CIBA-GEIGY CORPORATION
McINTOSH FACILITY

REMEDIAL ACTION PLANS

FOR

OPERABLE UNIT NO. 2
AND OPERABLE UNIT NO. 4

10055912

SITE: Ciba
BREAK: 7.8
OTHER:

June 1996

ciba

OHM Remediation Services, Corp.
A Subsidiary of OHM Corporation

RUST ENVIRONMENT & INFRASTRUCTURE

REMEDIAL ACTION PLANS

FOR

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

JUNE 1996

RUST PROJECT NO. 89892.300

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LIST OF ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
AMP	Air Monitoring Plan
ARARs	Applicable or Relevant and Appropriate Requirements
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CMP	Construction Management Plan
CQAP	Construction Quality Assurance Plan
FDR	Final Design Report
IDR	Intermediate Design Report
IQAT	Independent Quality Assurance Team
MHP	Materials Handling Plan
MSL	Mean Sea Level
O&M Plan	Operations and Maintenance Plan
OHM	OHM Remediation Services Corporation
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PDP	Performance Demonstration Plan
PDR	Preliminary Design Report
PDS	Project Delivery Strategy
PFDR	Prefinal Design Report
PRP	Potentially Responsible Party
PSVP	Performance Standards Verification Plan
RA	Remedial Action
RAPs	Remedial Action Plans
RAWP	Remedial Action Work Plan
RD	Remedial Design
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation, Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
Rust	Rust Environment & Infrastructure
RWWTS	Remediation Wastewater Treatment System
SARA	Superfund Amendment Reauthorization Act
Site	Ciba McIntosh Superfund Site
SOW	Statement of Work
TAG	Technical Assistance Grant
TTU	Thermal Treatment Unit
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this Remedial Action Work Plan (RAWP) is to provide a detailed plan of action for completing the RA activities as set forth in the September 30, 1991, Record of Decision (ROD) for Operable Unit (OU2) and Operable Unit (OU4). This plan has been prepared in accordance with Section IV, Task III, Paragraph A.1 of the Statement of Work for RD/RA Consent Decree, Operable Unit 2 and with Section IV, Task III, Paragraph A.1 of the Statement of Work (SOW) for RD/RA Consent Decree, Operable Unit 4. The RAWP has been prepared for Ciba-Geigy Corporation (Ciba) by Rust Environment & Infrastructure (Rust) in cooperation with OHM Remediation Services Corporation (OHM).

This RAWP has been prepared for the remedial action (RA) at OU2 and OU4 of the Ciba McIntosh Superfund Site (Site). In addition, contaminated surface soils from Operable Unit Three (OU3), the floodplain, will be excavated and backfilled into OU2. The RA includes:

- excavation, thermal treatment and/or backfill of OU2 soils, which consists of sites 1 through 7, 9 and 11
- excavation, thermal treatment and backfill of OU4 soils, which consist of site 8
- construction of a slurry wall outside the toe of the bluffline in site 8
- backfill of OU3 soils into excavations in OU2
- stabilization of exposed iron slurry at site 8

The RAWP has been developed in conjunction with the Construction Management Plan (CMP) and the Construction Health and Safety Plan/Contingency Plan (CHSP), included herein as Appendices A and C, respectively. Upon approval of the Final Design and this RAWP, Ciba will implement the RA in accordance with the construction management schedule (see Section 3).

This RAWP describes the major RA tasks. Section 2 includes a description of the tasks to be performed and a description of the work products to be submitted to the United States Environmental Protection Agency (USEPA). A schedule for completion of each required activity and submission of each deliverable to USEPA is presented in Section 3. The Project Management Plan is discussed in Section 4, and a description of the community relation support activities is discussed in Section 5. The Project Delivery Strategy (PDS) is included in Section 6. Detailed plans for implementation of the remedy are included as appendices to the RAWP.

1.1 SITE DESCRIPTION

The Ciba McIntosh plant is located in southern Washington County, northeast of McIntosh, Alabama and approximately 50 miles north of Mobile, Alabama. Drawing 89892-NG-02 provided in Appendix H of the Final Design Report (FDR) shows the plant location. The plant site occupies approximately 2.4 square miles and is bound by a pine forest to the north and by Olin Corporation to the south. Portions of the McIntosh Superfund Site extend to the floodplain of the Tombigbee River to the east. The western boundary extends past the Southern Railroad right-of-way towards U.S. Highway 43. The nearest population center is the town of McIntosh, approximately two miles to the southwest.

The two prominent topographic features at the McIntosh Superfund Site are the upland terrace near the manufacturing area and the low bottomland floodplain adjacent to the Tombigbee River. Elevations range from approximately 50 feet above mean sea level (MSL) in the terrace to 10 feet MSL along the floodplain. The McIntosh Superfund Site is essentially flat except for the escarpment separating the terrace and the floodplain, where there can be up to 40 feet of relief.

Site soils consist of a continuous surficial clay layer underlain by silts, sands, gravel, and clays. The alluvial aquifer exists under semi-confined conditions and has a slight gradient to the south-southeast, towards the Tombigbee River. This flow pattern is modified in areas by plant water supply wells and Corrective Action extraction wells.

The McIntosh Superfund Site has been divided into four operable units. OU2 includes ten of the eleven former waste management areas (called "sites"). OU4 consists of the contamination of soils in the former waste management area (site 8). Locations of the 11 sites are presented in Drawing 89892-NG-03 (FDR, Appendix H). Brief descriptions of the sites are given below. For purposes of the Remedial Design (RD) and the RA, OU2 and OU4 are addressed collectively as one treatment area. OU1 (groundwater in the alluvial aquifer) is not part of this RA.

<u>Site 1 (Original Effluent Impoundment)</u>

Site 1 is a former wastewater impoundment currently filled in with material from sandblasting activities. The site has black pond sediments intermingled with clayey to sandy soils. The contaminants are mainly DDT, DDD and DDE (known collectively as DDTr), hexachlorocyclohexane (BHCs), and chlorobenzenes. The site contains moderate amounts of concrete and fragmented metal debris. The approximate extent of contamination is presented in Drawings 89892-NP-01 and 89892-

NP-02 (FDR, Appendix H). The old impoundment surface area occupied is approximately 24,000 square feet.

Site 2 (Disposal Pit)

Site 2 is a small, former disposal pit used for the burial of rubble and pond sediments from site 1. The pit contains pesticide residues, by-products, and intermediates from pesticide manufacturing. Moderate amounts of debris include wood, concrete and metal fragments. The approximate extent of contamination is presented in Drawings 89892-NP-01 and 89892-NP-02 (FDR, Appendix H).

Site 3 (Tar Disposal Area)

Site 3 is an area consisting of five discrete past waste management areas evidencing broad surficial contamination. Based on field work conducted during the Remedial Investigation/Feasibility Study (RI/FS), site 3 has been divided into 5 specific areas and a general area of contamination. These are designated as 3A, 3B, 3C, 3D, and 3E, and 3 General.

Site 3A's contains small amounts of DDTr and diazinon. Some of the material is located with deteriorated steel drums. Area 3B contains xylenes, toluene, DDTr, and triazines. Drums were encountered at four feet. Area 3C contains xylene, toluene, ethylbenzene, chloroform, DDTr and triazines. Deteriorated drums were encountered two feet below the surface. Area 3D includes clayey silt soils containing burnt wood, shell and organic debris. A layer of black tar-like solid was encountered beneath the fill. The major contaminants are DDTr and BHCs. Area 3 consists of clayey silt soils containing shell, concrete, burnt wood and chemical waste which overlies undisturbed soil. The major contaminants are DDTr and hexachlorocyclohexanes. Area 3 General includes an area with a thin tar layer and contaminated soil, the stockpile area, and a former cooling water ditch with associated contaminated soil. The stockpile area contains soil excavated during construction of the new cooling water discharge pipeline. Suspected contaminated sediments in the eastern segment of the former cooling water ditch were also transferred to the stockpile area during construction of the new cooling water discharge pipeline. The major contaminant is DDTr. The approximate extent of contamination in site 3 is presented in Drawings 89892-NP-03 and 89892-NP-04 (FDR, Appendix H).

Site 4 (Disposal Pits)

Site 4 consists of three isolated, shallow disposal pits site 4A, 4B, and 4C, covered by clayey soils. The pits contain low levels of DDTr, triazines, and BHC isomers. The approximate extent of contamination in site 4 is presented in Drawings 89892-NP-05 and 89892-NP-06 (FDR, Appendix H).

Site 5 (Open Burn Area)

Site 5 is an area where open burning was formerly practiced. The site is covered by clayey soils and contains trash and some burned demolition debris. The main contaminant is DDTr. The approximate extent of contamination in site 5 is presented in Drawing 89892-NP-05 (FDR, Appendix H).

Site 6 (Temporary Trash Staging Area)

Site 6 is the location of two adjacent former trash staging areas covered by clay soils. The site contains trash consisting of combustible refuse such as plastic, paper, cardboard, and rubber. The location of site 6 is presented in Drawing 89892-NP-07 (FDR, Appendix H).

Site 7 (Disposal Site South of the Class C Landfill)

Site 7 is a former disposal pit covered by clay soils. The site contains drums, solid waste, jars, bulk solid wastes, and trash. The major contaminants are BHC isomers and triazines. The approximate extent of contamination is presented in Drawings 89892-NP-07 and 89892-NP-08 (FDR, Appendix H).

Site 8 (Bluffline Area)

Site 8 (OU4) is a former waste management area at the manufacturing facility. It is located partially on the top of a low terrace and partially in the floodplain of the Tombigbee River. Past waste management practices have resulted in the original bluffline being extended into the floodplain. The man-made extension of the natural bluff is composed of fill material consisting of construction debris such as metal fragments, large fragments of concrete and asphalt, asbestos debris, crushed piles of concrete, bricks, stone, fiberglass, and similar materials mixed with contaminated and uncontaminated soils. The major chemical contaminants are triazines. The northeast portion of site 8 contains iron

slurry and is known as the iron slurry subsite. The approximate extent of contamination is presented in Drawings 89892-NP-09, 89892-NP-10 and 89892-NP-11 (FDR, Appendix H).

Site 9 (BHC Burial Area)

Site 9 is a chemical material burial area covered with clay soil. The site predominantly contains BHC isomers. The approximate extent of contamination is presented in Drawings 89892-NP-03 and 89892-NP-12 (FDR, Appendix H).

Site 10 (Warehouse No. 218)

Site 10 consists of a thin layer of pond sediments partially covered by an existing storage warehouse. The site contains low levels of DDTr and is overlain by approximately eight feet of compacted clay soils. The ground surface is covered with reinforced concrete.

Site 11 (Trash Staging Area)

Site 11 consists of intermixed soil and pond sediments underlying the current trash staging area. The intermixed soil and pond sediments contain low levels of DDTr and are overlain by approximately four feet of compacted clay soils. The surface is covered with reinforced concrete except for a small portion along the southern and eastern edges, which is bare ground. The approximate extent of contamination is presented in Drawing 89892-NP-07 (FDR, Appendix H).

1.2 SITE HISTORY

A summary of the chronological history at the McIntosh Superfund Site is presented in Table 1-1.

1.3 PROJECT DESCRIPTION

In the summary, the RODs for OU2 and OU4, as modified by the Explanation of Significant Differences, require the following:

- excavation of soils exceeding the excavation Performance Standards to a depth of 20 feet below grade
- thermal treatment of excavated soils unless other, innovative technologies are determined to be technically and cost effective

- in-situ soil flushing in conjunction with isolation walls for soils exceeding excavation Performance Standards below a depth of 20 feet
- backfilling the excavated areas with common soil and providing a vegetative cover

In addition, the ROD for OU4 requires in-situ stabilization of the iron slurry in site 8.

Treatability testing conducted prior to the Design determined that none of the innovative technologies evaluated were effective in treating McIntosh Superfund Site soils. Thermal treatment will therefore be the sole treatment method for soils to a depth of 20 feet. The treatment of soils greater than 20 feet deep is discussed below. Following discussion with the agencies, it was determined that soils meeting the treatment Performance Standards can be placed back into the excavations.

The project will be executed as a thermal treatment operation with an in-situ stabilization segment (iron slurry) and a diversion/containment wall at site 8 (bluffline). The major operation will include a statistically designed excavation plan, an extensive soil conditioning program, thermal treatment with secondary oxidative destruction of off-gases, extensive gas cleaning and treated residuals placement as backfill. A second major part of the operation will involve debris. Several kinds of debris will be encountered and disposed. Metal will be decontaminated and recycled as scrap whenever possible, combustibles (paper, plastics, wood) will be shredded and sent for thermal treatment, large pieces of concrete will be cleaned and returned to the site, and large wooden pieces (logs, etc.) will be cleaned and returned to the site.

Excavation limits have been defined by a geostatistical method using indicator kriging. A commercial software package was purchased to accomplish this. The method will ensure that the site individually and as a whole will be remediated to meet the Excavation Performance Standards.

A remediation wastewater treatment system (RWWTS) will also be a part of this project. Site water will be encountered during excavation (perched and rain water), and water will be captured from the thermal treatment unit. This water will be treated as necessary and either used in the thermal treatment process or discharged to the McIntosh plant wastewater treatment facility (WWTF).
Final site restoration will involve proper grading and revegetation of all areas. It is intended that all remediated areas except site 8 (bluffline) will be available for general industrial use after remediation is complete, subject to certain restrictions.

FIGURE 1-1
SITE HISTORY
CIBA MCINTOSH SUPERFUND SITE

Date	Activity
October 1952	Facility begins operations as part of Geigy Chemical Corporation
1970	Geigy merges with Ciba, forming the Ciba-Geigy Corporation
August 1982	USEPA conducts site investigation
September 1983	Site added to the National Priorities List
October 1985	USEPA issues RCRA permit, which requires a site investigation
1985	Initiated RI/FS for the McIntosh Superfund Site
1987	Installed groundwater extraction system in the upper alluvial aquifer as part of the RCRA Corrective Action Program
September 1989	ROD for OU1
September 1991	ROD for OU2
July 1992	ROD for OU4
November 18, 1992	Consent Decree entered for OU2
September 1993	Combined RDWP (OU2 and OU4) submitted to USEPA and ADEM
November 1993	Explanation of Significant Differences for OU2 and OU4
May 13, 1994	Consent Decree entered for OU4

2.0 REMEDIAL ACTION PLANNING AND IMPLEMENTATION

This section references implementation plans for the various phases and components of the RA for the Site. OHM is the RA contractor, Ciba is the supervising contractor for the Ciba McIntosh Superfund Site. Rust is subcontracted to OHM for the design phase of the project. OHM currently plans to utilize the following subcontractors during the RA phase:

Performance Demonstration Test:

TRC Environmental Corporation
2315 West Sam Houston Parkway North
Houston, Texas 77043
(713) 827-0600

Slurry Wall Construction:

Inquip Associates, Inc.
711 West Burning Tree Lane
Arlington Heights, IL 60004
(847) 398-8007

2.1 PLANNING

This RAWP, in conjunction with the appended RA plans, comprise the documents which will be submitted to USEPA prior to initiating mobilization, construction and excavation. Mobilization activities will begin once these and other adjunct documents are reviewed and approved by the USEPA, and once acceptance of all permitting equivalencies are attained. At the thirty percent construction phase, the Operations and Maintenance Plan (O&M Plan) will be submitted to USEPA for review prior to operation of the thermal treatment unit (TTU).

The RA will be implemented in two phases. Phase I (referred to as "Interim RA" in the Intermediate Design Report) will be conducted during the summer of 1996 to take advantage of dry weather conditions and to verify the process for confirming the attainment of excavation Performance Standards. Phase I consists primarily of civil construction projects, as follows:

- construction of temporary facilities, including site trailers and a portable wastewater treatment system
- perimeter air monitoring
- excavation of sites 1, 4 and parts of site 3
- stockpiling of select soils for later treatment
- placement of excavated soils and one foot of clean cover over site 2
- construction of the slurry wall below the toe of slope in site 8
- soil verification sampling

No soils will be treated during Phase I. Excavated soils will either be backfilled or stockpiled for subsequent treatment during Phase II.

Phase II (referred to as "Final RA" in the Intermediate Design Report) involves the remainder of the RA, specifically excavation, thermal treatment of soils, and , if required, construction of a stabilized area in the iron slurry area at site 8. The remaining facilities, including utilities and the TTU, will be installed. A performance demonstration will be conducted to establish operating parameters for the TTU. Following thermal treatment, the site will be regraded and revegetated. Specific work items for Phase I and Phase II are shown in the construction schedule (Figure 3-1).

2.1.1 Project Delivery Strategy

The PDS is included as Section 6 of this RAWP and describes the strategy for delivering the project.

2.1.2 Construction Management Plan

The CMP is included as Appendix A of this RAWP and presents how the construction activities are to be implemented and coordinated with USEPA during the RA. This plan also presents procedures for USEPA review and approval of any construction changes.

2.1.3 Construction Quality Assurance Plan

The Contractor Quality Assurance Plan (CQAP) is included as Appendix B of this RAWP and includes a description of the quality control organization, Independent Quality Assurance Team (IQAT), testing required to monitor construction and Performance Standards, and reporting procedures.

2.1.4 Construction Health and Safety Plan

The CHSP is included as Appendix C of this RAWP. The CHSP includes procedural and equipment requirements for compliance with Occupational Safety and Health Administration (OSHA) regulations and protocols as well as a Contingency Plan to ensure protection of the environment and local residents. Perimeter air monitoring procedures are presented in the Air Monitoring Plan (AMP).

2.1.5 Materials Handling Plan

The Materials Handling Plan (MHP), included as Appendix D of this RAWP, describes the methods and equipment utilized to support the excavation, temporary storage, thermal treatment and backfill of soils.

2.1.6 Erosion and Run-off Control Plan

The Erosion and Run-off Control Plan is included as Appendix E of this RAWP and presents measures necessary to provide control of soil erosion and surface water run-off during construction and after completion of the RA.

2.1.7 Temporary Facilities Plan

The Temporary Facilities Plan is included as Appendix F of this RAWP and presents a general Site layout location of temporary facilities and equipment.

2.1.8 Air Monitoring Plan

The AMP is included as an Appendix to the CHSP. This plan presents the requirements and procedures associated with perimeter air monitoring and site dust control. Requirements for monitoring air quality on-site for purposes of setting worker protection levels are contained in the CHSP.

2.1.9 Operations and Maintenance Manual and Plan

At the thirty percent construction phase, the Operations and Maintenance Plan (O&M Plan) and Manual (O&M Manual) will be submitted for USEPA review and approval. These documents will present procedures required for operation and maintenance of the TTU during the RA work.

2.2 MOBILIZATION AND CONSTRUCTION

Mobilization and construction will be performed in accordance with the construction schedule presented in Section 3.

2.3 IMPLEMENTATION

The RA will be performed in accordance with this work plan and appendices as well as the O&M Plan. Appendix B, the CMP, contains a procedure for requesting and approving changes to these plans.

3.0 SCHEDULE

Figure 3-1 presents the construction schedule for the RA at the Site. The schedule is contingent upon receipt of USEPA and the Alabama Department of Environmental Management (ADEM) approvals, where required, on the dates noted. Final RA, including full mobilization and construction activities, will not commence until the following documents have been approved:

- Performance Demonstration Plan (PDP)
- Performance Standards Verification Plan (PSVP)
- Final Design Report (FDR)

The schedule in Figure 3-1 is contingent on acceptable site conditions. Changes to the work will impact the schedule. The schedule does not include time for delays due to unforeseen site conditions or extreme weather conditions, although some reasonable delays may occur. The Phase I work in particular is contingent on favorable weather conditions and that the river has receded from the floodplain. Construction of the slurry wall cannot begin until the floodplain is dry enough for heavy vehicle traffic.

The RAWP schedule for backfilling of soils during Phase I is contingent on USEPA approval of the performance verification sampling results.

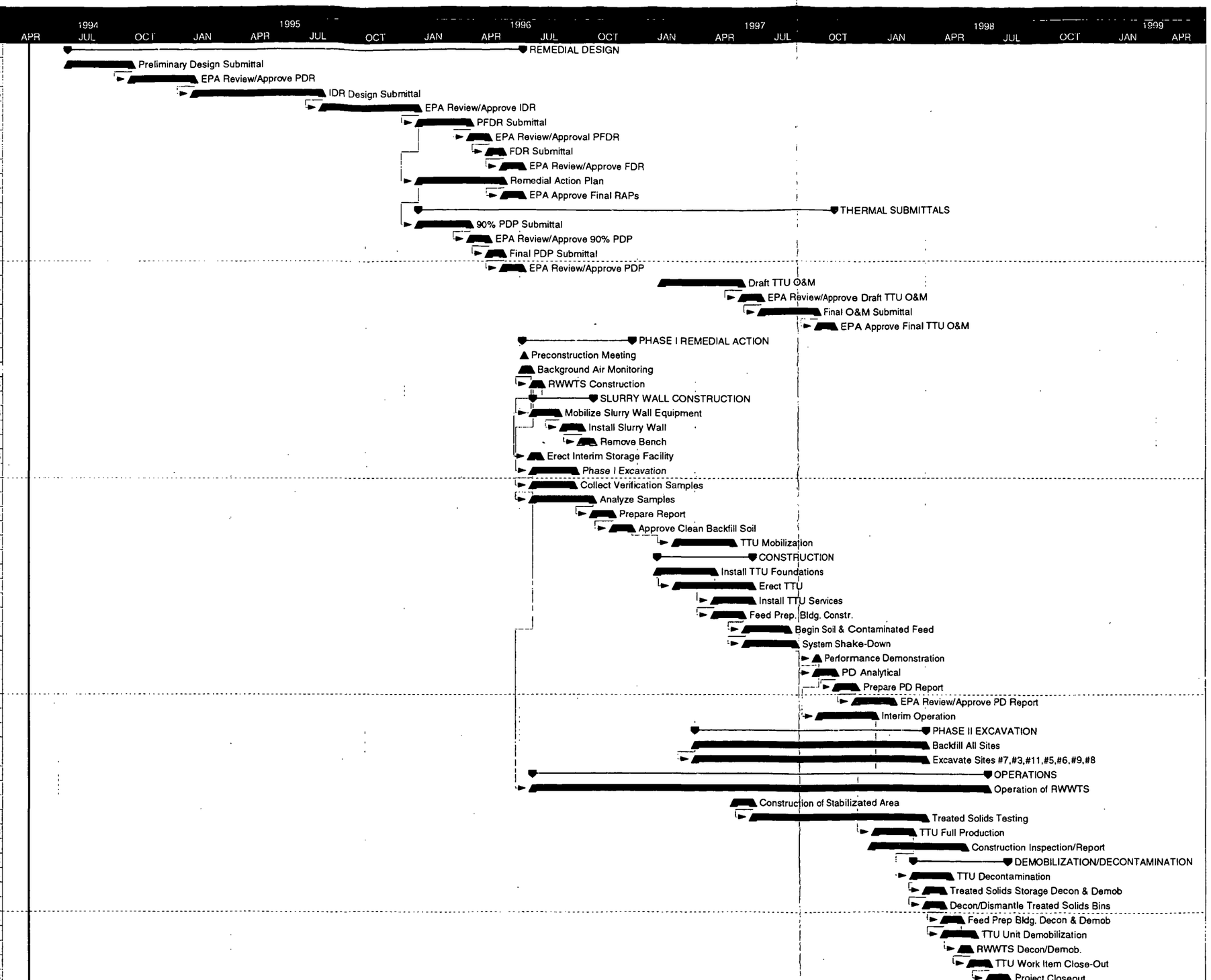
The following portions of the RA schedule are contingent upon agency approvals:

- approval of the Final Design Report and attendant work plans
- approval of the Operation and Maintenance Plan and Manual
- approval of the performance demonstration
- approval of the PSVP for excavation during Phase I.

The schedule provides reasonable periods for agency review and comment. Delay in agency approvals will impact the schedule.

The USEPA Remedial Project Manager (RPM) will be informed of any significant modifications to the schedule at the earliest opportunity. Revised RA schedules will be submitted as necessary.

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish
BB 001	REMEDIAL DESIGN	721 *	721 *	16JUL94	05JUL96
BB 001A	Preliminary Design Submittal	102	102	16JUL94	25OCT94
BB 001B	EPA Review/Approve PDR	100	100	25OCT94	01FEB95
BB 001C	IDR Design Submittal	203	203	01FEB95	22AUG95
BB 001D	EPA Review/Approve IDR	153	153	23AUG95	22JAN96
BB 001E	PFDR Submittal	82	82	23JAN96	13APR96
BB 001F	EPA Review/Approval PFDR	30	30	14APR96	13MAY96
BB 001G	FDR Submittal	22	22	14MAY96	04JUN96
BB 001H	EPA Review/Approve FDR	31	31	05JUN96	05JUL96
BB 001I	Remedial Action Plan	135	135	23JAN96	05JUN96
BB 001J	EPA Approve Final RAPs	30	30	06JUN96	05JUL96
CC 003	THERMAL SUBMITTALS	657 *	657 *	23JAN96	09NOV97
CC 003C	90% PDP Submittal	82	82	23JAN96	13APR96
CC 003D	EPA Review/Approve 90% PDP	30	30	14APR96	13MAY96
CC 003E	Final PDP Submittal	22	22	14MAY96	04JUN96
CC 003F	EPA Review/Approve PDP	31	31	05JUN96	05JUL96
CC 003G	Draft TTU O&M	126	126	07FEB97	12JUN97
CC 003H	EPA Review/Approve Draft TTU O&M	30	30	13JUN97	12JUL97
CC 003I	Final O&M Submittal	90	90	13JUL97	10OCT97
CC 003J	EPA Approve Final TTU O&M	30	30	11OCT97	09NOV97
DD 004	PHASE I REMEDIAL ACTION	172 *	172 *	05JUL96	23DEC96
DD 50010	Preconstruction Meeting	1	1	08JUL96	08JUL96
DD 50011	Background Air Monitoring	14	14	05JUL96	18JUL96
MO 006B	RWWTS Construction	14	14	22JUL96	04AUG96
MO 2400	SLURRY WALL CONSTRUCTION	95 *	95 *	22JUL96	24OCT96
MO 2405	Mobilize Slurry Wall Equipment	40	40	22JUL96	30AUG96
MO 2410	Install Slurry Wall	30	30	07SEP96	06OCT96
MO 2411	Remove Bench	20	20	05OCT96	24OCT96
MO 50000	Erect Interim Storage Facility	15	15	19JUL96	02AUG96
MO 50001	Phase I Excavation	68	68	22JUL96	27SEP96
DD 50014	Collect Verification Samples	65	65	22JUL96	24SEP96
DD 50015	Analyze Samples	95	95	22JUL96	24OCT96
DD 50016	Prepare Report	30	30	25OCT96	23NOV96
DD 50017	Approve Clean Backfill Soil	30	30	24NOV96	23DEC96
EE 005	TTU Mobilization	92	92	01MAR97	31MAY97
FF 006	CONSTRUCTION	149 *	149 *	01FEB97	29JUN97
LD 290	Install TTU Foundations	90	90	01FEB97	01MAY97
LD 300	Erect TTU	120	120	02MAR97	29JUN97
LD 340	Install TTU Services	60	60	01MAY97	29JUN97
LD 252	Feed Prep. Bldg. Constr.	45	45	01MAY97	14JUN97
LD 440	Begin Soil & Contaminated Feed	68	68	19JUN97	25AUG97
LD 445	System Shake-Down	79	79	19JUN97	05SEP97
LD 500	Performance Demonstration	5	5	08OCT97	12OCT97
LD 560	PD Analytical	35	35	08OCT97	11NOV97
LD 561	Prepare PD Report	30	30	12NOV97	11DEC97
LD 562	EPA Review/Approve PD Report	60	60	12DEC97	09FEB98
LD 563	Interim Operation	90	90	13OCT97	10JAN98
II 009	PHASE II EXCAVATION	366 *	366 *	01APR97	01APR98
MO 50007	Backfill All Sites	366	366	01APR97	01APR98
MO 50006	Excavate Sites #7,#3,#11,#5,#6,#9,#8	366	366	01APR97	01APR98
JJ 010	OPERATIONS	718 *	718 *	22JUL96	09JUL98
MO 006C	Operation of RWWTS	718	718	22JUL96	09JUL98
MO 2501	Construction of Stabilizated Area	30	30	01JUN97	30JUN97
LD 550	Treated Solids Testing	275	275	01JUL97	01APR98
LD 568	TTU Full Production	61	61	11JAN98	12MAR98
KK 011	Construction Inspection/Report	150	150	05JAN98	03JUN98
LL 012	DEMOBILIZATION/DECONTAMINATION	151 *	151 *	13MAR98	10AUG98
LD 600	TTU Decontamination	60	60	13MAR98	11MAY98
LD 602	Treated Solids Storage Decon & Demob	29	29	02APR98	30APR98
LD 610	Decon/Dismantle Treated Solids Bins	29	29	02APR98	30APR98
LD 604	Feed Prep Bldg. Decon & Demob	28	28	01MAY98	28MAY98
LD 620	TTU Unit Demobilization	50	50	01MAY98	19JUN98
MO 006D	RWWTS Decon/Demob.	14	14	29MAY98	11JUN98
LD 700	TTU Work Item Close-Out	30	30	12JUN98	11JUL98
MO 2310	Project Closeout	30	30	12JUL98	10AUG98



Run date	03JUN98
Data date	15MAY94
Start date	03MAY94
Finish date	10AUG98
Project name	CIBA

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FIGURE 3-1
Ciba McIntosh OU2 and OU4
Construction Schedule

Date	Revision	Checked	Approved
01JUN98	Issued with FDR	KMC	

4.0 PROJECT MANAGEMENT PLAN

4.1 PROJECT ORGANIZATION

The CMP (Appendix A) presents a project organization chart for implementation of the RA. Additionally, the CQAP (Appendix B), includes the organization chart for quality control. Both documents are being submitted simultaneously with the draft RAWP to USEPA for review and approval.

The responsibilities for implementation of the RA of USEPA, ADEM, the Owner, and the RA Contractor are discussed below.

4.1.1 Agencies

USEPA (Region IV) is the overall lead agency to ensure that the RA conforms to the requirements of the Consent Decree, SOW, and ROD for the Site. ADEM is the state agency responsible for overseeing that state regulatory equivalencies are achieved. USEPA is responsible for overall coordination with ADEM.

4.1.2 Owner

Ciba is the Owner of the McIntosh Facility and is the potentially responsible party (PRP) at the Site. Ciba is responsible for contracting with the Remedial Design (RD) and RA contractors and is ultimately responsible for ensuring that the construction, operation and maintenance of the soils RA is in accordance with the approved design and work plans.

