hydraulic mechanism.

The kiln is supported by bearing rollers, which are mounted to one of the flatbed trailers. The kiln is mounted so that it can be inclined from 2 to 6 deg, thus providing another variable for waste residence time.

By varying the rotation speed, the number and location of the refractory dams, and the angle of the kiln, the residence time of the waste in the kiln can be varied from 30 to 60 min.

Inside the kiln, the soil will be subjected to temperatures of 1000 to 1800°F, which will cause all combustibles to be either burned or gasified. The temperature of the rotary kiln is sufficient to desorb the dioxin from the soil matrix, driving the dioxin into the off-gas. The resulting gases will pass from the incinerator to the SCC, while the incinerated waste will remain in the kiln for at least 30 min to ensure destruction and removal of dioxin to at least the delisting criteria limit.

Kiln temperature, which is measured with a thermocouple at the kiln exit, is controlled by adjusting the fuel oil flow, combustion air, and waste input.

The kiln is equipped with a single natural gas-fired burner that can produce a minimum 14 MBtu/h. The burner has a propane pilot light and an ultraviolet flame detector.

Treated soil formed in the rotary kiln is discharged into a bellows-sealed breaching at the lower end of the kiln. Treated soil falls from this breaching into a treated soil receiving tank, which is filled with water to a height above the discharge lip of the breeching to provide a water seal. A chain drag conveyor removes the treated soil from the treated soil receiving tank and transfers it into portable bins, which are used to transport the treated soil to the clean soil storage area.

2.3 Secondary Combustion Chamber (SCC)

The purpose of the SCC or combustor is to completely burn the waste off-gas containing TCDD. The SCC is a carbon steel cylinder mounted horizontally on two supports on a flatbed trailer. It is lined with 2-1/4 in. of insulating brick and 4-1/2 in. of fire brick. The resulting interior dimensions are 79-1/2 in. inside diameter by 41 ft 6 in. long, providing a 1400 ft^3 effective volume.

Gases from the kiln arrive in the SCC via a carbon steel duct lined with 4 in. of castable refractory material and having a resulting 30 in. inside diameter. This duct introduces gases into the SCC tangentially through a rectangular port on the upper right side of the inlet end of the combustor. The duct is also equipped with an expansion joint that allows for thermal expansion and eases alignment during equipment setup.

By using a 24-MBtu/h vortex burner, the off-gases are heated to 2000 to 2400°F for 2.2 s in the presence of excess oxygen. That burner is designed to produce a short (4 ft), highly turbulent flame cone. To further ensure combustion turbulence, combustion air is introduced tangentially by a blower capable of delivering 5460 cfm at 35 in. water column pressure.

Because of the SCC residence time and temperature, 99.9999% of the TCDD in the off-gas will be oxidized to the simple combustion products of H_2O, CO_2, and HCl.

The gases exit the SCC through a 54-in.-ID carbon steel duct lined with 4 in. of castable refractory material. Although not shown in

Figure 2-2, this duct will be equipped with an emergency vent that can be opened to vent gases away from the boiler if a loss of coolant water occurs in the steam drum.

2.4 Waste Heat Boiler

After the gases exit the SCC, they enter the waste heat boiler. The purpose of the waste heat boiler is to produce 8400 lb/h of 250-psig steam. That steam is subsequently used as the motive fluid in the ejector scrubber downstream. The boiler's heat transfer capacity causes the off-gas temperature to reduce from 2200 to 388°F.

2.5 Off-Gas Treatment System

The air pollution control train consists of a quench system, a packed tower, an ejector scrubber and a stack. This equipment train is designed to cool the gases, remove approximately 1500 lb/h of HCl, and remove particulates in sizes greater than 0.3 um. The quench system and packed tower are installed on the same flatbed trailer that holds the waste heat boiler. The ejector scrubber and stack are installed on a separate trailer.

2.5.1 Quench System

This system consists of a quench sump and a vertical 90-deg quench elbow, which conveys exit gases from the waste heat boiler to the sump. The quench elbow contains several nozzles that spray a fine mist of recirculated water into the elbow to cool the gases from approximately 600 to 153°F. The mist interacts with the HCl in the off-gas. The HCl gas is absorbed into the water droplets, which then fall to the bottom of the quench sump or are carried over to the packed tower. If necessary, $CaCO_3$ (lime) will be added to the quench tank to help neutralize the acid gas.

The elbow is fabricated of Inconel to resist the corrosive effects of the acid gases in the system.

The quench sump serves as a collection sump for excess recirculation water from the entire air pollution control train and also provides additional residence time for cooling gases passing through the quench system.

The quench sump is fabricated of 3/8-in. fiberglass reinforced plastic and is 8 ft long by 4 ft, 6 in. wide by 2 ft, 6 in. high. The outlet duct that conveys gases to the packed tower is also fabricated of fiberglass reinforced plastic.

The quench system is served by a pair of pumps (one of which is a standby pump) that recirculates water from the quench sump to the spray nozzles in the quench elbow. An in-line solids separator between the pumps and the spray nozzles removes particulates that could otherwise plug the nozzles. The quench sump is served by a raw water line that enables the adding of emergency makeup water to the sump in case of an emergency low-water condition.

2.5.2 Packed Tower

The packed tower removes HCl from the off-gas. The packed tower can remove 99% of the HCl leaving the quench sump, assuming a maximum loading of 1600 lb/h. The gases flow upward through the tower and are scrubbed by a countercurrent flow of water that is recirculated from the packed tower sump and from the ejector scrubber sump. The packed tower can also add makeup water to the system. Excess recirculation water is pumped to the quench elbow.

The packed tower is a fiberglass-reinforced plastic tank; it stands 14 ft tall and has a 6 ft inside diameter. It is packed to a 6-ft depth with 2 in. diameter plastic shapes called "tellerettes." A demister pad lies above the packing material.

Recirculation water flows from the packed tower sump and ejector scrubber sump, and makeup water flows are measured by turbine type flowmeters that transmit signals to digital readouts on the control pane.

2.5.3 Ejector Scrubber

The ejector scrubber is designed to remove additional particulate and HCl from the gases before they are discharged through the stack. The scrubber can remove 99% of incoming particulates in sizes greater than 0.3 µm and remove 99% of the incoming HCl. Gases exiting the packed tower are drawn through the ejector mixing tube by the force of steam delivered through a nozzle in the mixing tube. The waste heat boiler provides steam for the mixing tube. The turbulence created by the unique nozzle in the mixing tube causes the agglomeration of submicron particulates and HCl in the water vapor supplied by the steam. This agglomerated material is removed by the demister, which is integrated into the scrubber.

The ejector scrubber also serves as the prime mover for the entire system. Drawing gases through the ejector mixing tubes produces up to 15 in. water column vacuum. This negative pressure is sufficient to draw gases through the entire incineration system and prevent fugitive emissions from leaking out the system. All structural components of the ejector scrubber are fiberglass-reinforced plastic.

Condensed water removed by the demister and drainage from the ejector scrubber drain into the ejector scrubber sump. A recirculation pump recirculates this water to the ejector scrubber and to the packed tower. The recirculation water passes through a solids separator to remove suspended solids. Capability is also provided to add makeup water to the ejector scrubber sump.

2.5.4 Exhaust Stack

The exhaust stack is made of fiberglass-reinforced plastic. Three sections form a stack 35 ft, 6 in. high. Condensate formed in the stack drains to the ejector sump.

2.6 Process Monitoring

The following discussion describes the function of the most important instruments. Table 2-1 (presented in Subsection 2.7) lists the major process parameters and their normal control values. Table 2-2 (Subsection 2.8) lists all instruments and their ranges, function, and calibration frequencies.

2.6.1 Kiln Indicator and Control Devices

The indicating and control devices are described below. All measuring devices (e.g., flowmeters and thermocouples) are located on the kiln or in its outlet duct and its fuel and waste feed systems. All indicating devices (e.g., digital readouts and computer monitor) and controllers are located, except where otherwise noted, on the control panel in the control room and laboratory trailer described in a following section. The data acquisition and control computer, located on the control panel, is used to acquire and store selected critical measurements. Some of these measurements are instantaneously displayed on the computer monitor and can be printed on the computer printer. This computer is programmed to perform automatic waste cutoff (see following section) and can be programmed to control selected operating functions based on the information it acquires.

Kiln outlet temperature is measured by redundant platinum-rhodium thermocouples located in the outlet duct of the rotary kiln. One of these thermocouples is connected to a digital readout on the control room panel. The other is connected to the data acquisition and control computer, which displays readings on the computer monitor.

Kiln skin temperatures are measured by mechanical thermometers magnetically attached to the kiln surface at 10-ft horizontal intervals. These thermometers are not connected to the control panel readouts.

Kiln pressure is measured by a pressure transducer located on the outlet duct of the kiln. This transducer is connected to the data acquisition and control computer that displays readings on the computer monitor.

The kiln flame and conditions inside the kiln are monitored by a remote TV camera connected to a TV screen on the control panel. In addition, an ultraviolet flame detector continuously monitors for a flame-out condition in the burner.

Fuel feed to the kiln burner is measured with a mass flowmeter, which sends signals to (a) the data acquisition and control computer, (b) a digital readout that provides both an instantaneous and a totalized reading, (c) a stripchart recorder, and (d) a controller that controls an electric modulating valve on the common fuel line to the burner. The controller can be operated manually or automatically (using programmed setpoints) to control fuel feed rate to the burner.

In addition, the fuel feed system is equipped with several pressure and temperature indicators (with local readouts) and several pressure regulators. It has two solenoid valves that are operated by the data acquisition and control computer to automatically shut off waste feed and open clean fuel feed when combustion efficiency, stack gas oxygen concentrations, or secondary combustor outlet gas temperature fall below set values. The system is also equipped with an electrically operated valve that can be shut by a low-pressure switch when feed pressure falls below a set limit. Finally, the feed system is equipped with another solenoid valve that is controlled by the flame supervisor to shut off fuel/waste feed when there is a loss of flame in the kiln. This same solenoid valve can be operated by the low-low liquid level switch on the steam drum to shut off fuel/waste flow to the kiln when water level in the drum falls below 25%.

Combustion air flow to the kiln burner is measured by an annubar flow measuring device in the combustion air supply duct. This device sends a signal to the data acquisition and control computer and a controller, which not only provides a digital readout but also controls a modulating butterfly valve on the combustion air supply line. The controller can be operated manually or automatically to control combustion air flow rate to the kiln burner. A differential pressure switch in the combustion air supply line signals the flame supervisor to shut off a solenoid valve to prevent fuel feed to the burner during startup when combustion air pressure is below a set limit.

Supplemental air to the kiln is regulated by a locally controlled butterfly valve in the supply duct delivering this air.

Solid waste feed through either a rotary auger or a ram feeder is not measured directly. Solid waste feed rates to the kiln will be determined by measuring or estimating the loading of such waste onto the feed conveyor or into the hopper. Control of the solid waste feed rate is accomplished by manually setting limiting switches on the ram feed. The data acquisition and control computer is programmed to shut off the hydraulic system that operates the ram feeder when any of the upset conditions delineated in Subsection 2.6.2 occur. Operation of the solid waste feed system is monitored by a remote TV camera that is connected to a TV screen on the control panel.

Indicating lights and lighted manual control buttons on the control panel report the status of all fuel, waste, wastewater pump, hydraulic pumps, and air blowers that serve the kiln. The on/off manual switches, plus the manually or automatically operated controllers, provide the means of fully operating the kiln from the control panel.

2.6.2 SCC Indicator and Control Devices

The following is a brief description of the indicating and control devices. The data acquisition and control computer and controllers and all the indicating devices, except where otherwise noted, are located on the control panel of the control room and laboratory trailer.

SCC skin temperatures are monitored by three thermocouples attached to the outside metal surface of the combustor. The brick temperatures are monitored by five thermocouples inserted in the firebrick lining of the combustor.

The pressure drop across the SCC is measured by a differential pressure transducer connected to the inlet and outlet ducts of the combustor. Transducer signals are routed to the data acquisition and control computer, which displays readings on the computer monitor. Manometers are also installed in the inlet and outlet ducts to provide redundant measurement of pressures. These manometers are not connected to indicating devices on the control panel.

The combustor flame and conditions inside the combustor are monitored by a remote TV camera connected to a TV screen on the control panel.

Fuel, combustion air flow, and atomizing steam flow to the burner of the secondary combustor are measured and controlled in the same manner as described for the rotary kiln.

Indicator lights and lighted manual control buttons on the control panel report the status of all fuel and air blowers that serve the combustor. The on/off manual switches, plus the manually or automatically operated controllers, provide the means of fully operating the combustor from the control panel.

2.6.3 Waste Heat Boiler

Gas inlet and outlet temperatures, steam pressures, temperature and flow, steam drum water level, differential gas pressure across the boiler, and boiler makeup water flow are measured and recorded in the data acquisition and control computer, which displays this information on the computer monitor. The steam drum is equipped with high-high, high, low, and low-low switches. The high-high and low-low switches signal alarms on the control panel. The high switch shuts off makeup feedwater to the steam drum. The low switch orders the addition of makeup feedwater. A low-low signal shuts off fuel and waste feed to the rotary kiln and fuel to the secondary combustor to prevent damage to the boiler.

2.6.4 Quench System Controls

Quench system outlet gas temperature is measured by a thermocouple in the outlet elbow, which sends signals to a digital readout and the data acquisition and control computer on the control panel. Quench system inlet temperature is measured by the SCC outlet temperature (described in 2.6.2).

Recirculation flow from the quench sump to the quench elbow and from the packed tower to the quench elbow is measured by turbine-type flowmeters, which transmit signals to digital readouts on the control panel.

A pressure indicator (with a local readout) and low-pressure switch, which signals a low-pressure alarm, are installed on the recirculation line from the quench sump to the quench elbow. A solenoid-activated diaphragm valve, operated by a cycle timer, controls blowdown of solids from the solids separator in the quench recirculation line.

The quench sump is equipped with high-high, high, low, and low-low water level indicators. The high-high and low-low indicators activate light and sound alarms on the control panel. The high and low indicators manage the flow of recirculation water from the packed tower to the quench elbow by operation of a solenoid valve. The quench sump is equipped with a sight glass for backup monitoring of water levels in the sump.

2.6.5 Packed Tower

The packed tower sump is equipped with high-high, high, low, and low-low water level indicators. The high-high and low-low indicators activate light and sound alarms on the control panel. The high and low indicators manage the flow of recirculation water from the ejector scrubber sump to the packed tower.

2.6.6 Ejector Scrubber

Ejector scrubber inlet and outlet temperatures are measured by thermocouples located in the inlet and outlet ducts. These measurements are transmitted to digital readouts on the control panel, and the outlet temperature measurement is transmitted to the data acquisition and control computer. Also, a pH meter is currently being installed in the scrubber sump to provide the data necessary to control the rate of NaOH injection.

Recirculation water from the ejector scrubber sump to the ejector scrubber and makeup water added to the ejector scrubber sump are measured by turbine-type flowmeters, which send signals to digital readouts on the control panel. The makeup water flow measurement is transmitted to the data acquisition and control computer.

Pressure in the ejector scrubber recirculation line is measured by pressure indicators with local readouts. Low pressure is detected by a low-pressure switch that sounds an alarm on the control panel.

Differential gas pressure across the ejector scrubber is measured by a pressure transducer that transmits its measurements to the data acquisition and control computer.

The temperature of the steam delivered to the ejector scrubber is measured by a thermocouple that transmits measurements to a digital readout on the control panel and to the data acquisition and control computer. The delivery steam line is also equipped with a pressure indicator (with local readout) and a low-pressure switch that operates an alarm on the control panel.

The ejector scrubber sump is equipped with high-high, high, low, and low-low water-level indicators. The high-high and low-low indicators activate light and sound alarms on the control panel. The high and low indicators manage the delivery of makeup water to the ejector scrubber sump. The sump is also equipped with a sight glass to independently monitor the water level in the sump.

2.6.7 Stack Monitoring

Stack outlet gas temperature is measured by a thermocouple that transmits measurements to a digital readout on the control panel. The stack has a system to continuously collect gases that are transmitted to the oxygen, carbon monoxide, carbon dioxide, and oxides of nitrogen analyzers in the control room and laboratory trailer. Gas analysis measurements are recorded on a stripchart on the control panel and are transmitted to the data acquisition and control computer, which stores this information and uses it (except for oxides of nitrogen data) to operate the automatic waste feed cutoff and waste-to-fuel switching controls, when required. A more detailed description of the stack gas monitoring system is provided in Appendix D.

2.6.8 Automatic Waste Feed Shutoff Controls

The data acquisition and control computer is programmed to automatically switch feed to the burner from waste to fuel and to simultaneously and automatically cut off wastewater and sludge flows to the wastewater and the sludge injection nozzles and solid waste feed through the ram feed when any of the following conditions occurs:

1. Combustion efficiency, as measured by 100 x $O_2/(CO_2 + CO)$, falls below 99, where CO and CO_2, respectively, are the carbon monoxide and carbon dioxide concentrations in the stack gases.

2. Oxygen concentration in the stack gases falls below 3%.

3. Secondary combustor outlet gas temperature falls below 2150°F.

These same conditions cause a simultaneous automatic wastefeed switching or waste cutoff to the secondary combustor. Figure 2-3 illustrates this control procedure. [Note: The wastewater and sludge injection nozzles will not be used in this demonstration project. The waste oil injection nozzles will be used only to dispose of waste kerosene oil used during final cleanup operations.]

Stack gas analyzers in the control room and laboratory trailer continuously supply measurements of the concentrations of oxygen, carbon monoxide, and carbon dioxide in the stack gases. These measurements are transmitted to the data acquisition and control computer, which uses them to monitor conditions 1 and 2 above, and effect automatic waste feed switching and shutoff. The thermocouple in the combustor outlet duct provides the computer with data to monitor condition 3 and effect automatic wastefeed switching and cutoff procedures.

The flame supervisor serving the kiln shuts off all fuel and waste flows to the kiln burner when there is a loss of flame in the kiln. This automatic shutoff procedure is illustrated in Figure 2-4.

The flame supervisor serving the secondary combustor switches feed to the kiln burner from waste to fuel and cuts off all other waste feeds to the kiln when there is a loss of flame in the combustor. Simultaneously, this supervisor shuts off all fuel and waste feeds to the combustor. This automatic procedure is illustrated in Figure 2-5.

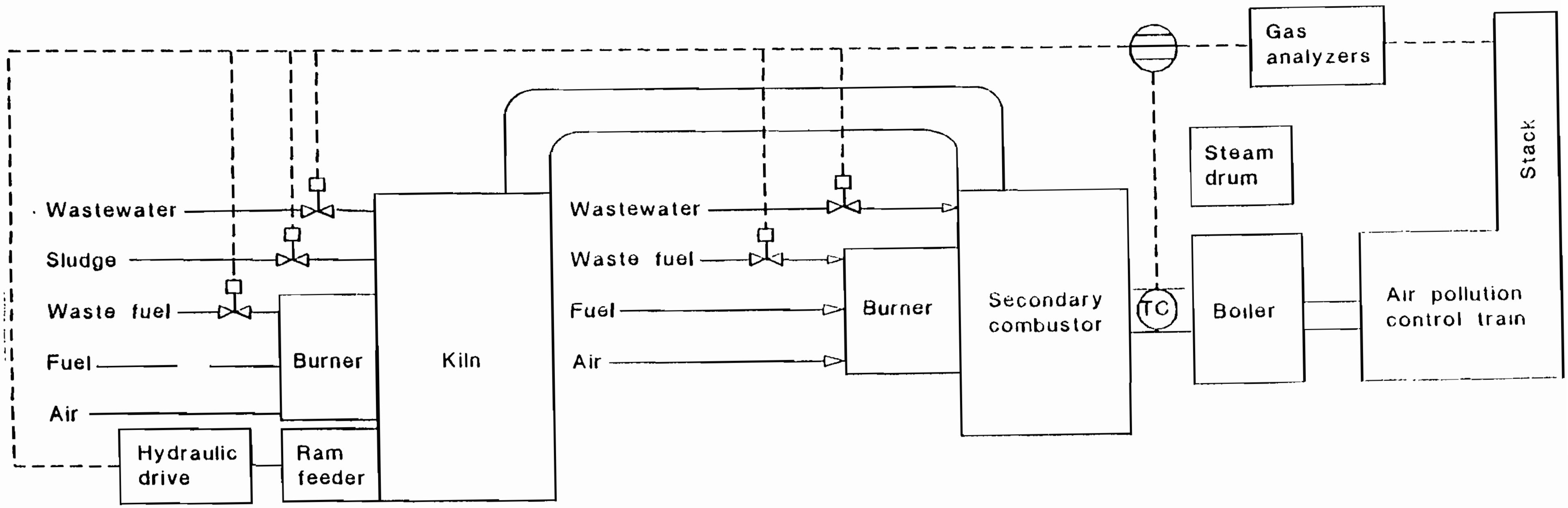


Figure 2-3. Automatic shutoff and feed switching controls for loss of designed thermal conditions.