4.1.3 Remedial Action Contractor

OHM will be responsible for conducting the RA so that the excavation and treatment Performance Standards are met, and for implementing the remedy in a manner that is protective of human health and the environment. OHM will obtain appropriate reviews and or approvals from Ciba and USEPA for field-mandated changes to approved plans. Any significant changes or modifications which are deemed appropriate based on the data collected, adverse field conditions, and/or interim results of the RA and their effect on the estimated schedule will be reviewed with USEPA for their approval. The mechanism for attainment of these reviews and approvals is presented in the CMP (Appendix A). A Preconstruction Meeting will be held at the site. The schedule shows the anticipated date of the

meeting and Figure 4-1 presents a preliminary Agenda of items to be addressed. USEPA and ADEM will be invited to attend the meeting.

4.2 DAILY ACTIVITY SUMMARY REPORT

The OHM Project Manager will provide Ciba with Daily Activity Summary Reports. These will include daily progress as well as input from the Daily QC Report and Health and Safety.

4.3 MONTHLY REPORTS

During the RA, Ciba shall submit monthly progress reports in accordance with the SOW for the Site Operable Units 2 and 4. These reports will be consistent in format and content with the monthly reports currently being submitted by Ciba. Over the duration of the RA, Ciba shall obtain monthly reports from the RA contractor. A typical format for the monthly progress reports is presented in Figure 4-2.

4.4 QUARTERLY MEETINGS

Ciba's Project Coordinator or designated representative will meet quarterly with USEPA's Remedial Project Manager or designated representative, unless USEPA determines that such a meeting is unnecessary. The RA contractor will be present at quarterly meetings, as necessary, to report on the progress of the RA. Additionally, Ciba's Project Coordinator or Ciba's designated representative will meet with USEPA's Remedial Project Manager or designated representative, as necessary, at the conclusion of each major phase of the RA (Phase I and Phase II).

4.5 DOCUMENTATION

Various documentation will be prepared and kept on Site during the RA. Documentation will be kept for the purposes of tracking materials on Site, employee health and safety, and for internal operational reasons. The adjunct documents describe the records which will be completed and kept on Site for the project duration as well as how they will be maintained. A partial listing of documentation and recordkeeping for the soils RA is given below:

Construction Quality Assurance Plan

- field log books for field sampling documentation
- Inspection Checklist
- Construction Quality Control Report

Operations and Maintenance Plan

- Shift Inspection Checklist
- Shutdown Maintenance Checklist
- Weekly Lubrication Checklist
- Consumable Items Inventory List

Construction Health and Safety Plan/Contingency Plan

- Site Orientation Sign-Off Sheet for Site Employees
- Daily Safety Meeting Summary
- Industrial Hygiene Monitoring
- Hotwork Permits
- Lockout Tabs
- Confined Space Entry Permits
- Hazard Communication Chemical Inventory
- Respiratory Protection Fit Test Forms
- Certification of Decontamination
- Incident Report and Investigation Forms
- Air Monitoring Logs

The individual plans should be consulted for more detail on how each type of documentation will be maintained.

FIGURE 4-1
PRECONSTRUCTION MEETING
PRELIMINARY AGENDA

I DEFINE ROLES, RELATIONSHIPS AND RESPONSIBILITIES OF ALL PARTIES

II REVIEW HEALTH AND SAFETY AND SECURITY REQUIREMENTS

III REVIEW DESIGN CRITERIA, PLANS AND SPECIFICATIONS

IV REVIEW CONSTRUCTION SCHEDULE

V REVIEW METHODS FOR DOCUMENTING AND REPORTING INSPECTION DATA

VI REVIEW METHODS FOR DISTRIBUTING AND STORING DOCUMENTS AND REPORTS

VII CONDUCT SITE RECONNAISSANCE TO VERIFY THAT THE DESIGN CRITERIA, PLANS AND SPECIFICATIONS ARE UNDERSTOOD

FIGURE 4-2
REMEDIAL ACTION MONTHLY REPORT FORMAT

MONTHLY PROGRESS REPORT - (INSERT MONTH/YEAR)

CERCLA REMEDIAL DESIGN/REMEDIAL ACTION - O.U. NO. 2 AND O.U. NO. 4
CIBA-GEIGY CORPORATION, McINTOSH, ALABAMA

GENERAL STATUS:

SUMMARY OF SAMPLING AND TESTS PERFORMED:

SCHEDULE:

COMMUNITY RELATIONS:

SCHEDULED WORK FOR NEXT MONTH:

5.0 COMMUNITY RELATIONS SUPPORT

At USEPA's request, Ciba will assist in preparing and disseminating information to the public regarding the RA work to be performed. Assistance will be provided on an as-needed basis.

5.1 GENERAL

As part of the RA process, Ciba intends to continue its ongoing public awareness and community involvement program which provides for input from local officials and citizens. Ciba fully expects that the environmental enhancement that results from the remediation will strengthen its record in environmental affairs and demonstrate its commitment to being a good neighbor.

In addition to any site remediation, it should be noted that Ciba will continue its ongoing facility improvement and wildlife enhancement program. Ciba will continue its long standing practice of communication with its employees, local citizens, locally elected officials, the media, and environmental agencies during all phases of the RA.

The information presented below describes Ciba's plans for community awareness during the RA process. Ciba will also continue its community awareness emphasis with regard to environmental programs in the following areas:

- groundwater Corrective Action Program
- in-unit effluent reduction
- plant facilities improvements

5.2 OBJECTIVES

The community relations program has been designed with two fundamental objectives:

- keep interested citizens and organizations appraised of RA activities at the Ciba facility
- continue Ciba's ongoing communication program with local citizens, organizations, political entities, and the media

5.3 KEY ORGANIZATIONS AND LOCAL CITIZENRY

Local organizations and community leaders will be provided with information on the RA and given an opportunity to express concerns and ideas. Ciba has identified the following key organizations and local citizenry:

- McIntosh City Commission
- McIntosh Community Advisory Council
- McIntosh Community Action Committee
- McIntosh Industrial Development Board
- McIntosh Community Evacuation Committee
- Washington County Commission
- Mobile and Washington County Legislative Delegations
- Mayor of McIntosh, Alabama
- Probate Judge and Chairman of Washington County Commission
- Sheriff of Washington County

5.4 COMMUNITY COMMITTEES

There are two community committees in place at McIntosh that function to communicate remediation activities to the local public. These committees are briefly described below:

McIntosh Community Advisory Council

The McIntosh Community Advisory Council is composed of local community leaders and a facilitator provided by Ciba to act as a clearing-house for information regarding plant activities. These plant activities include all aspects of the remediation process, and advisories regarding Superfund Amendments Reauthorization Act (SARA) releases, as well as other issues which may impact the community. The Community Advisory Council meets monthly.

McIntosh Community Action Committee

The McIntosh Community Action Committee, supported by a $50,000 USEPA Technical Assistance Grant (TAG), has been established by the community to review and analyze the remedial activities at the Ciba Site and report its findings to the community at large. The committee has hired a technical advisor to assist in evaluating the technical facets of the remediation process and the potential impact

on the McIntosh community. The committee plans to disseminate information to the community through the following techniques:

- fliers
- newspaper articles
- radio announcements
- community information on cable television
- bulletins at schools
- six written reports annually
- quarterly public meetings
- personal communication

5.5 MEETINGS/PRESENTATIONS

Ciba will plan to meet with the McIntosh community at the conclusion of each major phase of the RA. The meetings will include a slide or audio presentation to communicate plans and activities conducted to date. The meetings/presentations will be held at the conclusion of the following major RA phases.

An initial kick-off meeting will be held in conjunction with the RD meeting for the conclusion of the Final Design.

6.0 PROJECT DELIVERY STRATEGY

The purpose of this Project Deliver Strategy (PDS) is to address the management approach for implementing the RA, including procurement methods and contracting strategy, phasing alternatives, and contractor and equipment availability. This plan has been prepared in accordance with Section IV, Task III, Paragraph A.2 of the Statement of Work for RD/RA Consent Decree, Operable Unit 2 and with Section IV, Task III, Paragraph A.2 of the Statement of Work for RD/RA Consent Decree, Operable Unit 4. The PDS has been prepared for Ciba by Rust in cooperation with OHM. The PDS has been developed in conjunction with the RAWP, the CMP and the CHSP.

6.1 CONTRACTING STRATEGY

Rust is contracted to perform complete engineering and regulatory assistance to complete the RD. The contractor selected to implement the Remedial Action (RA) was Rust Remedial Services (RRS). OHM acquired RRS on May 26, 1995. OHM is contracted to provide field services, including labor and equipment, necessary to perform the RA.

Subcontracts include performance demonstration testing and laboratory services. TRC Environmental Corporation of Houston, Texas will perform the performance demonstration sampling and will subcontract the analytical portion of the work. Other analytical work will be performed on site by Ciba or a contract lab.

6.2 PHASING ALTERNATIVES

The project will be executed in accordance with the construction schedule presented in Section 3 of this RAWP. This schedule requires that some specific work items, identified as Phase I RA activities, occur prior to mobilization of the TTU.

6.3 CONTRACTOR AND EQUIPMENT AVAILABILITY

OHM will provide labor and equipment for the RA. Both permanent OHM employees and local hires will be utilized. Local labor requirements will be filled through selective advertising in the area newspapers, following applicable labor laws and equal opportunity hiring practices. Due to the specialized training required of remedial action workers, and the scarcity of such trained personnel in the open marketplace, the OHM team will provide project-specific training for all locally hired personnel. Subsequent refresher training will be provided throughout the project's life to meet CHSP

requirements. A significant portion of the total manpower will be hired locally for the RA. Local hires will fill office support staff positions, equipment operators, drivers and field technician positions.

Specialized equipment, including the TTU and water treatment equipment, is owned by the RA contractor and will be made available as scheduled for this project. Non-specialized equipment, such as dozers, front-end loaders and other excavating and earth moving equipment may be rented locally.

APPENDIX A

CONSTRUCTION MANAGEMENT PLAN

CONSTRUCTION MANAGEMENT PLAN

FOR REMEDIAL ACTION

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

JUNE 1996

RUST PROJECT NO. 89892.300

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LIST OF ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
ARARs	Applicable or Relevant and Appropriate Requirements
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CMP	Construction Management Plan
OHM	OHM Remediation Services Corporation
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PDR	Preliminary Design Report
PRP	Potentially Responsible Party
RA	Remedial Action
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
Rust	Rust Environment & Infrastructure
Site	Ciba McIntosh Superfund Site
SOW	Statement of Work
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This Construction Management Plan (CMP) has been prepared in accordance with Section IV, Task III, Paragraph A.3 of the Statement of Work for RD/RA Consent Decree, Operable Unit 2 and with Section IV, Task III, Paragraph A.3 of the Statement of Work for RD/RA Consent Decree, Operable Unit 4. The CMP has been prepared for Ciba-Geigy Corporation (Ciba) by Rust Environment & Infrastructure (Rust) in cooperation with OHM Remediation Services Corporation (OHM).

This CMP has been prepared for the remedial action (RA) at Operable Unit Two (OU2) and Operable Unit Four (OU4) of the Ciba McIntosh Superfund Site (Site). In addition, contaminated surface soils from Operable Unit three (OU3), the floodplain, will be excavated and backfilled into OU2. The RA includes:

- excavation, thermal treatment and/or backfill of soils in OU2, which consists of sites 1 through 7, 9 and 11
- excavation, thermal treatment and backfill of soils in OU4, which consists of site 8
- construction of a slurry wall outside the toe of the bluffline in site 8
- backfill of OU3 soils into excavations in OU2
- stabilization of exposed iron slurry at site 8

The purpose of the CMP is to provide information on how the construction activities are to be implemented and coordinated with the United States Environmental Protection Agency (USEPA) during the RA. The plan includes an organization chart in Section 2 showing lines of authority and descriptions of the duties of key personnel. Section 3 discusses how any construction changes will be administered and presents a plan for obtaining USEPA review and approval of those changes.

The CMP has been developed in conjunction with the Remedial Action Work Plan (RAWP), of which this CMP is an appendix, and the Construction Health and Safety Plan/Contingency Plan (CHSP) included as Appendix C to the RAWP.

2.0 PROJECT ORGANIZATION

Figure 2-1 presents the project organization chart for the RA. Individuals named are currently expected to fill the roles described. However, Ciba reserves the right to substitute individuals of similar qualifications. The responsibilities of USEPA, Alabama Department of Environmental Management (ADEM), the Owner and the RA Contractor for implementation of the RA are discussed below.

2.1 AGENCIES

USEPA is the lead agency to ensure that the RA conforms to the requirements of the Consent Decree, Statement of Work (SOW), and Record of Decision (ROD) for the Site. ADEM is the state agency responsible for ensuring that the project is implemented per state applicable or relevant and appropriate requirements (ARARs). Mr. C. H. Cox will serve as ADEM's Special Projects Manager. USEPA is responsible for overall coordination with ADEM. Mr. Charles L. King, Jr. will serve as USEPA Region IV's Remedial Project Manager.

2.2 OWNER

Ciba is the Owner of the McIntosh Facility and is the potentially responsible party (PRP) at the Site. Ciba is responsible for contracting with the Remedial Design (RD) and RA contractors and is ultimately responsible for ensuring that the construction operation and maintenance of the soils RA is in accordance with the approved design and work plans. Ciba is using an integrated project management team approach for implementation of the RA as shown in Figure 2-1. For purposes of assigning a contact as required in the ROD SOW, Mr. Sherman Williams of Ciba will act as the duly authorized representative of Ciba and as the RA Coordinator. He will provide final review of the RA and will continue to be the main contact with USEPA's Remedial Project Manager.

2.3 REMEDIAL ACTION CONTRACTOR

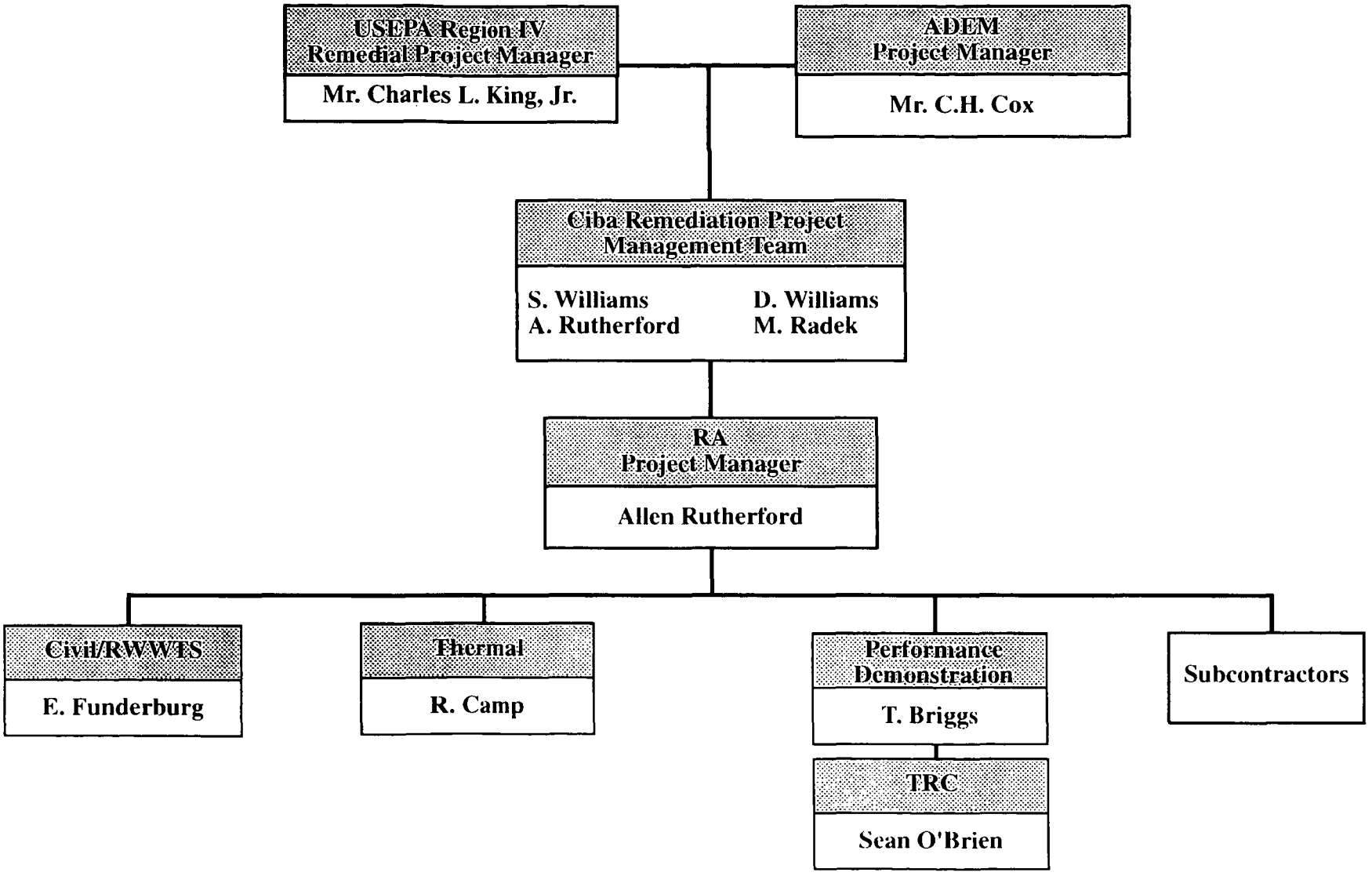
OHM will be responsible for conducting the RA so that the excavation and treatment Performance Standards are met, and for implementing the remedy in a manner that is protective of human health and the environment. OHM will obtain appropriate reviews and/or approvals from Ciba and USEPA and/or ADEM for field-mandated design changes. Only significant changes or modifications which are deemed appropriate based on the data collected, adverse field conditions,

and/or interim results of the RA and their effect on the estimated schedule will be reviewed with USEPA for their approval. Minor changes which do not alter the design plans, specifications, other approved documents, or the remedy will be noted as appropriate in the monthly reports submitted to USEPA.

OHM project management is fully supported by senior management at the corporate and regional level. As part of this approach, project managers have full authority to act for OHM in the execution of the contract scope of work. An executive sponsor ensures that both the project manager as well as representatives of Ciba have direct and immediate access to senior management within OHM.

OHM's project manager will be Mr. Allen Rutherford, who will be responsible for organizing and coordinating the day to day aspects of the project, both administrative and technical, including adherence to the schedule. He will be assisted by personnel experienced in remedial operations, as shown in Figure 2-1.

Figure 2-1
Project Organization Chart



OHM Remediation Services, Corp.
A Subsidiary of OHM Corporation

ciba
Ciba-Geigy Corporation

RUST ENVIRONMENT & INFRASTRUCTURE
GREENVILLE, SOUTH CAROLINA

FIGURE 2-1
Project Organization Chart
McIntosh, Alabama Superfund Site
Operable Units 2 and 4

3.0 ADMINISTRATION OF CONSTRUCTION CHANGES

The RA Contractor, OHM, will keep Ciba apprised of any changes made or required based upon the data collected, adverse field conditions, and/or interim results of the RA. Minor changes will be noted as appropriate in the monthly reports which are submitted to USEPA and ADEM. Documentation and approval of major changes will be administered through submittal of a Record of Field Change, as shown in Figure 3-1.

When required, the Record of Field Change will be initiated by OHM, who will complete the form, providing a description of the required change, the schedule impact, and any required revisions to approved documents. The Record of Field Change will then be submitted to Ciba's Project Coordinator for review and approval and forwarded to USEPA and ADEM for review and approval. This form is intended to provide quick communication to USEPA and ADEM regarding changes which impact the remedy implementation. Contractual changes between OHM and Ciba which occur due to any such revisions will be handled by the respective companies' internal contract change procedures.

Any changes to the design will be reflected in the record drawings.

Figure 3-1
Record of Field Change

CIBA MCINTOSH SUPERFUND SITE

RECORD OF CHANGE NO: _____

DATE: _____

TITLE: _____

BRIEF DESCRIPTION OF CHANGE:

_____

_____

_____

_____

WORK PLAN REFERENCE:

_____

AFFECT ON SCHEDULE:

_____

SUBMITTED: _____ DATE: _____
OHM Remediation Services Corporation (OHM)

APPROVED: _____ DATE: _____
Ciba-Geigy Corporation (Ciba)

APPROVED: _____ DATE: _____
United States Environmental Protection Agency (USEPA)

APPROVED: _____ DATE: _____
Alabama Department of Environmental Management (ADEM)

APPENDIX B

CONSTRUCTION QUALITY ASSURANCE PLAN

CONSTRUCTION QUALITY ASSURANCE PLAN

FOR REMEDIAL ACTION

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

REVISION 0

JUNE 1996

RUST PROJECT NO. 89892.300

APPROVALS PAGE

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OHM Remediation Services Corp.

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Approved by: _____
Date: _____
USEPA Remedial Project Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

AMP	Air Monitoring Plan
ADEM	Alabama Department of Environmental Management
ARARs	Applicable or Relevant and Appropriate Requirements
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CLP	Contract Laboratory Program
CMP	Construction Management Plan
CQAP	Construction Quality Assurance Plan
DQO	Data Quality Objective
FDR	Final Design Report
GC	Gas Chromatograph
IDR	Intermediate Design Report
IQAT	Independent Quality Assurance Team
LIMS	Laboratory Information Management System
MDL	Method Detection Limit
MS	Mass Spectrometry *or* Matrix Spike
MSD	Matrix Spike Duplicate
OHM	OHM Remediation Services Corporation
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PARCC	Precision, Accuracy, Representativeness, Comparability and Completeness
PDP	Performance Demonstration Plan
PDR	Preliminary Design Report
PQL	Practical Quantitation Limits
PRP	Potentially Responsible Party
PSVP	Performance Standards Verification Plan
QA	Quality Assurance
QC	Quality Control
QCO	Quality Control Officer
RA	Remedial Action
RAQC	Remedial Action Quality Control
RAS	Routine Analytical Services
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
Rust	Rust Environment & Infrastructure
RWWTS	Remedial Wastewater Treatment System
SAS	Special Analytical Services
Site	Ciba McIntosh Superfund Site
SOPs	Standard Operating Procedures

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SOW	Statement of Work
TRL	Target Reporting Limit
TTU	Thermal Treatment Unit
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this Construction Quality Assurance Plan (CQAP) is to support the Remedial Action (RA) Quality Assurance (QA)/ Quality Control (QC) objectives set forth in the September 30, 1991 and July 14, 1992 Records of Decision (ROD) for the Ciba McIntosh Superfund Site (Site), Operable Units Two and Four respectively. This plan has been prepared in accordance with Section IV, Task III, Paragraph A.4 of the Statement of Work (SOW) for RD/RA Consent Decree, Operable Unit 2 and with Section IV, Task III, Paragraph A.4 of the SOW for RD/RA Consent Decree, Operable Unit 4. The CQAP has been prepared for Ciba-Geigy Corporation (Ciba) by Rust Environment & Infrastructure (Rust), the RD Contractor, in cooperation with OHM Remediation Services Corporation (OHM), the RA Contractor.

This CQAP has been prepared for the RA at Operable Unit Two (OU2) and Operable Unit Four (OU4) of the Site. In addition, contaminated surface soils from Operable Unit Three (OU3), the floodplain, will be excavated and backfilled into OU2. The RA includes:

- excavation, thermal treatment and/or backfill of OU2 soils, which consist of sites 1 through 7, 9 and 11
- excavation, thermal treatment and backfill of OU4 soils, which consist of site 8
- construction of a slurry wall outside the toe of the bluffline in site 8
- backfill of OU3 soils into excavations in OU2
- stabilization of exposed iron slurry at site 8

Section 2 of this plan includes a description of the QC organization and members of the Independent Quality Assurance Team (IQAT). Section 3 presents the QA requirements, and Section 4 presents the QC procedures necessary to achieve the construction QA objectives. Section 5 presents the QC procedures necessary to achieve data quality objectives for analytical, sample management, chain of custody and data validation activities.

The CQAP has been developed in conjunction with the Remedial Action Work Plan (RAWP) of which this CQAP is an appendix and the Construction Health and Safety Plan/Contingency Plan (CHSP) included as Appendix C to the RAWP.

1.1 PURPOSE

This CQAP covers the specific requirements of RA QA/QC to be implemented at the Site by OHM. The CQAP provides or references the procedures, policies and practices to execute and document compliance with the specifications, drawings, referenced standards and QC established by the design. Compliance with the Final Design Report (FDR) requirements will be addressed by the IQAT. In general, the CQAP establishes controls for:

- major definable features of work
- quality control staff organization and authority
- personnel qualifications
- procedures, guidelines, checklists forms
- records
- inspections and tests
- documentation
- audits
- subcontractors

1.2 APPLICABILITY

This CQAP incorporates by reference the following project plans containing QA/QC requirements for specific work items:

- QA/QC requirements and procedures for sampling and analytical during the performance demonstration are provided in the Performance Demonstration Plan (PDP)
- QA/QC requirements and procedures for verification of excavation limits and acceptability of treated soils are provided in the Performance Standards Verification Plan (PSVP)
- QA/QC requirements and procedures for air monitoring samples are provided in the Air Monitoring Plan (AMP)

This CQAP presents QA/QC requirements for work items not included in other plans. This includes:

- construction activities to verify compliance with specifications
- thermal treatment unit (TTU) feed samples following the performance demonstration
- samples from the remediation wastewater treatment system (RWWTS)
- samples from potential borrow sources of soil
- samples of potential water sources for use in slurry wall construction
- samples of scrubber blowdown to determine compliance with density limits

1.3 DEFINABLE FEATURES OF THE WORK

This CQAP will be implemented to cover two major categories for QA/QC:

- site work and construction
- sampling and analysis

Table 1-1 presents RA tasks which tasks have associated QC requirements. The table also includes spaces for insertion of dates that the preparatory and initial inspections were performed and may be used as a checklist.

1.4 ACCEPTANCE OF CQAP

Work performed within the scope of this plan will not be started prior to the approval of this CQAP by the United States Environmental Protection Agency (USEPA) and the Alabama Department of Environmental Management (ADEM) unless otherwise permitted by USEPA/ADEM. Any significant changes to this CQAP will require notification of the changes to USEPA/ADEM in writing. All significant changes are subject to the approval of USEPA/ADEM.

1.5 CONTROL OF CQAP

This CQAP should be considered a working document. The Quality Control Officer (QCO) will maintain a list of CQAP holders, who will include the USEPA/ADEM, Ciba, OHM Corporate QA/QC Director, QCO, OHM Project Manager, OHM Health and Safety Director, OHM Site Safety Officer, and testing laboratories. Revisions to the CQAP will be made by sections, or by the addition of supplements or amendments. All approved changes and revisions will be transmitted

to plan holders. Each individual or organization holding a plan will be responsible to update and maintain their copy of the current plan. Superseded sections may be maintained for reference purposes provided the sections are clearly identified as superseded and noted for information only. Whenever a section of the plan is revised, the cover page, changed pages, and table of contents will also be revised to reflect the current revision number. Revision numbers will be consecutive beginning with the number one.

TABLE 1-1
LIST OF DEFINABLE FEATURES

TASK	QC Required	Inspection Performed	
		Preparatory	Initial
MOBILIZATION			
Set-up Thermal Offices	Inspect		
Delivery of TTU	Inspect		
Construct Air Monitoring Stations	Inspect		
Baseline Air Monitoring	Testing[1]		
PHASE I RA ACTIVITIES			
Construct Interim Temporary Facilities	Inspect		
Construct RWWTS	Inspect		
Construct Slurry Wall	Testing[2]		
Erect Interim Storage Facility	Inspect		
Excavate site 1	Testing[3]		
Backfill site 2	NA		
Excavate site 3	Testing[3]		
Excavate site 4	Testing[3]		
PHASE II CONSTRUCTION			
Site Preparation/Mobilization	Inspect		
Install TTU Foundations	Inspect		
TTU Mobilization/Construction	Inspect		
Erect TTU	Inspect		
Install Oxygen Pad	Inspect		
Water Tie-in for TTU	Inspect		
Set-up Process Water Tank	Inspect		
Set-up Oxygen Tanks and Vaporizers	Inspect		
Treated Solids Building Construction	Inspect		
TTU Electrical	Inspect		
TTU Natural Gas	Inspect		
Install TTU Instrumentation	Inspect		

TABLE 1-1 (CONTINUED)
LIST OF DEFINABLE FEATURES

TASK	QC Required	Inspection Performed	
		Preparatory	Initial
Install Water Lines	Inspect		
Construct Material Handling Building	Inspect		
Install Treated Solids Conveyor System	Inspect		
Install Oxygen Line	Inspect		
Install Feed Conveyors	Inspect		
TTU Mechanical Checkouts	Testing[2]		
PERFORMANCE DEMONSTRATION TEST			
Operator Training	NO		
Test Fire Burners	Inspect		
Conduct Clean Burn	Inspect		
Refractory Cure	Inspect		
Prepare Feed for Clean Burn	Inspect		
Clean Burn Demonstration	Inspect		
Contaminated Soil Shake-Out	Inspect		
Feed-Prep for Mini-burn	Testing[4]		
Shakedown with Contaminated Soils	Inspect		
Stockpile and Test Treated Solids	Testing[3]		
Mini-burn System Optimization	Testing[4]		
Mini-burn	Testing[4]		
PERFORMANCE DEMONSTRATION			
System Optimization	Testing[4]		
Mini-burn Report Preparation	Testing[4]		
Mini-burn Report Review	NO		
Performance Demonstration	Testing[4]		
Performance Demonstration Analytical	Testing[4]		

TABLE 1-1 (CONTINUED)
LIST OF DEFINABLE FEATURES

TASK	QC Required	Inspection Performed	
		Preparatory	Initial
PHASE II EXCAVATION			
Excavate sites 7, 3, 11, 5, 6, 9, 8	Testing[3]		
Backfill all Sites	Testing[3]		
OPERATIONS			
Operation of RWWTS	Testing[2]		
Construction of Stabilized Area at site 8 (as necessary)	Testing[2]		
Interim Operation	Testing[2]		
Treated Solids Testing	Testing[3]		
Interim Operation	Testing[2]		
Full Production Operation	Testing[2]		
DEMOBILIZATION			
TTU Decontamination	Inspect		
Treated Solids Building Decontamination and Demobilization	Inspect		
Decontamination/Dismantle Treated Solids Bins	Inspect		
TTU Unit Demobilize	Inspect		
Decontamination/Demobilization of RWWTS	Inspect		
Incineration Work Item Close-out	NO		
Project Close Out	NO		

1. QA/QC requirements are provided in the AMP.
2. QA/QC requirements provided in Specifications and in this CQAP.
3. QA/QC requirements included in the Specifications and in the Performance Standards Verification Plan (PSVP).
4. QA/QC requirements included in the PDP.

2.0 ORGANIZATION AND RESPONSIBILITIES

The Site RA QA/QC Organization Chart, Figure 2-1, defines the lines of authority and communication reporting functions of the Remedial Action quality control (RAQC) organization. The type and number of QC staff personnel may vary with project operations in progress, shift work and other activities affecting QC coverage.

Figure 2-1 presents the project organization chart for RAQC. The responsibilities of USEPA, Alabama Department of Environmental Management (ADEM), Ciba and the RA Contractor for implementation of RAQC are discussed below.

2.1 AGENCIES

USEPA is the lead agency to ensure that the RA conforms to the requirements of the Consent Decrees, SOW, and ROD for the Site. ADEM is the state agency responsible for ensuring that the project is implemented according to state permit equivalencies. Mr. C. H. Cox will serve as ADEM's Special Projects Manager. USEPA is responsible for overall coordination with ADEM. Mr. Charles L. King, Jr. will serve as USEPA's Remedial Project Manager (RPM).

2.2 OWNER

Ciba is the Owner of the McIntosh Facility and is the potentially responsible party (PRP) at the Site. Ciba is responsible for contracting with the RD and RA contractors and is ultimately responsible for ensuring that the RD, construction, and operation and maintenance of the soils RA is in accordance with the approved design and work plans. Ciba is using an integrated project management team approach for implementation of the RA, as shown in Figure 2-1. For purposes of assigning a contact as required in the ROD SOW, Mr. Sherman Williams of Ciba has been designated as Project Coordinator, Dr. David Williams as Alternate Project Coordinator, and both are the duly authorized representatives of Ciba. He will provide final review of the RA and will continue to be the main contact with USEPA's Remedial Project Manager.

2.3 REMEDIAL ACTION CONTRACTOR

The overall responsibility for implementation and enforcement of the CQAP is assigned to the OHM Project Manager. The responsibility for providing quality oversight direction and verification of

the effectiveness of the project CQAP is assigned to the QCO. An IQAT will also provide overall QA/QC independent of OHM.

The OHM QCO will be responsible for verification of all activities affected by this CQAP. An IQAT will provide inspection independent of OHM and the QCO. The QC staff has the authority and responsibility to identify and verify correction of any materials or work activities that do not conform to the design QC requirements. The QC staff will maintain a close working relationship with project management, keeping them advised of any situations which, if not corrected, would affect the quality of the project. QC personnel may perform other project activities provided they do not interfere or compromise their QC responsibility. QC staff members will not perform any QC acceptance verifications for work for which they were directly responsible. Duties for responsibilities assigned by the CQAP may be delegated to qualified individuals; however, overall responsibility remains as assigned.

2.3.1 Project Manager

Mr. Allen Rutherford will be the Project Manager for this Site RA. Mr. Rutherford will be responsible for implementation and enforcement of the CQAP. He will have the authority to access the required resources throughout OHM to ensure compliance with the design requirements including operational, QA/QC, health and safety, and regulatory matters. Attachment 1 of this CQAP contains a summary of Mr. Rutherford's qualifications.

2.3.2 Quality Control Officer

Mr. Scott Tucker will be the Quality Control Officer (QCO) for this Site RA. He will advise and assist the Project Manager in the implementation of the CQAP. The QCO will be assigned the responsibility for verification of operational compliance to the design requirements and has the authority to act for the Project Manager to stop work inconsistent with QC requirements.

The QCO will be responsible for oversight of the project CQAP. The QCO receives administrative direction from the Project Manager. The QCO will be responsible to the OHM Corporate QA/QC Manager for QC direction on any matters that may affect the QC requirements for the project.

The QCO provides oversight of the OHM QC staff and will also be responsible for monitoring subcontractor compliance with project QC requirements. Subcontractors will be required to identify their in-house individuals responsible for QC who will coordinate activities through the QCO.

Attachment 1 of this CQAP contains a summary of Mr. Tucker's qualifications.

2.3.3 QC Staff

A QC staff will be maintained as necessary to perform the specified QC functions. The type and number of the personnel will vary dependent upon work phase needs, shift work, rates of placement or excavations and other operations that may require QC coverage. The QC staff will be fully qualified by training and experience to perform their assigned duties. Changes in QC personnel will require submittal of the names and qualifications for each additional or replacement personnel.

2.3.4 Corporate QA/QC Director

Mr. Cecil Gibbs is the OHM Corporate QA/QC Manager and will be responsible for oversight and direction to ensure project QA/QC compliance with the design. He will oversee the QCO and interface as required with Health and Safety personnel. Attachment 1 of this CQAP contains a summary of Mr. Gibbs qualifications.

2.4 INDEPENDENT QUALITY ASSURANCE TEAM

The IQAT will include representatives from various organizations that will be responsible for overall QA/QC during the RA. The duties of the IQAT include the following:

- review plans and specifications for clarity and completeness
- direct and perform observations for quality assurance inspection activities
- verify the contractor is implementing the construction quality control according to the CQAP
- perform on-Site inspections of the work to assess compliance with design criteria, plans, specifications, FDR
- report to Ciba and USEPA/ADEM the results of all inspections and corrective actions, including work that is not of acceptable quality or that fails to meet the FDR
- order work stoppage for inconsistency with QC requirements.

The IQAT is broken down into two major components:

- Analytical verification
- Construction quality assurance

The members of the IQAT are Mr. James Norris of ERM Southeast, Inc. and Mr. Frank Innocenti of Ciba for analytical verification and Mr. James Pelham, P.E. of Smith Environmental and Mr. Richard Odom of Ciba for CQA.

The laboratories selected to perform analytical testing will have been audited by Ciba's Corporate Environmental Technology Group and will have met Ciba's internal criteria for data validation.

The IQAT will perform periodic inspections to verify that work meets the specifications of the FDR. If a variance is noted, the IQAT is responsible for involving all parties to correct the variance. If the variance is not correctable, it will immediately be reported to Ciba for communication to the USEPA/ADEM.

The IQAT will also be responsible for reviewing all data from contracted laboratories and material sources assuring they meet FDR specifications. Major corrections will be reported in to the USEPA/ADEM.

2.5 LABORATORIES

Ciba's on-Site laboratory will perform the majority of chemical analyses for soil and water samples. Ciba's laboratory will be supported by OHM's on-Site laboratory and subcontracted laboratory services, including OHM Remediation Services Corp. and Savannah Laboratories & Environmental Services, Inc. Air and industrial hygiene samples will be analyzed by M.D.S. Laboratory. Samples collected during the performance demonstration will be analyzed by independent third party subcontractor(s), including TRC Environmental Corporation, Triangle Laboratories and Quanterra Environmental Services. The following list of laboratories will be used to analyzed samples during the RA:

(1) OHM Remediation Services Corp.
Analytical Division
16406 U.S. Route 244 East
P.O. Box 551
Findlay, Ohio 54839-0551
Tel: (419) 423-3526
Fax: (419) 424-4998
Contact: Melanie A. Radabaugh

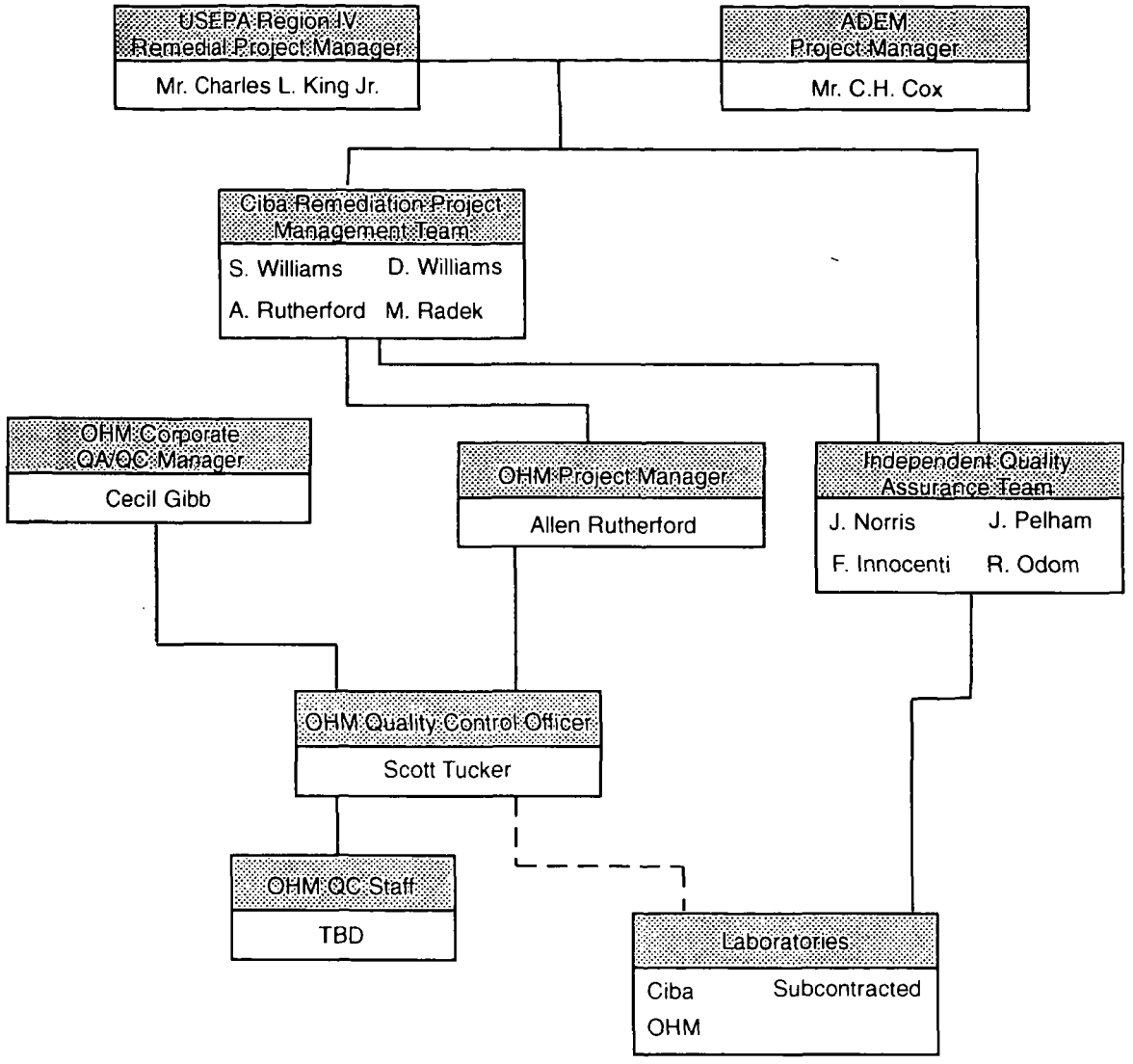
(2) M.D.S. Laboratory (AIHA)
4418 Pottsville Pike
Reading, PA 19605
Tel: (610) 921-8833
Fax: (610) 921-9667
Contact: Fred Usbeck

(3) Savannah Laboratories & Environmental Services, Inc.
900 Lakeside Drive
Mobile, AL 36693-5118
Tel: (334) 666-6633
Fax: (334) 666-6696
Contact: Jesse Smith

(4) TRC Environmental Corporation
2315 West Sam Houston Parkway North
Houston, Texas 77043
Tel: (713) 827-0600
Fax: (713) 827-0634
Contact: Sean O'Brien

(5) Triangle Laboratories
801 Capitola Drive
Durham, NC 27713
Tel: (919) 544-5729
Fax: (919) 544-5491
Contact: Selena Armistead

(6) Quanterra Environmental Services
880 Riverside Parkway
West Sacramento, Ca 95605
Tel: (916) 374-4334
Fax: (916) 371-2857
Contact: Robert Weidenfeld



OHM Remediation Services, Corp.
A Subsidiary of OHM Corporation

ciba
Ciba-Geigy Corporation

RUST ENVIRONMENT & INFRASTRUCTURE
GREENVILLE, SOUTH CAROLINA

FIGURE 2-1
Remedial Action Quality Control Organization Chart
McIntosh, Alabama Superfund Site
Operable Units 2 and 4

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3.0 QUALITY ASSURANCE REQUIREMENTS

QA/QC is an integrated program designed to ensure that all facets of the RA adhere and conform to standards set by OHM and Ciba in design documents, as well as regulatory performance criteria. The RAWP and its appendices contain policies, project objectives, specific responsibilities of personnel, and specific procedures necessary to ensure that all remedial activities conducted at the Site will be performed in a safe, consistent, and efficient manner.

Table 3-1 is a Quality Assurance Matrix that references the design specifications pertinent to this RA. Table 3-2 presents a list of chemical analyses which are included in the scope of the CQAP.

TABLE 3-1

CONSTRUCTION QUALITY ASSURANCE

Spec No.	Requirement	Means to Verify Compliance	Frequency	Documentation Required
02210	Compaction nominal - 3 passes of earth moving equipment	Visual	Once per day as fill is placed	Field Log Book Notation
	Placement nominal - 1 foot lifts	Visual	Once per day as fill is placed	Field Log Book Notation
02220	Excavation Limits	Survey	Prior to excavation of each depth interval shown on design drawings	Certified Survey by Alabama RLS
02245	Cement Content of Soil Cement	Measurement of Applied Cement	Once per batch	Field Log Book Notation
	Cement meets ASTM C150	Manufacturers certification of analytical testing	Once per manufacturer	Certification from supplier or laboratory results
02395	Bentonite - meet API SPEC 13A	Manufacturers certification or analytical testing	Once per manufacturer or if field verified, once per 10,000 pounds of bentonite	Certification from supplier or laboratory results.
	Wall Depth - cut into Miocene clay a nominal 2 ft	Visual - inspect cuttings	NA	NA

TABLE 3-1 (CONTINUED)

CONSTRUCTION QUALITY ASSURANCE

Spec No.	Requirement	Means to Verify Compliance	Frequency	Documentation Required
02395 (Continued)	Slurry viscosity prior to placement between 38 and 80 sec	Marsh Funnel	Once per shift and each time pond is prepared	Record in Daily Reports
	Slurry filtrate loss prior to placement not more than 25 cc in 30 minutes as measured by standard filter press at 100 psi	Standard Filter Press	Once per shift and each time pond is prepared	Record in Daily Reports
	In trench slurry density at least 65 pcf and at least 15 pcf lighter than backfill mix	Mud Balance	Once per shift	Record in Daily Reports
	In trench slurry viscosity minimum of 40 sec	Marsh Funnel	Once per shift	Record in Daily Reports
	Slurry pH not more than 10	Calibrated pH meter	Once per shift	Record in Daily Reports
	Backfill mix, slump between 4 and 8 inches	ASTM C 143	Once per shift	Record in Daily Reports
	Backfill mix, unit weight greater than 85 pcf	Appropriate Method	Once per shift and when slump changes	Record in Daily Reports
13100	Samples between carbon units	Analytical Testing	Twice per month	See Table 3-2
	Samples of RWWTS effluent	Analytical Testing	Twice per month	See Table 3-2

TABLE 3-1 (CONTINUED)

CONSTRUCTION QUALITY ASSURANCE

Spec No.	Requirement	Means to Verify Compliance	Frequency	Documentation Required
13261	Test of AWFCO and permissive interlock	Mechanical - go/no go Simulate shut-off conditions	Once prior to TTU soils feed and weekly thereafter	Log Book Notation
	CEM calibration	Certified Span Gases EPA/625/6-89/-023	Daily	Log Book Notation
	Weigh belt feed calibration	Fine zero and fine span are performed electronically at control panel. Acceptable zero span deviation +/-3%. Fine span: use test weight. Acceptable fine span = <2%.	Zero daily, span weekly	Log Book Notation
	Performance Demonstration	Analytical testing of feed and stack gas. Specific parameters and protocols are listed in PDP.	Analytical testing of feed and stack gas. Specific parameters and protocols listed are in PDP.	Analytical testing of feed and stack gas. Specific parameters and protocols listed are in PDP.
13262	Soil Management and Conditioning Equipment - Daily Inspection	Visual	Once per day	Record in Field Log Book
	Treated Solids Performance Standards	Analytical Testing. Specific parameters and protocols are listed in the PSVP.	Once per batch	Laboratory Reports

TABLE 3-2

LABORATORY ANALYTICAL REQUIREMENTS

Matrix	Description	Frequency	Turn Around Time for Analyses	Parameter	Required Detection[1] (ug/L for water) (mg/Kg for soils)	Method[2]	Target Laboratory Reporting (ug/L for water) (mg/Kg for soils)
Wastewater	RWWTS: 1. Influent to RWWTS; 2. Between lead and lag carbon unit; and 3. Following lag carbon unit (effluent).	1 sample every two weeks from each location excluding QA/QC samples	1 Week	Ametryn	630	SW-619	630
				Aniline	10	SW-8020	10
				Arsenic	50	SW-7061	50
				Atrazine	3.0	SW-619	3.0
				Alpha-BHC	0.6	SW-8080	0.6
				Beta- BHC	2.0	SW-8080	2.0
				Delta- BHC	0.2	SW-8080	0.2
				Gamma-BHC	0.2	SW-8080	0.2
				Bladex	14	SW-619	14
				Benzene	5.0	SW-8020	5.0
				Carbon Tetrachloride	5.0	SW-8010	5.0
				Chlorobenzene	5.0	SW-8010	5.0
				Chlorobenzilate	140	SW-8080	140

TABLE 3-2 (CONTINUED)

LABORATORY ANALYTICAL REQUIREMENTS

Matrix	Description	Frequency	Turn Around Time for Analyses	Parameter	Required Detection[1] (ug/L for water) (mg/Kg for soils)	Method[2]	Target Laboratory Reporting (ug/L for water) (mg/Kg for soils)
Wastewater (Continued)	RWWTS: 1. Influent to RWWTS; 2. Between lead and lag carbon unit; and 3. Following lag carbon unit (effluent).	1) 1 sample every two weeks from each location, excluding QA/QC samples:	1 Week	Chloroform	5.0	SW-8010	5.0
				Cresols (m-, p-)	10	SW-8040	10
				DDD	10	SW-8080	10
				DDE	10	SW-8080	10
				DDT	10	SW-8080	10
				Diazinon	6.0	SW-8140	6.0
				Methyl Ethyl Ketone	10	SW-8015	10
				Naphthalene	10	SW-8100	10
				Prometryn	28	SW-619	28
				Simazine	1.0	SW-619	1.0
				Toluene	2000	SW-8020	2000

TABLE 3-2 (CONTINUED)

LABORATORY ANALYTICAL REQUIREMENTS

Matrix	Description	Frequency	Turn Around Time for Analyses	Parameter	Required Detection[1] (ug/L for water) (mg/Kg for soils)	Method[2]	Target Laboratory Reporting (ug/L for water) (mg/Kg for soils)
Soils Feed to TTU for Routine Operations	Composite Samples from the prepared feed stockpile.	1 sample per week for the first four weeks of operation.	2 days	Chlorine	NA	SW-5050 Standard Method 4500-EPA 300.0	10 mg
				Arsenic	NA	SW-7060, 6010	
				Cadmium	NA	SW-7060, 6010	
				Chromium	NA	SW-7060, 6010	1.0 mg
				Lead	NA	SW-7060, 6010	
Process Water	Blowdown from Scrubber	1 sample every 4 hours	1 hour	Density			
Process Water	Supply for Slurry Wall	Non-recurring	2 weeks	pH	1 s.u.	EPA 9040	1 s.u.
				Hardness	50,000	HACH	50,000
				TDS	500,000	Standard Method	500,000
				Total Organics	50,000	TBD	50,000
Soil	Potential Borrow Sources	Non-recurring	2 weeks	alpha-BHC	0.4	SW-8080	0.4
				beta-BHC	1.7	SW-8080	1.7
				delta-BHC	0.3	SW-8080	0.3
				gamma-BHC	0.1	SW-8080	0.1

TABLE 3-2 (CONTINUED)

LABORATORY ANALYTICAL REQUIREMENTS

Matrix	Description	Frequency	Turn Around Time for Analyses	Parameter	Required Detection[1] (ug/L for water) (mg/Kg for soils)	Method[2]	Target Laboratory Reporting (ug/L for water) (mg/Kg for soils)
Soil (continued)	Potential Borrow Sources	Non-recurring	2 weeks	DDT	17	SW-8080	17
				DDD	24	SW-8080	24
				DDE	17	SW-8080	17
				Chlorobenzilate	20.9	SW-8080	20.9
				Diazinon	0.36	SW-8141	0.36
				Prometryn	38.5	SW-619	38.5
				Simazine	3.7	SW-619	3.7
				Atrazine	3.6	SW-619	3.6
				Bladex	2.0	SW-619	2.0

1. Required detection limits based on performance standards for RA. Limits are in ug/L for water samples and mg/Kg for soil samples.

2. Methods with SW- prefix are from Test methods for Evaluating Solid Watse, Volumes 1A-1C: Laboratory Manual, Physical/Chemical Methods; and Volume II: Field Manual, Physical/Chemical Methods, SW-846, Third Edition, Office of Solid Waste, USEPA, December 1987. Methods with an EPA prefix are from Methods for the Chemical Analysis of Water and Wastes (MCAWW), EPA-600/4-79-020, Revised March 1993, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, USEPA, 1983 and subsequent EPA-600/4 technical additions.

4.0 CONSTRUCTION QUALITY CONTROL PROCEDURES

The CQAP provides measures to verify and document that the work performed complies with the requirements specified in the FDR, specifications and drawings. These measures include QC inspections, control testing, document control, submittals, subcontractor quality control, quality assurance audits, and corrective actions.

Procedures for implementing the above measures are included throughout the CQAP. The plan may be supplemented by working procedures, guidelines or instructions for the implementation of measures to verify compliance with the design requirements.

4.1 QUALITY CONTROL INSPECTIONS

The measures required to verify the quality of work performed and compliance with the specified requirements include inspection of materials and workmanship before, during and after each definable feature of work. The QC inspection in general will consists of preparatory, initial, follow-up, completion, and documentation.

4.1.1 Preparatory Inspection

Preparatory inspections will be performed by the QC staff (monitored by the QCO and IQAT) prior to starting any definable feature of work listed in Table 1-1 which has control requirements and may include preparatory inspection meetings attended by the responsible construction staff personnel, any applicable subcontractor involved with the feature of the work, and the responsible QC staff. The preparatory inspection meeting will include:

- review of pertinent design requirements
- review of material and equipment documentation for required tests, submittals and approvals
- review of required control inspections and test requirements
- examination of the preliminary work necessary to begin the feature of the work for completeness and conformance to approved drawings and submittal data
- availability and examination of the required materials and equipment for commencement of the work and for use throughout the work feature
- review safety procedures/controls for compliance to the approved CHSP

Preparatory inspection meetings will be documented on the Preparatory Inspection Checklist (Figure 4-1).

4.1.2 Initial Inspection

An initial inspection will be conducted by the QC staff monitored by the QCO and IQAT soon after beginning each definable feature of the work. The inspection will be performed when it is determined that a sufficient portion of the feature of the work has been accomplished to evaluate the following criteria:

- compliance with the specifications, drawings, submittals and other design requirements
- acceptable levels of workmanship
- safety measures - compliance with activity hazard analysis
- resolution of differences

If manufacturer's certification is required, then the manufacturer will provide certification stating the following:

- the product or system has been installed in accordance with the manufacturer's recommendations
- the product or system has been inspected by a manufacturer's authorized representative
- the product or system has been serviced with the proper lubricants
- applicable safety equipment has been properly installed
- proper electrical and mechanical connections have been made
- proper adjustments have been made and the product or system is ready for functional testing, plant startup, and operation

Initial inspections will include participation of the responsible personnel including appropriate subcontractors and the QC personnel involved with the feature of the work and will be documented on Figure 4-2 and reported in the Daily Activity Summary Report.

4.1.3 In-Process Monitoring

In-processing monitoring of on-going activities which affect quality will be performed by the QC staff monitored by the QCO and IQAT. Any deficiencies noted during these activities will be documented and resolved per Section 4.7.

4.1.4 Follow-Up Inspections

Follow-up inspections will be performed by the QC staff monitored by the QCO and IQAT. The frequency of the follow-up inspections will be dependent upon the extent of the work being performed on each particular feature of the work. Follow-up inspections will be performed on all ongoing work and on any completed work phase prior to starting subsequent phases. Any deficiencies will be corrected prior to starting the new work. Follow-up inspections will be documented using the Follow-up Inspection Checklist (Figure 4-3) and Daily Activity Summary Report and copies of the Follow-up Inspection Checklists attached.

4.1.5 Completion Inspection

At the completion of each feature of the work or increment, the work will be inspected for compliance with the design plans and specifications. The QC staff monitored by the QCO and IQAT is responsible for initiating the completion inspection and verifying development of a punch list of items which do not conform to the specified requirements, including incomplete work items. Upon completion of the punch list items, a second inspection will be conducted by QC staff, monitored by the IQAT to verify all of the items conform to the requirements. When the work inspected meets the specified requirements, the CQO will document completion in the Final Inspection Log (Figure 4-4) and notify the OHM Project Manager or designee.

4.1.6 Inspection Documentation

The QCO monitored by the IQAT will be responsible for the maintenance of inspection records. All inspection records will be available to OHM and Ciba management.

4.2 TESTING

Testing procedures are shown in Table 3-1. OHM will cooperate with the laboratory personnel and provide access to the work. OHM will furnish incidental labor and facilities to:

- provide access to work to be tested
- obtain and handle samples at Site or at source of product to be tested
- facilitate inspections and tests
- notify laboratory sufficiently in advance of operations for laboratory scheduling

The QC requirements for the contractor's field sampling activities, laboratory activities for the performance demonstration, quality assurance/quality control procedure, and project deliverables relative to the acquisition and reporting of chemical data are described in Section 5 of this CQAP for applicable chemical sampling work items.

4.2.1 Construction Testing Requirements

A list of soils geotechnical and material tests, visual inspections and chemical analyses to be performed according to the specifications is included in Table 3-1. QC staff with oversight by the QCO and IQAT will be responsible for monitoring the testing activities to verify conformance to the design requirements. The monitoring will include project on-Site activities and off-Site laboratories and includes, but is not limited to:

- sampling, methods, locations and frequencies
- chain-of-custody
- testing procedures
- test equipment availability and compliance
- calibrations
- test documentation and results

4.2.2 Documentation

Testing activities and results of the test and monitoring activities will be included on the Daily Activity Summary Report. Test reports (including reports provided by contract laboratories), calibration records and other recording forms used for document test activities will be maintained by the QCO.

4.3 DOCUMENT CONTROL

The QC staff with oversight by the QCO and IQAT will maintain current records of QC activities and tests performed including those of suppliers and subcontractors. The records will include evidence that required control measures and tests have been performed and will indicate the results of the activities. Complete QC document files including drawings will be maintained by the OHM Project Manager or his designee.

4.3.1 Daily Activity Summary Report

A Daily Activity Summary Report will be prepared by the QC staff monitored by the QCO and IQAT and submitted as part of the Daily Activity Summary Report. The report will cover both conforming and nonconforming work. The Daily Activity Summary Report will include:

- type and number of control activities
- results of test and inspections
- types of defects/causes for rejection
- corrective actions
- trades working, description and number
- weather conditions
- verbal instructions

The Daily Activity Summary Report will include a statement of certification that all materials, supplies and work performed comply with the design requirements. The QCO or authorized designee will sign the Daily Activity Summary Report to indicate the above certification.

4.4 SUBMITTALS

4.4.1 Responsibilities

The QC staff (monitored by the QCO and IQAT) is responsible for the certification of specified submittals. The required submittals will be identified and documented on Submittal Register Form (Figure 4-5). The Project Manager or designee will be responsible for the preparation of this form and updating of the required submittals. The Project Manager will monitor the submittal activities to verify:

- all required submittals are included
- submittal schedule status
- current submittal status
- resubmittals

4.4.2 Submittal Control

OHM will control and schedule all submittals to Ciba. Ciba will forward the appropriate submittals to the USEPA/ADEM. These submittals include all items listed in the design document and listed or specified in the specifications. Units of weights and measures used on all submittals will be consistent with those used in the design documents.

Each submittal will be reviewed for completeness, detail, and compliance with design requirements by individuals qualified to perform the review of that specific item. Prior to each submittal, the QC staff (monitored by the QCO and IQAT) will certify that the submittal is in compliance with the design requirements. Submittals that do not comply with the requirements will be returned to the originator for corrective actions and resubmittal. Substitutions or variations of specified requirements will be clearly noted and will require approval or acceptance by Ciba. Certification of the approved submittals will be indicated by stamping and signing or initialing and dating the submittal form by the responsible QC personnel. The submittals will include, but not be limited to:

- plans and drawings
- sample and test specimens
- QC submittals
- contract closeout items

4.4.3 Submittal Scheduling

Submittals on components of a system or that are interrelated will be combined and submitted concurrently whenever possible. Certifications pertaining to specific documents will be submitted with these documents. OHM will schedule its drawings and other documentation reception, review, and approval process activities so that submittal items will be transmitted to Ciba and the Project Manager.

4.4.4 Review of Vendor Submittals

Vendors and subcontractors will be required to expeditiously submit items such as shop drawings, test data, operation curves, specifications, operation manuals, catalog cuts, and parts lists to OHM for review. OHM technical and QC personnel will review each submittal for compliance with contract documents. If acceptable, the item will be stamped as such and forwarded to Ciba and OHM management for review and approval. If unacceptable, errors or deficiencies will be identified and returned to the vendor or subcontractor for correction. The corrected item will be resubmitted to OHM for review until it meets contract requirements.

4.5 SUBCONTRACTOR QUALITY CONTROL

Subcontractors required to perform services or supply materials for this RA are responsible for compliance to the QC requirements of their respective subcontract. Subcontractors include organizations supplying quality related items or services to the project.

The requirements for personnel qualifications, technical performance levels, QC procedures, acceptability levels, and documentation will be included as a part of the subcontract documents. The QC staff (monitored by the QCO and IQAT) will review the subcontract procurement documents to verify all of the QC requirements are communicated to the subcontractor.

The QC staff (monitored by the QCO and IQAT) will be responsible for the performance of inspections, surveillances, document reviews, audits, and other QC for monitoring the subcontractor to verify compliance with the contract and subcontract requirements. These activities will be documented on inspection reports, checklists, audit reports, field logs, or other forms appropriate to the function performed.