CV5 2083

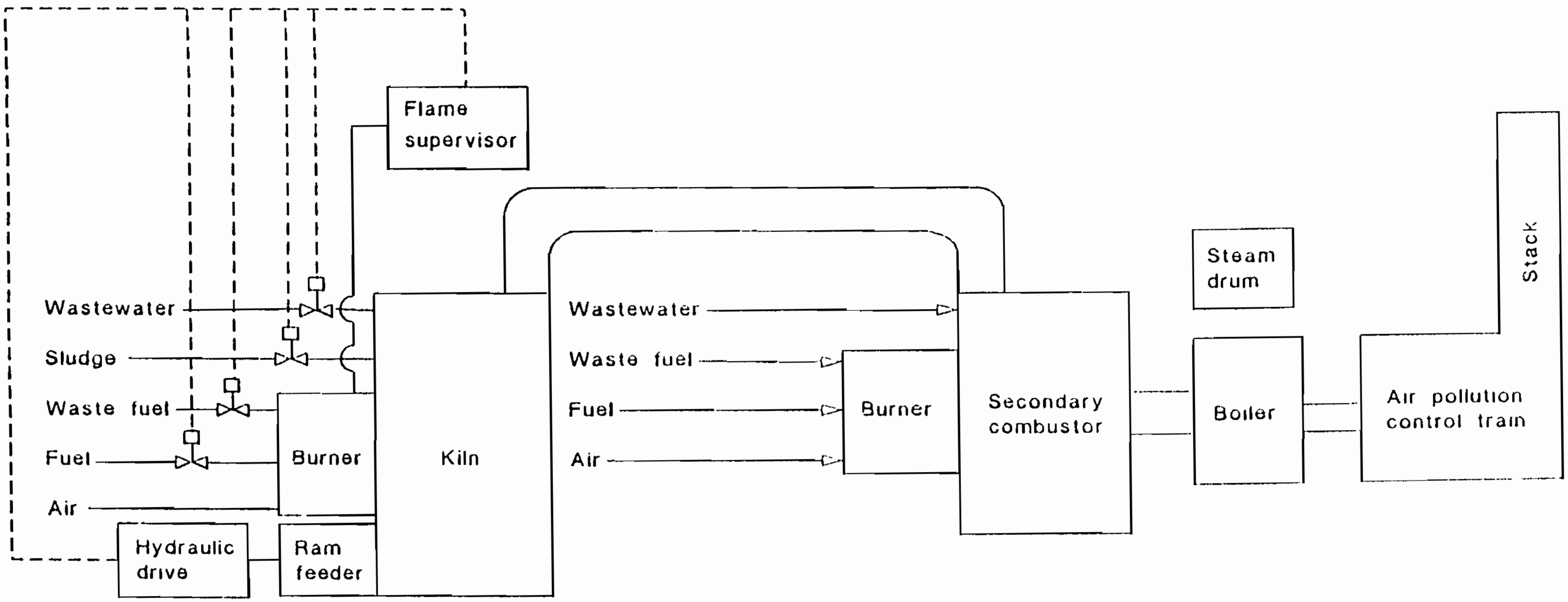


Figure 2-4. Automatic shutoff controls for loss of flame in rotary kiln.

CV5 2081

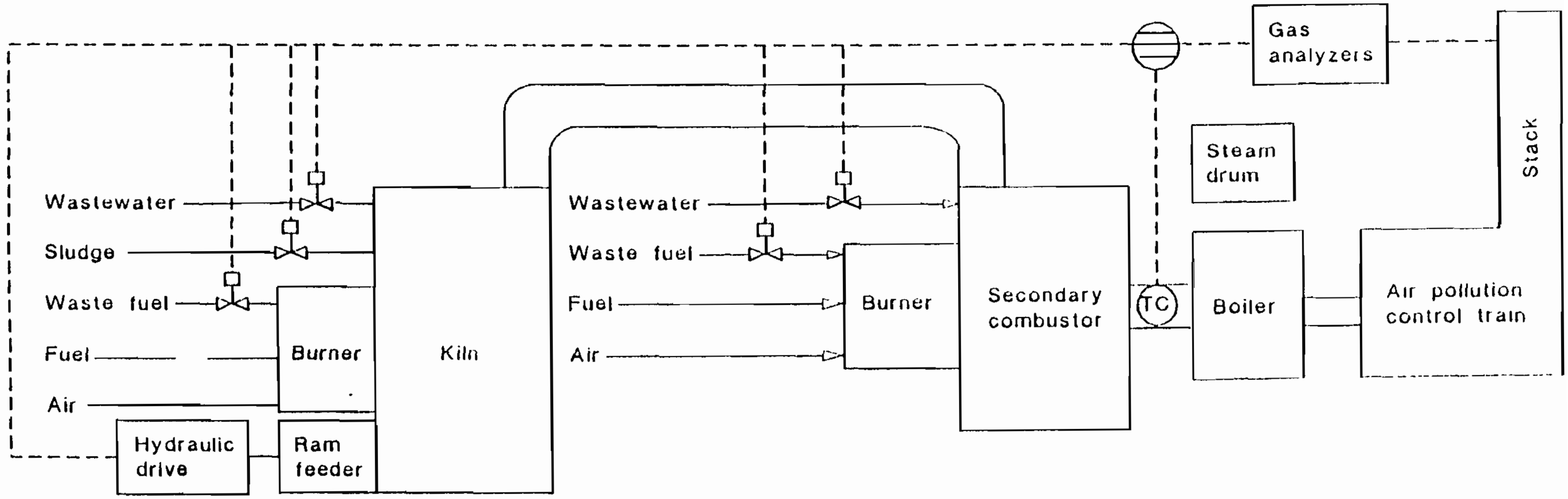


Figure 2-5. Automatic shutoff controls for loss of flame in secondary combustor.

CV5 2083

The low-low liquid level switch on the steam drum shuts off all fuel and waste feeds to the kiln and secondary combustor when the water level in the drum falls below 25%. This automatic procedure is illustrated in Figure 2-6.

2.6.9 Control Room and Laboratory

The control room and laboratory are located in a van trailer (Figure 2-1). The control room contains all indicator readouts, controllers, control switches, and the data acquisition and control computer used to operate the MWP-2000 efficiently and effectively. Most of this instrumentation is installed on a control panel. The control room also houses the stack gas analyzers that were discussed in 2.6.8.

The laboratory is fully equipped to enable chemical and heating value analyses of wastes to be burned and chemical analyses of the residues (treated soil and effluent wastewaters) generated by the system. The two major analytical instruments in the laboratory are a gas chromatograph equipped with both flame ionization and electron capture detectors, and an atomic absorption spectrophotometer equipped with hydride and mercury vapor systems. Additional equipment in the laboratory include an adiabatic bomb calorimeter, an oven, a furnace, a fume hood, an analytical balance, a pH meter, stirring and heating apparatus, and general laboratory glassware and chemicals.

2.7 Process Parameters and Control Values

Table 2-1 summarizes the major parameters for the MWP-2000. In addition, the normal control value, method of determining the value, instrument used to monitor the parameter, and method of controlling the monitoring instrument are provided.

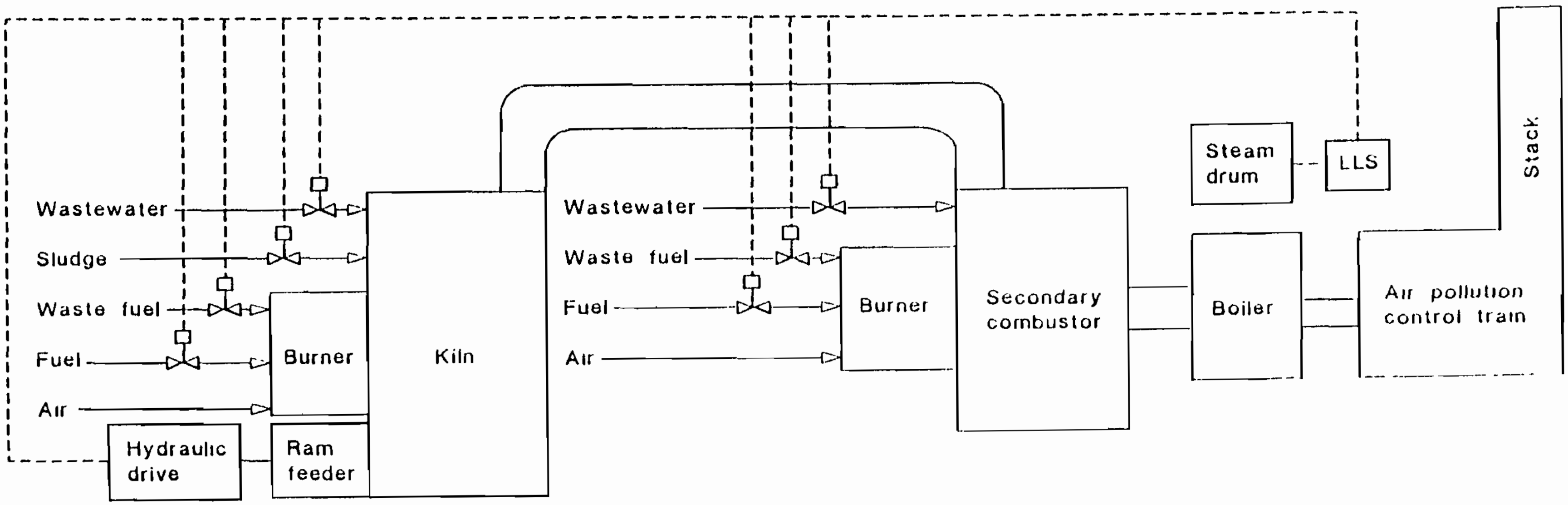


Figure 2-6. Automatic shutoff controls for low-low water level in steam drum.

CV5 2079

2.8 Inspection and Maintenance

Daily, weekly, monthly, and full shutdown instrument inspection and maintenance schedules are presented in Table 2-2.

2.9 Test Plan

In addition to the soil and fill materials identified in Section 1.3, small quantities of existing refuse and/or waste generated in association with the project will be fed to the incinerator. Such materials include personnel protective clothing, sampling equipment, combustible materials from erection of the process unit, decontamination materials, and chipped concrete from concrete pads on the storage site.

The MWP-2000 will be inspected before arrival onsite. The following gives a brief operation plan for the proposed project:

1. Transport equipment to NCBC.

2. Set up equipment (Figures 2-1 and 5-1) (approximately 6 weeks).

3. Inspect equipment. (A registered professional engineer will certify that equipment has been erected in accordance with permit conditions.)

4. Perform thermal test (approximately 2 weeks).

5. Perform initial test runs to provide performance verification data and any data required through EPA delisting process.

6. Hold period to obtain analytical results for 5 above.

7. Following successful completion of 5 and 6, begin 90- 120-day operational period.

8. Decontaminate equipment (approximately 1 week).

9. Shut down equipment.

10. Disassemble system (5 to 6 weeks). (A registered professional engineer will certify that equipment has been shut down and disassembled in accordance with permit conditions.)

11. Remove equipment from NCBC.

TABLE 2-1. PROCESS PARAMETERS/NORMAL CONTROL VALUES

Parameter	Method	Instrument	Method of Control	Normal Control Value
ROTARY KILN				
Soil feed rate	Calculated from weigh hopper and time of feed	Load cell and timer	Manual	2-3 tons/h
Soil residence time	Calculated from kiln rotational speed and calibration factor for material	Revolution counter	Hydraulic flow control valve	1-2 rpm
Combustion air supply[a]	Orifice	ΔP transducer	Butterfly valve	120 lb/min
Outlet gas temperature	NA	Thermocouple	Wastewater feed and combustion air	1600-1800°F
Soil temperature	Calculated from kiln shell temperature and gas temperature	Bimetallic temperature	Outlet gas temperature	1600°F
SECONDARY COMBUSTOR				
Waste feed to burner	NA	Mass flow meter	Flow control valve	30 lb/min
Combustion air to burner	Orifice	ΔP transducer	Butterfly valve	300 lb/min
Outlet gas temperature	NA	Thermocouple	Wastewater feed and combustion air	2200°F

TABLE 2-1. (continued)

Parameter	Method	Instrument	Method of Control	Normal Control Value
Gas residence time	Calculated from mass flows and gas temperature	NA	Adjust mass flows	2 to 2.1 s
Combustion efficiency	Calculated from stack gas CO and CO_2	Stack gas monitors	NA	99.9%
WASTE HEAT BOILER				
Outlet gas temperataure	NA	Thermocouple	NA	450°F
Steam pressure	NA	Pressure transducer	Steam drum vent control valve	220-240 psig
Steam drum level	NA	Level switches	Makeup flow control valve	40-60%
Makeup water flow rate	Orifice	ΔP transducer	Flow control valve	20-30 gpm
QUENCH SYSTEM				
Recirculation flow rate	Orifice	ΔP transducer	Constant	100 gpm
Makeup water flow rate	Orifice	Δ transducer	Flow control valve	15 gpm
Outlet gas temperature	NA	Thermocouple	NA	190°F
PACKED TOWER				
Recirculation flow rate	Orifice	Δ transducer	Constant	170 gpm
Makeup water flow rate	Orifice	ΔP transducer	Flow control valve	15 gpm

TABLE 2-1. (continued)

Parameter	Method	Instrument	Method of Control	Normal Control Value
SCRUBBER				
Recirculation flow rate	Orifice	ΔP transducer	Constant	40 gpm
Nozzle steam pressure	NA	Pressure transducer	Steam flow control valve	150 psig
STACK[b]				
Stack gas oxygen concentration	Extractive continuous emission monitor	O_2 analyzer	Combustion air	4% minimum
Stack gas carbon monoxide concentration	Extractive continuous emission monitor	CO analyzer	Waste feed	Maintain combustion efficiency above 90%
Stack gas carbon dioxide concentration	Extractive continuous emission monitor	CO_2 analyzer	Waste feed	Maintain combustion efficiency above 99%

a. A loss of combustion air supply will activate the automatic waste feed shutoff circuit.

b. Also operates during test burn.

TABLE 2-2. EQUIPMENT/INSTRUMENT LIST

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Rotary Kiln		
Waste feed to burner, lb/min	1	Continuous
Clean fuel feed, lb/min	1	Continuous
Sludge feed, lb/min	1	Continuous
Wastewater feed, lb/min	1	Continuous
Combustion air feed, lb/min	1	Continuous
Vacuum, in. water	1	Continuous
Outlet gas temperature, °F	1	Continuous
Liquid waste and fuel feed lines	2	Inspect for leaks. Repair if found.
Pump and strainer on operating waste fuel feed line	2	Switch feed to alternate pump. Remove and clean strainer.
Pump on operating clean fuel feed line	2	Switch feed to alternate pump.
Pump and strainer on operating wastewater feed line	2	Switch feed to alternate pump. Remove and clean strainer.
Combustion air and supplemental air blowers	2	Check for overheated bearings and vibrations. Repair if found.
Solid waste feed conveyor and ram or screw feed	2	Inspect for visual signs of malfunction. Repair if found.
Sight glass into kiln and TV camera lens	2	Clean.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Hydraulic drive for ram or screw feed	3	Inspect hydraulic fluid level. Fill if necessary. Inspect hoses for leaks.
Hydraulic drive for kiln	3	Inspect hydraulic fluid level. Fill if necessary. Inspect hoses for leaks.
Hydraulic drive for treated soil removal chain	3	Inspect hydraulic fluid level. Fill if necessary. Inspect hoses for leaks.
Feed pumps on waste fuel, clean fuel, wastewater and sludge feed lines	3	Inspect oil level. Fill if necessary.
Strainer on operating clean fuel feed line	3	Remove and clean.
Combustion air and supplemental air blowers	3	Lubricate.
Propane tank serving burner pilot	3	Check tank pressure. Fill if necessary.
Burner	3	Visually inspect externally for signs of leaks, wear, overheating or damage.
Ram or screw feed	3	Inspect tightness of nuts. Tighten if loose.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Combustion air and supplemental air blowers	4	Inspect suction filters and replace cartridges if necessary.
Roller bearings	4	Lubricate.
Solid waste feed conveyor	5	Lubricate roller bearings.
Refractory	5	Inspect for loose brick, spalling, cracking, or other damage. Repair if necessary.
Burner	5	Remove and clean nozzle and inspect for wear or damage. Repair if necessary.
Flame detector		Clean flame detector lens.
Cyclones	5	Inspect refractory for damage. Repair if found.
Treated soil removal system	5	Inspect chain drag for excessive wear. Replace if found.
Waste feed system	5	Clean and inspect heaters on waste fuel feed line. Repair if necessary.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Mass flow meters on fuel, wastewater and sludge feed lines	5	Calibrate.
Combustion air and supplemental air blowers	5	Inspect vanes for damage or excessive wear. Repair if found.
Secondary Combustor		
Waste feed to burner, lb/min	1	Continuous
Clean fuel feed, lb/min	1	Continuous
Wastewater feed, lb/min	1	Continuous
Combustion air feed, lb/min	1	Continuous
Pressure drop, in. water	1	Continuous
Outlet gas temperature, °F	1	Continuous
Oxygen, (%)	1	Continuous
Carbon monoxide, ppm	1	Continuous
Gas residence time, s	1	Continuous
Liquid waste and fuel feed lines	2	Inspect for leaks. Repair if found.
Pump and strainer on operating waste fuel feed line	2	Switch to alternate pump. Remove and clean strainer.
Pump on operating clean fuel feed line	2	Switch to alternate pump.
Pump and strainer on operating wastewater feed line	2	Switch to alternate pump. Remove and clean strainer.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Combustion air blower	2	Check for overheated bearings and vibrations. Repair if found.
Burner	2	Rod center tube of nozzle.
Sight glass into combustor and TV lens	2	Clean.
Oxygen and CO monitors	2	Calibrate (zero and span). Check flow rate and correct if necessary. Inspect desiccator. Replace desiccant if necessary.
Feed pumps on waste fuel, clean fuel and wastewater feed lines	3	Inspect oil level. Fill if necessary.
Strainer on operating clean fuel feed line	3	Remove and clean.
Combustion air blower	3	Lubricate.
Propane tank serving burner pilot	4	Check tank pressure. Fill if necessary.
Oxygen and CO monitors	4	Calibrate (four points on scale).
Burner	4	Visually inspect externally for signs of leaks, wear, overheating or damage.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Combustion air blower	4	Inspect suction filter and replace cartridge if necessary.
Combustor	5	Clean out accumulated solids.
Refractory	5	Inspect for loose brick, spalling, cracking, or other damage. Repair if found.
Burner	5	Remove and clean nozzle and inspect for wear or damage. Repair if found.
		Clean flame detector lens.
Waste feed system	5	Clean and inspect heaters on waste fuel feed line. Repair if necessary.
Mass flow meters on waste fuel, clean fuel and wastewater feed lines	5	Calibrate.
Oxygen monitor	5	Check fuel cell. Replace if required.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
CO monitor	5	Clean sample cell.
Combustion air blower	5	Inspect vanes for damage or excessive wear. Repair if found.
<u>Waste Heat Boiler</u>		
Outlet gas temperature, °F	1	Continuous
Steam drum water level, %	1	Continuous
Make-up water flow, gpm	1	Continuous
Pressure drop, in. water	1	Continuous
Steam temperature, °F	1	Continuous
Steam pressure, psig	1	Continuous
Steam flow, lb/min)	1	Continuous
Boiler feed pumps	3	Inspect oil level. Fill if necessary.
Strainers	3	Remove and clean.
Boiler	5	Inspect boiler tubes and end plates for solids buildup and corrosion. Clean and repair if necessary.
Boiler feed pumps	5	Lubricate bearings.
<u>Quench System and Packed Tower</u>		
Pressure drop, in. water	1	Continuous
Recirculation flow, gpm	1	Continuous