For field operations, the project QC staff will provide QC checks before and during the subcontractor operational activities to the extent required to determine the subcontractor is in compliance with the QC measures set forth by the contract and the applicable subcontract documents.

Audits of subcontractor activities will be conducted by the project QC staff (monitored by the QCO and IQAT) as necessary to verify compliance with the contract documents. Objective evidence of conformance to the subcontract documents will be reviewed during the audits.

Geotechnical and material testing will be performed by a subcontracted testing firm which will be responsible for the performance of earthwork, concrete, and other physical testing defined in the applicable work specification.

The QCO is responsible for monitoring the laboratory operations to verify:

- execution of all required tests
- frequency of tests
- calibration of test equipment
- test results
- documentation

4.6 QUALITY ASSURANCE AUDITS

The project QA/QC Plan will include periodic audits during the course of the project to verify that the program is in compliance with the CQAP. The audit will be performed on-Site by the QC staff monitored by the QCO and IQAT and will include, but not be limited to, the following:

- subcontractor performance
- field operation and records
- laboratory sampling and testing
- QC inspections and records
- document control

In addition to the internal QC staff audits, additional external audits may be conducted independently by the IQAT, Ciba and the USEPA/ADEM. These entities, at their own discretion, will determine:

- the number of external audits and scope to be performed
- the individuals to perform the audits
- the time and place of the audits

4.7 CORRECTIVE ACTION

When conditions are encountered that do not meet with the intent of the specifications, corrective action is required. The objective of this section is to outline the course of action to be taken when the condition of the process differs from that which is a requirement of the specification.

Compliance with the requirements of the specification is the responsibility of all project personnel that have a direct input in the process. It is their responsibility to identify materials or work activities that may not conform to the contract requirements. Upon the discovery of a potential deficiency that may effect the quality of the project, the individual must initiate a Deficiency Report (DR; Figure 4-6) and forward it to the project QC staff.

The QCO will review the DR, determine the status and complete Section 2 of the DR. If the condition is deficient, the QCO will confirm it and assign it a sequential number. The number will be prefixed with a "D" followed by the next available number, e.g., D-001, D-002. A DR log (Figure 4-7) will be maintained by the QCO showing all DR activity. If the disposition does not require engineering or client involvement, the QCO will complete Section 4 of the form and will then assign the DR to the appropriate area supervisor for correction. The assigned supervisor will make required corrections, sign and date Section 5 of the DR. After QC verification and acceptance, Section 6 of the DR will be signed and dated by the QCO.

If the QCO determines the condition may require engineering and/or Ciba review to correct the deficiency, the QCO will route as required to engineering, the Project Manager, and Ciba. If Ciba determines the condition may require USEPA/ADEM review, Ciba will discuss the DR with the USEPA/ADEM. No action will be taken to correct these deficiencies until USEPA/ADEM approval is received.

FIGURE 4-1
PREPARATORY INSPECTION CHECKLIST

CONTRACT NO.: _____ DATE: _____
SPECIFICATION SECTION: _____
DEFINABLE FEATURE OF THE WORK: _____

SECTION A
PERSONNEL PRESENT

NAME	POSITION	COMPANY

SECTION B
DRAWINGS AND SPECIFICATIONS

1. Has each specification paragraph, contract drawing and shop drawing been studied?:
   YES _____/ NO _____

2. Do all parties have up-to date drawings and specifications?
   YES _____/ NO _____

SECTION C
TRANSMITTALS INVOLVED

Number & Items	Code	Approval

SECTION D
TRANSMITTALS WHICH MUST BE SUBMITTED

ITEM	APPROVAL

SECTION E
HEALTH AND SAFETY REVIEW

1. Are Insurance Certificates on Site?:
   YES _____/ NO _____

2. Are Insurance Certificates current?:
   YES _____/ NO _____

(Continued on Next Page)

FIGURE 4-1 (CONTINUED)
PREPARATORY INSPECTION CHECKLIST

SECTION F
MATERIALS

1. Are all materials on Site? YES _____/ NO _____
2. Have all materials been checked for contract compliance against approved shop drawings and specifications?
   YES _____/ NO _____
3. If No, Explain deficiency and corrective action:

_____

SECTION G
TESTS REQUIRED IN ACCORDANCE WITH CONTRACT REQUIREMENTS

Test	Paragraph	Frequency

SECTION H
EQUIPMENT REQUIRING OPERATIONAL CHECK:

ITEM	CHECK

SECTION I
OPERATIONS AND MAINTENANCE MANUALS REQUIRED

1. Are O&M Manuals and/or field instructions required?
   YES _____/ NO _____

SECTION J
ITEMS DISCUSSED

1. Are any utility shut-downs required?
   YES _____/ NO _____
2. An initial inspection will be required as soon as a representative portion of the work has been completed.

_____

SECTION K
CONFLICTS NOTED

_____
_____
_____
_____

_____
QUALITY CONTROL REPRESENTATIVE

FIGURE 4-2
INITIAL INSPECTION CHECKLIST

CONTRACT NO.: _____ DATE: _____

SPECIFICATION SECTION: _____

DEFINABLE FEATURE OF THE WORK: _____

SECTION A
PERSONNEL PRESENT

NAME	POSITION	COMPANY

SECTION B
MATERIALS

1. Have all materials to be used been submitted and approved?:
   Yes _____ No _____

2. If No, list all materials to be used which have not been submitted:

_____

3. Do materials conform to submittals, plans and specifications?
   Yes _____ No _____

4. If No, explain and describe corrective action taken:

_____

SECTION C
TESTING

1. Is testing lab ready to perform required tests? Yes _____ No _____
2. If No, explain: _____

_____

SECTION D
EQUIPMENT

Is equipment required available and capable of performing work required?

Yes _____ No _____

(Continued on Next Page)

FIGURE 4-2 (CONTINUED)
INITIAL INSPECTION CHECKLIST

SECTION E
WORKMANSHIP

1. Has previous work been completed in accordance with plans and specifications:

Yes _____ No _____

2. If No, explain: _____

_____

SECTION F
GENERAL SAFETY REQUIREMENTS

_____

_____

SECTION G
ITEMS DISCUSSED

Are any utility shut downs required? Yes _____ No _____

_____

_____

_____

SECTION H
CONFLICTS NOTED

_____

_____

SECTION I
CORRECTIVE ACTION PLAN

_____

_____

SECTION J
WORK ITEM APPROVED FOR INSPECTION

_____
QUALITY CONTROL REPRESENTATIVE

FIGURE 4-3
FOLLOW-UP INSPECTION CHECKLIST

CONTRACT NO.: _____ DATE: _____

SPECIFICATION SECTION: _____

DEFINABLE FEATURE OF THE WORK: _____

SECTION A
PERSONNEL PRESENT

NAME	POSITION	COMPANY

SECTION B
MATERIALS

1. Have all materials to be used been submitted and approved?:
   Yes _____ No _____

2. If No, list all materials to be used which have not been submitted:

   _____

   _____

3. Do materials conform to submittals, plans and specifications?
   Yes _____ No _____

4. If No, explain and describe corrective action taken:

   _____

SECTION C
TESTING

1. Is testing lab ready to perform required tests? Yes _____ No _____
2. If No, explain: _____

   _____

(Continued on next page)

FIGURE 4-3 (CONTINUED)
FOLLOW-UP INSPECTION CHECKLIST

SECTION D
EQUIPMENT

1. Is equipment required available and capable of performing work required?
   Yes _____ No _____

2. If No, Explain: _____

_____

SECTION E
WORKMANSHIP

1. Has previous work been completed in accordance with plans and specifications:
   Yes _____ No _____

2. If No, Explain: _____

_____

SECTION F
GENERAL SAFETY REQUIREMENTS

_____

_____

SECTION G
ITEMS DISCUSSED

Are any utility shut downs required? Yes _____ No _____

_____

_____

SECTION H
CONFLICTS NOTED

_____

SECTION I
WORK ITEM APPROVED FOR INSPECTION

_____
QUALITY CONTROL REPRESENTATIVE

FIGURE 4-4
FINAL INSPECTION LOG

WORK FEATURES	FINAL INSPECTION DATE	APPROVED COMPLETE		
		CQO	PM	CIBA

FIGURE 4-5
SUBMITTAL REGISTER FORM

SUBMITTAL NO.	RECIPIENT	DOCUMENT TITLE	DATE

FIGURE 4-6
DEFICIENCY REPORT

SECTION 1: TO BE COMPLETED BY INITIATING INDIVIDUAL

CONTRACT NO.: _____ DATE: _____
SPECIFICATION SECTION: _____
DEFINABLE FEATURE OF THE WORK: _____

REPORT INITIATED BY: _____ DATE: _____
DESCRIPTION OF DEFICIENCY: _____

SECTION 2: COMPLETED BY QCO

QCO REVIEW: DATE: _____ SIGNATURE: _____

RECOMMENDED ACTION: _____

REQUIRED ROUTING FOR REVIEW (QCO MUST COMPLETE THEN ROUTE AS INDICATED)

REVIEW REQUIRED BY	YES	NO	SPECIFIC INDIVIDUAL
1. ENGINEERING			
2. PROJECT MANAGER			
3. CIBA			
4. USEPA/ADEM			

DEVIATION NUMBER ASSIGNED: D-____

(Continued on Next Page)

FIGURE 4-6 (CONTINUED)
DEFICIENCY REPORT

SECTION 3 - REVIEWS

COMPLETE IF SECTION 2 IS CHECKED YES FOR ENGINEERING REVIEW

ENGINEERING REVIEW: DATE:_____ SIGNATURE:_____
RECOMMENDED ACTION: _____
_____
_____
_____
INSPECTIONS REQUIRED:_____
APPROVALS REQUIRED: _____

COMPLETE IF SECTION 2 IS CHECKED YES FOR PROJECT MANAGER REVIEW

PROJECT MANAGER REVIEW: DATE:_____ SIGNATURE:_____
RECOMMENDED ACTION: _____
_____
_____
_____
INSPECTIONS REQUIRED:_____
APPROVALS REQUIRED: _____

COMPLETE IF SECTION 2 IS CHECKED YES FOR CIBA REVIEW

CIBA REVIEW: DATE: _____ SIGNATURE:_____
RECOMMENDED ACTION: _____
_____
_____
_____
INSPECTIONS REQUIRED:_____
APPROVALS REQUIRED: _____

(Continued on Next Page)

FIGURE 4-6 (CONTINUED)
DEFICIENCY REPORT

COMPLETE IF SECTION 2 IS CHECKED YES FOR USEPA/ADEM REVIEW

USEPA/ADEM REVIEW: DATE:_____ SIGNATURE:_____
RECOMMENDED ACTION: _____

INSPECTIONS REQUIRED:_____
APPROVALS REQUIRED: _____

SECTION 4 - INSTRUCTIONS TO AREA SUPERVISOR
TO BE COMPLETED BY QCO AFTER APPROPRIATE REVIEWS

SECTION 5 - COMPLETION REPORT
TO BE COMPLETED BY AREA SUPERVISOR

SIGNATURE: _____ DATE: _____

SECTION 6 - INSPECTION AND SIGNATURES

INSPECTED BY QCO: DATE: _____SIGNATURE: _____

SECTION 7 - FOLLOW-UP INSTRUCTIONS

FIGURE 4-7

DEFICIENCY REPORT LOG

DR #	DESCRIPTION	DATE INITIATED	ISSUED FOR REVIEW BY								DATE SENT TO PROJECT MANAGER	DATE COMPLETED
			ENGINEERING		PROJECT MANAGER		CIBA		USEPA			
			Initials	DATE	Initials	DATE	Initials	DATE	Initials	DATE		

5.0 ANALYTICAL QUALITY ASSURANCE

The primary purpose of this section is to define QA/QC procedures necessary to achieve data quality objectives for analytical, sample management, chain of custody and data validation activities.

The following documents were used in development of this CQAP:

- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (December 1980)
- Data Quality Objectives Process for Superfund (September 1993)
- National Functional Guidelines for Organic Data Review (OLM 01.1-8)
- Test Methods for Evaluating Solid Waste (SW-846) 3rd Edition, 1991
- Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV (February 1991)
- Standard Methods for the Examination of Waste and Wastewaters (September 1995)

5.1 OBJECTIVES

Specific objectives of the field analytical program for the Site to which this CQAP is applicable include:

- TTU feed samples to demonstrate that the prepared feed to the TTU meets applicable limits (if any) for metals and chlorine
- RWWTS effluent monitoring and testing under the requirements of the Ciba wastewater treatment plant
- verification of suitability of borrow soil material prior to approval for use on-Site
- samples of scrubber water blowdown to measure density

Note that analyses of treated soil samples and excavation verification samples are not addressed in this plan but are covered in the PSVP. The purpose of this section is to ensure that the data are technically valid, defendable, and meet or exceed the required Data Quality Objectives (DQOs). The CQAP describes the management policies, objectives, principles, and procedures which will be used to produce the required data quality. The CQAP also defines the QA program for oversight of field and laboratory activities and for the review of environmental data. The QA program is a system of documented checks and ensures the authenticity and validity of environmental data. QC includes the tools provided in the QA program for performing the data validation process.

Analysis of all samples will be conducted by laboratories utilizing standard USEPA approved or equivalent methods.

5.2 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

This QA program addresses both field and laboratory activities. The measurement of QC includes the PARCC parameters (i.e., precision, accuracy, representativeness, comparability, and completeness). The procedures described herein are designed to obtain PARCC data for each field procedure and analytical method. To ensure that quality data continues to be produced, systematic checks must show that test results and field procedures remain reproducible and that the analytical methodology is actually measuring the quantity in each sample.

5.2.1 PARCC Review

Specific PARCC measurements will be addressed to satisfy the QA objectives. These measurements are discussed in the following subsections.

5.2.1.1 *Precision*

Precision is commonly determined from duplicate samples; thus, precision is usually expressed as relative percent difference (RPD) or relative standard deviation (RSD). These quantities are defined as follows:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} * 100$$

$$RSD = \frac{100}{\sqrt{2}} * \frac{2\ |X_1 - X_2|}{(X_1 + X_2)}$$

where X_1 and X_2 are the reported concentrations for each duplicate sample.

5.2.1.2 *Accuracy*

Accuracy is a determination of how close the measurement is to the true value. When applied to a set of observed values, accuracy will be a combination of a random component and of a common systematic error (or bias) component. Bias is defined as the deviation due to matrix effects of the measured value from a known spiked amount. Accuracy will be determined from spiked samples as follows:

$$PR = 100(A-B)/C$$

where: A = spiked sample result
B = sample result
C = spike added

The bias (B) due to matrix effects based on a matrix spike is calculated as:

$$B = (X_s - X_u) - K$$

where: X_s = measured value for spiked sample
X_u = measured value for unspiked sample
K = known value of spike in sample

5.2.1.3 *Representativeness*

The representativeness criterion is best satisfied by making certain that sampling locations are selected properly and a sufficient number of samples are collected. Representativeness will be assessed by the use of duplicate samples. By definition, duplicate samples are collected so that they are equally representative of a given point in space and time. In this way, they provide both precision and representativeness information.

5.2.1.4 *Completeness*

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. Completeness will be represented by:

$$\%\ Completeness = \frac{Number\ of\ valid\ results}{Total\ number\ of\ results} \times 100$$

An 80% completeness is anticipated for the project tasks.

5.2.1.5 *Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units.

5.2.2 Data Quality Objectives and Levels

To generate data that will meet the project objectives, it is necessary to define the types of decisions that will be made, identify the intended use of the data, and design a data collection program. DQOs are defined as an integrated set of thought processes which define data quality requirements based on the intended use of the data. DQOs are necessary in obtaining sufficient data of known defensible quality for the intended use. The DQO process will assist in determining appropriate quantitation, detection, and reporting limits by defining analytical methods, sample handling procedures and data assessment requirements.

The overall data quality objective for this project is to limit the chance that sample data will lead to an incorrect conclusion for each of the various data uses. An important aspect of this objective is to minimize the chance for data which indicate that environmental matrices are "clean", when they are not (false negatives) and to minimize the chance of data which indicate that soils are "dirty", when they are not (false positives). To achieve this objective, control limits on PARCC parameters have been established, based on the intended use of the data.

Validation of all data collected during this program will be performed to assure that quality procedures have been followed and that the quality of data will adequately support the intended use

as described in the USEPA's Data Quality Objectives for Remedial Response Activities (March 1987). The QA/QC evaluation will determine whether data meet requirements of the CQAP and will include a validation of the laboratory data, when appropriate or applicable.

The DQOs for this project will incorporate data quality Levels II and III. Level II data will be utilized for testing the density of scrubber water blow-down. Level III DQOs will be utilized for laboratory analysis of TTU feed, RWWTS effluent and potential borrow source samples. These levels of data are defined as follows:

- Level II — Field screening or analysis using more sophisticated portable instruments. The quality of data generated is highly variable, depending on the use of suitable calibration standards, reference materials, sample preparation equipment, and the training of the operator. Results are available almost immediately.

- Level III — All analyses performed in an off-Site laboratory that may or may not follow Contract Laboratory Program (CLP) procedures. Quality assurance/quality control and documentation are less rigorous than CLP protocols. Results are not available immediately.

5.3 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES FOR FIELD ACTIVITIES

General considerations, sample container, preservation and storage requirements, equipment decontamination and data management procedures applicable to these activities are discussed below.

5.3.1 General Considerations

Field activities affecting data quality will be documented. Activities affecting data quality include sample management, reagent/standard preparation, decontamination, sample collection, field measurements, equipment calibration and maintenance, and corrective action which are components of this CQAP.

5.3.2 Sample Containers, Preservation, and Storage

Sample containers will be furnished clean by the laboratory or will be supplied by a commercial laboratory supply vendor.

5.3.3 Decontamination

Equipment used for sampling will be decontaminated prior to each use in accordance with the following cleaning procedures:

- remove visual contamination and wipe clean
- clean with tap water and phosphate-free laboratory detergent. Liquinox or equivalent) using a brush to remove particulate matter and surface films
- rinse thoroughly with tap water
- rinse thoroughly with deionized water
- rinse twice with pesticide grade isopropyl alcohol and allow to air dry. Isopropyl alcohol will not be applied to any PVC or plastic materials.
- rinse thoroughly, twice, with organic-free water if it is necessary to reuse the equipment before alcohol drying is complete
- wrap sampling equipment completely with aluminum foil, shiny side out, to prevent contamination if equipment is to be stored or transported

Clean, disposable gloves will be worn while handling sampling equipment or down hole tools during the final stages of decontamination. Organic free water will be stored in either glass or Teflon containers and applied via Teflon squeeze bottles or decanted directly from their storage containers. Deionized water will be stored in plastic containers and applied via plastic pump sprayers or decanted directly from the storage container.

5.4 SAMPLE CUSTODY PROTOCOL

Sample identification and documentation, field custody, sample packing and shipping, and laboratory custody procedures applicable to these activities are discussed below.

5.4.1 Sample Identification and Documentation

After sample collection, all sample containers will be labeled with an identification number that uniquely identifies the sample. The sample identification number will be logged in the field log book, along with the following information:

- sampling personnel
- bottleware lot number
- date and time of collection
- field sample location and depth (if appropriate)
- observations on ambient conditions
- type of sampling (composite or grab)
- method of sampling
- sampling matrix or source
- intended analyses
- preservation method
- observations of significant characteristics of the sample
- observations of significant affect to the sampling procedure
- sample chain of custody number

5.4.2 Field Custody Procedures

Field custody procedures regarding sample identification and documentation, field log book, sample containers, sample packing and sample shipping are described below. Examples of the chain-of-custody forms and label used to track custody are provided in Attachment 2.

5.4.2.1 *Field Log Book*

Sampling personnel will use a bound field log book with moisture resistant pages to record pertinent sampling information with waterproof ink. The log book identifies project name, project number, Project Manager and telephone number, and principal street address or geographic location of the Site. Daily field activities and sampling information will be entered in the log book on dated, initialed, and serially-numbered pages. Corrections will be made to entries by initialed line-out deletions. A diagonal line is drawn across the remaining blank space of the last page of each day's entry. Each day's entry is signed and dated by the author.

5.4.2.2 *Sample Identification*

A unique identification number will be assigned to each sample. This number will be a alphanumeric sequence or integer that serves as a mnemonic device or acronym to identify the sample. All information pertaining to a particular sample will be referenced by its identification number that is recorded on the sample bottleware, in the field log book, and on the sample chain-of-custody form.

A typical sample label is shown in Attachment 2. Following sample collection, the sample label will be completed in waterproof ink with the appropriate information as shown. The completed label will then be secured to the sample container with clear, wide tape.

5.4.2.3 *Sample Containers*

OHM will use sample containers furnished by the laboratory or a commercial supplier. OHM will verify that the laboratory has approved cleaning procedures in the laboratory's CQAP, or that the commercial supplier furnishes laboratory grade, certified clean containers. The source and lot numbers of sample containers used in the sampling event will be recorded in the project field log book for each sample collected. The lot number may be used to trace the bottleware preparation and certification of cleanliness when the containers are shipped from the OHM equipment manager.

5.4.2.4 *Sample Location, Sample Media, and Intended Parameters*

The specific sampling location of each sample will be recorded with each sample identification number in the field log book and on the sample chain-of-custody form. Sampling locations will be referenced to a Site location map.

The type of sample media will be recorded with the sample identification number in the field log book and on the chain-of-custody form. Laboratory analyses to be conducted on the sample will be recorded with the sample identification number in the field log book and on the chain-of-custody form.

5.4.2.5 *Date, Time, Personnel, and Ambient Conditions*

The date and time of sampling preparation and collection, and personnel who conducted sampling will be recorded with the sample identification number in the field log book and on the chain-of-

custody form. The names of sampling personnel, visitors and any other persons on-Site will also be recorded in the field log book. The ambient weather conditions and other conditions at the sampling location that may affect sample collection, the apparent representativeness of the sample, or sample analysis will also be recorded in the field log book.

5.4.2.6 *Preliminary Sampling Activities*

Sampling personnel will record in the field log book the preparation activities that may be pertinent to the sampling event at each sampling location.

5.4.2.7 *Sample Collection*

Sampling personnel will record in the field log book the type of equipment used to conduct sampling, the order of sample collection (typically from most sensitive to least sensitive parameter), field screening results measured during sample collection, special collection procedures, and aberrations to sampling procedures. Duplicate QC samples, as described in Section 5.8.2, will have the same information recorded in the field log book.

Following collection of the sample, the sample identification number and other information on the sample label will be verified to the entry in the field log book. Sample identification number, time, and date of collection will be recorded on the chain-of-custody form.

Following sample labeling verification, the sample will be placed in a cooler with ice and be maintained in the sampler's presence or in a secure location for the remainder of the daily sampling activities, or until custody is transferred to another party. A sample will be considered to be in a person's custody whenever it is in a person's physical possession, when it is in view of the sampler or responsible party, or when it is in a secure location. Custody of a sample is also maintained when the sample is shipped in a container that is properly sealed against tampering with custody seals.

5.4.2.8 *Quality Control Sample Collection*

Information on QC samples will be recorded in the field log book, on the sample bottleware label, and on the chain-of-custody form. Duplicate samples will have the same information recorded as a regular sample. Equipment blanks will have most of this same information recorded, with the exception that sample location and sample screening and preliminary activities are not applicable.

The equipment blank will also be referenced to the actual samples that it accompanies in shipment and handling. A detailed discussion of QC samples is presented in Section 5.8.2.

5.4.3 Sample Packing and Shipment

When samples are shipped off Site, the following procedures will be conducted, and will be recorded in the project field log book and sample chain-of-custody form, as indicated below.

5.4.3.1 *Sample Packing*

Samples will be packed for shipping in waterproof ice chests and coolers. The sample containers may be individually sealed in "Zip-lock" or other similar plastic bags, prior to packing them in the cooler with bubble wrap or suitable packing. Wet ice sealed in "Zip-lock" or other plastic bags (to inhibit cross contamination of samples by meltwater) will be placed with the samples in the cooler.

The chain-of-custody form (copy in Attachment 2) identifying the samples will be signed as "relinquished" by the principal sampler or responsible party. Forms will be sealed in a plastic bag and placed inside the cooler, typically by taping the bag to the inside lid of the cooler.

Following packing, the cooler lid will be sealed with strapping tape. Two custody seals (copies in Attachment 2) will be signed and dated and affixed about two corners of the cooler, across the seal of the lid, and additionally covered with clear tape.

5.4.3.2 *Sample Shipping*

The sample coolers will be typically shipped by overnight express carrier to the laboratory. A copy of the bill of lading will be retained by OHM and becomes part of the sample custody documentation. Concurrent with shipping, the sampler completes a sample shipping form for reporting by telephone to the laboratory that receives the samples.

5.4.4 Laboratory Custody Procedures

Upon receipt by the laboratory, samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

All samples will be received by the analytical laboratory and carefully checked for label identification and completed, accurate chain-of-custody records. The sample temperature will be measured upon arrival by measuring a temperature blank that is shipped with the samples. Each sample will then be assigned a unique laboratory identification number through a computerized Laboratory Information Management System (LIMS) that stores all identifications and essential information. The LIMS system tracks the sample from storage through the laboratory system until the analytical process is completed. Access to the laboratory will be restricted to prevent any unauthorized contact with samples, extracts, or documentation.

5.5 CALIBRATION PROCEDURES AND FREQUENCY

5.5.1 Standard/Reagent Preparation

A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical operations. The preparation and maintenance of standards and reagents will be performed by the selected laboratory per the specified analytical method.

Primary reference standards and standard solutions used by the laboratory will be obtained from the National Institute of Standards and Technology, an USEPA Cooperator Supplier, or other reliable commercial sources to ensure the highest purity possible. All standards and standard solutions will be cataloged to identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information.

Standard solutions will be validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source. Stock and working standards will be checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change in concentration. Care will be exercised in the proper storage and handling of standard solutions, and all containers will be labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation).

Reagents will be examined for purity by subjecting an aliquot or subsample to the analytical method in which it will be used; for example, every lot of dichloromethane (for organic extractables) will be analyzed for undesirable contaminants prior to use in the laboratory.

5.5.2 Instrument Calibration and Tuning

Calibration of instruments is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument will be calibrated with standard solutions appropriate to the type of instrument and the linear range established for the given analytical method. The frequency of calibration and calibration verification and the concentration of calibration standards will be determined by the manufacturer's guidelines and the analytical method.

5.6 ANALYTICAL METHODS AND REQUIRED DETECTION LIMITS

This section presents the analytical activities, parameters, and methods associated with the laboratory activities. Table 3-2 lists the parameters, methods and reporting limits required for each sampling activity. The method references include:

- Test Methods for Evaluating Solid Waste, Volumes 1A-1C: Laboratory Manual, Physical/Chemical Methods; and Volume II: Field Manual, Physical/Chemical Methods, SW-846, Third Edition, Office of Solid Waste U.S. Environmental Protection Agency, December 1987.

- Standard Methods for the Examination of Wastes and Wastewaters, September 1995.

The laboratory is required to determine Method Detection Limits (MDLs) for each analyte in accordance with methods specified in Method SW-846, USEPA, December 1987. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL is determined from multiple analyses of a standard in a given matrix. MDLs are associated with instrumentation only and do not reflect interferences which may be associated with the sample matrix.

Practical Quantitation Limits (PQLs) are those lower limits (for a given analytical method) which can be routinely achieved by a laboratory for a specific matrix. The PQLs are always greater than or equal to the MDL. The PQL for a sample cannot be less than the lowest calibration standard and may be higher than the target reporting limit due to matrix interference, moisture (soil samples), or dilution requirements. All results below the PQL but above the MDL for an analyte will be listed as the PQL flagged with a "J". Target Reporting Limits (TRLs) that the laboratories will be required

to meet based on the performance standards and the required detection limits for each analyte are given in Table 3-2. These TRLs may be higher than the laboratories PQLs.

Assuring the validity of quantitative measurements at low concentrations is an extremely difficult technical problem. With regulatory action levels being pushed lower and lower, the validity of any given measurement becomes even more important. The consequences of false positive or false negative data can be significant.

Many laboratories routinely report result below the MDL as Not Detected because, by definition, the reliability of the data at that level is questionable. For this RA, the laboratory will report data below the quantitation limit with the data flagged accordingly. The quantitation limit will be provided and will be adjusted for sample dilution and moisture content.

5.7 DATA REDUCTION, VALIDATION, AND REPORTING

The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in laboratory standard operating procedures (SOPs). Each analyst will review the quality of his or her work based on an established set of guidelines.

5.7.1 Data Reduction

All results will be calculated by the laboratory using the instructions and equations outlined in the specified method for each analyte. Wherever possible, data reduction will be computerized. All hand calculations will be documented in permanently bound notebooks or on preprinted data reduction pages. Analysts review data as it is generated to determine that the instruments are performing within specifications. This review will include calibration checks, surrogate recoveries, blank checks, retention time reproductibility, and other QC checks. If any problems are noted during the analytical run, corrective action will be taken and documented.

All comments or changes to raw data must be written in ink, initialed and dated by the analyst. All laboratory raw data must be labelled with the laboratory and OHM sample numbers. All information required to reproduce the sample results, i.e. dilution factors, injection volumes, spike concentrations, or sample weights and volumes, must be clearly indicated on the raw data.

5.7.2 Data Validation by Laboratory

Each laboratory has SOPs for the internal data validation process. The typical review process is described below.

The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in laboratory SOPs. Each analyst reviews the quality of his or her work based on an established set of guidelines. Where applicable or appropriate, the organic analyses will be validated with respect to the USEPA CLP "National Functional Guidelines for Organic Data Review" (OLM 01.1-8). The analyst reviews the data package to ensure that:

- sample preparation information is correct and complete
- analysis information is correct and complete
- the appropriate SOPs have been followed
- analytical results are correct and complete
- QC samples are within established control limits
- blanks are within appropriate QC limits
- special sample preparation and analytical requirements have been met
- documentation is complete (e.g., all anomalies in the preparation and analysis have been documented, anomaly forms are complete; holding times are documented, etc.)

The data reduction and validation steps are documented, signed and dated by the analyst. This initial review step, performed by the analyst, is designated Level 1 review.

The analyst then passes the data package to an independent reviewer, who performs a Level 2 review.

Level 2 review is performed by a supervisor or data review specialist whose function is to provide an independent review of the data package. This review is also conducted according to an established set of guidelines and is structured to ensure that:

- calibration data are scientifically sound, appropriate to the method, and completely documented
- QC samples are within established guidelines
- qualitative identification of sample components is correct
- quantitative results are correct
- documentation is complete and correct (e.g., anomalies in the preparation and analysis have been documented; anomaly forms are complete; holding times are documented, etc.)
- the data are ready for incorporation into the final report
- the data package is complete and ready for data archive

Level 2 review is structured so that all calibration data and QC sample results are reviewed and all of the analytical results from 10% of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

Level 2 data review is also documented and the signature of the reviewer and the date of review recorded. The reviewed data are then approved for release and a final report is prepared.

Before the report is released to the USEPA/ADEM, the data are reviewed for completeness and to ensure that the data meet the overall objectives of the project. This review is labeled Level 3.

Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgement of those conducting the review. This application of technical knowledge and experience to the evaluation of the data is essential in ensuring that data of high quality are generated consistently.

In addition to the three levels of review discussed above, there will be a random audit of 5% of the data packages reported. The QA audit includes verifying that holding times have been met, calibration checks are adequate, qualitative and quantitative results are correct, documentation is complete, and QC results are complete and accurate. The QA review will check the data from 20% of the samples back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

5.7.3 Data Reporting

A variety of reporting formats, from computerized data tables, to complex reports discussing regulatory issues, will be available from the selected laboratory. The laboratory is responsible for providing a data package consistent with the Level III data quality objective. The package will include the following information:

- case narrative describing any problems, unusual sample conditions, or data qualification requirements
- tabulated sample results labelled with laboratory sample number, OHM sample number, extraction date, analysis date
- tabulated results for matrix spike/matrix spike duplicate analyses
- method blank results
- laboratory control sample results
- surrogate recoveries
- chain-of-custody form.

Analytical results will be reported in standard units as specified by the method. All solid sample results will be reported on an as received basis. Sample results will not be corrected for blank contamination.

All pertinent QC information will be maintained by the laboratory so that a defendable package can be assembled. Corrective action for unacceptable QC data is presented in Section 5.12.1.

5.7.4 Data Verification

Following data validation by the laboratory, data verification will then be conducted as a QC procedure by the IQAT. The IQAT will review analytical data for surrogate recoveries and laboratory results for method blank, matrix spike/matrix spike duplicate, field duplicate, rinsate blank, and trip blanks samples. Field log books and chain-of-custody forms will be cross-checked to each other and to the laboratory results to assure conformity of sample identification numbers. This information will be compared to results of duplicate and blank samples, and to information on field conditions at the time of sample collection to qualify the sample analytical results.

5.8 INTERNAL QUALITY CONTROL

This section addresses QC procedures associated with analytical efforts. Included are general QC considerations as well as specific QC checks which provide ongoing control and assessment of data quality, in terms of precision and accuracy. QC checks which provide the basis for quantitative control and assessment of data quality, along with required frequency, acceptance criteria, and corrective action are summarized in USEPA's DQOs (USEPA, 1987).

5.8.1 Laboratory Quality Control

Laboratory Performance QC is based on the use of a standard, control matrix to generate precision and accuracy data that will be compared, on a daily basis, to control limits. This information in conjunction with method blank data, will be used to assess daily laboratory performance. Matrix-specific QC is based on the use of an actual environmental sample for precision and accuracy determinations and commonly relies on the analysis of matrix spikes and matrix spike duplicates. This information, supplemented with field blank results, will be used to assess the effect of the matrix and field conditions on analytical data. Laboratory control samples (duplicate control samples, single control samples, and method blanks) will be analyzed at a frequency equal to at least 5% of the total number of samples analyzed.

Table 5-1 summarizes the field and laboratory QC samples which will be collected and analyzed for this effort based on the methods selected. A description of these QC samples is provided below.

5.8.1.1 *Method Blank*

Method blanks, also known as reagent, analytical, or preparation blanks, are analyzed to assess the level of background interference or contamination which exists in the analytical system and which might lead to the reporting of elevated concentration levels or false positive data.

Analysis of a method blank with every batch of samples processed will be required of the selected laboratory. A method blank consists of reagents specific to the method which are carried through every aspect of the procedure, including preparation, clean-up, and analysis. The results of the method blank analysis are evaluated, in conjunction with other QC information, to determine the acceptability of the data generated for that batch of samples.

Ideally, the concentration of target analytes in the blank should be below the reporting limit for that analyte. In practice, however, some common laboratory solvents and metals are difficult to eliminate to the part-per-billion levels commonly reported in environmental analyses. Therefore, criteria for determining blank acceptability must be based on consideration of the analytical techniques used, analytes reported, and reporting limits required.

For organic analyses, the concentration of target analytes in the blank must be below the reporting limit for that analyte in order for the blank to be considered acceptable. If the blank does not meet acceptance criteria, the source of contamination will be investigated and appropriate corrective action will be taken and documented. Investigation includes an evaluation of the data to determine the extent and effect of the contamination on the sample results. Corrective actions may include reanalysis of the blank and/or repreparation and reanalysis of the blank and all associated samples.

Method blank results are reported with each set of sample results. Sample results are not corrected for blank contamination unless required by the analytical method or requested by the client. Occasionally, due to limited sample volume or other constraints, the laboratory reports data associated with the unacceptable blank. In these cases, the reporting limit for each analyte contained in the blank is raised to the level found in the blank for all sample results associated with that blank.

5.8.1.2 *Matrix Spikes and Matrix Spike Duplicates*

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. MS analyses will be performed for one out of every 20 samples for each matrix. Results are expressed as percent recovery. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. MSD analyses will be performed for one out of every 20 samples for each matrix.

The two spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as RPD and percent recovery.

5.8.1.3 *Surrogate Recoveries*

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Results are reported in terms of percent recovery.

Surrogate recoveries not meeting acceptance criteria will be flagged to reflect matrix interferences which adversely affect recoveries. Surrogate recovery interferences must be confirmed by preparation and re-analysis of the sample.

5.8.2 Field Quality Control Samples

Field QC samples will include field duplicates and equipment rinsates. The following sections define each field QC sample. A summary of the sampling analytical and QC program is presented in Table 5-1.

5.8.2.1 *Field Duplicates*

Duplicate samples collected in the field provide precision information for the entire measurement system including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. Samples for duplicate analyses will be selected at random by the QCO, and submitted blind to the laboratory for analyses. Duplicate analyses will be performed for one out of every 20 samples for each matrix or one per analytical batch, whichever is more stringent.

5.8.2.2 *Rinsate Blanks*

Rinsate blanks are defined as samples which are obtained by pouring analyte-free or deionized water through non-dedicated sample collection equipment (hand auger, trowel, etc.) after decontamination, and placing it in appropriate sample containers for analysis. These samples are used to determine if decontamination procedures have been sufficient. Rinsate samples will be collected from the various sampling devices to provide a representative indication of the success of field cleaning procedures. Rinsate blanks will be submitted at the rate of at least one per day for each matrix being sampled.

5.9 PERFORMANCE AND SYSTEMS AUDITS

OHM conducts both performance and systems audits of field screening and sampling activities. Routine audits of analytical laboratory operations are conducted both internally and externally in order to assure that the QC program objectives are achieved and maintained. Following is a discussion of both field and laboratory audits.

5.9.1 Laboratory Performance Audit

The laboratory will participate in system and performance audits. During the system audit, an outside auditing agency will review the laboratory operations to verify that the laboratory has the necessary facilities, equipment, staff, and SOPs in place to generate acceptable data. The auditing agency verifies the laboratory's ability to correctly identify and quantitate compounds in blind check samples. The purpose of these audits is to assure the selected laboratory is capable of generating scientifically sound data. Participation in these audits will be required for the selected laboratory.

5.9.2 Internal Laboratory Quality

In addition to external audits conducted by certifying agencies or clients, the laboratory will be required to regularly conduct the following internal audits:

- quarterly systems audits
- periodic (at least yearly) audits
- special audits when a problem is suspected.

The results of these check samples are used to identify areas where additional training is needed or clarification of procedures is required.

5.9.3 Laboratory Audit

The on-Site laboratory evaluations help to assure that all the necessary quality control is being applied by the laboratory in order to deliver a quality product. Quality assurance evaluations allow the evaluators to determine that:

- the organization and personnel are qualified to perform assigned tasks
- adequate facilities and equipment are available
- complete documentation, including chain-of-custody of samples is being implemented
- proper analytical methodology is being used
- adequate analytical quality control, including reference samples, control charts, and documented corrective action measures, is being provided
- acceptable data handling and documentation techniques are being used

A report will be prepared containing the results of the audit and any required corrective actions that need to be taken. Follow-up on these corrective actions will be documented by the audit team leader. An additional mid-project audit of reduced scope may be conducted to confirm continued compliance with approved sample and data handling protocols.

5.9.4 Field Performance

An inspection for suitability of the samples for proper laboratory analysis is the performance audit of the sample collection procedures. Insufficient sample volume for analysis or improper preservation of samples will be noted by the analytical laboratory. Such reports of samples unsuitable for analysis will indicate that the sampling procedures are poor or unacceptable. These analytical results are reviewed by the OHM Project Manager and the OHM QA/QC Manager to assess the performance and adequacy of sample collection procedures.

Systems audits of OHM's field operations are conducted to assure that proper field screening and sampling procedures are selected and executed in the field for the particular media and analytes of interest to the project.

Proper selection of field sampling methods is audited by the QCO and IQAT who reviews the CQAP prepared for the project under the direction of the OHM Project Manager. The QA program manager audits the CQAP to verify that it has adequately identified the sampling media and analytes

of interest, and that the proper field sampling methods and laboratory analytical methods have been selected to obtain representative samples for the appropriate analyses.

Proper execution of the field screening and sampling procedures is audited by the OHM Project Manager and the OHM QC staff who audit these project operations on a regular basis over the life of the project through review of the field log book and audit forms, and through discussion with the QCO and IQAT.

5.10 PREVENTIVE MAINTENANCE

Routine preventative maintenance will be conducted as appropriate to ensure accurate and precise data. Preventative maintenance procedures will be conducted for analytical and field screening instruments as described below.

5.10.1 Laboratory Maintenance

To minimize downtime and interruption of analytical work, preventive maintenance will be routinely performed on each analytical instrument. Designated laboratory personnel are typically trained in routine maintenance procedures for all major instrumentation. When repairs are necessary, they will be performed by either trained staff or trained service engineers employed by the instrument manufacturer.

5.10.2 Laboratory System Backup

The selected laboratory will have detailed SOPs on file that describe preventive maintenance procedures and schedules. The laboratory will also maintain detailed log books documenting the preventive maintenance and repairs performed on each analytical instrument.

The laboratory will maintain secondary backup equipment in the event of instrument failure. The laboratory must provide assurance that equipment or capacity is available for providing analysis within specified holding times.

5.10.3 Field Screening Instruments

Most of OHM's field instruments operate by solid-state circuitry and are designed for field use. Little preventative maintenance of the instruments is required, other than cleaning. Each field

screening instrument has its own log book that is carried in the instrument case. Preventative maintenance actions, with the exception of battery recharging, will be documented in each instrument's log book by the equipment manager or the person conducting the maintenance in the field.

5.11 DATA QUALITY ASSESSMENT

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its PARCC parameters (as defined in Section 5.2). This section describes protocols which will be used to evaluate data quality.

5.11.1 Precision

Precision is the degree to which the measurement is reproducible. Precision will be assessed by replicate measurements of duplicate control samples, reference materials, and/or environmental samples. Precision will be monitored by comparing the relative standard deviation (RSD) between a minimum of 90% of the duplicate control sample measurements with control limits established at plus or minus three standard deviations from the mean RSD of historical duplicate control sample data. Ideally, all of the duplicates (100%) will be used to assess the analytical methods. The minimum amount of duplicates for any given parameter is 90%; this will take into account loss of sample information due to breakage during shipment, matrix interferences, etc. The laboratory routinely monitors precision by comparing the RPD between duplicate control sample measurements with control limits established at plus three standard deviations from the mean RPD of historical duplicate control sample data.

Precision is frequently determined by comparison of replicates. The standard deviation of "n" measurements of "x" is commonly used to estimate precision.

Standard deviation is calculated as follows:

$$s = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2}$$

where a quantity "x" (e.g., a concentration) is measured "n" times.

The relative standard deviation, which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more replicates (although it may be applied in the case of n = 2).

$$RSD = 100\ (s/\bar{x})$$

Where:
RSD = relative standard deviation
s = standard deviation
$\bar{x}$ = *mean*

In the case of duplicates, the RPD between the two samples may be used to estimate precision.

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2}\ x\ 100$$

Where:
RPD = relative percent difference
D_1 = first sample value
D_2 = second sample value (duplicate)

5.11.2 Accuracy

Accuracy is a determination of how close the measurement is to the true value. Accuracy will be assessed using laboratory control samples, standard reference materials, or spiked environmental samples.

The determination of the accuracy of a measurement requires a knowledge of the true or accepted value of the parameter being measured. Accuracy will be calculated in terms of percent recovery as follows:

$$Percent\ Recovery = \frac{x}{T}\ x\ 100$$

Where:
x = the observed value of measurement
T = "true" value

5.11.3 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Some samples may require analysis of multiple phases to obtain representative results.

5.11.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions. To be considered complete, the data set must contain all analytical results and data specified for the project. In addition, all data are compared to project requirements to ensure that specifications were met. Any deviations are reported in the report narrative.

The percent completeness for each set of samples will be calculated as follows:

$$Completeness = \frac{valid\ data\ obtained}{total\ data\ planned} \times 100\%$$

5.11.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), consistency in reporting units (ppm, ppb, etc.), and analysis of standard reference materials.

5.12 CORRECTIVE ACTION FOR MEASUREMENT SYSTEMS

When a non-conformance or deficiency is identified during a formal audit or during a routine QC audit, corrective action will be initiated by the project OHM QA/QC Manager or the appropriate functionary (laboratory QA, etc.). The auditor will also be responsible for ensuring that the corrective action has indeed been taken, and that it adequately addresses the non-conformance. A non-conformance report form will be filed for all non-laboratory related deficiencies.

5.12.1 Laboratory Corrective Action and Response

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called "corrective actions," to resolve problems and restore proper functioning to the analytical system.

Laboratory personnel will be alerted that corrective actions may be necessary if:

- QC data are outside the acceptable windows for precision and accuracy
- blanks, duplicate control samples or single control samples contain contaminants above acceptable levels
- undesirable trends are detected in spike recoveries or RPD between duplicates
- there are unusual changes in detection limits
- deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples or
- inquiries concerning data quality are received from clients

When the analysis of any sample indicates the system may be out of control, a QC check sample is analyzed. If the analysis of the check sample indicates a problem, the laboratory supervisor is notified and corrective action taken. Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. The instrument cannot be put back into service until the check sample meets QA specifications. Also the laboratory supervisor must sign the maintenance log book and enter all the information related to the check sample. Once resolved, the check sample is reanalyzed to ensure the problem has been resolved. Full documentation of the corrective action procedure is filed with the project records.

5.12.2 Field Measurement Corrective Action and Response

Technical staff shall be responsible for reporting suspected technical non-conformances by initiating a non-conformance report of any issued deliverable or document. Staff shall be responsible for reporting suspected QA non-conformances by referencing any non-conformance items on the daily log.

The QCO monitored by the IQAT will be responsible for ensuring that corrective actions for non-conformances are implemented by:

- evaluating all reported non-conformances
- controlling additional work on nonconforming items
- determining disposition or action to be taken
- maintaining a log of non-conformances
- reviewing non-conformance reports
- evaluating disposition or action taken
- ensure non-conformance reports are included in the final Site documentation in document control

The on-Site coordinator will be responsible for carrying out corrective action as initiated by the QCO. The OHM Project Manager shall evaluate each non-conformance report and shall provide a disposition by checking the appropriate box and describing the action to be taken.

TABLE 5-1

SUMMARY OF QC SAMPLING FREQUENCY

SAMPLING EVENT DESCRIPTION	ANALYSIS	FIELD QC SAMPLE FREQUENCY			LABORATORY QC FREQUENCY	
		Equipment Blanks	Field Duplicates	MS/MSD[1]	Method Blanks	Surrogate Standards
Wastewater from RWWTS	Organic Compounds	1 in 20	1 in 20	1 in 20	1 per analytical batch[2]	1 per analytical batch[2]
Soil Feed to TTU (First month of operation)	Chlorine, Metals	1 in 20	1 in 20	1 in 20	1 per analytical batch[2]	1 per analytical batch[2]
Process Water, Scrubber Blowdown	Density	NA	NA	NA	NA	NA
Soil, potential borrow sources	Organic Compounds	1 in 20	1 in 20	1 in 20	1 per analytical batch[2]	1 per analytical batch[2]
Process Water - slurry trench construction	pH, hardness, TDS, organics	NA	NA	NA	NA	NA

1. MS/MSD: Matrix Spike/ Matrix Spike Duplicate Samples

2. Analytical Batch: Number of samples (including QC samples) processed as a group during parameter testing. Actual batch size will be determined by laboratory.

ATTACHMENT 1

PERSONNEL QUALIFICATIONS

PERSONNEL QUALIFICATIONS

Mr. Allen Rutherford Mr. Rutherford will be the Project Manager for the RA. Mr. Rutherford was the Project Manager at the Old Midlands Site remedial action in Ola, Arkansas and has been involved in the mobilization of the TTU equipment to the Drake Site in Pennsylvania. In addition, Mr. Rutherford has been the Project Manager throughout the Ciba McIntosh RD and is therefore familiar with the requirements of the design drawings and specifications as well as the intent of the design documents. Mr. Rutherford's continued presence will lend continuity to the RA.

Dr. Scott Tucker Dr. Tucker will be the Quality Assurance Officer for this project. Dr. Tucker has over 25 years of experience in various industrial quality roles, including air quality monitoring, analytical laboratory support services and QA/QC for thermal treatment programs. Dr. Tucker has been involved in the Ciba McIntosh Remedial Design and development of the Air Monitoring Plan and Construction Quality Assurance Plan. His oversight of the QA/QC program will provide continuity with the design.

Mr. Cecil Gibbs Mr. Gibbs is the OHM Corporate QA/QC Manager. Mr. Gibbs has over 20 years experience in QA/QC, providing quality program management for government and private industry in engineering, procurement, construction and environmental projects. Currently, Mr. Gibbs is responsible for directing implementation of the Corporate Quality Program in OHM district offices and project Sites.

ATTACHMENT 2

CHAIN OF CUSTODY FORMS AND LABELS

...l Remediation Services Corp.

CHAIN-OF-CUSTODY RECORD

LAB COF
Form 00
Field Technical Servic
Rev. 08/

177044

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PROJECT NAME		PROJECT LOCATION
PROJ. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.
CLIENT'S REPRESENTATIVE		PROJECT MANAGER/SUPERVISOR

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)								REMARKS
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME	REMARKS
1						
2						
3						
4						SAMPLER'S SIGNATURE

SAMPLE LABEL

Project Name _____ Project No

Sample ID _____ Sampler _____

Sample Description/Location _____

_____

Preservatives _____

Date _____ Time _____ Container ____ of ____
(MM/DD/YY) (HH:MM–military time)

APPENDIX C

CONSTRUCTION HEALTH AND SAFETY PLAN

Construction Health And Safety Plan
Ciba-Geigy Corporation
Remediation Of Operable Units No. 2 And No. 4
McIntosh, Alabama

Submitted to:

Ciba-Geigy Corporation
McIntosh, Alabama

Submitted by:

OHM Remediation Services Corp.
Norcross, Georgia 30092

Prepared by:

Mark Wilson, CIH
Regional Health and Safety Manager

Approved by:

J. Angelo Liberatore, CIH
Regional Health and Safety Director

Project No. 31000

May 1996

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List of Acronyms and Abbreviations

ADEM	Alabama Department of Environmental Management
AMP	Air Monitoring Plan
ARARs	Applicable or Relevant and Appropriate Requirements
APCs	Air Pollution Control System
BIF	Boilers and Industrial Furnaces
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CMP	Construction Management Plan
CQAP	Construction Quality Assurance Plan
DRE	Destruction and Removal Efficiency
IQAT	Independent Quality Assurance Team
MHP	Materials Handling Plan
O&M Plan	Operations and Maintenance Plan
OHM	OHM Remediation Services Corp.
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PDP	Performance Demonstration Plan
PFDR	Prefinal Design Report
PRP	Potentially Responsible Party
POHC	Principal Organic Hazardous Constituent
PSVP	Performance Standards Verification Plan
PVC	Polyvinyl Chloride
RA	Remedial Action
RAPs	Remedial Action Plans
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
Rust	RUST Environment & Infrastructure
RWWTS	Remediation Wastewater Treatment System
SCC	Secondary Combustion Chamber
Site	Ciba McIntosh Superfund Site
SOW	Statement of Work
SSO	Site Safety Officer
TCLP	Toxicity Characteristic Leaching Procedure
TTU	Thermal Treatment Unit
USEPA	United States Environmental Protection Agency

1.0 SITE SPECIFIC HEALTH AND SAFETY PLAN

OHM has developed this Construction Health And Safety Plan (CHSP) for the ROD SOW contained in Section IV, Task III, Paragraph A.5 of the Statement of Work for RD/RA Consent Decree, Operable Unit 2 and Section IV, Task III, Paragraph A.5 of the SOW for RD/RA Consent Decree, Operable Unit 4. This CHSP specifically addresses the policies and procedures which protect workers and the public from potential hazards posed by work at this site. The health and safety procedures contained in this CHSP are a part of OHM's Corporate Health and Safety Program, which complies with 29 CFR 1910.120(b)(1) through (b)(4). OHM considers safety the highest priority during work at a site containing potentially hazardous materials. All project activities will be conducted in a manner that minimizes the probability of injury, accident or incident occurrence.

Although the plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials.

This CHSP has been prepared in accordance with OSHA's "Hazardous Waste Operations and Emergency Response" standard contained in 29 CFR 1910.120. A copy of the Ciba-Geigy Corporation Safety Manual for the McIntosh, Alabama, facility will be followed and available onsite. This manual is a part of the CHSP with the manual index contained in Appendix A. OHM will comply with the requirement of this CHSP and the facility's safety manuals during remediation activities.

1.1 SITE DESCRIPTION

The Ciba-Geigy Corporation, McIntosh facility is located in southern Washington County, Northeast of McIntosh, Alabama approximately 50 miles north of Mobile, Alabama. The operating facility, which encompasses approximately 2.4 square miles, is situated between the Southern Railroad right-of-way on the west end and extends to the escarpment separating the upland terrace from the flood plain of the Tombigbee River. The property boundaries extend beyond the railroad, westward toward U.S. Highway 43. The northern edge of the property merges into an undeveloped pine forest. The south side of the property is bounded by the Olin Corporation facility. The southeastern portion of the property extends to the banks of the Tombigbee River.

1.1.1 Site Geology and Hydrogeology

The manufacturing facility is constructed upon low terrace and alluvium soils deposited by the Tombigbee River system. A relatively persistent silty clay layer is present at land

surface. The thickness of the surficial silty clay ranges from 0 to over 50 feet with an average thickness of 25 to 30 feet. The surficial silty clay is underlain by 12 to 55 feet of sands and gravels interlayered with discontinuous clay lenses that comprise the uppermost aquifer beneath the site. A regionally extensive confining layer is located approximately 90 feet below land surface. A groundwater corrective action system pumps and treats groundwater from the uppermost aquifer and forms a hydraulic barrier to groundwater flow from beneath the manufacturing facility.

1.1.2 Site History

The Geigy McIntosh facility, formerly owned by Geigy Chemical corporation, began operations in October 1952, with the manufacture of one product, dichlorodiphenyl-trichloroethane (DDT). Through 1970, Geigy expanded its McIntosh facilities by adding the production of fluorescent brighteners used in laundry products, herbicides, insecticides, agricultural chelating agents, and sequestering agents for industry.

In 1970, Geigy merged with Ciba (Chemical Industry in Basel, Switzerland), forming the Ciba-Geigy Corporation. Since then Ciba-Geigy has continued to expand its operations with the production of resins and additives used in the plastics industry and small-volume specialty chemical products (i.e., water treatment chemicals and fire fighting foams). The present facility occupies approximately 1,500 acres and employs approximately 1,200 workers.

The EPA Region IV Environmental Services Division (ESD) conducted an investigation in August 1982 of the Ciba-Geigy property. This sampling indicated the presence of Lindane in one well sample. The Hazard Ranking System (HRS) score calculated for the site in June 1983 was 53.42 and included evaluation of the groundwater, surface water and air media. The groundwater component, considering the presence of Lindane in samples collected from water wells at the site, contributed the most to the score. The surface water component considered the presence of DDT, related compounds, and Lindane in sediment samples collected in the floodplain. The air component did not contribute to the HRS score. The Ciba-Geigy McIntosh Plant was included on the National Priorities List (NPL) in September 1983.

In October 1985, EPA issued Ciba-Geigy a RCRA Permit, which included a Corrective Action plan requiring Ciba-Geigy to remove and treat contaminated groundwater and surface water at the site. The Corrective Action Plan stipulated that Ciba-Geigy would prepare a Remedial Investigation/Feasibility Study (RI/FS) for the disposal areas being conducted by the Superfund program. The plan included conditions for closing hazardous waste management facilities that may contribute to environmental contamination. The RI/FS resulted in identifying four (4) Operable Units (O.U.) including two Areas of Contamination.

The RI/FS generated information characterizing individual sites within the past waste management area, the wastes contained within these sites, and releases to the soil, surface water, and sir from these sites. Groundwater has been addressed by Ciba under its extensive RCRA Corrective Action Program and the CERCLA ROD for O.U. No. 1. O.U. No. 2 consists of ten past disposal sites in the upland area of the Ciba property including SIte 1 through 7 and Site 9 through 11. O.U. No. 4 consists of the site previously identified during the RI/FS as Site No. 8.

1.2 PROJECT SCOPE OF WORK

The following general work activities will be conducted at the Site:

- Task 1 – Site preparation and mobilization
- Task 2 – Capture, collection, transportation, contaminated water
- Task 3 – Water treatment – installation of power, control and associated electrical equipment
- Task 4 – Water treatment – equipment installation and plumbing
- Task 5 – Water treatment – system start-up and testing
- Task 6 – Water treatment – system operations and maintenance
- Task 7 – Transport contaminated and non-contaminated soil and debris to staging area
- Task 8 – Excavation of contaminated soil/debris
- Task 9 – Thermal treatment unit – installation of power, control and associated electrical equipment
- Task 10 – Thermal treatment unit – equipment installation and plumbing
- Task 11 – Thermal treatment unit – system start-up and testing
- Task 12 – Thermal treatment unit – system operation and maintenance
- Task 13 – Prepare contaminated materials for thermal treatment unit
- Task 14 – Excavate buried drums
- Task 15 – Staging drums
- Task 16 – Backfill and compact excavation
- Task 17 – Slurry wall construction
- Task 18 – In situ stabilization within Site 8, iron slurry waste area
- Task 19 – Equipment, debris, personnel
- Task 20 – Demobilization

During these operations, personnel may come in contact with soils, sediments, and debris which is potentially contaminated with Pesticides (Atrazine, Bladex, BHC (A, B, D & G), Chlorobenzilate, DDT, DDD, DDE, Diazinon, Prometryn) and Heavy Metals (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Nickel, Mercury, Selenium, Silver

and Thallium). Concentration of these materials is described in Section 1.3.1. Based on the description provided, Atrazine, DDT, DDE, Diazinon, and BHC's are the chemicals which present the highest exposure potential. Engineering controls included in the Thermal Treatment Facility combined with administrative controls and personal protective equipment use will be essential to controlling exposure to these materials. Administrative controls may include the use of excavation techniques or other dust control methods to reduce dust generation. Dust control will be essential in controlling airborne levels of Atrazine, DDT, and Diazion these materials.

2.0 KEY PERSONNEL AND MANAGEMENT

OHM maintains a policy of providing its employees, subcontractors, and authorized visitors with information and procedures in order to protect them and the adjacent community from any adverse effects that might result from work at a job site involving potentially hazardous substances. All personnel involved with this project will follow the health and safety procedures set forth in this plan. Visitors will not be given entry unless they read and agree to comply with this plan. The site safety plan acknowledgement will be signed by all personnel required to enter contaminated work areas.

2.1 SITE SAFETY OFFICER

OHM designates a site safety officer (SSO) who defines, implements and enforces the project safety program and procedures. The SSO will conduct the daily safety meetings and will interface as required with other site representatives. The SSO takes the following action(s) when appropriate:

- Orders the immediate shut-down of site activities in the case of a medical emergency or unsafe practice.
- Ensures protective clothing and equipment are properly stored and maintained.
- Ensures that the environmental and personnel monitoring operations are on-going and in accordance with this CHSP.
- Restricts visitors from areas of potential exposure to harmful substances.

Health and safety documentation will be kept for all OHM activities. The health and safety documentation forms contained in Appendix B will be completed by the SSO during project activities.

The SSO has responsibility for implementing and enforcing the site safety program and procedures. He will oversee any personnel monitoring and will decide when action levels have been reached which require more stringent personnel protection. The SSO establishes and enforces the use of protective equipment for various site activities. The SSO will maintain contact with OHM Regional and Corporate Certified Industrial Hygienists (CIH).

2.2 SITE SUPERVISOR

The site supervisor (SS) has responsibility for all field activities and enforces safe work practices by all crew members. He watches for any ill effects on any of the crew members, especially those symptoms caused by heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the site. The SS maintains communication with the OHM project manager and client representative(s).

2.3 EQUIPMENT OPERATORS

Equipment operators will be responsible for the maintenance, inspection, and safe operation of their equipment. Operators are responsible for daily inspection of their equipment and assuring it is in safe operating condition.

2.4 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for his own safety as well as the safety of those around him. The employee shall use all equipment provided in a safe and responsible manner as directed by his supervisor. All OHM personnel will follow the policies set forth in OHM's Health and Safety Procedures Manual and the OHM Health and Safety Procedures. Health and Safety Procedures relevant to site operations are attached to this CHSP.

All site activities that involve physical or chemical hazards will be performed by a work team of no fewer than two persons (hereafter referred to as the buddy system). For potential high hazard situations or activities, a third person will be located in the support zone to serve as a safety observer or respond to a rescue situation should the need arise.

2.5 RESPONSIBLE OHM HEALTH AND SAFETY PERSONNEL

The following personnel are responsible for health and safety on site:

Project Manager:	Allen Rutherford
Site Supervisor:	TBD (on-site)
Site Safety Officer:	TBD (on-site)
Regional Health and Safety Director:	J. Angelo Liberatore, CIH, CSP (770) 453-7671
Regional Manager:	Keith Angell (770) 729-3900

3.0 JOB HAZARD ANALYSIS

This section discusses concerns to workers on the site.