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Flow from packed tower, gpm	1	Continuous
Effluent flow, gpm	1	Continuous
Inlet gas temperature, °F	1	Continuous
Recirculation flow, gpm	1	Continuous
Flow from scrubber, gpm	1	Continuous
Flow to quench system, gpm	1	Continuous
Entire system and associated piping	2	Inspect for leaks. Repair if found.
Quench recirculation pumps	3	Inspect oil level. Fill if necessary.
Packed tower recirculation pumps	3	Inspect oil level. Fill if necessary.
Strainer on packed tower recirculation line	3	Remove and clean.
Mass flow meters on quench recirculation line, packed tower recirculation line, line from packed tower to quench elbow, line from scrubber sump to packed tower and packed tower water makeup line	5	Calibrate.
Quench sump	5	Clean if necessary. Inspect for heat damage.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Ductwork	5	Inspect for solids buildup, corrosion, and heat damage. Clean and/or repair as necessary.
Quench elbow	5	Clean and inspect nozzles.
Solids separators	5	Clean and inspect for operability. Repair as necessary.
Ejector Scrubber and Stack		
Inlet gas temperature, °F	1	Continuous
Outlet scrubber gas, °F temperature	1	Continuous
Pressure drop, in. water	1	Continuous
Inlet steam pressure, psig	1	Continuous
Recirculation flow, gpm	1	Continuous
Makeup water flow, gpm	1	Continuous
Outlet stack gas, °F temperature	1	Continuous
Oxygen, %	1	Continuous
Carbon dioxide, %)	1	Continuous
Carbon monoxide, ppm	1	Continuous
Nitrogen oxides, ppm	1	Continuous
Combustion efficiency, %	1	Continuous
Entire system and associated piping	2	Inspect for leaks. Repair if found.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
pH meter in scrubber sump	2	Calibrate.
Recirculation pumps	3	Inspect oil level. Fill if necessary.
Caustic feed pumps	3	Inspect oil level. Fill if necessary.
Strainer on recircula-ion line	3	Remove and clean.
Mass flow meters on recirculation, caustic feed and makeup water line	5	Calibrate.
Scrubber sump	5	Clean if necessary.
Solids separators	5	Clean and inspect for operability. Repair as necessary.
Stack Sampling Equipment		
Water trap and filter	2	Drain water from trap. Clean filter if required. Inspect desiccant and replace if necessary.
Air line and sample line	2	Check adequacy of air flow to drier. Correct if necessary. Check flow rate in sample line. Adjust if necessary.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Oxygen, CO, CO_2, NO_x and hydrocarbon analyzers	2	Calibrate (zero and span).
pH and conductivity meters	2	Calibrate.
Pump	3	Inspect pump flow output. Replace pump head if necessary.
Oxygen, CO, CO_2, NO_x, hydrocarbon analyzers	3	Calibrate (four points on scale).
CO and CO_2 analyzers	4	Clean sample cell.
Oxygen analyzer	4	Check fuel cell. Replace if required.
NO_x analyzer	4	Clean capillary orifice.
Hydrocarbon analyzer	4	Check pump pressure and photoionizacell output. Correct if necessary.
Monitoring system	5	Drain and clean or replace tubing.
<u>Neutralization and Concentration Unit</u>		
Entire unit and associated piping	2	Inspect of leaks. Repair if found.
Concentrator recirculation pump	2	Check to ensure steam flow to pump casing.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Transfer pumps from neutralizer to concentrator	3	Inspect oil level. Fill if necessary.
Concentrator recirculation pumps	3	Inspect oil level. Fill if necessary.
Lime feeder	4	Lubricate bearings.
Neutralization tank	4	Drain and clean.
Concentrator	5	Drain and clean.
Concentrator recirculation pumps	5	Clean.
<u>Boiler Water Makeup Treatment Unit</u>		
Entire unit and associated piping	2	Inspect for leaks or spills. Repair if found.
Boiler feed pumps	2	Alternate operation.
Tanks	2	Check adequacy of water/reagent in tanks. Correct if necessary.
Raw water transfer pumps	3	Inspect oil level. Fill if necessary.
Treated water transfer pumps	3	Inspect oil level. Fill if necessary.
Sulfite and caustic solution transfer pumps (if installed)	3	Inspect oil level. Fill if necessary.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Strainers on raw water line, treated water line, salt solution feed line and boiler feed line	3	Remove and clean.
Saltwater solution tank	4	Empty, clean and refill.
Mass flow meters on treated water line, de-aerator inflow line and boiler makeup water feed line	5	Calibrate.
Air Supply System		
Compressor	2	Check for unusual noise or vibration. Repair if found. Inspect oil level. Fill if required.
Air tank	2	Drain condensate.
Regulators on instrument lines	2	Drain condensate.
Compressor	3	Clean air inlet filter.
Air tank	3	Inspect operability of pressure relief valve.
Compressor	4	Clean after-cooler tubes and cooler fins.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Desiccators	4	Inspect desiccant. Fill or replace as necessary.
Compressor	5	Change oil.
Emergency Generator		
Generator	2	Start to ensure operational readiness. Repair if necessary.
Bulk Liquids Staging Unit		
Tanks and piping	2	Inspect for leaks. Repair if found.
Containment system	2	Inspect for standing water or liquids. Remove if found.
Unloading and recirculation/transfer pumps	3	Inspect oil level. Fill if necessary.
Strainers on unloading and recirculation/transfer lines	3	Remove and clean.
Bulk Solids Staging Unit		
Wastes staged	2	Inspect for improper segregations of batches and signs of wind or water erosion of wastes. Correct if found.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Loose Solids Staging Unit		
Wastes staged	2	Inspect for improper segregation of batches and leaking containers or items. Correct if found.
Containment System	2	Inspect for standing water or liquids. Remove if found.
Drum and Solids Processing Units		
Fugitive emission control equipment and procedures	2	Inspect for malfunction or improper implementation. Correct if found.
Containment system	2	Inspect for standing water or liquids. Remove if found.
Pumps	3	Inspect oil level. Fill if necessary.
Hydraulic drives	3	Inspect hydraulic fluid levels. Fill if necessary. Inspect hoses for leaks. Repair if found.
Motors and equipment bearings	4	Lubricate.

TABLE 2-2. (continued)

Equipment/Instrument	Inspection/ Calibration Frequency[a]	Inspection/ Maintenance
Treated Soil Staging Unit		
Roll-off boxes and drums	2	Inspect for being covered. Correct if not covered.
Effluent Staging Unit		
Tanks and piping	2	Inspect for leaks and spills. Repair if found.
Containment system	2	Inspect for standing water or liquids. Remove if found.
Clean Fuel Storage Unit		
Tank and piping	2	Inspect for leaks and spills. Repair if found.
Containment system	2	Inspect for standing water or liquids. Remove if found.
MWP-2000 Site		
Containment sumps	2	Inspect for standing water or liquids. Remove if found.

a. Key for frequency column: 1 = continuous computer monitoring; 2 = daily; 3= weekly; 4 = monthly; 5 = full shutdown.

3. PROCESS VALIDATION

3.1 Technology Assessment and Selection

The primary alternatives considered for the disposal or detoxification of dioxin-contaminated soils are presented below.

Soil contamination by polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) compounds, which are acutely toxic and have aroused great public concern, is a large environmental problem. In the state of Missouri, for example, about 40 sites have been contaminated with 2,3,7,8-TCDD. Through examinations of emergency measures and remedial options, terminal disposal methods have been conducted for the Missouri sites. Contamination at Johnston Island and NCBC is similar in TCDD concentration (generally 1 to 200 ppb) to Missouri, where concentrations range from 1 to 1600 ppb. At Johnston Island and NCBC, however, 2,4,-D and 2,4,5-T ester residues are also present and must be considered in any potential treatment processes.

The following major approaches to managing soil containing TCDD or PCDD exist:

1. Excavation and offsite disposal or treatment

2. Excavation and onsite storage and treatment.

The costs incurred by excavation, transportation, and disposal or treatment at EPA-permitted hazardous waste facilities presently eliminate option 1 as a near-term environmental restoration technology.

Onsite treatment of TCDD in soil has great social and political appeal. Furthermore, restoration costs are reduced if excavation and transportation of the soil are eliminated.

Alternatives are classified as thermal, chemical, and physical; the availability of laboratory, pilot scale, or demonstration scale data relates to either dioxin or similar organic compounds.

3.1.1 Chemical Treatment

3.1.1.1. UV Photolysis. The International Technology Corporation (ITC) has developed a process of thermal desorption of dioxin from contaminated soil followed by destruction of that dioxin using ultraviolet light. This technology is potentially a flexible and viable alternative of dioxin detoxification. A pilot-scale demonstration of this process was conducted at NCBC in 1985. Results of the demonstration are being compiled in a final report by EG&G Idaho. Small-scale test runs will be conducted at a former HO storage site on Johnston Island in the central Pacific in early 1986.

3.1.12. Alkalide Polyglycoxide Process. Several companies have filed patents for processes that involve nucleophilic displacement of chlorine from dioxin in solution, on surfaces, and in soil by treatment with a combination of alkali or basic carbonate, an oxidizing agent, and an organic reagent, such as polyethylene glycol. Although most of the suggested procedures operate at elevated temperature, the Sea Macroni, Inc. patent states that the process is applicable at room temperature. Field testing at Times Beach, Missouri, is under way for a process marketed by Galston Associates. Advantages to the alkalide polyglycoxide process are its application as a continuous process, its high rate of reaction, and the generation of a completely decontaminated effluent stream. Disadvantages include uncertainty about the effect of water on the reaction and the need for laboratory testing to indicate effectiveness and optimize application for each case. This technology is applicable to in situ treatment of contaminated soils, although formulations and methods of application to the particular soil must be correctly defined and are not available at this time.

3.1.1.3. Chemical Oxidation with Catalyst. The successful degradation of dioxin dissolved in water, chloroform, nitromethane, carbon tetrachloride, or other organic solvents of non-nucleophilic character has been demonstrated. The procedure is based on oxidation catalyzed by small amounts of ruthenium tetroxide. At room temperature, TCDD in chloroform solution showed a half-life of less than 15 min. Disadvantages of this technology are the limited data base, expensive alloys needed for construction of materials, and toxicity of ruthenium tetroxide. The procedure is not expected to be applicable for in situ treatment of contaminated soils. It may be able to destroy small amounts of TCDD after its separation from soil and collection in an organic solvent.

3.1.1.4. Wet Oxidation.

3.1.1.4.1 Catalyzed Wet Oxidation--ITC has performed laboratory tests demonstrating greater than 99.5% reduction of TCDD in aqueous organic waste streams by the process of catalyzed wet oxidation. This process, carried out at temperatures between 175 and 225°C, is based on the use of catalytic amounts of multivalent transition metal ions, bromide, and nitrate ions to promote oxidation of organic compounds to CO_2, H_2O, and inorganic reaction products. The process involves high capital expense, is carried out at high pressures, and uses new technology. Application to contaminated soil would complicate the process, and because of the developmental state and projected high treatment costs, this technology will not be considered further.

3.1.1.4.2 Supercritical Fluids--The Modar Corporation has constructed a pilot plant to test a process based on the oxidation of dioxin in aqueous streams. Testing is to take place at Love Canal in the near future. The reaction takes place at supercritical water conditions (325°C, 5000 to 8000 psi), using air or oxygen as the oxidizing agent. Although the reaction is reputed to have very high reaction rates, the lack of a strong data base, in combination with the requirement for expensive corrosion-resistant materials of construction, limits the immediate applicability of this technology.

3.1.1.4.3 Organo-Metals Dechlorination Process--Numerous companies have developed similar methods to treat transformer oils contaminated with 100- to 1000-ppm PCBs. The methods are based on the dechlorination of PCBs using elemental metal (such as sodium) and a reagent (naphthalene in tetrahydrofuran in the Goodyear method). The methods yield a reusable transformer fluid or a usable fuel. Demonstration tests using SunOhio mobile units resulted in final PCB concentrations of 1 to 7 ppm. Goodyear estimates the cost of decontamination at 30 cents/gal of oil. This dechlorination method may be technically applicable to dioxin-contaminated organic liquids; however, soil containing moisture will result in high chemical costs.

3.1.1.4.4 Hydrazine Reduction Process--The Research Manufacturing Consultation (RMC) Corporation has tested a soil detoxification method using hydrazine (H_2H_4) and a catalyst in alkaline solution to reduce dioxin to harmless end-products. The process is reported to be suitable for in situ use or treatment of excavated material. In moist soil, the reaction produces hydrogen peroxide, which can oxidize other reaction products, such as benzene and phenol, to carbon dioxide and water. Excess hydrazine oxidizes to elemental nitrogen. Laboratory test results indicated that soil treated with ppm levels of dioxin were successfully detoxified, and RMC plans to conduct tests at Times Beach to gather data to establish the technical performance of the methods. Low capital and operating costs are projected for this treatment alternative.

3.1.2 Microbiological Treatment

3.1.2.1. Preliminary Microbial Metabolization. A few species of bacteria have been shown to have the ability to hydroxylate TCDD. Although this technology is very promising, it is currently limited by:

- The lack of data base

- Uncertainty regarding degradation intermediates and end-products, and their toxicity

- Complications that arise in soil detoxification applications because of the strong sorptive properties of TCDD on soil and consequent long-term uncertainties.

3.1.2.2. Preliminary Enzyme Applications. Although few companies are marketing processes to detoxify dioxin and PCBs through organic compound modification by enzymes, this emerging technology is limited by the same factors that limit microbial applications.

3.1.3 Thermal

3.1.3.1. Incineration. Laboratory studies have shown that destruction of 2,3,7,8-TCDD at temperatures above 800°C can be greater than 99% successful. Herbicide Orange contaminated with 2,3,7,8-TCDD was successfully incinerated at sea in the 1970s. Furthermore, rotary kiln incineration is a proven technology for a variety of other incineration needs.

A rotary kiln incinerator was chosen as the best available technology to demonstrate reliability and maintainability to achieve the stated goal at the lowest cost. The rotary kiln was chosen because of the availability of rotary kiln incineration data, the mobility of the proposed incinerator, and the lack of detailed data from the other processes considered. Although other alternatives could be made portable, the proposed incinerator is already portable and manufactured with existing readily available components.

3.1.3.2. Microwave Plasma Detoxification. The decomposition of PCBs in liquids or gases by exposure to the microwave-excited electrons of a gaseous plasma was investigated in pilot-scale tests by the USEPA Solid and Hazardous Waste Research Division. Conversion efficiency of only 99% was achieved; however, tests on highly chlorinated pesticides resulted in conversion efficiencies of 98%. Decomposition products from microwave plasma tests on Aroclor 1242 (PCB) liquid were identified as CO_2, CO, H_2O, $COCl_2$, Cl_2CO, and HCl. Although this technology may have application to detoxification of dioxin-contaminated material, the state of process development precludes its further consideration at this time.

3.1.3.3. Vitrification. A soil detoxification process proposed by Battelle Northwest decomposes organics and converts inorganics to glass. It is based on heating soil using electrodes placed at depths of up to 30 to 40 ft in the soil. High voltage is applied to the electrodes for 3 to 5 days. The area being treated is covered, and the off-gases generated are collected for treatment. Projected costs for treatment using this process are \$100 to \$400/yd^3 of soil. Costs are dependent on soil moisture, electrode spacing, and required depth of vitrification. The lack of a strong data base for this innovative technology and projected high costs preclude its further consideration for application to this case.

3.1.3.4. Plasma Arc Pyrolysis. A mobile pyrolytic unit centered around a plasma arc device and plasma reactor is to be tested by Pyrolysis Systems Incorporated at Love Canal for the destruction of TCDD in liquids and sludges. Tests conducted on a similarly designed pilot unit at the Royal Military College of Canada showed a destruction removal efficiency of 99.9999999% in the destruction of Askarel (PCB). In either unit, wastes are injected into a co-linear electrode space, where they are atomized by plasma species relaxing from highly activated states to lower levels. Wastes are then pyrolized in the reactor. Hydrogen chloride by-product from the pyrolysis reaction of chlorinated organic compounds is converted to sodium chloride in a caustic scrubber. The mobile unit is sized to accept 1 to 2 gal/min of waste material. Until pilot testing data are available, the regulatory acceptability and technical feasibility for application to contaminated soil are not clear.

3.1.3.5. Corona Glow Processing. Westinghouse Electric Corporation has developed a process to destroy organic materials in carrier gas streams by passing the gas stream through the discharge region of a corona glow device. The discharge excites molecules, rupturing bonds and resulting in detoxification of the organic material. This innovative technology presently has a limited data base and is not directly applicable for contaminated soils.

3.1.3.6. Radio Frequency Detoxification. Several companies have proposed an in situ soil decontamination technique based on heating the soil using radio frequency waves. The technology is discussed in an EPA publication "Decontamination of Hazardous Waste Substances from Spills and Uncontrolled Waste Sites by Radio Frequency In Situ Heating," PB84-167642, 1984. Field demonstrations of this process have been conducted on oil shales and tar sands for the recovery of liquid hydrocarbon fuels. Although this process may be technically feasible, it is not a practical choice for demonstrating decontamination of soil because of projected high capital cost, high power cost, uncertainty that all the material can be decontaminated to the desired specification at the required soil depths, and the difficulty and unreliability of collecting all vaporized compounds for subsequent treatment/destruction.

3.1.4 Separation and Concentration Technologies

These technologies are intended to separate TCDD from other matrices, thereby decontaminating the matrix. The intent is to transfer the TCDD into a medium in which it can be treated more effectively using one of the technologies identified above, or to concentrate the TCDD into a small volume waste that can be stored, transported, and disposed of at an offsite commercial facility.

3.1.4.1. Extraction. ITC, in a report to the USEPA-OHMSB entitled "Laboratory Feasibility Testing of Prototype Soil Washing Concepts," presents results of laboratory testing of the extraction of 2,3,7,8-TCDD from soil using solvents, water, and water/surfactant solutions. Extractant systems tested were toluene/IPA, Freon, Freon/methanol, diesel fuel/water, kerosene/water, water, water/Adsee 799 (a surfactant), and water/Hyonic (a surfactant). After three simple batch extractions, the most effective extractant, the Freon/methanol system, removed 97.1% of the TCDD from spiked soil samples. The water extractant system, after one extraction, removed less than 1% of the TCDD. The water/surfactant systems, after three extractions, removed 75% of the TCDD from spiked soil samples. The data in this report indicate that extraction using solvents, water, or water/surfactant systems is not a viable means of achieving the 99% removal of TCDD required for detoxification of soil contaminated in the 100- to 1000-ppb range. The quantities of solvent and number of extraction stages would be impractical due to the low extraction efficiencies, and 1-ppb levels were not achieved.

3.1.4.2. Adsorption. The very low solubility of dioxin in water makes it a good candidate for effective carbon adsorption. Similar compounds, such as PCB, can be effectively adsorbed onto carbon from solvents such as Freon. However, limited data are available regarding dioxin adsorption, and until a data base is developed, carbon adsorption of dioxin remains an unproven technology. Adsorption is only applicable to treating water or certain solvents contaminated with TCDD, accomplishing a separation/volume reduction function. Spent carbon would still require ultimate disposal or destruction.

3.1.4.3. Distillation/Stripping. Another separation/concentration technique that could be considered for contaminated liquids is distillation or stripping. For aqueous streams, removal of dioxin by steam stripping may be technically viable because it has a very high activity coefficient in water. For organic (solvent) solutions containing dioxin, distillation of the lower boiling organic from the high boiling dioxin should be technically feasible, but neither technology has been demonstrated on any scale for dioxin-containing liquids.

3.2 Process Confirmation

The purpose of this project is to demonstrate the reliability and maintainability of a rotary kiln incinerator for processing dioxin-contaminated soil. The Ensco incineration system is a proven commercial technology; however, data are needed to determine whether this technology can be used at other DOD installations. The proposed incinerator has an excellent base of background data that indicates minimal environmental impact. This section briefly describes the viability of the basic dioxin incineration process.

The processing of dioxin-contaminated soil requires two basic steps: desorption of dioxin from the soil matrix and destruction of the desorbed dioxin by incineration.

The IT Corporation conducted a series of tests in 1984 to determine the applicability of the EPA Mobile Incinerator System for treating soils contaminated with Herbicide Orange. Those tests were performed to establish the effect of the key process variables, namely residence time and temperature, on the treatability (i.e., dioxin removal efficiency) of three different test soils. The soil samples came from former HO storage sites at Eglin Air Force Base in Florida, NCBC in Gulfport, and Johnston Island in the central Pacific.

After the soils were prepared by drying and screening, separate aliquots were place in a small furnace for different time periods. The treated samples were analyzed for 2,3,7,8-TCDD, and the results were evaluated to determine the relationship between treatment conditions and final concentrations of 2,3,7,8-TCDD.