3.1 CHEMICAL HAZARDS

The contaminants of concern for O.U. No. 2 include high molecular weight chlorinated pesticides (DDT, gamma-BHC), and site manufactured pesticides (Diazinon, chlorobenzilate). The principal contaminated medium is soil, for which separate surface soil (i.e., direct contact) and subsurface soil standards have been developed. The direct contact soil cleanup levels were calculated by the EPA assuming direct contact by site workers with surface soil which may have surface contamination. The difference in the exposure pathways (i.e., direct contact vs. groundwater ingestion) resulted in the apparent conflict in cleanup levels for chlorobenzilate and Diazinon. Though the cleanup standards established in the ROD for the direct contact soils for chlorobenzilate and Diazinon are higher than those for the subsurface soils, soils at the surface that exceed the subsurface cleanup standards will be handled as subsurface soils, subject to the lower concentration cleanup standards.

The contaminants of concern for O.U. No. 4 include, as in O.U. No. 2, chlorinated pesticides and site manufactured pesticides. Also included in O.U. No. 4 are the herbicides Atrazine, Bladex, Simazine, and Prometryn. The O.U. No. 4 ROD contains higher direct contact soils cleanup standards for Diazinon, Atrazine, Bladex, Simazine, and Prometryn, than the subsurface cleanup standards. Soils at the surface that exceed subsurface cleanup standards will be handled as subsurface soils with the lower concentration cleanup standards.

Chlorobenzene, toluene, and xylene are chemical products used at the McIntosh facility which pose an additional potential airborne contaminants during remedial activities at Operable Units No. 2 and No. 4. Chlorobenzene has an ACGIH TLV of 10 ppm for an 8-hour TWA, while toluene and xylene have TLVs of 50 ppm and 100 ppm, respectively. Toluene has a "skin" notation meaning that it is absorbed through the intact skin.

Table 1, on the following page, presents the estimated average concentrations of the contaminants of concern for both Operable Units combined and provides exposure action limits based on OSHA PELs and/or AGCIH-TLVs (8 hour time-weighted average). Although they are not project contaminants of concern for this project (i.e., they do not have cleanup standards), metal contaminants which were measured during the RI/FS have also been included in Table 1 to assess exposure action levels.

Table 3.1 – Chemical Exposure/Action Limits							
Waste Contaminants							
Chemical	*Est. Conc. in Soil*	*Airborne Exposure Limit*[1]	*STEL*[2]	*IDLH*[3]	*OSHA Regulated*[4]	*Carcinogen*[5]	*PPE Required*[6]
Remediation of Operable Units Nos. 2 and 4							
Pesticide, Toxic, Organochlorine							
DDT	0.01-10,850 mg/kg	1 mg/m³	--	--	--	Yes	C
DDD	0.005-3,627 mg/kg	--	--	--	--	No	C
DDE	0.005-19,864 mg/kg	--	--	--	--	No	C
Pesticide, Toxic, Organophosphorus							
Diazinon	0.25-179.00 mg/kg	0.1 mg/m³	--	--	--	No	C
Pesticide, Toxic							
Simazine	0.14-1,788 mg/kg	--	--	--	--	--	C
Others							
Atrazine	0.12-31,798 mg/kg	5 mg/m³	--	--	--	No	C
Bladex	0.20-1,154 mg/kg	--	--	--	--	No	C
Chlorobenzilate	0.25-1,337 mg/kg	--	--	--	--	No	C
Prometryn	0.12-6,077 mg/kg	--	--	--	--	No	C
αBHC	0.005-803,000 mg/kg	--	--	--	--	No	C
δBHC	0.005-142,000 mg/kg	--	--	--	--	No	C
ξBHC	0.0025-15,000 mg/kg	--	--	--	--	No	C
γBHC	0.005-21,000 mg/kg	--	--	--	--	No	C
Metals							
Antimony	1.00-40 mg/kg	.5 mg/m³	--	80 mg/m³	--	No	C
Arsenic	005-18 mg/kg	.5 mg/m³	--	100 mg/m³	29 CFR 1910.1018	Yes	C
Barium	4.00-280 mg/kg	.5 mg/m³	--	1,100 mg/m³	--	No	C
Beryllium	.24-2.80 mg/kg	.002 mg/m³	0.005 mg/m³C	10 mg/m³	--	No	C
Cadmium	.16-78 mg/kg	.005 mg/m³		50 mg/m³	29 CFR 1910.1027	No	C
Chromium	1.30-584 mg/kg	.5 mg/m³	--	N.E.	--	No	C
Lead	.50-660 mg/kg	.05 mg/m³	--	700 mg/m³	29 CFR 1910.1025	No	C
Nickel	1.00-449 mg/kg	1 mg/m³	--	N.E.	--	Yes	C
Mercury	.05-.98 mg/kg	.01 mg/m³	0.04 mg/m³C	10 mg/m³	--	No	C
Selenium	.40-250 mg/kg	.2 mg/m³	--	--	--	No	C
Silver	.64-4.44 mg/kg	.01 mg/m³	--	N.E.	--	No	C
Thallium	.25-1.00 mg/kg	.1 mg/m³	--	20 mg/m³	--	No	C

1 Lower of the OSHA-PEL or ACGIH-TLV, 8-hour TWA
2 Maximum 15-minute exposure, no more than 4 times/day
3 No entry, no work, evacuate!!!
Dash marks indicate item is not OSHA regulated and/or information is not available.
4 Note specific OSHA requirements (29 CFR 1910.1000-1500)
5 Maintain exposure as low as reasonably achievable (ALARA)
6 Min. PPE/Respirator for potential exposure limit excedance

3.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all OHM personnel and OHM subcontractors. Hazard communication will include the following:

- **Container Labeling**
  OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

- **Material Safety Data Sheets (MSDSs)**
  There will be an MSDS located on site for each hazardous chemical known to be used on site. All MSDSs will be located in Appendix A of the CHSP. The site safety plan can be found in the project office trailer.

- **Employee Information and Training**
  Training employees on chemical hazards is accomplished through on ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

At a minimum, OHM and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals
- What the company has done to prevent workers' exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on OHM sites
- Emergency spill procedures
- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM and related subcontractor employee will be given information in the same manner as during the safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed.. Attendance is mandatory for all on site employees.

Refer to Appendix C of the site safety plan to find a list of hazardous chemicals anticipated to be brought to the site and the corresponding MSDSs for these chemicals.

3.3 PHYSICAL HAZARDS

There are numerous physical hazards associated with this project which, if not identified and addressed, could present operational problems as well as cause accidents and personal injury to the work force. Hazard identification and mitigation, training, adherence to work rules and careful housekeeping can prevent many problems or accidents arising from physical hazards. The following outlines the major physical hazards and the suggested preventative measures to be followed during this project:

- **Heavy and Bulky Loads**
  Intelligent thought shall be exercised before heavy and bulky loads are lifted or handled manually by personnel. Mechanical equipment such as fork-lifts, wheel barrows, hand-trucks, loaders, and cranes shall be utilized when possible and needed. **Note: Back injuries are real, debilitating, unproductive, and costly to both employees and employers, and sometime permanent. Back injury prevention must be given high priority on all project sites. If you think the load you are about to lift is too heavy or bulky, it probably is! Get help or utilize mechanical equipment.**

- **Explosion Hazard**
  Flammable materials in confined spaces (i.e., excavation areas) can produce an explosive atmosphere which can be triggered by a spark or other energy source. To prevent this type of accident, the concentration of flammable material in air will be carefully monitored and confined space entry procedures will be followed.

- **Hoisting Accidents**
  Employees can have suspended loads dropped on them, be caught behind a load and a stationary object, or be crushed or struck by the counterweight. All hoisting will be done by qualified personnel only after safety checks are made of chokes and

cables. In addition, no hoisting will take place without a designated signal man present.

- **Heavy Equipment**
  Heavy construction equipment operators present construction safety hazards to operating and ground personnel. OHM has safe operating procedures (SOPs) for the use of heavy construction equipment. Only trained and qualified operators are authorized to operate heavy construction equipment. The operator is responsible for performing daily equipment inspections on their equipment to identify, take out of service, and correct any equipment defects of non-functioning safety devices that would render the equipment unsafe to operate. Standard safety devices and equipment required to be inspected and functional during use includes:

  - Seat belts,
  - Safety glass in enclosed cab,
  - Braking system,
  - Back-up alarms,
  - Portable fire extinguisher,
  - Horn,
  - Tires, and
  - Steering and hydraulic systems.

  Operators are required to wear seat-belts when operating equipment and are responsible for the location of ground personnel in their work area. The turning radius of trackhoes is guarded to prevent contact between the equipment counterweight and ground personnel.

- **Bulk Fuel Storage**
  A bulk fuel storage area will be designated for storage of bulk fuels and other flammable materials. The bulk fuel vessels will be grounded with bonding cables attached. The area will be prominently posted as a flammable fuels area and no smoking signs erected. At least one 20-pound dry chemical, ABC-type fire extinguisher will be positioned in this area.

- **Flame, Heat or Spark Producing Operations**
  Because of the possibilities of flammable materials being present at this site, flame, heat, or spark producing operations will be limited. If a case arises where hot work is necessary, OHM will follow the hot work procedures and permit detailed in the appendix.

- **High Pressure Washing**
  Washing or cleaning certain pieces of equipment may require the use of high pressure washers referred to as lasers. These devices can be hazardous if not used properly. Refer to Appendix B for specific laser safety instructions.

- **Small Quantity Flammable Liquids**
  Small quantities of flammable liquids will be stored in "safety"cans and labeled according to contents.

- **Electrical Hazards**
  Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact or sever them during site operations. Electrical equipment used on-site may also pose a hazard to workers. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight, corrosion-resistant, connecting cables will be used on-site. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. To eliminate this hazard, weather conditions will be monitored and work will be suspended during electrical storms. An additional electrical hazard involves capacitors that may retain a charge. All such items will be properly grounded before handling. OSHA's standard 29 CFR Part 1910.137 describes clothing and equipment for protection against electrical hazards.

  Electrical devices and equipment must be de-energized prior to working near them. All extension cords must be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical circuits must be protected with ground fault interrupters. Only qualified electricians are authorized to work on electrical circuits.

- **Slip/Trip/Fall Hazards**
  Some areas may have wet surfaces which will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with fall hazards. Good housekeeping practices are essential to minimize the trip hazards.

- **Confined Spaces**
  Some activities may require personnel to enter spaces which may be confined and have other associated physical and chemical hazards. Whenever confined space entry is necessary, a confined space permit shall be completed and confined space entry procedures must be followed before personnel begin work. See appendix for more information.

- **Tank/Drum Opening**
  Accessing tanks presents the potential of contacting buried utilities, igniting explosive atmospheres and other hazards. OHM will follow guidelines established in the standard safety procedure, Underground Tank Removal. See Appendix B for more information.

- **Ground Personnel**
  All ground personnel should be constantly aware of the possibility of slips, trips, and falls due to poor and possibly slippery footing in the work areas. Before crossing either in front of or behind a piece of heavy equipment, ground personnel will signal the equipment operator and receive confirmation before moving.

- **Stairs and Ladders**
  Access to high places will be provided by approved ladders and stairs in accordance with ANSI 14.1-3. Stairs and platforms will be constructed in compliance with OSHA regulations.

- **Water Safety**
  Any work performed on boats or other floating devices require all personnel to wear approved personal flotation devices. At several locations surrounding the basin, water rescue equipment will be stationed such as an emergency horn, life ring with attached line, boat with oars, and life jackets.

- **Excavations and Trenching**
  Excavations and trenching present a special risk to workers due to the hazard of trench wall collapse. If any OHM personnel must enter excavations 5 feet in depth or greater, the sides of the excavation will be sloped 1-1/2:1 (horizontal:vertical) or shored in accordance with 29 CFR 1926.650 through 652.

- **Pumping Equipment**
  Various types of pumps may be used for the removal of materials from ditches, ponds, lagoons, etc. The handling of pressurized hoses that could rupture and violently release liquid materials to the work area will be controlled by inspecting all hose fittings for secure connections [all OPW (camlock) and fittings must be secured with the wire]. All employees must wear splash gear including splash shields when moving or disconnecting pumps and hoses.

- **Noise**
  Work around large equipment often creates excessive noise. The effects of noise can include:

- Workers being startled, annoyed, or distracted.

- Physical damage to the ear, pain, or temporary and/or permanent hearing loss.

- Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

  If employees are not able to hear normal conversation without shouting, noise levels exceeding 85 dBA are likely and hearing protection is required to be worn. The use of portable power tools and the operation of certain heavy construction equipment (i.e. bulldozers), requires mandatory use of hearing protection. OHM maintains an effective hearing conservation program as described in OSHA Regulation 29 CFR Part 1910.95.

- **Drum Handling and Opening**
  The chemical hazard shall be minimized by having personnel wear full Level B protection. To minimize other hazards, drums shall be inspected and their integrity assured prior to moving or opening. Unlabeled drums shall be considered to contain hazardous substances and handled accordingly until the contents are identified. Drum and container movement shall be minimized throughout the duration of the project.

  Prior to the movement of drums and containers, all employees involved in the drum handling activity shall be warned of these potential hazards. USDOT specified salvage drums and absorbent materials shall be readily available for use in case of spills, leaks, or ruptures. Where major spills may occur, a spill containment program shall be implemented. Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container. If buried drums are suspected, ground penetrating detection systems shall be used in lieu of exploratory excavation and soil or covering materials shall be removed with caution. Fire extinguishers shall be on hand and ready for use to control small fires. All equipment shall be such to prevent sources of ignition. Respirator airlines and air supply systems shall be protected from contamination and physical damage. Extraneous personnel shall not be present near the drum opening operation. A suitable blast shield shall be placed between personnel and the drums being opened. Controls for drum opening, monitoring equipment, and fire suppression equipment shall be located behind the explosion resistant shield. Excess interior drum pressure shall be relieved safely by the use of remote equipment and/or appropriate shielding.

- **Control of Hazardous Energy Sources**
  - When operations require the servicing and maintenance of machines, and equipment in which the unexpected energization or start-up of the equipment or release of stored energy could cause personal injury or damage to the equipment, Lockout/Tagout Procedures shall be implemented.

  - As applicable, the OHM Lockout/Tagout Procedures shall be implemented.

- **IDLH Level = No Entry**
  No entry shall be allowed under conditions which are Immediately Dangerous to Life or Health (IDLH).

  a. An oxygen level of less than 19.5% constitutes an IDLH and precludes entry.

  b. Life rescue entry should never be necessary because external extraction should have been planned for all areas which could become IDLH. Nevertheless, IDLH rescue entry shall be performed **only** if in Self-Contained Breathing Apparatus [SCBA] with harness and lifeline.

  c. When an IDLH is measured, forced mechanical ventilation of the area shall be employed until the oxygen level has returned to and is maintained at 19.5 percent or higher.

- **Line Breaking**
  a. When operations involve the opening/breaking of fixed or flexible piping which may contain materials which are under pressure, are toxic, flammable, corrosive, reactive with air or moisture, or otherwise present a hazard to personnel, Line Breaking Procedures shall be implemented. This requirement does not apply to <u>hoses</u> used in the temporary connection of a tank truck, vacuum truck or pieces of equipment where the nature of the hazards is well established and other precautions are implemented.

  b. As applicable, the OHM Line Breaking Procedures shall be implemented.

- **Grounding and Bonding**
  a. When operations involve the handling of potentially flammable or combustible liquids or sludges, combustible dusts or fibers, or potential for generation of ignitable vapors, grounding and bonding procedures shall be implemented.

  b. When grounding and bonding is required, a "Hot Work" Permit shall be completed prior to work on the affected operations.

c. Portable generators shall be properly and adequately grounded by use of a ground rod or by grounding to a structure which is grounded.

- **Working Around Moving or Rotating Mechanical Equipment**
  When operations involve employees working near or on moving or rotating mechanical equipment such as conveyors, augers, drill rigs, dredges, mechanical power transmissions apparatus (i.e., power take off), hydraulic rams, soil/waste mixing apparatuses (i.e., harrow, pug mill, etc.), etc., care must be taken to ensure that employees are protected from the hazards associated with these operations. When maintenance activities are required on these systems, lockout/tagout of the operating controls and blocking, chocking, chaining, use of shims or other measure shall be taken to prevent employee injuries. When operating, these systems shall be equipped with guards and operational safety devices as installed by the manufacturer and as required by 29 CFR 1910.211-222(Subpart O). Minimal guarding requirements are also applicable to hand tools, bench grinders, etc.

  Where PPE is in use, hazards associated with the PPE use around mechanical equipment shall be evaluated. Where the use of airline hoses, safety tag lines, loose fitting gloves and coveralls or the use of other PPE presents additional hazards such as entanglement, the need for PPE modification or additional safety measure shall be evaluated and additional precautions and hazard awareness training implemented.

- **Thermal Treatment Unit Operations**
  Thermal operations include the use of a natural gas fired incinerator. This device is used to thermally separate and destroy contaminants in soils and sludges. These systems operate at elevated temperatures and involve mechanical conveying and rotating systems. They present the potential for oxygen deficient and carbon monoxide hazardous atmospheres being generated during thermal unit operations and maintenance activities, in addition to potential fires and explosions hazards

  A process safety review shall be performed and documented during any design/installation of this type of equipment. In addition, a Pre-Startup Safety Review shall be conducted and documented to ensure that all necessary equipment has been installed, all required guards are in place, all necessary maintenance has been performed and all safety interlocks are operational. The scope of these operations may warrant the preparation of additional detailed work plans due to the extensive environmental, health and safety concerns which may be associated with these types of operations.

All OHM personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. In addition, the SS will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses, and safety boots will be required in all areas of the site. Specific health and safety SOPs that apply to site remedial operations procedures are included in Appendix D.

3.4 ENVIRONMENTAL HAZARDS

3.4.1 Weather and Heat Stress

The combination of warm ambient temperature and use of protective clothing anticipated during site operations, the potential for heat stress is a concern. The potential exists for:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stroke, heat cramps, and heat exhaustion are covered in detail during OHM's 40-hour OSHA 29 CFR 1910. 120 approved pre-employment course. In addition, this information is discussed during a safety "tailgate" meeting before each work day. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather. Water and electrolyte-containing beverages will be provided on-site and will be available for consumption during work breaks.

An action level for heat stress has been established at 75°F ambient temperature when site personnel are wearing chemical protective clothing during the performance of field activities. The following work/rest schedule is recommended, with personnel drinking fluids (tepid water and/or electrolyte) at rest periods consistent with their fluid loss:

Ambient Temperature (degrees F)	Work Period (minutes)	Rest Period (minutes)
75 - 80 F	120	15
80 - 85 F	90	15
85 - 90 F	60	15
90 - 95 F	30	15
95 - 100 F	15	15

The above work/rest schedule is only a guideline for use during field activities when personnel are wearing protective clothing. The actual work/rest schedule will be determined by conducting pulse monitoring before and after the work period and by

performing daily pre/post work shift body weights. The action level for adjusting the work/rest schedule would be 110 beats per minute (bpm), obtained immediately after the work period in a seated, shaded position. When a person's pulse exceeds 110 bpm, that person is undergoing heat stress, which will require the work period to be reduced in 15 minute intervals, while maintaining the same rest period, until post work period pulse monitoring is maintained below 110 bpm. In addition, should a person's body weight change at the end of the work day by more than 1.5 percent, the work period must be reduced in 15 minute intervals; while maintaining the same rest period, until no daily body weight changes greater than 1.5 percent are observed.

Field activities, in which site personnel are required to wear chemical protective clothing at ambient temperatures higher than 95 degrees F, will be avoided, whenever feasible, by scheduling these activities during the work day to avoid peak ambient temperatures (10 a.m. -- 2 p.m.). Site personnel who have experienced a heat-related illness (heat cramps, heat exhaustion) will be restricted to Level D tasks for a minimum of one day after illness occurrence and will return to tasks requiring chemical protective clothing only with the concurrence of the attending physician. Site personnel will follow OHM's Standard Operating Procedure (SOP) for heat stress prevention.

3.5 TASK SPECIFIC HAZARD ANALYSIS

The following task-specific hazard analysis tables outline the hazards, along with relevant control measures for the major project phases during remedial actions.

Table 3.2 *Task 1 – Site Preparation and Mobilization*	
Principle Steps Set-up work zones and support facilities, decontamination trailer, and office; construct decontamination facilities and process equipment staging pads	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 24)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)
7) Underground utility hazards	7) Locate all buried utilities and pipelines prior to initiating excavation/grading operations.
8) Heavy equipment operating hazards	8) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 8) Do not carry personnel or lift anyone except in an approved safety platform 8) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 8) Heavy equipment shall have fully functioning safety devices 8) Follow OHM SOP for Equipment Inspection (No. 51)

Table 3.2 *Task 1 – Site Preparation and Mobilization*	
Principle Steps Set-up work zones and support facilities, decontamination trailer, and office; construct decontamination facilities and process equipment staging pads	
Potential Hazards Involved	**Hazard Control Measures**
9) Vehicular safety hazard	9) All vehicles must be operated in a safe and legal manner 9) Seat belts must be worn while driving 9) Personnel shall drive at posted speed limits or at safe speeds 9) Follow OHM SOP for Vehicle Safety (No. 49)
10) Noise	10) Follow SOP for Hearing Conservation Program (No. 19) 10) Personnel will wear hearing protection above 90 dBa 10) Personnel will be included in a hearing conservation program

Table 3.3 *Task 2 – Capture, Collection, Transportation Contaminated Water*	
Principle Steps Transfer contaminated soils	
Potential Hazards Involved	**Hazard Control Measures**
1) Slips, trips and falls	1) Follow SOP for Slips, Trips, and Falls (No. 34) 1) Tools and debris must be picked up 1) Spills will be cleaned up immediately 1) Personnel will not walk or climb on equipment not designed as walking surfaces
2) Exposure to hazardous materials	2) Follow this CHSP Section 4.1 and 6.2 2) Monitor with PID/LEL
3) Manual lifting and material handling hazards	3) Follow SOP for Personnel Lifting Safety (No. 33) 3) Do not carry personnel or lift anyone except in an approved safety platform 3) Employees will make certain the load can be safely lifted 3) No loads over 60 pounds will be lifted 3) Proper lifting techniques will be utilized
4) Spill/splash hazard	4) Follow this CHSP Section 4.1 and 6.2
5) Fire/explosion	5) Stage fire protection equipment at exclusion zone entry
6) Pumping equipment	6) Inspect hoses and pumping equipment before use 6) Do not leave pumps, pressurized hoses unattended when operating 6) Ensure proper grounding and bonding of equipment
7) Heavy equipment operating hazards	7) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 7) Do not carry personnel or lift anyone except in an approved safety platform 7) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 7) Heavy equipment shall have fully functioning safety devices 7) Follow OHM SOP for Equipment Inspection (No. 51)
8) Vehicular safety hazard	8) All vehicles must be operated in a safe and legal manner 8) Seat belts must be worn while driving 8) Personnel shall drive at posted speed limits or at safe speeds 8) Follow OHM SOP for Vehicle Safety (No. 49)
9) Noise	9) Follow SOP for Hearing Conservation Program (No. 19) 9) Personnel will wear hearing protection above 90 dBa 9) Personnel will be included in a hearing conservation program

Table 3.4 *Task 3 – Water Treatment – Installation of Power, Control and Associated Electrical Equipment*	
Principle Steps Install power and control (P&C) equipment; install electrical panels; install and interconnect well pumping equipment and P&C wiring	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Portable power tool hazards	3) All hand tools and power tools shall be in good repair 3) When working, overhead tools will be secured when not in use 3) Tools cannot be thrown or dropped from heights 3) Follow OHM SOP for Equipment and Hand Tools (No. 41)

Table 3.5 *Task 4 – Water Treatment – Equipment Installation and Plumbing*	
Principle Steps Installation of air stripper and carbon filter systems; install process tanks and plumbing equipment	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 24)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)
7) Crane operation and hoisting hazards	7) Prepare a crane lift plan prior to crane operations 7) Inspect all rigging equipment prior to each use 7) Operators must be qualified 7) Load limits on crane, hoist, hooks, slings, wire rope cannot be exceeded 7) Tagline will be used 7) Follow OHM SOP Crane and Hoisting (No. 31)

Table 3.6 *Task 5 – Water Treatment – System Start-up and Testing*	
Principle Steps Mechanical and electrical equipment check-out and adjustments	
Potential Hazards Involved	**Hazard Control Measures**
1) Inhalation, dermal contact with process chemicals, filtration media (spent carbon) and chemical contaminant spikes	1) Wear appropriate PPE 1) Follow chemical handling procedures on MSDSs located in office trailers 1) Follow this CHSP Section 3.1 and 5.2
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Spill, splash hazards	3) Wear splash protection 3) Cleanup spills immediately 3) Follow this CHSP Section 3.1 and 5.2
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program

Table 3.7 *Task 6 – Water Treatment – System Operations and Maintenance*	
Principle Steps Water sampling (influent, effluent) well testing, bailing and maintenance; clean oil water separator; acid wash air stripper packing; change out air stripper packing; Replace pumps/blowers; clean/replace bag filter; carbon backwashing/replacement; control panel repairs/troubleshooting	
Potential Hazards Involved	**Hazard Control Measures**
1) Inhalation, dermal contact with process chemicals, filtration media (spent carbon) and chemical contaminant spikes	1) Wear appropriate PPE 1) Follow chemical handling procedures on MSDSs 1) Follow this CHSP Section 3.1 and 5.2
2) Confined space entry hazard	2) The OHM Confined Space Permit will be completed before entry 2) The atmosphere will be monitored for oxygen, combustible gases, and toxins. 2) All personnel will be trained for confined space entry 2) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 2) Follow OHM SOP for Confined Space Entry (No. 24)
3) Spill, splash hazards	3) Wear splash protection 3) Clean up spills immediately
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program
5) Electrical hazards	5) Electrical work will only be performed by approved electricians 5) No electrical work should be done on an energized circuit 5) Hand tools must be grounded or double insulated 5) GFI must be used 5) Follow OHM SOP for Electrical Safety (No. 32)
6) Material handling/manual lifting	6) Do not carry personnel or lift anyone except in an approved safety platform 6) Employees will make certain the load can be safely lifted 6) No loads over 60 pounds will be lifted 6) Proper lifting techniques will be utilized 6) Follow OHM SOP for Lifting Safety (No. 33)
7) Pumping equipment operation hazards	7) Emergency eye wash stations will be located adjacent to pumping equipment operations 7) Follow equipment manufacturer's recommendation for pump operation and maintenance 7) Hoses will be appropriate for materials and temperature and secured

Table 3.8 *Task 7 – Transport Contaminated and Non-contaminated Soil and Debris to Staging Area*	
Principle Steps Transport soil/debris	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 1) Heavy equipment shall have fully functioning safety devices 1) Follow OHM SOP for Equipment Inspection (No. 51)
2) Overhead hazard to ground personnel	2) Do not suspend or travel with load over ground personnel
3) Vehicular safety hazard	3) All vehicles must be operated in a safe and legal manner 3) Seat belts must be worn while driving 3) Personnel shall drive at posted speed limits or at safe speeds 3) Follow OHM SOP for Vehicle Safety (No. 49)
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program
5) Exposure to hazardous materials	5) Follow this CHSP, Section 3.1 and 5.2

Table 3.9 *Task 8 – Excavation of Contaminated Soil/Debris*	
Principle Steps Excavate soil	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Personnel shall be cognizant of the boom swing area and stay clear 1) Heavy equipment shall have fully functioning safety devices
2) Excavation and cave-in hazards	2) All underground installations will be located and marked 2) All materials must be kept 2 feet from the excavation's edge 2) Daily inspections of the excavations will be conducted by a competent person and soil type determined 2) The OHM excavation permit will be used 2) Excavations for piping trenches and others requiring personnel entry will not be greater than 4 feet deep 2) Excavations with potential hazardous atmosphere must be tested O_2/LEL /toxic 2) Follow OHM SOP (No. 28)
3) Buried and overhead electrical utility hazards	3) Locate all buried utilities prior to excavation operations 3) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
4) Overhead hazard to ground personnel	4) Do not suspend or travel with load over ground personnel
5) Vehicle safety hazard	5) All vehicles must be operated in a safe and legal manner 5) Seat belts must be worn while driving 5) Personnel shall drive at posted speed limits or at safe speeds 5) Follow OHM SOP for Vehicle Safety (No. 49)
6) Exposure to hazardous materials	6) Follow this CHSP Section 3.1 and 5.2
7) Slips, trips and falls	7) Tools and debris must be picked up 7) Spills will be cleaned up immediately 7) Personnel shall not walk or climb on equipment not designed as walking surfaces 7) Follow OHM SOP for Slips, Trips and Falls (No. 24)
8) Manual lifting and material handling hazards	8) Do not carry personnel or lift anyone except in an approved safety platform 8) Employees will make certain the load can be safely lifted 8) No loads over 60 pounds will be lifted 8) Proper lifting techniques will be utilized 8) Follow OHM SOP for Lifting Safety (No. 33)
9) Confined space entry	9) The OHM Confined Space Permit will be completed before entry 9) The atmosphere will be monitored for oxygen, combustible gases, and toxins. 9) All personnel will be trained for confined space entry 9) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 9) Follow OHM SOP for Confined Space Entry (No. 24)

Table 3.10 *Task 9 – Thermal Treatment Unit – Installation of Power, Control and Associated Electrical Equipment*	
Principle Steps Install power and control (P&C) equipment; install electrical panels	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Portable power tool hazards	3) All hand tools and power tools shall be in good repair 3) When working, overhead tools will be secured when not in use 3) Tools cannot be thrown or dropped from heights 3) Follow OHM SOP for Equipment and Hand Tools (No. 41)

Table 3.11 *Task 10 – Thermal Treatment Unit – Equipment Installation and Plumbing*	
Principle Steps Installation of fuel systems; install burn area and plumbing equipment	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33). 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 24)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)
7) Crane operation and hoisting hazards	7) Prepare a crane lift plan prior to crane operations 7) Inspect all rigging equipment prior to each use 7) Operators must be qualified 7) Load limits on crane, hoist, hooks, slings, wire rope cannot be exceeded 7) Tagline will be used 7) Follow OHM SOP Crane and Hoisting (No. 31)

Table 3.12 *Task 11 – Thermal Treatment Unit – System Start-up and Testing*	
Principle Steps Mechanical and electrical equipment check-out and adjustments	
Potential Hazards Involved	**Hazard Control Measures**
1) Inhalation, dermal contact with process chemicals, filtration media (spent carbon) and chemical contaminant spikes	1) Wear appropriate PPE 1) Follow chemical handling procedures on MSDSs located in office trailers 1) Follow this CHSP Section 3.1 and 5.2
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Spill, splash hazards	3) Wear splash protection 3) Cleanup spills immediately 3) Follow this CHSP Section 3.1 and 5.2
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program

Table 3.13 *Task 12 – Thermal Treatment Unit – System Operation and Maintenance*	
Principle Steps Load material on feeder, burning unit, scrubbers	
Potential Hazards Involved	**Hazard Control Measures**
1) Inhalation, dermal contact with process chemicals, filtration media (spent carbon) and chemical contaminant spikes	1) Wear appropriate PPE 1) Follow chemical handling procedures on MSDSs 1) Follow this CHSP Section 3.1 and 5.2
2) Confined space entry hazard	2) The OHM Confined Space Permit will be completed before entry 2) The atmosphere will be monitored for oxygen, combustible gases, and toxins. 2) All personnel will be trained for confined space entry 2) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 2) Follow OHM SOP for Confined Space Entry (No. 24)
3) Spill, splash hazards	3) Wear splash protection 3) Clean up spills immediately
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program
5) Electrical hazards	5) Electrical work will only be performed by approved electricians 5) No electrical work should be done on an energized circuit 5) Hand tools must be grounded or double insulated 5) GFI must be used 5) Follow OHM SOP for Electrical Safety (No. 32)
6) Material handling/manual lifting	6) Do not carry personnel or lift anyone except in an approved safety platform 6) Employees will make certain the load can be safely lifted 6) No loads over 60 pounds will be lifted 6) Proper lifting techniques will be utilized 6) Follow OHM SOP for Lifting Safety (No. 33)
7) Explosion/fire hazard	7) Monitor with LEL 7) Stage fire protection equipment at unit

Table 3.14 *Task 13 – Prepare Contaminated Materials for Thermal Treatment Unit*	
Principle Steps Mix contaminated soil	
Potential Hazards Involved	**Hazard Control Measures**
1) Moving equipment/pinch points	1) Pinch points/pulleys/conveyors must be guarded 1) Do not wear loose fitting clothing 1) Fall protection required
2) Heavy equipment operating hazards	2) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 2) Do not carry personnel or lift anyone except in an approved safety platform 2) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 2) Heavy equipment shall have fully functioning safety devices 2) Follow OHM SOP for Equipment Inspection (No. 51)
3) Vehicular safety hazard	3) All vehicles must be operated in a safe and legal manner 3) Seat belts must be worn while driving 3) Personnel shall drive at posted speed limits or at safe speeds 3) Follow OHM SOP for Vehicle Safety (No. 49)
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program
5) Exposure to hazardous materials	5) Follow this CHSP, Section 3.1 and 5.2

Table 3.15 *Task 14 – Excavate Buried Drums*	
Principle Steps Excavate buried drums	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 1) Heavy equipment shall have fully functioning safety devices and blast shield 1) Follow OHM SOP for Equipment Inspection (No. 51)
2) Excavation and cave-in hazards	2) All underground installations will be located and marked 2) All materials must be kept 2 feet from the excavation's edge 2) Daily inspections of the excavations will be conducted by a competent person and soil type determined 2) The OHM excavation permit will be used 2) Excavations for piping trenches and others requiring personnel entry will not be greater than 4 feet deep 2) Excavations with potential hazardous atmosphere must be tested O_2/LEL /toxic 2) Follow OHM SOP (No. 28)
3) Buried and overhead electrical utility hazards	3) Locate all buried utilities prior to excavation operations 3) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
4) Drum removal/fire explosion	4) Handle drums remotely 4) Equipment must have blast shield 4) Stage fire prevention equipment in area
5) Vehicle safety hazard	5) All vehicles must be operated in a safe and legal manner 5) Seat belts must be worn while driving 5) Personnel shall drive at posted speed limits or at safe speeds 5) Follow OHM SOP for Vehicle Safety (No. 49)
6) Exposure to hazardous materials	6) Follow this CHSP Section 3.1 and 5.2
7) Slips, trips and falls	7) Tools and debris must be picked up 7) Spills will be cleaned up immediately 7) Personnel shall not walk or climb on equipment not designed as walking surfaces 7) Follow OHM SOP for Slips, Trips and Falls (No. 24)
8) Manual lifting and material handling hazards	8) Do not carry personnel or lift anyone except in an approved safety platform 8) Employees will make certain the load can be safely lifted 8) No loads over 60 pounds will be lifted 8) Proper lifting techniques will be utilized 8) Follow OHM SOP for Lifting Safety (No. 33)
9) Confined space entry	9) The OHM Confined Space Permit will be completed before entry 9) The atmosphere will be monitored for oxygen, combustible gases, and toxins 9) All personnel will be trained for confined space entry 9) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 9) Follow OHM SOP for Confined Space Entry No. 24

Table 3.16 *Task 15 – Staging Drums*	
Principle Steps Pick up drums and transport to staging area	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Slips, trips, and falls	2) Tools and debris must be picked up 2) Spills will be cleaned up immediately 2) Personnel shall not walk or climb on equipment not designed as walking surfaces 2) Follow OHM SOP for Slips, Trips and Falls (No. 24)
3) Heavy construction equipment traffic and use	3) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 3) Do not carry personnel or lift anyone except in an approved safety platform 3) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 3) Heavy equipment shall have fully functioning safety devices and blast shield 3) Follow OHM SOP for Equipment Inspection (No. 51)
4) Overhead electrical utility hazards	4) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
5) Portable power tool hazard	5) All hand tools and power tools shall be in good repair 5) When working, overhead tools will be secured when not in use 5) Tools cannot be thrown or dropped from heights 5) Follow OHM SOP for Equipment and Hand Tools (No. 41)
6) Exposure to hazardous materials	6) Follow this CHSP, Section 3.1 and 5.2

Table 3.17 *Task 16 – Backfill and Compact Excavation*	
Principle Steps Place backfill	
Potential Hazards Involved	**Hazard Control Measures**
1) Excavate and cave-in hazards	1) All underground installations will be located and marked 1) All materials must be kept 2 feet from the excavation's edge 1) Daily inspections of the excavations will be conducted by a competent person and soil type determined 1) The OHM excavation permit will be used 1) Excavations for piping trenches and others requiring personnel entry will not be greater than 4 feet deep 1) Excavations with potential hazardous atmosphere must be tested O_2/LEL /toxic 1) Follow OHM SOP (No. 28)
2) Heavy equipment operating hazards	2) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 2) Do not carry personnel or lift anyone except in an approved safety platform 2) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 2) Heavy equipment shall have fully functioning safety devices 2) Follow OHM SOP for Equipment Inspection (No. 51)
3) Overhead electrical utility hazards	3) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
4) Vehicular safety hazard	4) All vehicles must be operated in a safe and legal manner 4) Seat belts must be worn while driving 4) Personnel shall drive at posted speed limits or at safe speeds 4) Follow OHM SOP for Vehicle Safety (No. 49)
5) Noise	5) Follow SOP for Hearing Conservation Program (No. 19) 5) Personnel will wear hearing protection above 90 dBa 5) Personnel will be included in a hearing conservation program
6) Exposure to hazardous materials	6) Follow this CHSP, Section 3.1 and 5.2

Table 3.18 *Task 17 – Slurry Wall Construction*	
Principle Steps – Excavate and place slurry	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Personnel shall be cognizant of the boom swing area and stay clear 1) Heavy equipment shall have fully functioning safety devices
2) Excavation and cave-in hazards	2) All underground installations will be located and marked 2) All materials must be kept 2 feet from the excavation's edge 2) Daily inspections of the excavations will be conducted by a competent person and soil type determined 2) The OHM excavation permit will be used 2) Excavations for piping trenches and others requiring personnel entry will not be greater than 4 feet deep 2) Excavations with potential hazardous atmosphere must be tested O_2/LEL /toxic 2) Follow OHM SOP (No. 28)
3) Buried and overhead electrical utility hazards	3) Locate all buried utilities prior to excavation operations 3) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
4) Overhead hazard to ground personnel	4) Do not suspend or travel with load over ground personnel
5) Vehicle safety hazard	5) All vehicles must be operated in a safe and legal manner 5) Seat belts must be worn while driving 5) Personnel shall drive at posted speed limits or at safe speeds 5) Follow OHM SOP for Vehicle Safety (No. 49)
6) Exposure to hazardous materials	6) Follow this CHSP Section 3.1 and 5.2
7) Slips, trips and falls	7) Tools and debris must be picked up 7) Spills will be cleaned up immediately 7) Personnel shall not walk or climb on equipment not designed as walking surfaces 7) Follow OHM SOP for Slips, Trips and Falls (No. 24)
8) Manual lifting and material handling hazards	8) Do not carry personnel or lift anyone except in an approved safety platform 8) Employees will make certain the load can be safely lifted 8) No loads over 60 pounds will be lifted 8) Proper lifting techniques will be utilized 8) Follow OHM SOP for Lifting Safety (No. 33)
9) Confined space entry	9) The OHM Confined Space Permit will be completed before entry 9) The atmosphere will be monitored for oxygen, combustible gases, and toxins. 9) All personnel will be trained for confined space entry 9) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 9) Follow OHM SOP for Confined Space Entry (No. 24)
10) Spill/splash hazard	10) Follow this CHSP Section 5.1 and 5.2
11) Pumping equipment	11) Inspect hoses and pumping equipment before use 11) Do not heave pumps, pressurized hoses unattended when operating 11) Ensure proper grounding and bonding of equipment

Table 3.19 *Task 18 – In situ Stabilization Within Site 8, Iron Slurry Waste Area*	
Principle Steps Stabilize materials – dump trucks will be used to transport contaminated dirt to landfill	
Potential Hazards Involved	**Hazard Control Measures**
1) Heavy equipment operating hazards	1) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 1) Heavy equipment shall have fully functioning safety devices 1) Follow OHM SOP for Equipment Inspection (No. 51)
2) Overhead hazard to ground personnel	2) Do not suspend or travel with load over ground personnel
3) Vehicular safety hazard	3) All vehicles must be operated in a safe and legal manner 3) Seat belts must be worn while driving 3) Personnel shall drive at posted speed limits or at safe speeds 3) Follow OHM SOP for Vehicle Safety (No. 49)
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 90 dBa 4) Personnel will be included in a hearing conservation program
5) Exposure to hazardous materials	5) Follow this CHSP, Section 3.1 and 5.2
6) Slips, trips and falls	6) Tools and debris must be picked up 6) Spills will be cleaned up immediately 6) Personnel shall not walk or climb on equipment not designed as walking surfaces 6) Follow OHM SOP for Slips, Trips and Falls (No. 24)
7) Manual lifting and material handling hazards	7) Do not carry personnel or lift anyone except in an approved safety platform 7) Employees will make certain the load can be safely lifted 7) No loads over 60 pounds will be lifted 7) Proper lifting techniques will be utilized 7) Follow OHM SOP for Lifting Safety (No. 33)
8) Spill/splash hazard	8) Wear splash protection 8) Cleanup spills immediately 8) Follow this CHSP Section 3.1 and 5.2

Table 3.20 *Task 19 – Decontamination of Equipment, Debris, Personnel*	
Principle Steps Decontaminate personnel; decontaminate equipment; collect and containerize decontamination water	
Potential Hazards Involved	**Hazard Control Measures**
1) Slips, trips, and falls	1) Tools and debris must be picked up 1) Spills will be cleaned up immediately 1) Personnel shall not walk or climb on equipment not designed as walking surfaces 1) Follow OHM SOP for Slips, Trips and Falls (No. 24)
2) Exposure to hazardous materials	2) Follow this CHSP Section 3.1 and 5.2
3) Manual lifting and material handling hazards	3) Do not carry personnel or lift anyone except in an approved safety platform 3) Employees will make certain the load can be safely lifted 3) No loads over 60 pounds will be lifted 3) Proper lifting techniques will be utilized 3) Follow OHM SOP for Lifting Safety (No. 33)
4) Spill/splash hazard	4) Wear splash protection 4) Cleanup spills immediately 4) Follow this CHSP Section 3.1 and 5.2
5) Noise	5) Follow SOP for Hearing Conservation Program (No. 19) 5) Personnel will wear hearing protection above 90 dBa 5) Personnel will be included in a hearing conservation program
6) Pressure washing hazard	6) Wear appropriate PPE 6) Only trained personnel will operate high pressure washer 6) The equipment cannot be altered 6) Follow OHM SOP for Pressure Washing (No. 30)

Table 3.21 *Task 20 – Demobilization*	
Principle Steps Take down work zones fencing, decontamination trailer, and office; remove decontamination facilities	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 24)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment are clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities". Each work area will be divided into three zones: an exclusion or "hot" zone, a contamination reduction zone (CRZ), and a support zone.

4.1 EXCLUSION ZONE

The exclusion zone will consist of areas where inhalation, oral contact, or dermal contact with contaminants will be possible. The boundaries of the site exclusion will be marked with flagging, tape, and/or fencing before site operations commence. The location of the site exclusion zone will also be marked on the facility layout drawing.

4.2 CONTAMINATION-REDUCTION ZONE

The CRZ or transition zone will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ. Personnel and equipment decontamination facilities will be located in the CRZ and marked on the facility layout drawing.

4.3 SUPPORT ZONE

The support zone will consist of a clearly marked area where the office and decontamination trailer are located. Smoking and drinking will be allowed only in designated areas. Eating will be allowed in the breakroom only.

4.4 ACCESS CONTROLS

The SSO and the SS shall establish the physical boundaries of each zone and shall instruct all workers and visitors on the limits of the restricted areas. No one shall be allowed to enter the restricted area without the required protective equipment for that area. The SS shall ensure compliance with all restricted area entry and exit procedures.

The SS shall also designate a decontamination point for personnel to exit from the contaminated area and enter into the clean area where personnel may rest and drink.

Visitors will be required to check in immediately upon arrival. Only authorized visitors will be allowed access to the contaminated areas. Each visitor will be required to provide the necessary protective equipment for use during the visits and shall be escorted by the SS while on site. All visitors who seek access to the exclusion zone and/or contamination reduction zone, will be required to show proof of completion, as a minimum, the 24-hour training required by OSHA for occasional visits to hazardous waste sites. 24-hour OSHA training is only applicable when visitors are unlikely to be exposed over the permissible exposure limit and published exposure limits and are not required to wear respirators, otherwise 40-hour OSHA training will be required prior to granting access to these site zones.

All visitors, subcontractors and personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read, understand and will comply with the site health and safety plan. Failure to comply with this site entry procedure will result in expulsion from the site.

Lighting

Lighting in conformance with or in excess of 29 CFR 1910.120 & 1926.65 requirements shall be secured by OHM if not readily available on site. Work areas and transit ways shall be lighted. No work shall be performed in any inadequately lighted areas.

Sanitary Facilities

All sanitary facilities shall be located in areas where exposures are below the Permissible Exposure Limits and Published Exposure Levels or "clean" air ventilation shall be provided.

Water

An adequate supply of potable water shall be provided on the site and provisions provided for clean and sanitary dispensing of the drinking water. Containers and outlets for non-potable water shall be properly marked.

Toilet Facilities

A minimum of one toilet facility shall be provided. When more than twenty personnel are expected to be on the site, one toilet seat and one urinal shall be provided for each 40 personnel working on the site. When sanitary sewers are not available, chemical toilets, recirculating toilets, or combustion toilets shall be provided. This requirement shall not apply to small mobile crews that have transportation readily available for transport to nearby facilities which meet these requirements.

Washing Facilities
Adequate washing facilities for removing hazardous substances shall be provided for all employees who handle or are exposed to hazardous substances. This requirement shall also be applicable when handling non-RCRA hazardous waste and/or chemical additives.

Showers and Change Rooms
When waste handling/removal operations commence, and where the nature of the contaminants and tasks to be performed warrant, showers and change rooms shall be provided. The requirements are indicated in the Contamination Control/Decontamination Schematic (Figure 1). Showers provided shall meet the requirements of 29 CFR 1910.141. Additionally, the Project Manager shall ensure that all employees have been instructed to shower at the end of the work shift and when leaving the site if they have worked in the Exclusion Zone.

Laundry Facilities
Laundry facilities may be provided for the on-site laundering of work clothing. Alternately, an off-site commercial/industrial laundry may be contracted to provide laundering of garments worn under Chemical Protective Clothing.

Communication
Personnel in the Exclusion Zone should remain in constant radio communication or within sight of each other. Any failure of communication requires an evaluation of whether personnel should leave the Exclusion Zone.

Air horns or other suitable means shall be used for on site notification of emergencies. Customer Specific Emergency Signals shall also be assessed and included in the Contingency Plan.

The following standard hand signals will be used in case of failure of radio communications:

Signal	***Communication***
Hand gripping throat	Out of air, cannot breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, negative

Telephone communication to the Command Post or office trailer should be established as soon as practicable during project mobilization and be available on site when active work is being conducted.

Radio transmitters must be intrinsically safe. Permission must be obtained from the Ciba-Geigy Construction Coordinator prior to use.

Work Zones

General

A site must be controlled to reduce the probability of exposure to any contaminants present and to limit the transport of contaminants by personnel or equipment from the site.

Site Surveillance

A control system is required to assure that personnel and equipment working on the hazardous waste site are under appropriate health and safety surveillance and complying with the HASP. This includes the presence of an SSO on site at all times that active work is being conducted.

Contaminant Control Measures

The possibility of exposure or translocation of contaminants can be reduced or eliminated in a number of ways. Several which shall be used are:

- Minimizing the number of personnel and equipment on-site consistent with effective operations.
- Establishing clearly marked work zones within the site.
- Establishing control points to regulate access to work zones.
- Conducting operations in a manner to reduce the exposure of personnel and equipment.
- Minimizing the airborne dispersion of contaminant(s) through professional equipment handling methods, soil moisture control, and the use of foam or visqueen when necessary.
- Implementing appropriate decontamination procedures for personnel and equipment.

Field Operations Work Areas

Work areas (zones) shall be established based on work to be performed and the anticipated contamination level. Actual zone boundaries shall be demarcated by barrier tapes, or other suitable means of marking the zone(s). Within these zones, prescribed operations shall occur utilizing appropriate personal protective equipment as assigned by task or work area.

Movement between areas shall be controlled at access points using well delineated corridors.

As depicted in Figure 1, the planned zones typically include the following:

- Exclusion Zone (contaminated);
- Contamination Reduction Zone (CRZ) with a Clean Break Station;
- Equipment Decontamination Zone; and,
- Support Zone (non-contaminated).

Exclusion Zone
The Exclusion Zone is ideally the innermost area of three concentric rings and is considered contaminated, dirty, or "hot." Within this area, the prescribed protection (see Appendix C) reflects the highest exposure anticipated for any task and must be worn by all entering personnel whether engaged in that task or not.

- An entry checkpoint or portal shall be established at the periphery of the Exclusion Zone to control the flow of personnel and equipment between contiguous zones and to ascertain that the procedures established to enter and exit the zones are followed.

- The Exclusion Zone boundary shall be established in accordance with the work schedule to contain all of the area under active remediation.

- The Exclusion Zone shall be clearly marked with red barrier tape, tape with red flags or other suitable barrier mechanism. The barrier legend or signage should be imprinted with the words "Exclusion Zone" or "Hot Zone".

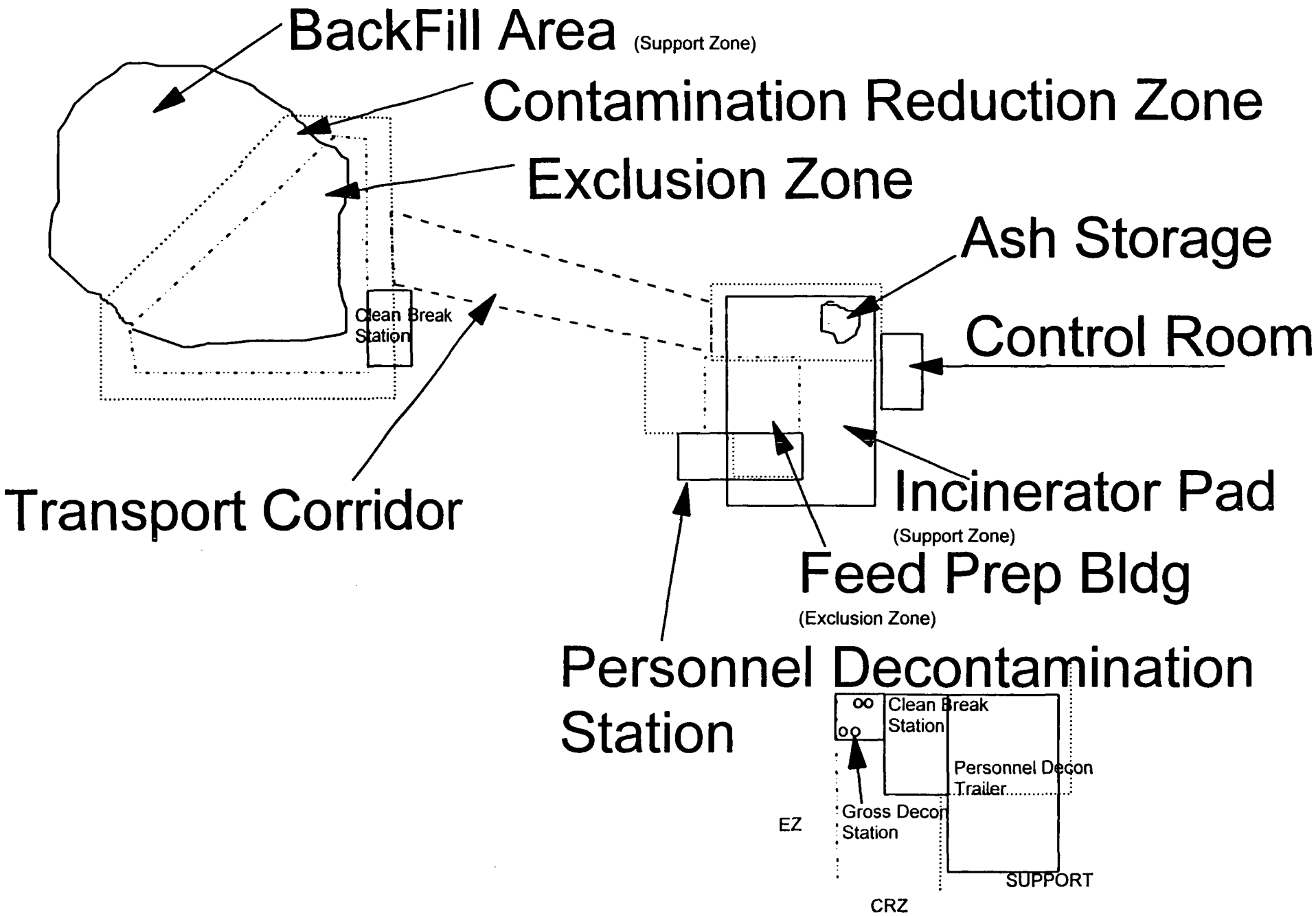
Contamination Reduction Zone
Between the Exclusion Zone and the Support Zone is the Contamination Reduction Zone. The purpose of this zone is to provide an area to prevent or reduce the transfer of contaminants which may have been picked up by personnel or equipment returning from the Exclusion Zone.

- All decontamination activities occur in this area.

- A Clean Break Station shall be established in the Contamination Reduction Zone. Entry into this area shall require decontamination per the Decontamination Schematic through the Field Wash Step. This area shall be available for smoking, drinking and using the toilet facilities.

TYPICAL WORK ZONE LAYOUT

(Normal Operations)



- The boundary between the Support Zone and the Contamination Reduction Zone is the contamination control line. This boundary separates the possibly-contaminated area from the clean zone.

- Entry into the Contamination Reduction Zone from the clean area shall be through an access control point or portal.

- Personnel entering this zone, for whatever reason, shall wear the prescribed personal protective equipment for working in the Contamination Reduction Zone.

- Exiting the Contamination Reduction Zone to the clean area requires the removal of any suspected, or known, contaminated personal protective equipment and compliance with decontamination procedures.

- The Contamination Reduction Zone is bordered toward the Exclusion Zone with red barrier tape or red flagged tape and bordered toward the Support Zone with yellow barrier tape or suitable barrier. Signage shall be imprinted with the words "Contamination Reduction Zone."

Support Zone
The Support Zone is the outermost of three rings and is considered a non-contaminated or clean area. It contains the Emergency Command Post for field operations and other elements necessary to support site activities.

- Level D work clothes are the appropriate apparel within this zone.

- Access to this area shall be controlled by limiting entry to designated portals, usually in association with on site office trailers.

- The Support Zone is bordered toward the Contamination Reduction Zone with yellow barrier tape and may be bordered at the limit of RUST area of responsibility with green barrier tape. Signage shall be imprinted with the words "Support Zone."

Equipment Decontamination Zone
The Equipment Decontamination Zone is established as appropriate to clean vehicles and equipment by the most effective method and without requiring additional movement of the equipment. Personal protective equipment required for equipment decontamination activities is prescribed in this plan.

Zone Dimensions

Considerable judgement is needed to assure safe working distances for each zone, balanced against practical work considerations. Physical barriers may constrain ideal locations. The zones shall be placed where practical in the judgement of the PM, SSO, and Ciba-Geigy's Representative.

5.0 PROTECTIVE EQUIPMENT

This section details the personal protective equipment (PPE) that will be provided and worn by site personnel to protect them against dermal contact and inhalation exposure to hazardous chemicals present on site.

5.1 LEVELS OF PROTECTION

The following levels of protection and accompanying PPE will be used during site operations.

Level B Protection

- Supplied-air respirators - self-contained breathing apparatus (SCBA) or 5-minute egress system with airline hose
- Saran-coated tyvek coveralls
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex/PVC overboots
- Tape overboots and outer gloves to tyvek
- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

Level C Protection

- Full facepiece air-purifying respirator with combination organic vapor/HEPA cartridges
- Tyvek or saran-coated tyvek coveralls
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots and outer gloves to Tyvek

- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

Modified Level D Protection

- Tyvek or saran-coated tyvek
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots outer gloves to Tyvek
- Hard hat
- Safety glasses with side shields
- Splash protection - as required by task
- Hearing protection - as required by task

Level D Protection

- Coveralls
- Steel toe/shank boots
- Safety glasses with side shield
- Hard hat
- Work gloves - as required by task
- Splash protection - as required by task
- Hearing protection - as required by task

5.2 TASK-SPECIFIC LEVELS OF PROTECTION

The following Levels of Protection are designated for each task performed in site work zones, based on the hazards posed by each task. Modifications of these Levels of Protection are provided for those tasks with specific personal protective equipment requirements. **An upgrade/downgrade in the designated Level of Protection may only be instituted for those tasks where more than one level of protection is specified (i.e., Modified D/C) and only after air monitoring results justify the upgrade/downgrade, based on the action levels listed in this plan. For those tasks where more than one level of protection (Modified D) is the initial level of protection required for the task, with the second level (Level C) being either the downgrade or upgrade level of protection.**

NO CHANGES TO THE DESIGNATED LEVEL OF PROTECTION BELOW WILL BE MADE FOR THOSE TASKS WHERE ONLY ONE LEVEL OF PROTECTION IS

SPECIFIED WITHOUT AN AMENDMENT TO THIS PLAN AND THE APPROVAL OF THE REGIONAL HEALTH AND SAFETY MANAGER/DIRECTOR.

The tasks and levels of protection are presented in Table 5.1 below:

Table 5.1
Levels of Protection

Task	Level of Protection
Task 1 – Site preparation and mobilization	Level D
Task 2 – Capture, collection, transportation contaminated water	Level C/Modified Level D with sarans
Task 3 – Water treatment – installation of power, control and associated electrical equipment	Level D
Task 3 – Water treatment – installation of power, control and associated electrical equipment	Level D
Task 4 – Water treatment – equipment installation and plumbing	Level D
Task 5 – Water treatment – system start-up and testing	Level D/Modified Level D/C
Task 6 – Water treatment – system operations and maintenance	Level C/Modified Level D with tyvek
Task 7 – Transport contaminated and non-contaminated soil and debris to staging area	Level C/Modified Level D with tyvek/Level D
Task 8 – Excavation of contaminated soil/debris	Level B/C/Modified D
Task 9 – Thermal treatment unit – installation of power, control and associated electrical equipment	Level D
Task 10 – Thermal treatment unit – equipment installation and plumbing	Level D
Task 11 – Thermal treatment unit – system start-up and testing	Level D/Modified Level D/Level C with tyvek
Task 12 – Thermal treatment unit – system operation and maintenance	Level C/Modified Level D with tyvek
Task 13 – Prepare contaminated materials for thermal treatment unit	Level B/C/Modified Level D with tyvek
Task 14 – Excavate buried drums	Level B with sarans
Task 15 – Staging drums	Level B with sarans
Task 16 – Backfill and compact excavation	Modified Level D/C with tyvek
Task 17 – Slurry wall construction	Level B/C/Modified Level D/Level D
Task 18 – In situ stabilization within Site 8, iron slurry waste area	Level C/Modified Level D with tyvek
Task 19 – Equipment, debris, personnel	Level C/Modified Level D with sarans
Task 20 – Demobilization	Level D

5.3 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with Mine Safety Appliance (MSA) GMC-H air purifying cartridges. The GMC-H cartridge holds approval for:

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m3
- Asbestos containing dusts and mists
- Radon daughters
- Radionnuclides
- Pesticides

5.4 AIR-PURIFYING RESPIRATORS

OHM's air-purifying respirators for this project will be MSA's ultratwin full facepiece respirator with nose cups. OHM's Respirator Protection Program for air purifying respirators is adhered to on site.

5.5 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty conditions may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance, or breakthrough of a chemical warning property.

5.6 SUPPLIED-AIR RESPIRATORS

In the event that air quality data shows that respiratory protection must be upgraded, then OHM personnel will wear Survivair 9881-02 Hippack Airline respirators with 5-minute egress bottles. Personnel requiring Level B protection and high mobility will wear Survivair Mark 2 SCBA units.

Airline respirator wearers will be connected to a bank of breathing air cylinders with the total length of airline hose to each wearer no greater than 250 feet. The breathing air cylinder bank (six-pack) will be equipped with a pressure gauge/regulator and alarm.

5.7 BREATHING-AIR QUALITY

Code of Federal Regulations 29 1910.134 states breathing air shall meet the requirement of the specification for Grade D breathing air as described in the Compressed Gas Association Specification G7.1-1989. OHM requires a certificate of analysis from vendors of breathing air in order to show that the air meets this standard.

The preferred method for creating breathing air shall be to mix liquid oxygen and liquid nitrogen. Air compressors located at project sites are not acceptable because of possible contamination at the intake of the pump and excessive analytical costs of sampling the air.