Based on the results of IT Corporation's studies, which are supported by previous results of related studies, the following conclusions have been developed:

1. Thermal treatment studies of Herbicide Orange contaminated soils from Johnston Island, Eglin Air Force Base, and NCBC at conditions representative of the EPA mobile incinerator system were successful in achieving less than 1-ppb residual concentrations of 2,3,7,8-TCDD and related isomers in the treated soils. Concentrations of 2,3-DBE and 2,4,5-TBE were reduced to less than 50 ppb under the same condition, equivalent to greater than 99.99% removal efficiency from the soils.

2. Treatment is greatly influenced by temperature and residence time. Statistical evaluation of the treatability data from all three test soils showed that the 2,3,7,8-TCDD concentration after treatment is directly proportional to the starting concentration and logarithmically proportional to the time and temperature. Treatment of all three soils to less than 1-ppb 2,3,7,8-TCDD is feasible if temperatures of 500°C are maintained for at least 15 min.

3. The soil type had a minor influence on treatability. Eglin soil gave the highest removal efficiencies and Johnston Island soil gave the lowest. The differences in treatability appeared greater at lower temperatures.

4. Chemical and physical changes occur in each of the three soils studied depending on their composition. None of these changes was determined to pose a serious operational difficulty, such as slagging.

5. Entrainment of soil particles was determined to represent a potential operating difficulty if high soil feed rates and high excess air are used. The amount of entrainment is dependent on soil type and corresponding particle size distribution.

Following desorption, the dioxin released from the treated soil matrix must then be incinerated at high temperature. Laboratory tests have shown that incineration of vaporous dioxin at 2000 to 2200°F will destroy the dioxin to simple combustion products, namely CO_2, H_2O, and HCl.

EPA has developed a mobile incinerator system to process a variety of hazardous wastes including dioxin-contaminated soils. That incinerator uses a rotary kiln that operates at 1600°F to desorb the dioxin from the soil. The kiln is followed by a secondary combustion chamber that operates at 2100°F, which completely oxidizes the vaporous dioxin.

To demonstrate the mobile incinerator system, a trial burn was conducted at the Denney Farm in McDowell, Missouri. During that test, soil contaminated with TCDD was incinerated. The data from those tests show that all effluent streams, including the treated soil (incinerated soil) and off-gases could meet delisting criteria established by EPA, Office of Solid Waste.

Because the construction and operating parameters of the MWP-2000 Ensco incinerator are very similar to the EPA Mobile Incinerator System, the Ensco incinerator is expected to perform similarly. The dioxin is expected to desorb from the soil and be incinerated in the secondary combustion chamber to produce the simple combustion products of H_2O, CO_2, and HCl. The HCl will be scrubbed out in the air pollution control train.

The following points of comparison should be considered:

1. The EPA mobile incinerator runs at approximately 200°F lower than the Ensco incinerator.

2. The solids retention time for the EPA unit is 30 min, whereas Ensco's is approximately 45 min.

3. The secondary combustion temperature for the Ensco unit is 100-200°F higher than the EPA unit.

4. The Ensco unit is larger than EPA's, increasing the success of meeting the 99.9999% destruction removal efficiency.

4. EMERGENCY AND CONTINGENCY PLAN

4.1 Emergency Response

This section provides generalized guidance for contingency events associated with all activities at the NCBC and specifically provides for the demonstration of the Ensco technology at the former HO storage site.

4.1.1 General Emergency Practices at NCBC

The emergency practices for NCBC personnel are outlined below.

1. Upon evacuation notice by NCBC, all personnel involved in this project must be prepared to evacuate the NCBC and do so when ordered.

2. NCBC requirements regarding hurricane protection will be observed. Specifically, equipment will have appropriate tiedowns in case of hurricanes.

4.1.2 Emergency Practices for NCBC HO Site

In addition to the preceding emergency practices, specific required practices related to HO site activities are presented below. Names and telephone numbers of emergency action coordinators involved with the demonstration and other responsible individuals will be provided to EPA at a later date for incorporation into a permit. The next two pages will be posted in work areas at the HO site prior to any onsite activity:

1. All personnel must be trained in the use of the personnel protective equipment specified in Section 5.

2. All personnel must be familiar with and implement procedures for health and environment for exposure or release to the environment of dioxin.

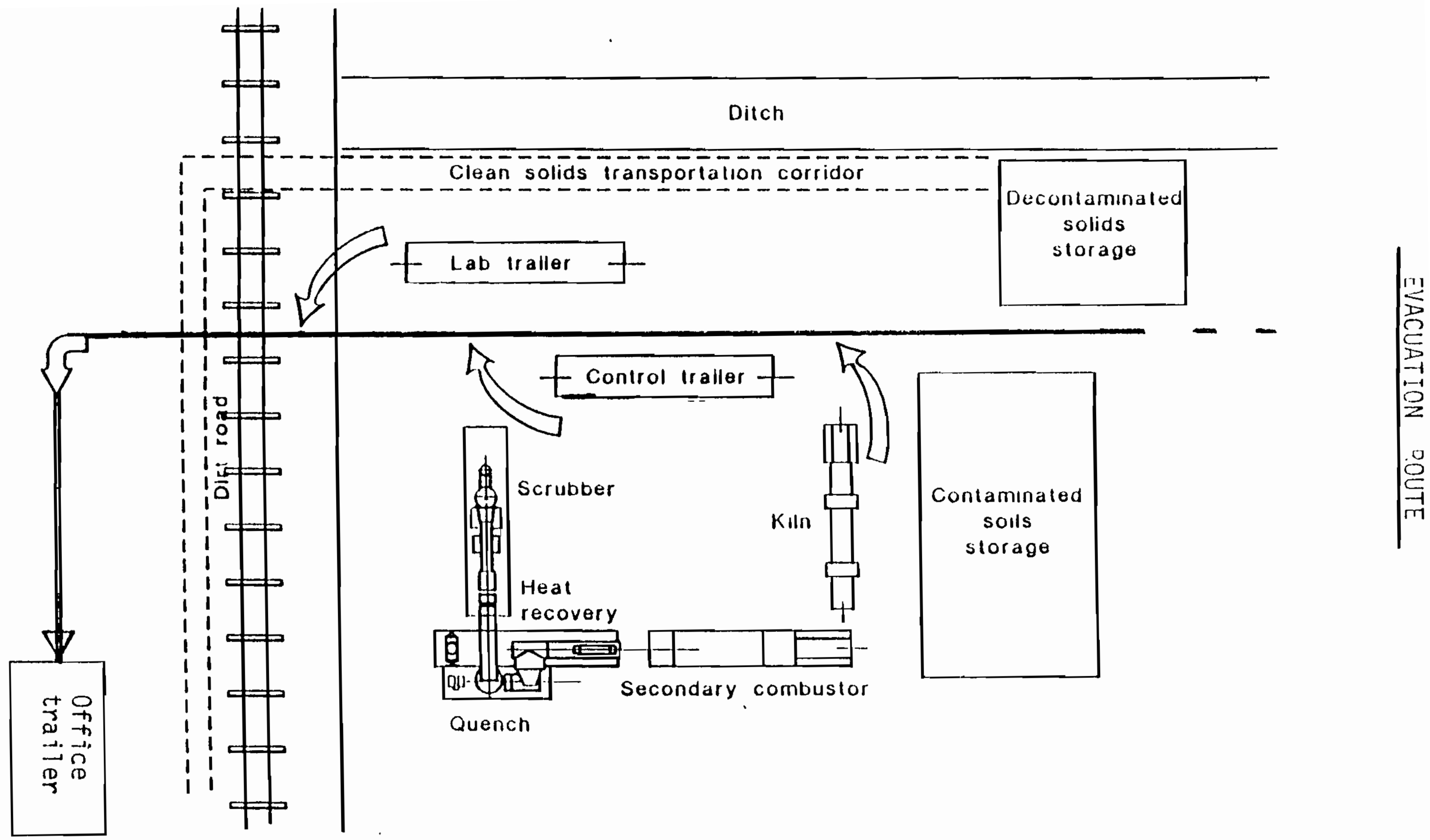
NCBC

EMERGENCY RESPONSE

Fire Department	865-2333
Ambulance	865-2421
Hospital	863-1441
Security	865-2230
Safety Office	865-2437
Base Commander	865-2201

HQ SITE

	Name	Phone
Project Manager	____________________	___________
Alternate	____________________	___________
ENSCO Supervisor	____________________	___________



Ditch
Clean solids transportation corridor
Decontaminated solids storage
Lab trailer
EVACUATION ROUTE
Control trailer
Dirt road
Scrubber
Kiln
Contaminated soils storage
Heat recovery
Secondary combustor
Quench
Office trailer

3. All personnel are to be trained in fire fighting for the materials involved in the demonstration activity. Minor or nonspreading fires will be extinguished according to procedures for the specific materials involved. Major or spreading fires will not be fought by demonstration personnel. All personnel will immediately evacuate the area and notify the NCBC fire department.

4. Any exposure to a hazardous material must be reported to the Project Manager and the NCBC first-aid station for evaluation and treatment.

5. All personnel will report releases of any hazardous material to the Project Manager.

6. All personnel will report abnormalities in equipment operation. Operation under unplanned or abnormal conditions will not be permitted.

7. Employee emergency guidelines in Section 5 will be followed.

8. Appropriate protective equipment and clothing must be worn when engaged in any emergency response/mitigation activity.

9. The Project Manager is responsible for reporting all incidents, abnormalities, and emergency responses to the appropriate agencies.

4.2 Hazard Assessment

The major mitigating factors to consider in assessing the potential impact of the incineration process on the surrounding areas and personnel are as follows:

a. Soil handling, where the total quantity of soil to be handled over the 90-day operating period is approximately 9000 yd^3. The vapor pressure of TCDD, 2,4,5-T, and 2,4-D is extremely low; and the primary means of migration from the immediate site is airborne particles. Therefore, all appropriate provisions will be taken to avoid fugitive dust emissions during soil handling (see Section 5 for ambient air monitoring and soil handling procedures).

4.3 Failure Modes

Postulated failure modes that could result from the demonstration activities on the HO site at NCBC are described below. Only the most likely failure modes or worst-case accident scenarios are presented.

4.3.1 Combustion Efficiency

When combustion efficiency drops below 99% and/or excess oxygen in the stack gases drops below 3%, the data acquisition and control computer will cut off all waste feeds to both units. The system will operate on fuel oil only until the operator can determine the cause of the malfunction and safely reinitiate the feeding of wastes.

4.3.2 Loss of Burner Flame

In the event of a loss of flame in the kiln, the kiln's ultraviolet flame detector will signal the data acquisition and control computer to cut off all fuel and waste feed to that unit; operation of the SSC will be maintained at normal operating conditions. The operator will relight the flame following normal operating procedures. When operating conditions are reestablished, the operator will reinitiate the feeding of soil to the kiln.

In the event of a loss of flame in the secondary combustion chamber, the flame supervisor serving that unit will signal the data acquisition and control computer to perform the following functions: cut off fuel feed to the SCC and cut off all waste feed to the kiln.

The operator will relight the flame and maintain the kiln at normal operating conditions. When normal operating conditions are reestablished in the SCC using diesel fuel, the operator will reinitiate waste feed to the kiln.

4.3.3 Steam Drum Water Loss

If the water level in the steam drum falls below the 25% level, the low-low liquid level switch on the steam drum will alert the operator to shut off all waste and fuel feed to the kiln and the SCC. Upon hearing the alarm, the operator will perform the following steps:

- Cut off steam flow to the ejector scrubber
- Open the emergency vent on the SCC outlet duct
- Begin pumping makeup water into the steam drum
- Discontinue waste feed.

The operator then will ascertain the cause of the low water problem and will restart the system only after solving the problem.

4.3.4 Primary Power Failure

If a power outage occurs, operators will manually start the standby generator. The operator will then perform the following steps:

- Discontinue all waste and fuel feed to the kiln and SCC
- Restart the recirculation pumps in the air pollution control train

- Restart rotation of the kiln

- Restart the combustion air blowers

- Relight the burners in both the kiln and the SCC.

These steps will reestablish normal operating conditions in the kiln and SCC with the burning of diesel fuel only. If normal power is restored after the reestablishment of operating conditions, the operator will reinitiate waste feed to the kiln. If power is not restored within one hour after normal operating conditions have been reestablished, the operator will begin a normal shutdown of the system.

4.3.5 Loss of Coolant Makeup Water

If an interruption occurs in the makeup water supply system, an alarm will alert the operator to cease waste feed operations and initiate corrective actions.

A loss of makeup water would cause the steam drum to become depleted of water within 3.5 min. As a result, the quench system would fail, causing excessive temperatures in the packed tower and other equipment downstream. Such a series of events is unlikely.

If loss of quench water does occur, no health hazards would occur since the dioxin would be destroyed by the residual heat in the SCC and the kiln.

4.3.6 Computer Failure

Failure of the data acquisition system computer is an anticipated event. However, a computer "crash" should not cause any secondary process accidents because the entire process is manually operated (with the exception of the flame supervisor).

The computer is an IBM personal computer. A spare computer is available in the control room, with a second computer available in the laboratory, if necessary.

Should a computer failure occur, the operator would discontinue waste feed and initiate repair operations. If the computer cannot be repaired or replaced within 60 min, the operator will begin routine shutdown operations.

4.3.7 Fires

Emergency plans for NCBC contain requirements for notification and evacuation in emergency situations involving fires. In addition, the base fire department will inspect the project site before operations to assess fire-fighting requirements specific to this project. The fire department is only three blocks from the project site. The type, number, and location of fire extinguishers at the project site are listed below.

(20) 20 lb dry chemical (powder)
Two extinguishers are mounted on each trailer and on the project grounds strategically located around the unit.

(2) 100-lb "wheel" units (nitrogen charged)
These units can be placed anywhere on the project as an extinguisher, near the tank farm or the secondary combustor, etc.

(1) 15-lb Haylon
Located in the control room.

(1) 12-lb Haylon
Located in the laboratory.

(1) 15-lb CO_2
Located in the trailer.

4.3.8 Maximum Hypothetical Accident (Explosion)

The maximum hypothetical accident would be an accident of unknown origin with the worst conceivable consequences. This scenario would be an explosion in the incinerator system with subsequent internal dioxin contamination to the workers at the HO site. Those workers who are not wearing respirators, if uninjured from the postulated explosion, could quickly don their assigned respirators and evacuate the immediate area, thus minimizing their risk. The injuries sustained to a worker as a result of a postulated explosion are obviously much more significant than any potential injuries sustained as a result of dioxin contamination. Workers standing at the HO site boundary during such an accident could conceivably be exposed to dioxin during worst-case weather conditions. If an explosion were to occur, NCBC emergency response requirements would be immediately activated for notification and evacuation.

4.3.9 Effects on NCBC

An evaluation of the possible events presented in Sections 4.2 and 4.3 for impact to areas of NCBC other than the former HO storage site indicates that there will be no impact. Even the maximum hypothetical accident discussed in 4.3.7 will not impact any area outside the former HO storage site.

5. HEALTH AND ENVIRONMENTAL PROTECTION

5.1 Health and Safety

5.1.1 Introduction

2,3,7,8-TCDD can be found as a contaminant of chemicals such as 2,4,5-trichlorophenoxyacetic acid (a herbicide), 2,4,5-trichlorophenol (used in the production of pesticides or herbicides), or hexachlorophene (a skin cleaner). It can also be a breakdown product resulting from the exposure of chlorinated hydrocarbons, such as PCBs, to intense heat. Like other organochlorine compounds, such as DDT and PCBs, dioxin is persistent in the environment and accumulates in living tissues.

All Ensco employees will receive the appropriate level of training before arriving at the site. A training program for dioxin and any other possible hazardous chemicals that may be used in conjunction with this project will be carried out. In general and as a minimum, the program will include:

- The specific nature of the operations that could result in exposure to dioxin
- The purpose, proper selection, fitting, use, and limitations of respirators and protective clothing applicable to dioxin work
- A description of the medical surveillance program
- Information concerning the adverse health effects associated with exposure to dioxin and other chemicals that will be used
- Routes of exposure (skin penetration, inhalation, and ingestion)
- The engineering controls and safe work practices associated with the employee's job assignment.

To prevent hazards to the immediate vicinity and workers, Ensco's Health and Safety Plan (described in the following sections) is established according to zones. Each zone is regulated by different rules, which generally include:

1. Personnel protective equipment to be worn in the zone

2. Procedures for entering into the zone

3. Procedures for exiting from the zone

4. Occupational air monitoring to be performed in the zone

5. Equipment decontamination procedures to follow when moving equipment out of zones (see Section 8, Closure Plans).

Standard Operating Procedures (SOPs) will be written covering all normal activities, including startup and shutdown, and defining proper procedures for handling abnormal situations. These SOPs will be reviewed and approved by the Ensco Project Manager, Project Leader, Quality Assurance Officer, and Health and Safety Officer, and EG&G Idaho.

5.1.2 Purpose

This health and safety plan prescribes workplace procedures that must be followed to protect employees working with TCDD and other hazardous materials that may be present at NCBC. The requirements may change as work progresses due to changing conditions, but no changes will be made without prior approval by the Ensco Health and Safety Officer. The program outlined is for both Ensco employees and Ensco subcontractor personnel.

5.1.3 Program Structure

The project Health and Safety Officer (with the assistance of subordinate employees) will be responsible for the coordination of this plan. The Officer (or representative) will be onsite for the duration of the job. Liaison with officers or representatives of USAF or EG&G Idaho on matters relating to safety and health will be handled by the project Health and Safety Officer.

The Project Leader is responsible for field implementation and enforcement of the health and safety plan. This includes communicating the specific requirements to all personnel, conducting audits, and consulting with the Health and Safety Officer regarding appropriate changes in safety and health requirements.

All onsite personnel are responsible for understanding and complying with the requirements of this plan. The Health and Safety Officer will have the authority to temporarily dismiss any person who fails or refuses to comply with this plan or the orders issued by the Officer pursuant to this plan. The Health and Safety Officer will direct all responses to an emergency situation (details of Emergency Response actions are presented in Section 4).

5.1.4 Regulated Areas

Zones delineated as 1 and 2 on the site will be fenced and controlled to prevent unauthorized entry. Otherwise, Zones 1, 2, and 3 will be marked by perimeter barriers and signs and will have controlled access points. All persons who are authorized to enter the site will be informed as to the locations of the zones and the rules that apply to each.

5.1.4.1 Zone 1. Zone 1 will cover all site areas where workers are likely to come into direct contact with wastes or be exposed to volatilized contaminants or contaminated dust.

During cleanup of a site, an area initially classified as Zone 1 may be converted to and reclassified as Zone 2 after the area no longer meets the criteria above.

5.1.4.2 Zone 2. Zone 2 will be all site areas where wastes are being actively managed (i.e., being transferred, processed, or incinerated). Such areas include:

- The area encompassing the incinerator when the incinerator is burning wastes or contaminated materials
- Areas where solid wastes are being staged
- Areas where wastes are being processed in totally enclosed systems.

A Zone 2, or portions thereof, may be permanently or temporarily reclassified as a Zone 3 when wastes are not being actively managed in the zone.

5.1.4.3 Zone 3. Zone 3 will be all areas of the site that are not classified as Zones 1 or 2.

5.1.5 Personnel Protection

5.1.5.1 Permissible Exposure Limits. The permissible exposure limits for 2,3,7,8-TCDD and other materials are presented below.

1. 2,3,7,8-TCDD: Review of 2,3,7,8-TCDD risk assessments performed by regulatory agencies and related to PCB transformer fires at Binghamton, New York, and One Market Plaza, California, indicates that a limit of 18 pg/m^3 over an 8-h time-weighted average is appropriate. Therefore, until further research is completed, this limit will be observed for 2,3,7,8-TCDD.

2. Herbicide Orange:

2,4-D = 10 mg/m^3 air (8-h time-weighted average)

2,4,5-T = 10 mg/m^3 air (8-h time-weighted average)

3. Other materials: The only other hazardous material to be used in this project is diesel fuel. Spill Prevention Control and Countermeasure plans are identified in this section.

4. Engineering controls and operational procedures will be used to maintain levels of hazardous materials within the limits set forth above. This may be accomplished by the use of dust-suppression techniques with 2,3,7,8-TCDD and closed systems and ventilation controls. These controls will be coupled with protective equipment of the appropriate level for exposures encountered.

5.1.5.2 Protective Equipment. All persons who enter Zones 1, 2, or 3 must wear the protective equipment specified below. Additional protective equipment may be required by the Health and Safety Officer.

Zone 1 Protective Equipment: All persons who enter a Zone 1 must wear the following protective equipment:

- o Hard hat
- o Safety glasses or a full-face shield
- o An organic vapor/acid gas (OV/AC) respirator equipped with a disposable cartridge and dust prefilter as specified by the Health and Safety Officer, or an air-supplied full-face respirator when ordered by the Health and Safety Officer

- Coveralls (cotton or disposable)

- Outer disposable coveralls (Tyvek for particulates or Saranex for liquids)

- Steel-toed safety shoes or boots with disposable over-boots taped to the disposable coveralls, or steel-toed neoprene boots taped to the disposable coveralls

- Nitrile outer gloves taped to disposable coveralls

- Disposable inner gloves under neoprene gloves when there will be direct contact with wastes.

Zone 2 Protective Equipment: All persons who enter a Zone 2 must wear the following protective equipment:

- Hard hat

- Safety glasses.

They must also carry the following:

- An OV/AG respirator equipped with a disposable cartridge and dust prefilter as specified by the Health and Safety Officer. This respirator must be available to be worn on the face when ordered by the Health and Safety Officer.

All persons who enter and remain in a Zone 2 for more than 6 h must wear steel-toed safety boots and coveralls.

Zone 3 Protective Equipment: No personnel protective equipment must be worn in Zone 3 except when the Health and Safety Officer orders that the following equipment be worn because of construction or other activity in the zone:

- A hard hat

- Safety glasses.

5.1.5.3 <u>Entry and Exit Procedures</u>. The following procedures will be observed by all personnel entering Zones 1, 2, or 3. The Health and Safety Officer can deny entrance into a zone of the requirements are not met.

Each person entering a Zone 1 must:

1. First, don the protective equipment specified in the previous section for Zone 1 or as otherwise specified by the Health and Safety Officer

2. Be certified under the Medical Monitoring Program (as identified in Section 5.6)

3. Be accompanied by another person at all times when in the zone.

Each person entering a Zone 2 who will remain in the zone for less than 6 h must first don the protective equipment specified in the previous section, or as otherwise specified by the Health and Safety Officer. Additionally, if the person has accumulated a residency of more than 40 h in Zones 1 and 2, that person must be certified under the Medical Monitoring Program (as identified in Section 5.1.6).

Each person entering a Zone 2 who will remain in the zone for more than 6 h must first don the protective equipment specified in the previous section, or as otherwise directed by the Health and Safety Officer and must be certified under the Medical Monitoring Program (Section 5.1.6).

Each person who enters a Zone 3 must first don the protective equipment specified in the previous section, or as otherwise specified by the Health and Safety Officer.

The following procedures must be followed when exiting from Zones 1, 2, or 3.

Each person who exits a Zone 1 and enters a Zone 2 for continued work or residency in Zone 2 must pass through the personnel decontamination unit to:

1. Remove mud and dirt from outer clothing

2. Remove all disposable protective equipment

3. Thoroughly wash hands and face.

Each person who exits Zone 1 and enters Zone 3 to take a break, have a meal, or temporarily stay or work in Zone 3 must pass through the personnel decontamination unit to:

1. Remove mud and dirt from outer clothing

2. Remove all protective equipment except nondisposable coveralls and safety shoes

3. Thoroughly wash hands and face.

Each person who exits a Zone 1 and enters a Zone 3 to leave the site must pass through the personnel decontamination unit to:

1. Remove mud and dirt from outer clothing

2. Remove all protective equipment

3. Shower

4. Change into street clothes.

Each person who exits a Zone 2 and enters a Zone 3 to take a break, have a meal, or temporarily stay or work in Zone 3 must pass through the personnel decontamination unit to:

1. Remove mud and dirt from outer clothing

2. Thoroughly wash hands and face.

Each person who exits a Zone 2 and enters a Zone 3 to leave the site (except those that have been in the zone for less than 6 hours) must pass through the personnel decontamination unit to:

1. Remove mud and dirt from outer clothing

2. Remove all protective equipment

3. Shower

4. Change into street clothes.

Except for washing hands and face, no health and safety procedures for exiting from Zone 3 will be in force unless the Health and Safety Officer has required that protective equipment be worn. In such cases, the equipment will be removed before exiting the zone.

5.1.6 Medical Monitoring Program

Each person who is expected to work in Zones 1 or 2 will be required to have a medical examination by a company-retained doctor who finds the person fit to work in an environment where hazardous wastes are being handled. This medical examination will include the following: medical history, physical examination, EKG stress test, urinalysis including microscopic, chest x-ray, cardiovascular and respiratory test, pulmonary function test, hematology tests, methemoglobin test, audiometry test.

This medical examination must be repeated annually if the person continues to be employed by the company. In addition, each person will be required to have the same medical examination when terminating from the company.

5.1.7 Occupational Health Program

5.1.7.1 Occupational Air Monitoring. An occupational air monitoring program will be developed specifically for work at NCBC. The following description is the minimal general Ensco health and safety program, the purpose of which is to detect the occurrence of airborne contaminants in concentrations significantly higher than background concentrations and determine when higher levels of occupational health protection than those being practiced are required. Programs vary according to types of wastes and contaminated materials handled, methods by which these wastes will be handled, and the degree and nature of the airborne contaminants that might be produced by the wastes and the handling methods. At a minimum, each program will include the following procedures:

Zone 1 Monitoring: Because most contaminants in the soil will be bound to the soil and associated dust, dust monitoring as a surrogate for 2,3,7,8-TCDD will be carried out at least once per hour using portable dust monitors in and around the breathing zones. This information could be used to determine levels of personnel protective equipment at the discretion of the onsite Health and Safety Officer and with concurrence of the associated project manager. Continuous area monitoring can be used as a supplement to the breathing zone. A permanent record of readings will be maintained. Permissible dust levels will be determined by the level of 2,3,7,8-TCDD contained in the dust or soil, but cannot exceed the permissible exposure limit (PEL) for nuisance dust or the PEL for silicate-containing dust, whichever applies. When these levels are exceeded, personnel will be required to leave the area and dust abatement procedures will be implemented. Workers will not be allowed back into the site until the dust level falls below the criterion levels. Full-face air-purifying cartridge respirators will normally be used. If the dust cannot be lowered to the acceptable level, workers will be required to wear a demand-type air-supplied full-face respirator. Worker exposure to the dust will also be monitored daily using a personal sampler with filter cassette (and perhaps cyclone) and analyzed gravimetrically. The same criteria will be used to judge exposure limits.

Zone 2 Monitoring: Monitoring in this zone will be carried out generally the same as in Zone 1, except that the frequency will be two times per day. An industrial hygienist will conduct such monitoring at random to avoid biasing results. Time-weighted average filter samples will be taken for a full shift. Administrative controls for working in this zone will be identical to those in Zone 1.

Zone 3 Monitoring: No occupational air monitoring will be routinely performed in Zone 3 areas.

The Health and Safety Officer will calibrate each instrument to be used for the above analyses in accordance with the manufacturers' specifications and before and after each use. A background reading in Zone 3, upwind from all prevailing work activity, will be used in the event that results would be significantly biased by background dust. A wind direction indicator will be located on the stack of the incinerator to indicate upwind and downwind areas.

5.1.7.2 Other Occupational Health Protection Procedures. Persons required to wear disposable coveralls and who do not work in an air-conditioned environment will be allowed appropriate rest periods as specified by the Health and Safety Officer. All such personnel will be specially trained to recognize symptoms of heat stress and watched closely by the Health and Safety Officer, or a subordinate employee, for signs and symptoms of heat-related illness. Work break schedules will be carefully planned to avoid heat stress.

When ambient temperatures exceed 75°F, electrolyte balanced thirst quenchers will be provided in the break and lunch room and at one or more drink stations in each Zone 2 (where disposable cups must be used and discarded). Personnel will be encouraged to drink at least 3 oz of thirst quencher each hour.

When ambient temperatures fall below 30°F, personnel who do not work in a heated environment will be required to wear appropriate warm clothing and will be allowed to come indoors periodically to avoid prolonged exposure to cold or wind chill.

No eating, drinking, or smoking will be allowed in any Zone 1 or 2, except that drinking of water or thirst quencher from disposable cups may be allowed at the drink stations in Zone 2.

5.1.8 Personnel Decontamination Procedures

The trailer housing the personnel decontamination unit will contain:

1. An outside wash pad

2. A dirty change room

3. A shower and washroom

4. A clean changeroom.

Onsite barriers or fencing will restrict access to the unit so that outside entry or exit into/from the clean changeroom is only to a Zone 3, and outside entry or exit into/from the dirty change room is only to Zone 1 and 2 areas. Interior configuration of the unit will require personnel to pass through the shower and wash room when moving between the dirty and clean changerooms. The clean and dirty changerooms will have lockers for workers to store street clothes and nondisposable equipment, respectively.

When leaving the contaminated area, personnel will be required to:

1. Wash or brush mud and dirt from their boots and outer clothing and remove boots and disposable equipment at the outside wash pad

2. Remove nondisposable clothing, as required, in the dirty changeroom

3. Wash or shower, as required, in the shower and wash room

4. Change into street clothes in the clean changeroom.

When entering the contaminated area, personnel will be required to remove all street clothing and put on disposable and clean protective clothing in the clean area. [Reusable equipment (for example, respirators, boots, and hard hats) that have been decontaminated may also be put on in a designated section of the clean area.]

Disposable equipment will be placed in bins or drums on the outside wash pad and will be subsequently burned in the incinerator or otherwise properly disposed of as a hazardous waste. Nondisposable coveralls will be laundered periodically. After each on-shift use, respirator face masks will be cleaned in warm water and detergent, and the cartridges and dust filters of the OV/AG respirators will be replaced. Wastewaters generated at the personnel decontamination unit will be burned in the incinerator, or otherwise properly disposed of as a hazardous waste.

The interior of the personnel decontamination unit will be cleaned daily. Lavatories will be provided in the decontamination unit.

5.1.9 Health and Safety Training/Recordkeeping

5.1.9.1 Training. All personnel who will frequently work in Zones 1 and 2 will be given the following training before they begin work:

- Orientation of the purpose of the project and how it is to be accomplished

- Information on the potential health hazards associated with the project, potential exposure routes, symptoms of exposure, and basic first aid treatment for exposures

- The care, donning, removal, and limitations of OV/AG respirators and full-face, air-supplied respirators. Fit testing will be provided for all employees and records maintained.

- The care, donning, removal, and limitations of all other personnel protective equipment that they may be required to wear

- The procedures for entering and exiting Zones 1 and 2 and the importance of these procedures

- The signs, symptoms, and first-aid treatment for heat stroke, heat cramps, and heat exhaustion, and the preventive measures for same

- The reasons for prohibiting eating, drinking, and smoking in Zones 1 and 2

- The locations and use of emergency showers and eyewashes

- The locations of fire extinguishers and first-aid equipment and the proper use of this equipment

- The procedures to be followed when an alarm is sounded

- The location and use of communications equipment

- o Roles and duties during an emergency
- o The safe operation of the equipment that each person will operate.

Additionally, at least two persons on each shift will be required to have valid American Red Cross, or equivalent, certificates in basic first-aid and CPR. (See Section 4 for Emergency Response details.)

All personnel who frequently work in Zones 1 and 2 will be required to attend weekly health and safety meetings to reinforce the above training.

5.1.9.2 Inspections. Table 5-1 lists items that will be inspected daily by the Heath and Safety Officer. In addition, the Health and Safety Officer will continuously observe compliance with this Health and Safety Plan.

5.1.9.3 Records. The Health and Safety Officer will maintain the following records:

- o A daily log of persons who entered a Zone 1 or 2
- o A log of the daily calibration of and measurements made with all air monitoring instruments
- o A log of daily inspections
- o A weekly updated inventory of personnel protective equipment, fire extinguishers, and emergency equipment
- o A log of health and safety training sessions and meetings held.

These records will be kept in the project office.

TABLE 5-1. DAILY HEALTH AND SAFETY INSPECTION SCHEDULE

Item	Inspection/Action
Personnel protective equipment	Check adequacy of inventory of disposable equipment. Obtain additional inventory if necessary.
--	Inspect condition of nondisposable equipment. Replace, repair or fill (air supply tanks) as necessary.
Decontamination unit and break and lunch room	Inspect cleanliness of units. Order cleaning if necessary.
Zone barriers	Inspect adequacy of barriers. Repair if necessary.
Safety and warning signs	Check existence and proper placement of signs. Correct if necessary.
Active work areas	Inspect areas for unsafe conditions. Order repairs if necessary.
Safety showers and eyewashes	Inspect operability of units. Order repairs if necessary.
Drink stations	Inspect adequacy of water, thirst quencher and disposable cups. Correct if necessary.
Fire control equipment	Check existence and proper location of equipment. Correct if necessary.
--	Check date for next filling. Fill if necessary.
First aid and other emergency equipment	Inspect adequacy of inventory and condition of equipment. Correct or repair if necessary.
Communication and alarm equipment	Check operability of equipment. Order repair if necessary.
Air monitoring instruments	Calibrate.
Respirators (air-powered and self-contained)	Check condition, order repairs if necessary, remove from use until properly repaired.

5.2 Environmental Protection

An environmental assessment that addresses potential environmental impacts was completed for this project in March 1986.

5.2.1 Applicable Regulations

Potential adverse environmental impacts will be mitigated through pollution control measures that will ensure compliance with applicable environmental regulations. The major environmental requirements that will be adhered to include:

The Clean Air Act, as amended 42 USC 7409 (42 USC 7401 et seq., as amended)

Environmental Protection Agency Regulations on National Primary and Secondary Ambient Air Quality Standards, 40 CFR 50

The Federal Water Pollution Control Act (86 Stat. 816, 33 USC 1251)

33 CFR 153, Control of Pollution by Oil and Hazardous Substances
40 CFR 110, Environmental Protection Agency Regulations on Discharge of Oil
40 CFR 112, Environmental Protection Agency Regulations on Oil Pollution Prevention
40 CFR 116, Designation of Hazardous Substances
40 CFR 117, Determination of Reportable Quantities for Hazardous Substances

The Toxic Substances Control Act (16 USC 2601, et seq., as amended)

The Resource Conservation and Recovery Act of 1976 (42 USC 6901, et seq., as amended)

40 CFR 260-270, Hazardous Waste Regulations

40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan

The Endangered Species Act of 1973

National Historic Preservation Act of 1966

National Environmental Policy Act of 1969

Marine Protection Research and Sanctuaries Act of 1972

Executive Order 12088 (1978) Federal Compliance with Pollution Control Standards

5.2.2 Transport Pathway

The potential environmental impacts from the operation of the incineration process are limited by the following characteristics of dioxins:

1. Dioxins are generally tightly bound to soils (the strength of binding is related to the organic content of the soils), and thus are not readily moved out of the upper layers after deposition.

2. Volatilization of dioxins is low due to its low vapor pressure.

3. Dioxins have very low water solubilities.

Therefore, the major environmental transport pathway would be suspension of particles on which dioxin is absorbed, since both vertical and horizontal migration is limited by the characteristics of the soil and dioxin.

5.2.3 Effluent/Waste Control and Monitoring

Requirements for control of fugitive dust emissions (i.e., no visible dust plumes), especially during soil handling, will be met through careful handling and application of dust suppressants whenever necessary. Because the Ensco incinerator will have been demonstrated to achieve 99.9999% destruction and removal efficiency, perimeter air monitoring for process emissions will not be of great concern. However, an ambient air monitoring program will be conducted to determine the fugitive particulate concentrations during soil-handling operations. The fugitive particulate matter will be sampled using flow-controlled, high-volume samplers operating at a minimum flow rate of 40 cfm. The high-volume samplers will be located and operated during this demonstration as shown in Table 5-2. In addition, the soil will be sampled and analyzed after treatment to meet criteria established in Appendix A.

Dilute HCl from the quench sump will be neutralized if necessary to a pH of 6.5 to 7 by the addition of $CaCo_3$. Water from the ejector scrubber will be neutralized to a pH of 6.5 to 7 in the scrubber sump through NaOH injection. From the sumps, the water is passed through tandem activated-carbon filters, then to a holding tank. The water will be held in the tank to allow a representative sample to be drawn according to sampling protocol for tanks in SW 846. The sample will be analyzed for TCDD using EPA Method 8280. If tank contents are $\leq$10 parts per trillion (ppt), the water will be transferred to the lift station at NCBC for discharge to the publicly owned treatment works (POTW).

5.2.4 Soil Handling

Approximately 11,000 yd^3 of contaminated soil will be treated in the incinerator. Figure 5-1 illustrates the location of the major process components in relation to the HO site (see Figure 2-1 for specific site layout).

TABLE 5-2. OPERATION OF HIGH-VOLUME SAMPLERS

Location[a]	Operation[b]
1. Hi-vol offsite upwind (clean control)	Operated during all activities onsite
2. Hi-vol onsite downwind of activity approximately 75 ft	Operated during any activity onsite
3. Hi-vol onsite downwind of activity (same as No. 2)	Operated following activity for same amount of time[c]
4. Hi-vol offsite downwind of site	Operated during any activity onsite

a. Location is on NCBC.

b. Only operated as listed; otherwise shut down.

c. Time determined following each daily activity.

Contaminated soil will be excavated using 20- x 20-ft grids, to a depth specified by the results of the soil mapping program (see Subsection 1.2.3). Each excavated grid will be sampled to ensure that the TCDD and total CDD and CDF limits as stated in Appendix A are met. Appropriately sized equipment will be used to excavate the contaminated soil on an as-needed basis, usually daily. The soil will be transferred to roll-off bins on dump trucks, then to a conveyor belt that feeds to the feed hopper. This portion of the process will be skirted to prevent escape of fugitive dust. Before operation, a route through the site will be identified and designated for transport of all contaminated soil.

The treated soil will be transferred to roll-off bins on dump trucks. The treated soil will be held in batches in each bin, pending verification of meeting criteria as defined in Appendix A, Sampling and Analysis Matrix. When verification has been completed, the soil will be reloaded and transported via a designated clean route to a verified clean spot for placement back on the HO site.

All activities will be stringently controlled to prevent dust generation. The USAF had agreed to the U.S. Navy's requirement that no visible dust plumes will be generated during any activities associated with the field demonstration. Therefore, water will be used liberally for dust suppression whenever necessary. In addition to the constant visual monitoring, the area will be monitored through the ambient air monitoring program (see Subsection 5.2.3).

5.2.5 Spill Prevention Control and Countermeasures Plan

As previously mentioned, other than laboratory chemicals, the only other hazardous material that will be used in this demonstration will be diesel fuel.

This section describes the types of information that will be included in the spill prevention control and countermeasures (SPCC) plan that will be developed for and implemented at each location where the MWP-2000 is

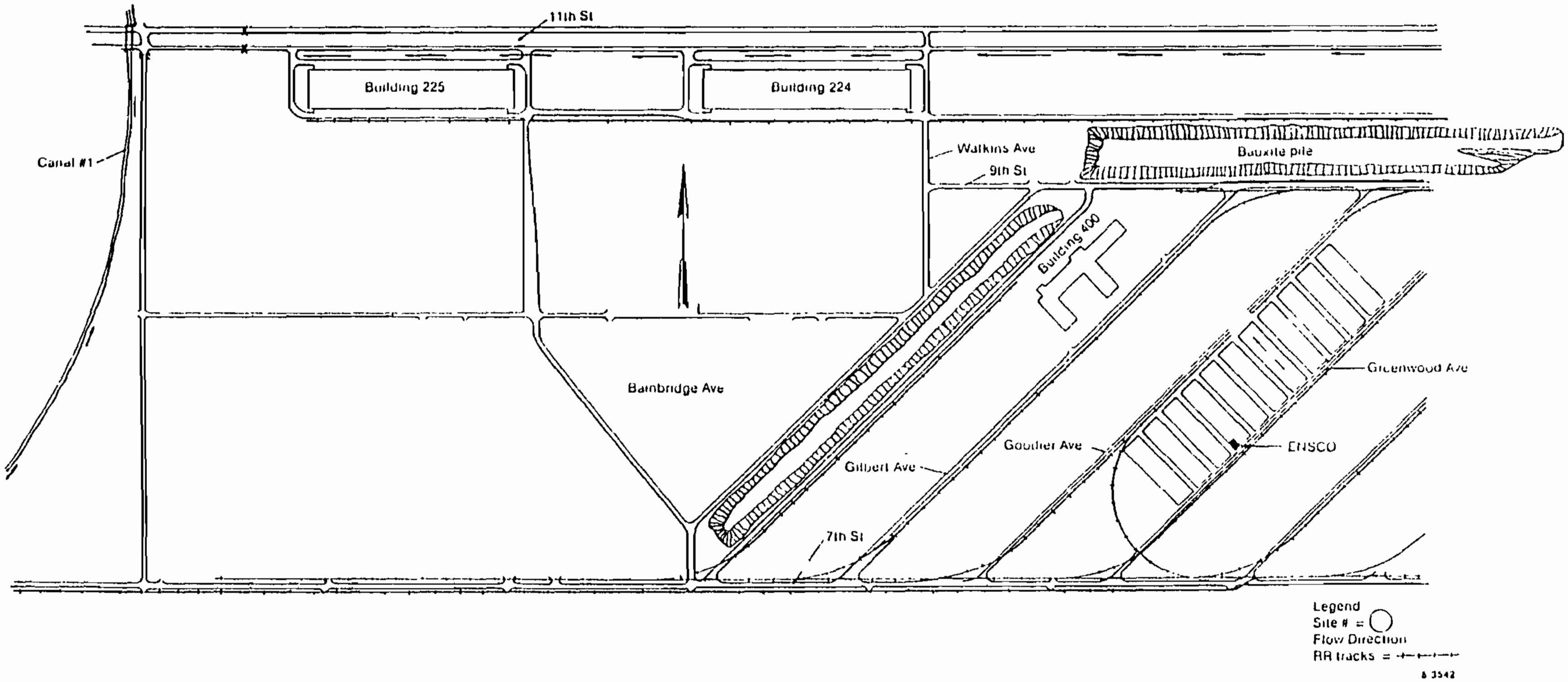


Figure 5-1. Location of Ensco equipment at NCBC.

being operated. Because a SPCC plan needs to be project-specific (e.g., describe the design of containment systems and define procedures for management and disposal of scrubber effluent), it is not possible to provide an SPCC plan in this document. Rather, an SPCC plan will be developed for each project and will be reviewed and certified by a professional engineer.

The objectives of each SPCC plan will be to minimize the occurrence of oil and hazardous materials spills, contain and cleanup any spills that do occur, and control runoff from potentially contaminated waste staging and processing units. These objectives will be achieved through a combination of equipment design, operating practices, and routine inspection and maintenance of equipment. In addition, requirements of the NCBC/SPCC will be incorporated in the HO SPCC plan.

5.2.5.1 Spill Prevention.

Drummed Waste Staging and Processing: Drums will be carefully handled to prevent damage or rupture. Any leaking drums will be placed in overpacks. Drums will be kept closed except when being sampled, decanted or emptied. Drums will be staged in double-row lots with ample aisle space between lots to permit inspection and access to individual drums. Drums usually will not be stacked. If stacked, they will not be stacked more than two tiers high, and pallets or sheets of plywood will be placed between the tiers.

Solid Waste Staging and Processing: Bulk and loose solid wastes will be carefully transferred to and placed in their respective staging units to avoid spillage of these wastes outside of the containment systems of these units. For the same reason, these wastes will be carefully transferred to processing units or to the solid waste feed system serving the kiln.

Solid Residuals Staging: Solid residuals removed from the MWP-2000 will be placed and staged in roll-off boxes, containers, or other units to prevent spillage of these materials.

Scrubber Effluent Staging: If scrubber effluent has to be held before being transported or conveyed to disposal, it usually will be staged in closed-top tanks, most often "frac" tanks (portable tanks commonly used in oil fields). These will be carbon steel tanks designed to hold aqueous wastes. Therefore, if the scrubber effluent is highly acidic, it will be neutralized with sodium bicarbonate before being stored in these tanks. These tanks will be top-filled to prevent backflow in the event of a power failure when being filled and will be equipped with a high-liquid-level alarm and pump shutoff control to prevent overfilling.

As indicated in Chapter 2, Process Description, valves will be properly set and the high-liquid-level indicator will be checked before a tank is brought on line for filling. Similarly, valve settings will be properly set, hose connections will be checked, and a technician will remain at the tank when it is being emptied. These operating procedures are designed to prevent spills.

As indicated in the Inspection and Maintenance Schedule in Table 2-1 tanks will be inspected daily for leaks or spills. In addition, whenever the tanks are installed or reinstalled, they will be cleaned and thoroughly inspected for corrosion damage (if they have been previously used) and will be hydrostatically tested before being placed in use. Associated piping also will be pressure-tested before it is put in use.

Clean Fuel Storage: The tank or tank trailer used to store clean fuel will be designed to hold such fuel. It will be top-filled to prevent backflow in the event of a power failure during filling.

As indicated in the Operating Procedures in Section 17, valve settings will be properly set, hose connections will be checked and a technician will remain at the tank when it is being filled. These operating procedures are designed to prevent spills and overfilling.

As indicated in the Inspection and Maintenance Schedule in Table 2-1, the storage tank will be inspected daily for leaks or spills.

MWP-2000: As indicated in the Inspection and Maintenance Schedule in Table 2-1, all liquid waste feed lines and all liquid-containing lines and vessels (e.g., sumps) in the air pollution control train, neutralization and concentration unit and boiler makeup water treatment unit will be inspected for leaks or spills. In addition, this equipment will be pressure tested after installation and before it is put into service.

5.2.5.2 Spill Containment. Although every precaution will be taken to prevent spills of oil and hazardous materials, the potential for such spills will exist. Therefore, the waste staging and processing units, clean fuel storage unit and effluent staging unit will be equipped with containment structures to contain spills if they occur.

Waste Staging and Processing Units: All waste staging and processing units will be located, at least, in lined, earthen-like containment systems. In some cases, including those cases where it is required by regulation or the project plan, the drum staging unit and/or the drum processing unit will be located in concrete containment systems. Those staging and processing units handling liquid wastes will have no-discharge sumps to facilitate the removal of rain water and any spilled waste. These containment systems will be sized to hold the contents of the largest tank or container in the unit (or, in the case of the drum staging unit, the volume of 25% of the drums staged in the unit) plus the rain water from a major storm event.

All of the pumps, manifolds, and valves serving the bulk liquids staging unit either will be located within the containment system of that unit or will be installed in a fabricated carbon steel pan to collect any leaks from this equipment.

As listed in the Inspection and Maintenance Schedule in Table 2-1, the containment systems of all waste staging and processing units, except the bulk solids staging unit, will be inspected daily and any standing rain water or liquids will be removed when found. Rain water in the bulk solids staging unit that will not be absorbed by the solid wastes (e.g., soils) contained in this unit also will be removed.

Clean Fuel Storage Unit: The clean fuel tank or tank trailer will be located in an earthen-dike containment system capable of holding the contents of the tank or trailer. The pumps, manifolds, and valves serving this unit either will be located within the containment system or will be installed in a fabricated carbon steel pan to collect any leaks from this equipment. The containment system will be inspected daily and any standing rain water or liquids will be removed when found.

Effluent Staging Unit: The tanks in the effluent staging unit will be located in a topographic depression or an earthen-dike containment system having a capacity equal to or larger than the largest tank in the unit. This containment system also will be inspected daily and any standing water removed.

MWP-2000: The MWP-2000 either will be located in a earthen dike or will drain to a containment basin or a surface runoff management system capable of containing 2000 gal of liquids (the flow of makeup water, recirculation water, scrubber effluent, wastewater feed or liquid waste feed that might result from a one hour rupture of any of the lines carrying these liquids). This containment system also will be inspected daily and any standing rain water or liquids removed.

5.2.5.3 Spill Cleanup and Rain Water Disposition. Small spills or leaks of liquid wastes (e.g., <50 gallons) will be absorbed and removed with Oil Dri (or another suitable absorbent), which subsequently will be incinerated as solid waste. If the spill or leak occurs on a soil surface, the contaminated surface layer of the soil will be removed and subsequently incinerated as solid waste.

Major spills of liquid wastes into the containment systems of the Drum Staging Units or the Drum Processing Unit will be pumped into a tank truck or trailer or drums and subsequently incinerated as liquid waste. Major spills of clean fuel into the containment system of the Clean Fuel Storage Unit will be handled in a similar matter.

Major spills of liquid wastes or fuel outside of the above containment systems, for which Ensco Environmental Systems is responsible, will first be contained to the extent possible and then will be removed and handled in the manner just described. Where Ensco Environmental Services will have responsibility for such spills, by definition in the project SPCC plan for the particular project, it will either be equipped to contain and cleanup such spills or will have an arrangement with a local or regional cleanup contractor to respond to such events.

Contaminated rain water collected in and removed from any of the containment systems discussed above will be pumped into one or more tanks in the Bulk Staging Unit and subsequently incinerated, or will be treated and disposed of in a manner prescribed in the project SPCC plan (e.g., discharged to an onsite wastewater treatment system if the level of contamination is low and falls within prescribed limits which can be handled by that treatment system). Rain water removed from a containment system will be considered to be contaminated if (a) it contains spilled or leaked wastes which have not been removed prior to the collection of the rain water or (b) the rain water has come into direct contact with waste in the unit (e.g., the situation that would prevail in the Bulk Solids Staging Unit).

Rain water collected in and removed from any of the containment system which does not meet the criteria delineated above will be disposed of in the manner prescribed by the project SPCC plan. This might include discharge to an onsite treatment system, a POTW sewer or the stormwater handling system for the particular site. Further, it might or might not require testing of the rain water for contamination prior to disposal, depending on the prescribed disposal method and the water pollution control requirements applicable to that method.

Solid wastes cleaned up from spills of such wastes or resulting from the cleanup of liquid waste spills or leaks will be handled and subsequently incinerated as solid wastes.

5.2.5.4 Recordkeeping and Reporting. The procedures and schedules for inspecting equipment and containment systems, as described above, will be those contained in the Inspection and Maintenance Schedule presented in Section 2.8. A daily log of the inspections made pursuant to this Schedule will be maintained by the Maintenance Foreman.

Major spills, those that result from a rupture of a tank, other vessel or pipe or hose line, or result in a spill of a harmful quantity of oil (as defined in 40 CFR 110) or a reportable quantity of hazardous substance (as defined in 40 CFR 117) outside of the containment systems described in this document, will be reported to the National Spill Response Center and other authorities as required by the project SPCC plan. Following the spill and its cleanup, the Project Manager will prepare a report describing the event, the corrective actions taken and the actions that will be taken to prevent its recurrence and will submit this report to the Regional Administrator having jurisdiction if required to do so by 40 CFR 112.4(a). In addition, Op Nav Inst 5090.1 will be followed, which will satisfy CERCLA requirements of 40 CFR 110, 117, 264, 300, and U.S. Navy requirements.

5.2.6 Wildlife

The environmental assessment currently being prepared for this project will address any potential environmental impacts on wildlife. An initial assessment study of NCBC was conducted for the Navy Assessment and Control of Installation Pollutants Department, Port Hueneme, California, in 1985. This study identifies the wildlife in the area. However, the pollution prevention measures employed in this demonstration should prevent any adverse impacts to the wildlife.

6. MONITORING PLAN

6.1 Independent Verification

The demonstration process will be sampled by an independent sampling team, and those samples analyzed by an independent laboratory. This will provide independent verification of process performance. Environmental monitoring (as specified in Section 5) will also be performed by contractors. Specific information is pending contract award. Analytical data validation will be performed by EG&G Idaho. Whenever available, EPA protocol will be adhered to (specifically SW-846 for sample collection and analysis and Dioxin-Containing Wastes; Rule).

The Statement of Work for the independent sampling and analyses tasks is presented in Appendix E. The Sampling and Analysis Matrix is presented in Appendix A. The sampling plans and quality assurance (QA) programs for contract work will be provided as appendices to this document, pending contract award.

Independent verification will be carried out through the duration of this project, and specific requirements will be defined in a Scope of Work pending subcontract award. Process monitoring will be conducted onsite by Ensco.

Ensco's mobile laboratory contains the following equipment:

1. Gas chromatograph with dual FID, ECD, and automatic integrator

2. Atomic Absorption Spectrophotometer with hydride generator
   Fiberglass fume hood

3. High temperature (1100°C) furnace

4. Oven

5. Adiabatic bomb calorimeter

6. Barnstead Type 1 Reagent grade water system with organics removal cartridge

7. Mettler electronic balance

8. pH meter

9. Glassware for extractions and wet chemistry analysis

10. Self-contained water system

11. Portable Photoionizer/Vapor detector

12. Radiation survey meter

13. Metal detector

14. Explosimeter

15. Oxygen meter

16. Benchtop Gas Chromatograph/Mass Spectrometer with autosampler and GC/MS-MSD computer.

Environmental monitoring activities will continue throughout the project and be conducted by an independent contractor.

6.2 QA/QC Plan Outline

The QA activities for the USAF demonstration projects can be divided into two broad areas as follows:

- Those that occur within the analytical laboratory, i.e., they are the responsibility of the analytical laboratory

- External QA activities, which can be grouped according to those specific to the sampling effort and those specific to the analytical effort.

The specific QA activities planned for the subject program can be outlined as follows:

External QA

1. Sampling-Related

   a. Sampling will be performed according to approved protocol where such is available; such protocol typically contains specific QA requirements.

   b. Sampling will be performed in a manner to produce representative samples.

2. Analytical-Related

   a. Blank samples will be included on a selected basis and submitted for analysis.

   b. Replicate samples will be taken on a selected basis and submitted for analysis.

   c. A limited number of sample splits will be taken and submitted to the on-call laboratory for analysis.

   d. All analytical data will be reviewed and validated for completeness, consistency, and accuracy.

Internal QA

1. Approved analytical procedures will be used where applicable; such procedures typically contain specific QA requirements.

2. Internal standards and surrogate standards will be used, when appropriate, to provide checks on recoveries and method accuracy.

3. Duplicate analyses will be performed on selected samples for specific components.

4. Method blanks will be analyzed, as appropriate.

5. Matrix spike samples will be prepared and analyzed on a selected basis.

6. All analytical data will be reviewed for completeness, consistency, and accuracy before release by the laboratory.

7. FINANCIAL REQUIREMENTS

The Naval Construction Battalion Center is a Federal facility; therefore, the demonstration is exempt from the requirements of 40 CFR 264, Subpart H, specifically as stated in 40 CFR 264.140(c).

8. CLOSURE AND EQUIPMENT DECONTAMINATION PLAN

This section describes the closure procedures that will be followed when the soil processing activities at the NCBC are completed and before the MWP-2000 is removed from the site. In general, the intent of this closure plan is to leave the site with pre-test contours and no listed waste as a result of the RD&D activity. In addition, equipment leaving the site will be cleaned to acceptable levels. The following is a description of the equipment decontamination procedures.

8.1 Equipment Decontamination Procedures

Equipment used in a Zone 1 will be decontaminated before it leaves that zone to enter into either a Zone 1 or 2 (see Section 5 for zone descriptions). However, equipment being used to transfer wastes from Zone 1 to Zone 2 staging units will not have to be decontaminated before making each delivery when the movement of this equipment is restricted to dedicated traffic routes. Equipment used in a Zone 2 to handle wastes before incineration, including equipment used for the staging and processing of wastes to be fed to the MWP-2000, will be decontaminated before it leaves that zone to enter into a Zone 3.

Equipment will be decontaminated by being thoroughly washed with clean diesel oil followed by water wash. The dirty oil and the washwater will be burned in the MWP-2000. If the equipment is to be returned to nonhazardous waste service, representative surface wipe samples will be taken and analyzed to determine the adequacy of decontamination before the equipment will be allowed to go offsite. Each sample will be taken from a 100 cm^2 area with a cotton swab saturated with an appropriate solvent and will be analyzed for the significant contaminants in the waste that had been handled by the equipment.

At the end of a project, emptied roll-off boxes that had been used for holding solid residuals generated by the system will be decontaminated with high-pressure water and the washwater incinerated in the MWP-2000. The waste staging and processing equipment and other equipment used to handle wastes before incineration will be decontaminated, as described above. The MWP-2000 then will be operated for 8 h on clean fuel. Following this operation, treated soil, solids, waters in the several sumps and tanks of the system, and effluents in staging units will be removed from the system, sampled, and analyzed. The several sumps and tanks of the system and the effluent staging tanks will be flushed with high-pressure water, and this water will be sampled and analyzed. The MWP-2000 will then be disassembled for removal from the site.

Wastes generated by decontamination activities will be incinerated whenever possible. Treated soil and solids will be sampled and analyzed before placement in a verified clean spot on the HO site. Liquid wastes (decontamination wash waters, scrubber water, etc.) will be incinerated whenever possible. Otherwise the liquids will be filtered through activated carbon, held in a tank for sampling and analysis, then discharged to the POTW.

A more detailed description of these activities is presented below.

8.1.1 Waste Staging and Processing Units

It will be possible to remove and incinerate all of the wastes and contaminated materials in the waste staging and processing units. The equipment in these units will then be decontaminated for removal by following the steps below.

1. All wastes in the Loose Solids Staging Unit will be transferred to the Solids Processing Unit and processed in that unit. The resulting wastes either will be fed directly to the incinerator or will be transferred to the Bulk Solids Staging Unit for subsequent incineration.

2. The equipment in the Solids Processing Unit will be triple-rinsed with kerosene before removal. Kerosene will be collected and incinerated.

8.1.2 MWP-2000 and Auxiliary Units

The MWP-2000 and its auxiliary units will be decontaminated before removal from the site. The procedures that will be used to accomplish this are delineated below.

1. The weigh hopper, feed hopper, and solids feed conveyor will be steam-cleaned and then swabbed with kerosene or diesel fuel. The ram or screw feed will be swabbed with the same type of fuel as will support structures. The steam condensate and dirty fuel will be collected and incinerated.

2. Solids will be removed from the treated receiving bin, secondary combustor, sumps in the air pollution control train, and other points in the system. They will be placed in roll-off bins and tested. Based on the test results, they will be transferred either to the incinerator if contaminated or the site if clean.

3. After all wastes and contaminated materials are incinerated, the MWP-2000 will be operated on clean fuel at full thermal loading and required thermal destruction operating conditions for at least 8 h. It will then be normally shut down.

4. Water will be removed from the treated soil receiving bin and all of the sumps in the air pollution control train and held in storage tanks. It will be tested for verification of meeting criteria for TCDD of <10 ppt, then discharged to the POTW.

5. Refractory in the system will not be removed unless required by an abnormal event. If refractory is removed from the system, it will be incinerated as a minimum in the cleanup run in 3 above.

6. The system will then be dismantled and removed from the site.

7. All foundations, concrete pads, and sumps will have the protective covering removed during the 8-h run. They will remain in place.

3.1.3 Residual Staging Units

The tanks, erected basins, roll-off boxes, and other containers used in these staging units will be cleaned with water and removed. The washwater will be disposed of during the 8-h run. Any earthen containment structures will be leveled or filled, as appropriate, and the area returned to its pre-test contours.

8.2 Temporary Closure

The type of closure for this RD&D activity is considered to be the result of an Emergency Action and is covered in Section 4.

The 1984 RCRA Hazardous and Solid Waste Amendments, Section 214, provides permits for research, development, and demonstration of innovative, experimental hazardous waste treatment technologies. An evaluation of draft EPA guidance for the Regions to utilize is the Table of Contents of this document. In addition, 40 CFR 264 is evaluated in this appendix for comparison purposes. As such, those subparts that are nonapplicable (N/A) are designated as waived by the draft RD&D Guidance Manual.

Subpart A--General		Applicability
264.1	Purpose, scope, and applicability	Yes
264.3	Relationship to interim status standards	N/A
264.4	Imminent hazard action	N/A
Subpart B--General Facility Standards		
264.10	Applicability	Yes
264.11	Identification number	Yes--App.F
264.12	Required notices	N/A
264.13	General waste analysis	Yes--Vol I
264.14	Security	Yes--Vol I
264.15	General inspection requirements	Yes--Vol I
264.16	Personnel training	Yes--Vol I
264.17	General requirements for ignitable, reactive, or incompatible wastes	N/A
264.18	Location standards	N/A
Subpart C--Preparedness and Prevention		
264.30	Applicability	Yes
264.31	Design and operation of facility	Yes--Vol 2, 4, 5, 6
264.32	Required equipment	Yes--Vol 5
264.33	Testing and maintenance of equipment	Yes--Vol 2, 5
264.34	Access to communications or alarm system	Yes--Vol 4, 5
264.35	Required aisle space	N/A
264.37	Arrangements with local authorities	Yes--Vol 9

9. PUBLIC RELATIONS

The USAF and U.S. Navy will develop a community relations program for Gulfport and surrounding areas. A formal public comment period will be included as part of the RD&D process. In addition, the following will be accomplished:

- Public information meeting
- Placement of a copy of the RD&D permit application in the local public library.

10. PERSONNEL QUALIFICATIONS

Key personnel involved in this project and the project structure are presented in Figure 10-1. In addition, abbreviated resumes of key personnel qualifications are provided.

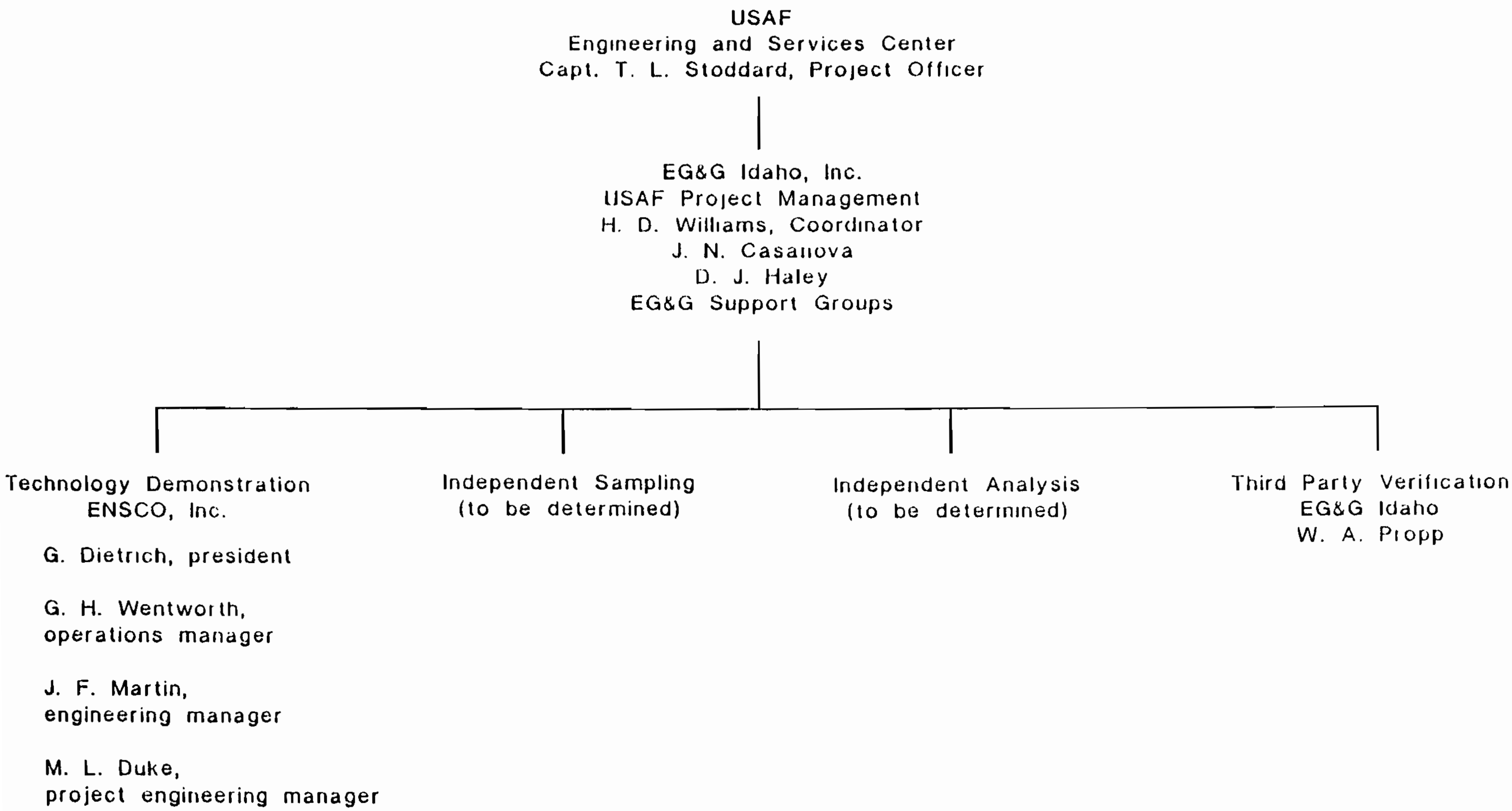


Figure 10-1. USAF Technology Demonstration Project.

CV5 2087

H. D. Williams

Principal Program Specialist
Waste Technology Programs

Education

B.S., Chemical Engineering, University of Colorado
M.S., Nuclear Engineering, University of Idaho

Experience

Twenty-three years experience in program, project, technical, and operations management in the nuclear and aerospace industry. Developed and implemented the Hazardous Waste Management Plan and Procedures for the Space Transportation System (Shuttle) at Vandenberg AFB. Initiated hazardous waste operations at Vandenberg AFB. Chairman of the National Department of Energy (DOE) Committee for Development of Criteria and Regulations for DOE Low-Level Radioactive Waste (DOE Order 5820). Supervisor of plant operations and maintenance for three nuclear test reactors and the experiment operations for Naval Reactors Program, various universities, and other governmental agencies.

Publications

Numerous publications in hazardous waste management, nuclear waste management, nuclear reactor operation, and nuclear experimentation.

At the INEL, current assignments include the program management responsibilities of the USAF Site Demonstrations: Environmental Restoration Technologies.

J. N. Casanova

Senior Program Specialist
Waste Technology Programs

Education

B.A., Journalism/Wildlife Biology, University of Montana
M.S., in progress (completion in 1986), Environmental Science and Engineering, University of Idaho

Experience

Nine years experience in environmentally related projects, programs, and activities, which includes preparation and review of environmental documents and technical reports, research and evaluation of alternate energy technologies, and development of resource managment plans. Assisted in initiation and development of hazardous waste management program for the INEL, and developed, implemented, and managed environmental compliance program for EG&G Idaho. Currently, area of expertise is hazardous waste regulatory compliance with emphasis on permitting.

W. A. Propp

Scientist
Chemical Sciences

Education

B. A., Chemistry, University of Colorado
Graduate work equivalent to a PhD., Physical Chemistry, Oregon State University

Experience

Eight years varied industrial experience in air pollution control and resources and energy recovery from municipal solid waste. Experience includes work in process engineering, analytical chemistry, process chemistry research and development, and environmental science and engineering.

At the INEL, current assignments include oversight and monitoring responsibilities for an ongoing laboratory analysis and quality assurance/quality control program supporting a USAF soil sampling and mapping program for dioxin contamination at former herbicide orange storage sites and the USAF Environmental Restoration Program for Site Demonstrations.

Publications

Publications in solid state chemistry, air pollution control chemistry, and energy recovery from municipal solid waste.

D. J. Haley

Senior Program Specialist
Waste Technology Programs

Education

B. S., Environmental Engineering, The Pennsylvania State University
M.S., Mechanical Engineering, The Pennsylvania State University

Experience

Five years experience in nuclear programs. Designed remote handling equipment and facility modifications in support of several nuclear materials examination programs and a nuclear fuel reprocessing plant. Performed safety analysis of an incinerator for processing radioactive waste. Planned, developed, and conducted engineering tests in a high-temperature pressure water facility for nuclear instrument calibration and valve sizing tests.

Publications

Condensation Mechanisms in A Source Sampling System with Dilution.

R. L. Sillau

Safety Engineer
Safety and Environmental Programs

Education

B. S., Biology, Colorado State University
M.S., Technical Education (concentrated in Industrial Engineering), Oklahoma State University

Experience

Nine years experience as a safety professional, with extensive experience in hazardous material safety. Taught several hazardous materials courses while assistant professor at a major state university. Completed extensive safety analyses on hazardous materials storage locations. Conducted emergency response training for chemical spills. Developed and taught training courses for shipment of hazardous materials. The shipping experience included extensive usage of AFR-71-4 in the associated MIL-STDs for government shipments.

T. H. Smith

Manager, Waste Technology Programs
Waste Management Programs

Education

B.E.S., Chemical Engineering, The Johns Hopkins University
Ph.D., Mechanical Engineering, University of Utah
Licensed Professional Engineer

Experience

Seventeen years of technical and management experience in waste management, principally in radioactive waste. Management of programs in environmental surveillance, environmental document preparation, decontamination and decommissioning, and storage and disposal of radioactive waste as well as hazardous waste. Performed engineering, safety, and risk evaluations for thes types of activities. Serves as member of IEEE Committee on Nuclear System Reliability and Safety. Reviewer for IEEE Transactions on Reliability Journal.

Publications

Numerous publications in several areas of radioactive waste management: cost/benefit analysis, risk analysis, waste certification, environmental surveillance, subsurface migration of contaminants.

A. E. Grey

Senior Scientist
Chemical Sciences

Education

B. S., Chemistry, University of Idaho
M. S., Organic Chemistry, University of Idaho
2-1/2 years, Ph.D program, Bio-Organic Chemistry, Washington State University

Experience

Seventeen years experience in the petrochemical industry in analytical, plant process, and research chemistry. Head of laboratory for analytical and process chemistry. In addition, five years experience in radioactive waste management, primarily concerned with criteria development and interpretation of environmental and nuclear laws and regulations. Responsible for three laboratories in a multidisciplinary laboratory complex.

Publications

Numerous publications in organic, organometallic, radioactive, and inorganic chemistry at university, commercial, and governmental levels. Several studies in synthesis/process control, one of which is patented.

K. L. Falconer

Manager, Hazardous Waste Program
Waste Technology Programs

Education

B. A., Botany and Chemistry, University of Montana
M. S., Water Resources Engineering and Water Chemistry, University of Wisconsin

Experience

Seven years experience in hazardous materials management, covering a variety of research and regulatory areas. Includes environmental risk assessment, hazardous waste management, low-level radioactive waste management, and occupational health. Expertise in the areas of chemistry, hydrology, and engineering.

Publications

Publications in the areas of hazardous material, risk analysis, contaminant migration, and disposal site selection.

J. E. Winchester

Instrumentation and Controls Engineer
Ensco, Inc.

Education

B. S., Electrical Engineering, Tennessee Technological University
M. S., Engineering Science, University of Tennessee

Experience

Thirteen years experience in the design of instrumentation and control systems. Experience includes the design of numerous measurement and control systems associated with combustion research and development. Configured computerized data acquisition and control systems for two mobile incineration systems that are presently operational. Conceptualized a burner management system for a four-burner waste-fired boiler system. Contributed to the implementation of a complex control scheme to modulate the injection of aqueous waste at an incineration facility. Designed measurement and control systems for research and development testing of coal-fired magnetohydrodynamic electric generators.

G. H. Wentworth

Operations Manager
Ensco, Inc.

Education

Civil Engineering Studies, Oregon State

Experience

Twenty years experience in management of heavy construction projects including dams, wastewater and water treatment systems, and power facilities. General contractor for construction of water and wastewater treatment facilities and other utilities. Construction activities included two 25-MW gas turbine generator stations, gas heater and purification system, water treatment facility, adminstrative/computer building, two 1-million-gallon water tanks, one 1-1/2 million-gallon fuel tank, and other associated work. As a project engineer, assisted in powerhouse and dam construction. Other engineering experience includes subdivision design, surveying, construction inspection, and field engineering on highway construction projects.

J. F. Martin

Engineering Manager
Ensco, Inc.

Education

B. S., Physics, University of Tennessee
M. S., Engineering Science, University of Tennessee
Registered Professional Engineer

Experience

Responsible for administrative and technical direction of a DOE/Magnetohydrodynamic coal energy conversion facility. Coordinated efforts of major architectural and engineering firms, coal combustion equipment suppliers, and DOE in design approval of systems and components. Specific project experience includes directing engineering design of oxygen enriched combustion system, thermal oxidation furnace, quench and other ancillary systems that make up a mobile hazardous waste incineration system. Developed facilities for testing and operating this system in an EPA-approved trial burn. Developed a preliminary design of a coal gasification system using an entrained bed oxygen blown gasifier. Developed designs for using dirty fuels such as coal or waste in an oxygen-enriched combustion environment. Managed design effort of high pressure, high temperature coal burner for advanced power systems, combustion chambers, coal feed systems, and high temperature slag separation cyclones. Developed design criteria for gas cleanup equipment for various combustion systems.

Publications

Several papers concerning developments in magnetohydrodynamics, high-temperature coal combustion, and related test facilities.

M. L. Duke

Ensco, Inc.

Education

B. S., Environmental and Water Resources Engineering, Vanderbilt University

Experience

Nine years experience in water, wastewater, hazardous waste management, and environmental engineering. Experience in design and operation of water and wastewater treatment systems, operator training, troubleshooting and upgrading of existing water and wastewater treatment systems, preparation of permit applications, regulatory negotiation, expert testimony, development of solid and hazardous waste management systems, and development of sludge management systems.

G. C. Combs

Vice President, Engineering
Ensco, Inc.

Education

B. S., Chemical Engineering, University of Arkansas
Ph.D., Engineering Science, University of Arkansas

Experience

Responsible for modification and maintenance of incinerator and the overall technical responsibility for operations. Responsible for technical aspects of an integrated waste disposal facility. Supervised a test burn on hexachorocyclopentadiene waste and conducted and supervised research related to drilling and production of oil and gas. Supervised design, construction, testing, and permitting of a large rotary kiln incinerator system that was permitted to incinerate solid PCB materials. Involved in the design and engineering of technical and economic evaluation of solid waste incinerators, wood-waste incinerators, hazardous waste incinerators, conceptual design and development of capital and operating budgets, evaluation of European hazardous waste incinerators to select those capable of complete destruction of high refractory compounds, and measurement of adsorption isotherms and design of charcoal filtration system. Member of the Scientific Policy Review Committee for the Arkansas Department of Pollution Control and Ecology.

J. H. Hicks

Ensco, Inc.

Education

B. S., Chemistry, Tennessee Technological University

Experience

Eleven years experience in environmental chemistry including the monitoring, analysis, and control of air emissions. Extensive experience in the development of on-line instrumentation systems, as well as the performance of sampling and analytical testing. Set up and performed ambient air sampling and analysis using both on-line instrumentation and wet chemistry methods. Supervised group responsible for process and stack gas sampling and analysis using continuous analyzers and the EPA reference manual methods. Assisted in setting up and implementing a water sampling and analysis program. Supervised waste sampling team for hazardous and nonhazardous wastes.

Performed laboratory analysis on coal and ash samples to include proximate and ultimte analyses. Performed laboratory analysis on liquid fuels such as kerosene and diesel fuel. Used atomic absorption spectrophotometer for metals analysis. Used gas chromatography with various detection systems for analysis of organic and inorganic constituents in gaseous and liquid samples.

Responsible for permitting of mobile incinerator for air, water, hazardous waste, and toxic substances at federal, state, and local levels. Assisted with permitting of other units.

R. Lipscomb

Ensco, Inc.

Education

B. S., Chemical Engineering, University of Tennessee

Experience

Responsible for supervision of the installation, startup, and operation on job sites. Oversees the development and implementation of the health and safety program and the quality control program. Supervised electrical, mechanical, and instrumentation engineers in the design of automatic control systems including energy management, boilers, bulk weighing/handling, drilling machines, winding machines, and assembly plant transfer systems. Responsible for projects such as an electric-arc phosphorus furnace plant from cost estimating to startup. Projects included waste incineration in a rotary kiln, rock crushing/screening, plant expansion, and boiler controls.

Provided technical feasibility studies, cost estimates, and profitability analyses for specialty chemical products. Worked in the development of a computer model of a distillation plant. Supervised the fabrication and instllation of replacement tower trays and heat exchangers necessitated by severe corrosion while developing new process procedures, alloys, cladding techniques to prevent future corrosion.

R. E. Lea

President, Entek Analytical Laboratory
Ensco, Inc.

Education

B.S., Chemistry, University of Arkansas
Ph.D., Organic Chemistry, University of Arkansas

Experience

Responsible for maintenance and optimization of all major instrumentation of commercial analytical laboratory. Assists in gc/ms analysis and in training and methods development on other instruments. Supervises performance of chemists and serves as a consultant in health and safety areas. Established and operated a commercial analytical laboratory for analysis of environmental contaminants. Served as a training consultant in gas chromatography and environmental analysis. Managed toxicological research providing analytical support. Instructor of gas chromatography and gc trouble-shooting.

APPENDIX A
SAMPLING AND ANALYSIS MATRIX

APPENDIX A

SAMPLING AND ANALYSIS MATRIX

Table A-1 presents the Criteria List that will determine the sampling and analysis requirements for this RD&D project. Individual constituents were identified through evaluation of existing data of NCBC soil and comparison with the Appendix VIII constituents in 40 CFR Part 261. EPA Headquarters has reviewed and commented on the constituents.

The goal of this demonstration is to reduce the TCDD concentrations in the soil at the HO site to ≤1 ppb and the total chlorinated dibenzodioxins and dibenzofurans to <1 ppb. Therefore, the treated soil and excavated holes will be sampled and analyzed throughout the demonstration to meet these goals.

In addition, a test run will be conducted before full operation to allow sampling and analysis of the treated soil to ensure that the remaining criteria in Table A-1 are met.

A requirement for issuance of the sampling and analysis subcontracts is that EPA sampling protocol and analytical methods be adhered to. Additional details of sampling and analysis will be available following award of subcontracts.

DELISTING PLAN

Final disposition of the treated soil will be determined through the delisting petition process through EPA Headquarters, Office of Solid Waste, Waste Identification Branch. Delisting efforts were formally initiated in October 1985. Petition identification number 0615 has been assigned to delisting activities for this project.

TABLE A-1. SAMPLING AND ANALYSIS MATRIX

Criteria List

Constituent	Analytical Method	Criteria/ Detection Limit[a]
Parameters for Routine Sampling		
Total chlorinated dibenzo-dioxins and dibenzofurans (CDDs and CDFs)	8280	<1 ppb
2,3,7,8-TCDD	8280	≤1 ppb
Parameters for Test Run		
Metals		
Antimony	SW846-7040	1 ppm
Arsenic	EP Toxicity	5 ppm
Barium	EP Toxicity	100 ppm
Beryllium	SW846-7090	1 ppm
Cadmium	EP Toxicity	1 ppm
Chromium	EP Toxicity	5 ppm
Copper	SW846-7210	1 ppm
Lead	EP Toxicity	5 ppm
Mercury	EP Toxicity	0.2 ppm
Nickel	SW846-7520	1 ppm
Selenium	EP Toxicity	1 ppm
Silver	EP Toxicity	5 ppm
Thallium	SW846-7840	1 ppm
Zinc	SW846-7950	1 ppm
Appendix VIII Constituents		
Benzo[b]fluoranthene (2,3-Benzofluoranthene)	SW846-8250	4.800 ppb
	SW846-8310	0.018 ppb
Benzo[a]pyrene (3,4-Benzopyrene)	SW846-8100	NG[b]
	SW846-8250	2.500 ppb
	SW846-8310	0.013 ppb
	8310	0.013 ppb
Chlorinated benzenes [EPA comment: use methods for individual benzenes][c]		
Chlorinated phenol [EPA comment: use methods for individual phenols][c]		

Constituent	Analytical Method	Criteria/ Detection Limit[a]
Chrysene (1,2-Benzphenanthrene)	SW846-8100 SW846-8250 SW846-8310	NG[b] 2.500 ppb 0.150 ppb
Coal tars [EPA will determine if this is necessary][c]		
Creosote (Creosote, wood) [EPA will determine if this is necessary][c]		
Dibenz[a,h]anthracene (1,2,5,6-Dibenzanthracene		
2,4-Dichlorophenol (Phenol, 2,4-dichloro-)	SW846-8040	0.390 ppb 0.630 ppb
2,6-Dichlorophenol (Phenol, 2,5-dichloro-)	SW846-8040 SW846-8250	NG[b] 2.700 ppb

a. Detection limits are for liquids. Solids detection limits may be considerably higher.

b. NG = not given.

c. Guidance from EPA Headquarters, Office of Solid Waste, Waste Identification Branch.

d. ND = not determined.

APPENDIX B

ASSESSMENT OF PART 264

STANDARDS FOR OWNERS AND OPERATORS OF

HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

The 1984 RCRA Hazardous and Solid Waste Amendments, Section 214, provides permits for research, development, and demonstration of innovative, experimental hazardous waste treatment technologies. An evaluation of draft EPA guidance for the Regions to utilize is the Table of Contents of this document. In addition, 40 CFR 264 is evaluated in this appendix for comparison purposes. As such, those subparts that are nonapplicable (N/A) are designated as waived by the draft RD&D Guidance Manual.

Subpart A--General		Applicability
264.1	Purpose, scope, and applicability.	Yes
264.3	Relationship to interim status standards.	N/A
264.4	Imminent hazard action.	N/A
Subpart B--General Facility Standards		
264.10	Applicability.	Yes
264.11	Identification number.	Yes--App.F
264.12	Required notices.	N/A
264.13	General waste analysis.	Yes--Vol I
264.14	Security.	Yes--Vol I
264.15	General inspection requirements.	Yes--Vol I
264.16	Personnel training.	Yes--Vol I
264.17	General requirements for ignitable, reactive, or incompatible wastes.	N/A
264.18	Location standards.	N/A
Subpart C--Preparedness and Prevention		
264.30	Applicability.	Yes
264.31	Design and operation of facility	Yes--Vol 2, 4, 5, 6
264.32	Required equipment.	Yes--Vol 5
264.33	Testing and maintenance of equipment.	Yes--Vol 2, 5
264.34	Access to communications or alarm system.	Yes--Vol 4, 5
264.35	Required aisle space.	N/A
264.37	Arrangements with local authorities	Yes--Vol 9

Subpart D--Contingency Plan and Emergency Procedures		Applicability
264.50	Applicability.	Yes
264.51	Purpose and implementation of contingency plan.	Yes--Vol 4
264.52	Content of contingency plan.	Yes--Vol 4
264.53	Copies of contingency plan.	Yes--Vol 4
264.54	Amendment of contingency plan.	N/A
264.55	Emergency coordinator.	Yes--Vol 4
264.56	Emergency procedures.	Yes--Vol 4

Subpart E--Manifest System, Recordkeeping, and Reporting

264.70	Applicability	N/A

Subpart F--Ground-water Protection

264.90	applicability.	N/A

Subpart G--Closure and Post-Closure

264.110	Applicability.	Yes
264.111	Closure performance standard.	Yes--Vol 8
264.112	Closure plan; amendment of plan.	Yes--Vol 8
264.113	Closure; time allowed for closure.	N/A
264.114	Disposal or decontamination of equipment.	Yes--Vol 8
264.115	Certification of closure.	N/A
264.117	Post-closure care and use of property.	N/A
264.118	Post-closure plan; amendment of plan.	N/A
264.119	Notice of local land authority.	N/A
264.120	Notice in deed to property.	N/A

Subpart H--Financial Requirements

264.140	Applicability.	N/A--Vol 7

Subpart I--Use and Management of Containers		Applicability
264.170	Applicability.	N/A
Subpart J--Tanks		
264.190	Applicability.	N/A
Subpart K--Surface Impoundments		
264.220	Applicability.	N/A
Subpart L--Waste Piles		
264.250	Applicability	N/A
Subpart M--Land Treatment		
264.270	Applicability.	N/A

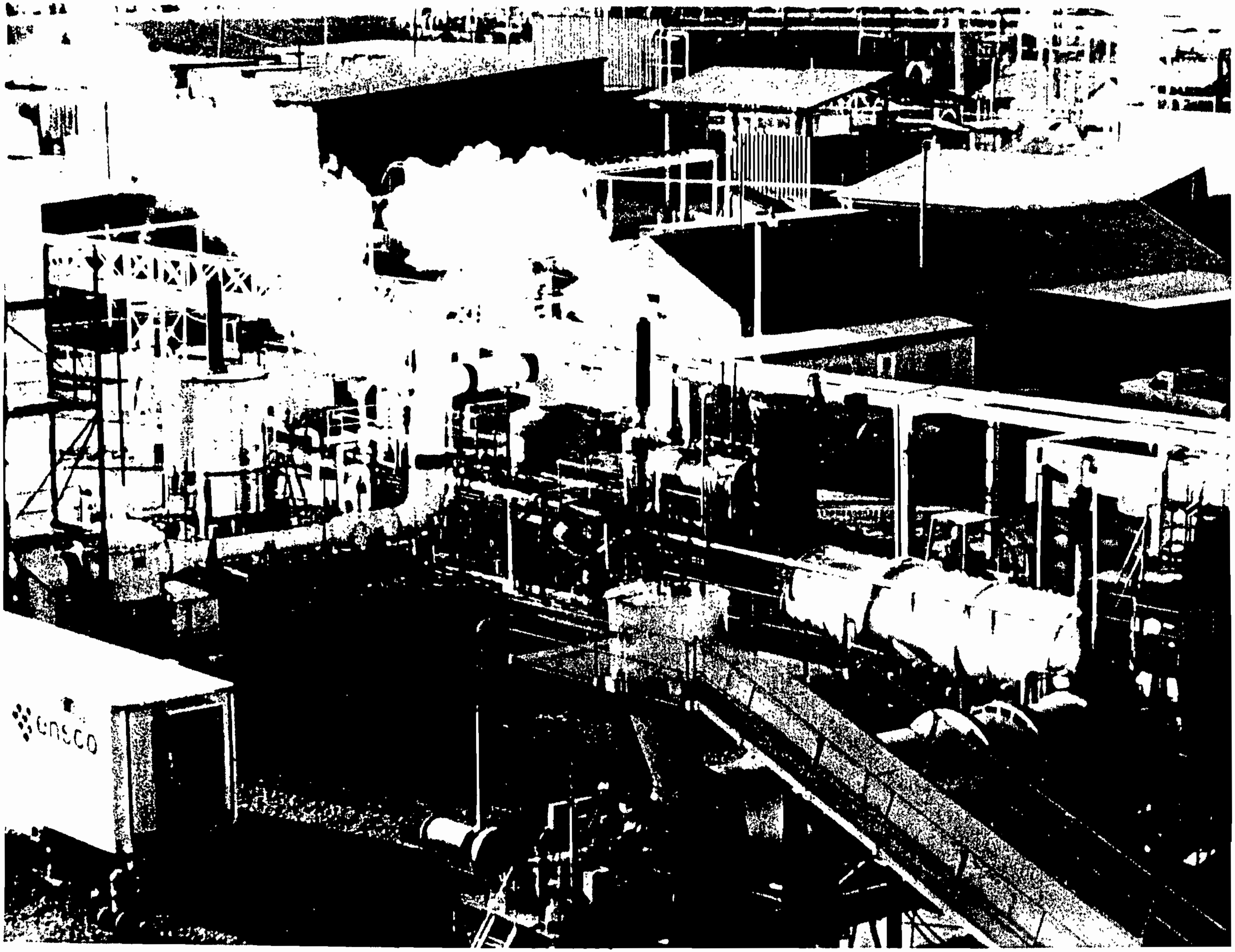
-COMMENT-

The regulations of Subpart M apply to treatment of soil in a land treatment unit; i.e., in-situ treatment of contaminated soil. They are not applicable to soil excavated to be tested on site; however, the requirements of 264.272 Treatment Demonstration are covered in the document.

Subpart N--Landfills		
264.300	Applicability.	N/A
Subpart O--Incinerators		
264.340	Applicability.	N/A

APPENDIX C

ENSCO MOBILE WASTE PROCESSOR 2000


ensco

APPENDIX D

STACK GAS MONITORING SYSTEM

APPENDIX D

STACK GAS MONITORING SYSTEM

The stack gas monitoring system consists of an extraction and conditioning system that feeds the conditioned stack gas to continuous monitors. These dedicated instruments continuously analyze the conditioned gas for carbon monoxide, carbon dioxide, oxygen, hydrocarbons, and nitrogen oxides. The analytical results are continuously monitored by the data acquisition and control system and can be used by the computer to effect automatic waste feed shutdown when abnormal conditions occur. Additionally, the readings from the oxygen and carbon monoxide monitors are continuously recorded by strip chart recorders.

The stack gas sampling probe is located at a point greater than 8 stack diameters downstream of the last bend and 2 stack diameters upstream of the stack exit. This stainless steel probe has a thermocouple reading the temperature of the extracted sample. A coarse particulate filter removes some of the water droplets and larger particulates before the sample enters the conditioning system. A calibration gas port is at the exterior of the probe to ensure system integrity. A diaphragm pump with Teflon seals provides the prime mover of the gas sample to the analyzers. This is done to keep the sample under a positive pressure so that any leaks that may develop will not affect the readings of the monitors.

The gas sample is pushed from the pump through an air-cooled Teflon tube of about 10 ft long to allow the gas to begin cooling and condense the entrained moisture. The gas sample then passes through a chilled condenser to remove the condensable moisture from the gas. This condenser consists of a 20-ft-long stainless steel tubing with a chilled water jacket. The cooling water is recirculated through a chiller thermostated at 37°F. The sample then passes through a water trap to remove the condensate. This trap has a float-operated drain to automatically expel the condensate under positive pressure. The condensate free gas then goes through a fine particulate filter followed by a permeation type dryer.

This condensate is contained in a condensate catch. Within this catchment are probes connected to continuous analyzers. These analyzers continuously monitor this stack condensate for pH and conductivity. These readings are manually logged by the operations personnel during all operating shifts.

In this dryer, the gas sample flows thrugh several selectively permeable membranes. A countercurrent flow of dry compressed air allows water vapor to permeate the membrane, yielding a gas sample with a very low water content. This clean dry gas sample then goes to the control room via Teflon tubing.

Within the control room is the instrumentation to monitor the stack gas. The instruments are contained in an instrumentation cabinet with the plumbing and controls for analysis. The stack gas is manifolded to each analyzer with an individual flow control for each instrument. Also included are the controls for the dry air flow to the permeation dryer and the calibration gas. Each of the continuous analyzers has a 4-20 milliamp output which is interfaced with the microcomputer system for data handling and storage.

The oxygen content of the stack gas is continuously monitored by a Teledyne #326 oxygen analyzer. This analyzer utilizes a fuel cell to measure the concentration of oxygen. This cell is specific to oxygen, has an absolute zero, and produces a linear output from zero through 100% oxygen. The oxygen cell is a sealed electrochemical transducer with no electrolyte to change or electrodes to clean. When the cell reaches the end of its useful life, it is replaced with a fresh cell. This analyzer has a choice of three ranges available: 0-5%, 0-25%, and 0-100% oxygen. This instrument has a sensitivity of 0.5% of full scale and accuracy is ±2% of full scale. The monitor has a 4-20 milliamp output, which is relayed through a shielded pair wire to the computer for data handling and storage.

The carbon dioxide content of the stack gas is continuously monitored by an Infrared Industries IR-703 carbon dioxide analyzer. This analyzer is a dual-beam, nondispersive infrared analyzer designed for the measurement of carbon dioxide. This system compares the infrared transmittance of two identical optical paths, one through the sample gas and the other through the reference path. The difference in optical transmittance between these paths then is a measure of the optical absorption due to the concentration of the carbon dioxide. Circuitry processes the nonlinear output signal and linearizes it to provide a linear output signal. This instrument has two ranges available: 0-5 and 0-50% carbon dioxide. The monitor has a 4-20 milliamp output, which is relayed through a shielded pair wire to the computer for data handling and storage. The sensitivity of this instrument is 0.5% of full scale, and accuracy is ±1% of full scale.

The carbon monoxide content of the stack gas is continuously monitored by a Horiba PIR-2000 carbon monoxide analyzer. This analyzer operates on the nondispersive infrared absorption principle. Twin beams of infrared radiation are projected through parallel cells. One beam traverses the sample cell; the other beam, the comparison cell. Carbon monoxide absorbs (and reduces) the radiation reaching the detector via the sample beam. The detector converts this into an electrical signal proportional to the concentration of the carbon monoxide. This instrument has a linear 4-20 milliamp output over the range 0-500 ppm of carbon monoxide. The output is relayed through a shielded pair wire to the computer for data handling and storage, as well as to an independent strip chart recorder. The sensitivity of this instrument is 1% of full scale, and accuracy is ±2% of full scale.

The hydrocarbon content of the stack gas is continuously monitored by an hnu Model 1201 hydrocarbon analyzer. This analyzer operates on the detection principle of photoionization. The sensor consists of a sealed ultraviolet light source that emits photons that are energetic enough to ionize many organic species, but not the major components of air. A chamber adjacent to the ultraviolet source contains a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions formed by the absorption of UV light to the collector electrode where the current (proportional to the concentration) is measured. This instrument has a linear 4-20 milliamp output over the range 0-1500 ppm. The output is relayed through a shielded pair wire to the computer for data handling and storage. The sensitivity of this instrument is 0.1 ppm, and accuracy is ±3% full scale.

The nitrogen oxides content of the stack gas is continuously monitored by a Thermo Electron Model 10 chemiluminescent NO/NOx analyzer. The chemiluminescent reaction of NO and O_3 provides the basis for this analysis. Light emission results when electronically excited NO_2 molecules revert to their ground state. To measure NO concentration, the gas sample to be analyzed is blended with ozone in a reaction chamber. The resulting chemiluminescence is monitored through an optical filter by a high-sensitivity photomultiplier positioned at one end of the chamber. The filter/photomultiplier responds to light in a narrow wavelength band unique to the reaction. The output from the photomultiplier is linearly proportional to the NO concentration. To measure NO_x concentrations, the gas sample flow is diverted through a NO_2-to-NO converter. The chemiluminescent response in the reaction chamber to the converter effluent is linearly proportional to the toal NO_x concentration entering the converter. This instrument has eight ranges available from 0-2.5 up to 0-10,000 ppm NO/NO_x. The 4-20 milliamp output is linear through all ranges and is relayed through a shielded pair wire to the computer for data handling and storage. The sensitivity of this instrument is 0.5% of full scale, and accuracy is ±1% of full scale.

These stack monitors are calibrated by flowing the standardized calibration gases to the calibration port on the stack probe. This flow rate must be 1.5 times the total sampling rate of the stack monitoring system to ensure that there is no dilution of the calibration gas by the stack sample (nominally, about 30 ft^3/h). This flow rate expels the excess calibration gas through the probe and into the stack, allowing the sampling system to only extract the desired calibration gases. This certified gas then goes through the entire sampling system and to the continuous monitors as if it were stack gas. The controls to regulate this calibration gas are contained within the control room to allow flagging of the data as it is stored by the computer system.

Each monitor undergoes a four-point calibration cycle at least once a week, or more often if the daily checks indicate the need. These four points consist of a zero gas, full scale within 25%, half of full scale ±25%, and one point within 25% of the normal reading of the instrument during the incineration of the waste, based on historical data. At least once a day, the zero and full-scale calibration gases are used to check the response of each analyzer. The zero gas is typically pure nitrogen, although the calibration gas for another analyzer may be used if the gas is free of any impurities that might have an effect. For economy and ease of operation, the calibration gases for CO, CO_2, and O_2 are combined since these are not mutually reactive, only limited by the partial pressure of the CO_2 gas. The calibration gases from NO_x for hydrocarbons are stored separately from the others.

The data from the daily and weekly checks are recorded automatically by the computer for the readings from the monitors. Additionally, a separate calibration record is maintained. The instruments are not adjusted during the daily checks, but the data are recorded to attempt to determine any drift or other variation that may occur. The instruments are only adjusted during the full four-point calibration cycle. All calibration and daily checks are examined every 2 to 4 weeks to attempt to identify any maintenance or operational problems that may be occurring. Whenever these are identified, they are added to the manufacturer's recommendations for that analyzer during the course of that particualr cleanup, unless they are identified as being a continuing problem. During the weekly four-point calibration cycle, all filters and traps throughout the sampling system are examined and replaced or cleaned as necessary.

APPENDIX E
INDEPENDENT SAMPING AND ANALYSES
STATEMENTS OF WORK

APPENDIX E

INDEPENDENT SAMPLING ANALYSES

STATEMENTS OF WORK

To be determined when sampling and analytical contractor has been selected.

APPENDIX F

NOTIFICATION FORM

EPA 8700-12 (6-85)

FOR

RESEARCH. DEVELOPMENT, AND DEMONSTRATION

Please print or type with ELITE type (12 characters/inch) in the unshaded areas only.

Form Approved OMB No. 2000-0098
GSA No. 0246-EPA-OT Expiration Date 12/31/86

EPA U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTALLATION'S EPA I.D. NO.

I. NAME OF INSTALLATION

II. INSTALLATION MAILING ADDRESS

III. LOCATION OF INSTALLATION

PLEASE PLACE LABEL IN THIS SPACE

INSTRUCTIONS: If you received a preprinted label, affix it in the space at left. If any of the information on the label is incorrect, draw a line through it and supply the correct information in the appropriate section below. If the label is complete and correct, leave Items I, II, and III below blank. If you did not receive a preprinted label, complete all items. "Installation" means a single site where hazardous waste is generated, treated, stored and/or disposed of, or a transporter's principal place of business. Please refer to the INSTRUCTIONS FOR FILING NOTIFICATION before completing this form. The information requested herein is required by law (*Section 3010 of the Resource Conservation and Recovery Act*).

DETACH

FOR OFFICIAL USE ONLY

COMMENTS

C

INSTALLATION'S EPA I.D. NUMBER | APPROVED | DATE RECEIVED (yr., mo., & day)

F | T/A C: 1

I. NAME OF INSTALLATION

Naval Construction Battalion Center

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX

3 Code Orange

CITY OR TOWN	ST.	ZIP CODE
4 Gulfport	MS	39051

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER

5 As Above

CITY OR TOWN	ST.	ZIP CODE
6 Gulfport	MS	39051

IV. INSTALLATION CONTACT

NAME AND TITLE (last, first, & job title)	PHONE NO. (area code & no.)
2 J Cluff Base Env Coordinator	601-865-2484

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER

8 United States Navy

B. TYPE OF OWNERSHIP (enter the appropriate letter into box)

F — FEDERAL
M — NON-FEDERAL

F

VI. TYPE OF HAZARDOUS WASTE ACTIVITY (enter "X" in the appropriate box(es))

N/A

- [ ] A. GENERATION
- [ ] B. TRANSPORTATION (complete item VII)
- [ ] C. TREAT/STORE/DISPOSE
- [ ] D. UNDERGROUND INJECTION

VII. MODE OF TRANSPORTATION (transporters only — enter "X" in the appropriate box(es))

- [ ] A. AIR
- [ ] B. RAIL
- [ ] C. HIGHWAY
- [ ] D. WATER
- [ ] E. OTHER (specify)

N/A

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notificatio
If this is not your first notification, enter your installation's EPA I.D. Number in the space provided below.

- [ ] A. FIRST NOTIFICATION
- [ ] B. SUBSEQUENT NOTIFICATION (complete item C)

C. INSTALLATION'S EPA I.D. NO

IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information.

EPA Form 8700-12 (6-85) CONTINUE ON REVERSE

I.D. — FOR OFFICIAL USE ONLY

W

IX. DESCRIPTION OF HAZARDOUS WASTES *(continued from front)*

A. HAZARDOUS WASTES FROM NON-SPECIFIC SOURCES. Enter the four-digit number from 40 CFR Part 261.31 for each listed hazardous waste from non-specific sources your installation handles. Use additional sheets if necessary.

1	2	3	4	5	6
F027	F028				
7	**8**	**9**	**10**	**11**	**12**

B. HAZARDOUS WASTES FROM SPECIFIC SOURCES. Enter the four-digit number from 40 CFR Part 261.32 for each listed hazardous waste from specific industrial sources your installation handles. Use additional sheets if necessary.

13	14	15	16	17	18
19	**20**	**21**	**22**	**23**	**24**
25	**26**	**27**	**28**	**29**	**30**

C. COMMERCIAL CHEMICAL PRODUCT HAZARDOUS WASTES. Enter the four-digit number from 40 CFR Part 261.33 for each chemical substance your installation handles which may be a hazardous waste. Use additional sheets if necessary.

31	32	33	34	35	36
37	**38**	**39**	**40**	**41**	**42**
43	**44**	**45**	**46**	**47**	**48**

D. LISTED INFECTIOUS WASTES. Enter the four-digit number from 40 CFR Part 261.34 for each listed hazardous waste from hospitals, veterinary hospitals, medical and research laboratories your installation handles. Use additional sheets if necessary.

49	50	51	52	53	54

E. CHARACTERISTICS OF NON-LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non-listed hazardous wastes your installation handles. *(See 40 CFR Parts 261.21 — 261.24.)*

☐ 1. IGNITABLE (D001) ☐ 2. CORROSIVE (D002) ☐ 3. REACTIVE (D003) ☐ 4. TOXIC (D000)

DETACH

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE	NAME & OFFICIAL TITLE *(type or print)*	DATE SIGNED
H W Williams	H. D. Williams Principal Program Specialist	Jan. 20, 1986

EPA Form 8700-12 (6-85) REVERSE

This document has been prepared by:

EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, Idaho 83415

Contacts: H. D. Williams
(FTS 583-1763)

or J. N. Casanova
(FTS 583-9736)

For

U.S. Air Force
Engineering Services Center
HQ AFESC/RDVW,
Tyndall Air Force Base, Florida 32403

Contact: Capt. T. L. Stoddart
[FTS (904) 283-2942]