5.8 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

5.9 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative pressure respirators. The test will utilize isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.10 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator.

5.11 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.12 CONTACT LENSES

Contact lenses shall not be worn with any type of respirator.

5.13 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination of personnel shall be accomplished to ensure that any material, which personnel may have contacted in the hot zone, is removed in the contamination-reduction zone. Decontamination of personnel exiting the exclusion zone will utilize the following steps for Level B/C/Modified Level D personnel decontamination:

- Step 1: Equipment/backpack/egress system drop
- Step 2: Scrub outer boots and gloves with a detergent-water solution.
- Step 3: Remove tape and discard.
- Step 4: Remove and discard outer boots and gloves.
- Step 5: Remove hard hat and wipe clean.
- Step 6: Remove chemical protective clothing (Tyvek/sarans) and discard into 55-gallon drum.
- Step 7: Remove respirator/facepiece (Levels B/C only) and suitably store while on breaks and during lunch. At the end of shift, discard the cartridges into 55-gallon drum, then clean, disinfect, rinse and air dry the respirator.
- Step 8: Discard inner gloves into 55-gallon trash drum.
- Step 9: Depart transition zone in work clothes and boots.
- Step 10: Wash hands, face and neck before breaks and lunch.

6.2 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the

decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the First Aid Station.

6.3 PERSONAL HYGIENE

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face. To promote personal hygiene and to control personnel exposure to contaminants, project-issued work coveralls worn under chemical protective clothing must remain at the job site and must be laundered at regular intervals during the course of the project.

6.4 OTHER DECONTAMINATION PROCEDURES

All disposable items (i.e., protective clothing) or other items which cannot be adequately decontaminated (i.e., miscellaneous sampling equipment) will be disposed of in accordance with EPA requirements.

6.5 HEAVY EQUIPMENT DECONTAMINATION

Gross contamination (soil, mud) will be removed from the heavy equipment prior to exiting the exclusion zone. Heavy equipment will be decontaminated using a high-pressure washer until all visible contamination is removed. Those parts of the equipment that come into direct contact with contaminated materials (i.e., buckets, tires, tracks) will receive special attention.

Decontamination solutions, soil, mud, etc., removed with the high pressure washer will be collected, placed into containers and disposed of according to EPA requirements.

7.0 PERSONNEL AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following personnel air monitoring procedures will be used at this site. Additional air monitoring may be conducted at the discretion of the SSO. Work area and perimeter air monitoring procedures are addressed in the Air Monitoring Plan, contained in Appendix E.

The following table describes the personnel air monitoring required and appropriate action levels. Action limits specified in this table apply for a 5-minute average reading when the recommended action must be instituted.

Table 7.1
Exposure Monitoring

Real-Time Sampling Requirements:

Instrument[1]	Location(S)[2]	Frequency[3]	Duration[3]	Action Limit	Req'D[4] Action
Combustible Gas /Oxygen Meter (LEL/O_2) (CO)	Confined Spaces, Hot Work Areas, Excavation Area, Incineration Pad Area	Prior to Hot Work, Confined Space Entry, Continuous on Excavation Operations conducted in Level C	Each Event, Continuous on Excavation and Incineration Operation while working in Level C	>10% LEL <20.8% O2 >35 ppm CO	Stop operations; allow vapors to vent <10% before continuing Stop operations Upgrade to Level B
Photoionization Detector (PID)	Worker Breathing Zone	Pre-Shift, Periodic and as indicated during waste handling	Full Project	5 ppm above background in Breathing Zone	Upgrade to Level C
				50 - 250 ppm	Level C with benzene detector tube monitoring
				> 250 ppm	Level B
Dust/Aerosol Monitor [PPM® HAM]	Worker Breathing Zone	Pre-Shift, Hourly and as indicated during waste handling	Full Project-Excavation /Handling of Contaminated Soils	>2.5 mg/M³	Upgrade to C
			Full Project-Handling Treated Materials	>2.5 mg/M³	Level C
Benzene Detector Tubes	Worker Breathing Zone	PID reading >5 ppm		>.5 ppm	Level C
				>25 ppm	Level B
Dust/Aerosol Monitor	Worker Breathing Zone	Periodic	Place of "clean" backfill materials and other non-waste handling operations	5 mg/M³	Level C

Table 7.1 *Exposure Monitoring*					
Real-Time Sampling Requirements:					
Instrument[1]	Location(S)[2]	Frequency[3]	Duration[3]	Action Limit	Req'D[4] Action
Noise Monitor	Site	Initial Survey	Initial Survey Establish controlled areas. Annual follow-up.	85 dBA-TWA	Ear Plugs
PESTICIDES	Sampling Pump	3/week until assessed	Waste Handling.	Area	T010
Benzene /Chlorobenzene	Sampling Pump	PID reading >50 ppm in BZ	Waste Handling.	Personal	NIOSH 1501
BHC (i.e. Lindane)	Sampling Pump	3/week until assessed	Waste Handling.	Personal	S274
SUGGESTED ANALYTICAL LAB: AIHA Accredited (Southern Research Inst., Birmingham, AL)					

1 Instruments must be calibrated, operated and maintained in accordance with the manufacturer's instructions or applicable RUST SDP. [ ] Indicates Example Instrument, similar may be substituted.
2 Additional locations may be required based on existing or changing site conditions. To be assessed by the PM and SSO.
3 Initial site assessment required. Frequency and/or duration may be downgraded if warranted by results of initial assessment and stable site conditions.
4 Action required in the event that the Action Limit is met or exceeded.

The above LEL action level only applies to LEL readings obtained in an area where flammable/explosive vapors may be present, but personnel entry into the area will not occur. The confined space entry LEL and oxygen action levels for personnel entry into a confined space are 0% LEL and 20.9% oxygen, with LEL/oxygen readings taken at representative locations inside the space. The hot work LEL and oxygen levels for UST cold-cutting operations and any related hot work are less than 10% LEL and less than 8 percent oxygen.

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN METER

Prior to entering a confined space area or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/O2 measurements must be obtained. LEL monitoring will be conducted at each borehole when drilling in suspected contaminated areas on site.

7.2 PHOTOIONIZATION DETECTOR (PID)/ ORGANIC VAPOR ANALYZER (OVA)

A 10.2eV PID or OVA will be used to monitor total organic contaminants in ambient air. A PID/OVA will prove useful as a direct reading instrument which will aid in determining if respiratory protection needs to be worn (Level C) or upgraded to Level B and to indicate if the exclusion zone encompasses the required areas. PID/OVA monitoring will be performed in personnel breathing zone during site operations to document that the proper level of protection is worn by site personnel.

The SSO will take measurements before operations begin in an area to determine the amount of volatile organic compounds (VOCs) naturally occurring in the air. This is referred to as a background level. The PID/OVA breathing zone action level only applies to PID/OVA readings above background (i.e. 5 ppm for 5 minutes above background).

7.3 REAL-TIME AEROSOL MONITOR (MINIRAM)

A real-time aerosol monitor (miniram) will be used to measure airborne particulate in personnel breathing zones and site work area locations. A breathing zone action level has been specified that requires upgrading to Level C protection based on sustained (5-minute average) miniram results. The miniram will be used to monitor personnel breathing zone when wearing Modified Level D protection and to determine when an upgrade to Level C is warranted.

7.4 AIR SAMPLING AND ANALYSIS

Personal air samples will be collected in personnel breathing zones to document that the appropriate level of protection was worn during remedial actions on-site. Air samples will be collected on personnel with the greatest potential for exposure during each major project phase. Air samples will be analyzed by an AIHA accredited laboratory. Air samples will be collected and analyzed for pesticides and aromatic hydrocarbons in accordance with NIOSH methods 5510 and 1501, respectively.

7.5 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include instrument used, instrument reading, location, type of reading (breathing zone or work area) and site operations being performed. The Regional and Corporate OHM CIH will periodically review this data.

7.6 CALIBRATION REQUIREMENTS

The PID/OVA, LEL/O2 meter, miniram and air sampling pumps will be calibrated daily prior to use, in accordance with the manufacturer's procedures. A separate log will be kept detailing date, time span, gas, or other standard, and name of person performing the calibration.

7.7 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE AND CONTINGENCY PLAN

This contingency plan details the emergency response procedures to be implemented for anticipated emergency situations during site operations.

8.1 PRE-EMERGENCY PLANNING

Before starting site operations, the SSO will implement emergency procedures that include:

- Identifying the location and route to emergency medical services
- Establishing site communications
- Designating emergency warning signal and evacuation routes
- Inventorying emergency equipment
- Communicating emergency procedures to personnel
- Name of person who will be responsible in the event of an emergency incident
- Plan for initial site safety indoctrination and training of all employees, name of the person who will give the training and the topics to be covered
- Plan and date for meeting with the local community, including local, state and federal agencies involved in the cleanup, as well as the local emergency squads and the local hospitals
- A list of the first aid and medical facilities including location of the first aid kits, names of personnel trained in first aid, a clearly marked map with the route to the nearest medical facility, all necessary emergency phone numbers conspicuously posted at the job site (i.e., fire, rescue, local hazardous materials teams, National Emergency Response Team, etc.). Plans for protection of public and visitors to the job site.

8.2 PERSONNEL ROLES, LINES OF AUTHORITY

The SSO takes the lead during site emergencies until off-site emergency responders arrive on-site. In cases of major emergencies, OHM personnel will evacuate the site, contact local emergency responders, and rely on them to handle the emergency. Minor emergencies that

are controllable on-site with emergency equipment located at the site will be addressed by OHM personnel with the approval of the SSO.

8.3 EMERGENCY RECOGNITION AND PREVENTION

The SSO will conduct an initial site safety briefing to review the requirements of the site safety plan with site personnel. This briefing will include discussions on the recognition, prevention and control of emergencies anticipated on-site. Daily safety meetings will be held to emphasize emergency prevention and control measures.

8.4 SITE SECURITY AND CONTROL

Access to the site will be controlled by the SSO until local emergency responders arrive. The SSO will then relinquish site security/control to the authorized emergency response organization.

8.5 SITE COMMUNICATIONS

Site Communications will provide means for both on-site and off-site communications. On-site communications will be established between the support zone and site work zones and will consist of verbal communications, line of sight observations or two-way radios. Off-site communications will be established in the support zone to summon off-site emergency services and will consist of either cellular or installed telephones. When reporting an emergency situation to off-site emergency responders, the following information must be provided:

- Name of person making the call;
- Telephone number and location of person making the call;
- Name of person(s) exposed or injured;
- Description of exposure and emergency;
- Actions taken; and
- Name and location of site contact for emergency, if other than caller.

8.6 PERSONAL PROTECTIVE EQUIPMENT AND EMERGENCY EQUIPMENT

The following personal protective equipment (PPE) and emergency equipment will be located in the CRZ at the site decontamination facilities and will be immediately available for site emergencies:

- Portable fire extinguishers (minimum 20 lb.-A/B/C)
- Industrial first aid kit

- Snake bite kit
- Portable eye wash/emergency shower
- Self-contained breathing apparatus (SCBAs)
- Chemical protective apparel
- Spill equipment, materials and supplies
- Two-way radio
- Air horns
- Wind sock

8.7 EMERGENCY ALERTING PROCEDURES

A tested system must exist for rapid and clear emergency communications. Air horns will be used to communicate emergency situations on-site between OHM personnel. Any time an emergency signal is sounded on-site, site operations must temporarily cease and the emergency condition must be addressed. The following air horn signals will be used to warn personnel of specific emergency conditions and the need for a general site evacuation:

Emergency Signal	*Emergency Condition*
1 Air horn blast	Medical/personal injury
2 Air horn blasts	Fire
3 Air horn blasts	General Site Evacuation

8.8 EMERGENCY MEDICAL TREATMENT

All personnel must be provide with concise, clear directions and transportation to local emergency medical treatment services. The name, location and map outlining the directions to the nearest hospital must be posted on-site.

8.8.1 First Aid Procedures

First aid trained personnel shall only give first aid and stabilize an individual needing assistance. Life support techniques such as CPR and treatment of life threatening problems such as airway obstruction, and shock will be given top priority. At least one person trained in first aid/CPR trained shall be on-site during site operations. Professional medical assistance shall be obtained at the earliest possible opportunity.

To provide first-line assistance to field personnel in the case of sickness or injury, the following items will be immediately available:

- First aid kit
- Snake bite kit
- Portable emergency eye wash/shower
- Supply of clean water

8.8.2 Medical Emergency Actions

If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger and sound the alarm (one long blast).
- Render first aid if necessary. Decontaminate affected personnel after critical first aid given.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.
- Notify client of incident.

8.9 FIRE EMERGENCY ACTIONS

Portable fire extinguishers will be located at the site decontamination facility and on each piece of mobile heavy construction equipment. The following procedures apply to fire emergencies on-site:

- Sound the fire emergency alarm (two long blasts);
- Attempt to extinguish the fire by discharging the contents of portable fire extinguishers in the area.
- If unable to extinguish the fire, sound the general site evacuation alarm and evacuate the site.
- Notify off-site fire emergency responders and provide detailed information on the fire emergency conditions.
- The SSO will interface with the fire department upon arrival and provide technical assistance.

8.10 SPILL CONTROL AND COUNTER MEASURES

Spill control and containment plan will be prepared and implemented for remediation activities that includes the following elements:

- Contingency measures for potential spills and discharges from materials handling and/or transportation.

- A description of the methods, means, and facilities required to prevent contamination of soil, water, atmosphere, and uncontaminated structures, equipment, or material by spills or discharges.

- A description of the equipment and personnel necessary to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. This collected spill material must be properly disposed of.

- A description of the equipment and personnel to perform decontamination measures that may be required for previously uncontaminated structures, equipment, or material.

8.11 EMERGENCY DECONTAMINATION

Any personnel requiring emergency medical attention shall be evacuated immediately from the exclusion and contamination-reduction zones. Personnel shall not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury an the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid. For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed:

- Wash external clothing and cut it away.

If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.

- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.

- Send along site personnel familiar with the incident.

8.12 GENERAL SITE EVACUATION

A general site evacuation will be ordered in the event of a fire, explosion, spill or toxic vapor release where on-site personnel are unable to control the emergency condition.

8.12.1 Safe Distance and Places of Refuge

The on-site assembly point will be located in the SZ where site personnel are accounted for and emergency services are contacted. The SSO will evaluate the emergency situation based on the hazards posed to site personnel remaining at the on-site assembly point, then determine the need and location of further off-site evacuation and assembly points.

8.12.2 Evacuation Routes and Procedures

The emergency evacuation signal will be three long blasts with an air horn. Evacuation routes will be designated that direct evacuation from the EZ in an upwind direction. A wind sock will be erected in a prominent location on-site so a visual determination of upwind direction may be made by personnel evacuating the site. In cases of uncontrollable emergencies such as fire, explosion, or toxic vapor release, a site evacuation shall be implemented as follows:

- Sound the emergency warning signal (three long blasts with air horn).

- Stop work activities and evacuate the EZ in an upwind direction.

- Assemble in the SZ and account for personnel. Dispatch a response team equipped with appropriate PPE (minimum Level B protection) and rescue unaccounted personnel.

- Contact off-site emergency response services.

8.13 RESPONSE FOLLOW-UP

The SSO must complete an incident investigation form for site emergencies within 24 hours of the incident and submit/fax it to their Division Manger. Incidents involving potential Lost Time Accident (LTA) injuries, overexposure incidents, property damage or emergencies causing general site evacuations must be reported within 24 hours after incident occurrence to:

Angelo Liberatore
Regional Health and Safety Director
(770) 453-7671
(770) 476-0112 (home)
(404) 453-7672 (fax)

The SSO will identify the cause(s) of the incident and take action to prevent occurrence. The SSO will also evaluate the effectiveness of the site's emergency response procedures and institute corrective actions when warranted.

8.14 EMERGENCY CONTACTS

The following emergency contacts and telephone numbers will be posted onsite. The Ciba-Geigy facility emergency notification procedures will be followed by OHM during emergencies. The capabilities of the listed hospital will be verified prior to project mobilization.

Ciba-Geigy Facility: 2222 (in-plant phone)

Ambulance Phone Number: 911

Hospital: University of Southern Alabama Medical Center, 2451 Filling St., Mobile, AL

Hospital Phone Number: (205) 471-7000

Fire Department: 911 or _____

Police: 911 or _____

Poison Control: 800-382-9097

Insert route to hospital below:

To be completed prior to project start-up by SSO.

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training is comprehensive and covers all forms of personal protective equipment. In addition, this course covers the toxicological effects of various chemicals including nerve agents, handling of unknown tanks, drums and confined space entering procedures and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120(e).

OHM has developed and implemented a Bloodborne Pathogen Exposure Control Plan which meets the OSHA requirements set forth in 29 CFR 1910.1030. All OHM field personnel hired after January 1992, must receive this training as part of the required 40-hour training. Field personnel hired prior to January 1992, receive the training in an OHM 8-hour annual refresher training course. A copy of the OHM Bloodborne Pathogen Exposure Control Plan will be maintained in the office trailer on-site.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and will be required to sign the CHSP, acknowledgement which is included as Appendix E. OHM has a full-time training department which, in addition to providing in-house training, has assisted Federal OSHA and USEPA in developing training program requirements.

Personnel training files for all OHM personnel are maintained at the employees' homebase division office. On long-term remediation projects where the Regional Health and Safety Director deems necessary, the following documentation will be required on-site for all personnel entering the exclusion zone:

- 40-hour training
- 8-hour annual refresher training
- Annual fit test record
- 8-hour supervisor training (supervisory personnel only)
- First aid/CPR training as applicable

OHM subcontractors, who will be working in the site exclusion zone, will be required to certify, in writing, that their employees have been trained in accordance with 29 CFR 1910.120(e).

10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program that meets the requirements of 29 CFR1910.120 and ANSI Z-88.2. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. There are no additional medical testing anticipated to be performed on project personnel. This program was developed in conjunction with a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine and consultant toxicologist. Other medical consultants are retained when additional expertise is required.

OHM subcontractors, who will be working in the site exclusion zone, will be required to certify, in writing, that their employees have been medically qualified to perform hazardous waste operations in accordance with 29 CFR1910.120(f).

Table 10.1
Worker Medical Profile

Item	Initial	Annual
Medical History	√	√
Work History	√	√
Visual Acuity and Tonometry	√	√
Pulmonary Function Tests	√	√
Physical Examination	√	√
Audiometry Tests	√	√
Chest X-ray	√	√
Electrocardiogram/Stress Test (based on age)	√	√
Complete Blood Counts	√	√
Blood Chemistry (SMAC-23)	√	√
Complete Urinalysis	√	√
Dermatology Exam	√	√

11.0 RECORDKEEPING

Recordkeeping procedures will be instituted onsite that maintain health and safety records during remedial actions at the project. This recordkeeping will be comprised of the training, medical surveillance and respirator fit certifications for all site personnel, daily health and safety forms completed by the SSO and specific task permit requirements.

The following is a listing of health and safety records that will be maintained onsite.

- Site orientation sign-off sheet for site employees
- Daily safety meeting summary
- Industrial hygiene monitoring
- Hotwork permits
- Lockout tabs
- Confined space entry permits
- Hazard communications chemical inventory
- Respiratory protection fit test forms
- Certification of decontamination
- Incident report and investigation forms
- Air monitoring logs for continuous real-time samples
- Employee training and medical monitoring records

APPENDIX A

CIBA-GEIGY CORPORATION
SAFETY MANUAL INDEX

CIBA-GEIGY CORPORATION
MCINTOSH, ALABAMA
SAFETY MANUAL INDEX

August, 1992

	PROCEDURE NUMBER	REVISED DATE
GENERAL PLANT RULES		
Smoking Areas	15-I-3.00	?/92
Office Safety	15-I-4.00	10/91
Plant Vehicle Safety Procedure	15-I-9.00	4/25/90
Safety & Housekeeping Rules	15-I-11.00	7/1/85
SAFETY PERMITS		
Safety Permits	15-II-1.00	1/22/88
Tagout and Lockout Procedure	15-II-2.00	7/22/91
Job Safety Checklist	15-II-3.00	11/30/91
PERSONAL PROTECTIVE EQUIPMENT		
Bloodborne Pathogens	15-III-1.00	2/92
Eye and Face Protection Procedure	15-III-2.00	10/17/89
Head Protection Procedure	15-III-3.00	1/92
Hearing Conservation Program	15-III-6.00	12/16/91
Respiratory Protection	15-III-8.00	7/6/87
Chemical Protective Clothing	15-III-10.00	2/27/91
Company Issued Clothing	15-III-11.00	3/18/92
RULES FOR HANDLING COMPRESSED GAS AND AIR		
Handling of Carcinogens	15-IV-2.00	8/1/90
Rules & Guidelines for Operating Explosion Suppression System	15-IV-10.00	3/10/83
Compressed Gas Bottles Handling Procedure	15-IV-11.00	2/1/88
PRODUCTION AREA SAFETY RULES		
Forklift Safety Rules	15-V-1.00	6/8/87
ENGINEERING AREA SAFETY RULES		
Crane or Derrick Suspended Personnel Platform	15-VI-3.00	1/3/89
Ladder Instructions	15-VI-4.00	3/14/91
Hot Water, Steam and Nitrogen Usage	15-VI-5.00	9/1/89
Excavation Permit Procedure	15-VI-6.00	10/89
Safety Device Identification	15-VI-8.00	4/23/84
Elevated Work Procedure	15-VI-9.00	7/22/91
WAREHOUSE AND STORAGE RULES		
Blue Flag Signs	15-VIII-1.00	8/25/86
EMERGENCY AND DISASTER PLANS		
Fire Protection Program	15-IX-1.00	8/24/81
Fire Brigades	15-IX-2.00	8/24/81
Fire Brigades Personal Protective Equipment	15-IX-3.00	8/24/81
Fire Extinguishers and Training	15-IX-5.00	8/24/81
ADMINISTRATIVE PROCEDURES		
Hazard Communication	15-X-1.00	1/92
Process and Operations Analysis (PR/OP)	15-X-2.00	4/92
Initial Process Safety Training	15-X-3.00	5/92
Pre-startup Safety Review	15-X-4.00	5/92
Management of Process Change	15-X-5.00	5/92
Employee Participation Plan	15-X-6.00	5/92
Mechanical Integrity	15-X-7.00	8/92

SAFETY MANUAL INDEX - Continued

	PROCEDURE NUMBER	REVISED DATE
ACCIDENT AND INJURY		
Injury Report	15-XI-1.00	2/26/92
Injury Classification Procedure	15-XI-2.00	3/10/92
Accident/Incident/Close Call	15-XI-3.00	5/29/92
Deaths on the Site	15-XI-4.00	2/92
CONTRACTOR SAFETY		
Contractor Safety	15-XII-1.00	5/92

APPENDIX B

HEALTH AND SAFETY FORMS

Accident/Injury/Illness Report Form
Accident/Injury/Illness Status Report Form
First Aid Log
Daily Safety Meeting Log
Instrument Calibration Logs (LEL/PID)
Air Monitoring Instrument (Direct Reading) Logs
Heavy Equipment Inspection Forms
Fire Extinguisher Checklist/Inventory Form
SCBA/SAR Inspection Forms
Project Site Safety Inspection Checklist (weekly)
SSO Daily Report
Air Sampling & Analysis Log
Air Sampling Data Sheet
Chain-of-Custody Record

OHM Remediation Services Corp.

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Check all that apply: ☐ Injury/Illness ☐ Fatality ☐ Complaint ☐ Not Work Related
☐ Auto Liability ☐ Auto Physical Damage
☐ General Liability ☐ Property Damage ☐ Environmental

Exact Date and Time of Incident _____ ____ a.m. ____ p.m. Shift ☐ 1st ☐ 2nd ☐ 3rd

OHM CORPORATION _____
(Employee's Home Division/Regional Office/Subsidiary)

Address _____
City State

PROJECT IDENTIFICATION (Project Related Incidents Only)

Project No. _____ Project Start Date _____ Completion Date _____

Location (Full Address) _____

Telephone _____ Project Manager _____

EMPLOYEE INFORMATION

Employee's Full Name _____ Employee No. _____

☐ Regular Full Time ☐ Regular Part Time ☐ Temporary ☐ Non-Employee

Home Address _____

Date of Birth _____ Age ____ Social Security No. ____-____-_____ Sex ☐ M ☐ F

Job Title _____ Department _____ Date Hired _____

Length of Employment ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs. Time in Job Class ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs.

Name of Employee's Direct Supervisor _____

Supervision at Time of Accident ☐ Directly Supervised ☐ Indirectly Supervised ☐ Not Supervised

Specific Location Where Incident Occurred _____

_____ ☐ OHM Facility ☐ Project Site ☐ Other _____

To Whom Was Incident Reported? _____ When? _____

Witness Name/Address _____

Witness Job Title/Reason In Area _____

Describe Employee's Job Duties Being Performed When Injured _____

_____

_____

Describe Fully the Events Which Resulted in the Accident/Injury/Illness _____

_____

_____

(Use Extra Page If Needed)

Describe the Injury/Illness in Detail; Indicate Part of Body Affected _____

Name of Object/Substance Which Directly Injured Employee _____

Has/Will Employee Seek Treatment? ☐ Yes ☐ No Did Employee Die? ☐ Yes ☐ No

Name/Address of Hospital/Doctor _____

Describe Treatment Given _____

Was Employee Able To Return To Work? ☐ Yes ☐ No

If YES: ☐ Regular Work ☐ Work with Restricted Activities

Restriction _____

If NO: Date Lost Time Began _____ Date/Est. Date To Return _____

Identify Personal Protective Equipment Used by Injured Employee _____

What Training or Instruction Had Been Given? _____

How Could This Accident Have Been Prevented? _____

Corrective Action _____

Signature _____ (Supvr/Manager) Date _____

Signature _____ (Safety Officer) Date _____

Signature _____ (Proj. Manager) Date _____

DISTRIBUTION Original To: Division Secretary at Employee's Home Office

Copy To: ☐ Corporate Health & Safety ☐ Regional Health & Safety Manager
☐ Project Manager ☐ Site Safety File

OHM Remediation
Services Corp.

EMPLOYEE'S ACCIDENT REPORT

Check all that apply: ☐ Injury/Illness ☐ Fatality ☐ Complaint ☐ Not Work Related
☐ Auto Liability ☐ Auto Physical Damage
☐ General Liability ☐ Property Damage ☐ Environmental

Date, Day, and Time of Incident _____ _____ ☐ am ☐ pm

Your Name: _____ Your Emp. No.: _____

Home Address: _____ Home Phone # _____

Birth Date: _____ Age: _____ Social Security No.: _____ Sex: _____

Job Title: _____ Dept.: _____ Date of Hire: _____

Accident location (If Project related, give Project #, Client, Address and Phone #): _____

_____

On OHM premises? ☐ Yes ☐ No

Witness Name/Address _____

How did accident occur?: _____

_____

_____

Was medical attention required? ☐ Yes ☐ No

Did you return to work? ☐ Yes ☐ No Your usual Job? ☐ Yes ☐ No If not explain: _____

Was the accident reported to a supervisor? ☐ Yes ☐ No Supervisor's name: _____

_____

Employee's Signature Date

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

Form 0085
H & S Dept.
2/95

INJURY/ILLNESS STATUS REPORT

Employee _____ Social Security No. _____

Home Address _____ Phone _____

Job Title _____ Home Division _____

Date of Injury/Illness _____ Description of Injury/Illness _____

AUTHORIZATION TO RELEASE INFORMATION

I hereby authorize all physicians, hospitals, clinics and all persons to discuss with, and release to OHM Remediation Services Corp. and its authorized agents, any information or copies thereof acquired in the course of my examination or treatment for the injury identified above. This authorization shall not extend to any other medical condition, past or present, unless the same is causally or historically relevant or related to the injury referred to above.

Employee Signature _____ Date _____

PHYSICIAN OR MEDICAL PERSONNEL TO COMPLETE REMAINDER OF FORM

WORK STATUS

☐ Employee may return to work with no limitations

_____
Date

☐ Employee may return to work on _____
Date
with limitations indicated. These restrictions are in effect until _____ or until Reevaluation
Date
on _____
Date

Employee may work _____ hours in a work day.

☐ Employee is totally incapacitated at this time.

Patient will be reevaluated on _____
Date

DEGREE

☐ **Sedentary Work.** Lifting 10 pounds maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

☐ **Light Work.** Lifting 20 pounds maximum with frequent lifting and/or carrying of objects weighing up to 10 pounds. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

☐ **Medium Work.** Lifting 50 maximum with frequent lifting and/or carrying of objects weighing up to 25 pounds.

☐ **Heavy Work.** Lifting 100 pounds maximum with frequent lifting and/or carrying of objects weighing up to 50 pounds.

☐ **Very Heavy Work.** Lifting objects in excess of 100 pounds with frequent lifting and/or carrying of objects weighing 50 pounds or more.

LIMITATIONS

1. The Employee may:
   a. Stand/walk
      ☐ None ☐ 1-4 hours
      ☐ 4-6 hours ☐ 6-8 hours
   b. Sit
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
   c. Drive
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
2. Employee may use hands for repetitive:
   ☐ Single grasping ☐ Pushing & pulling
   ☐ Fine manipulation
3. Employee may use feet for repetitive movement as in operating foot controls:
   ☐ Yes ☐ No
4. Employee is able to:

	Frequenty	Occasionally	Not all All
a. Bend	☐	☐	☐
b. Squat	☐	☐	☐
c. Climb	☐	☐	☐

PHYSICIAN'S REPORT

Diagnosis _____

Treatment _____

Other _____

_____

Date of this Report _____

☐ Referred to company physician
☐ Employee referred/admitted to:

Whom _____

Address _____

Phone _____

Date _____ Time _____

Physician's Name _____ Physician's Signature _____
Print

Address _____ Phone _____

White - Company Copy
Canary - Clinic Copy
Pink - Employee Copy

16406 U.S. Route 224 E. • P.O. Box 551 • Findlay, OH 45839-0551 • (419) 425-6064

FIRST AID LOG

Project _____

Project No. _____

Date/ Time	Name	Employee Number	Job Working When Injured	Description of Injury/Illness and Treatment

HM Corporation

DAILY SAFETY MEETING LOG

Date: _____ Client: _____

Specific Location: _____ Job No.: _____

SAFETY TOPICS PRESENTED:

Protective Clothing/Equipment: _____

_____

Chemical Hazards: _____

_____

Physical Hazards: _____

_____

Emergency Procedures: _____

_____

Hospital/Clinic: _____ Phone: _____

Hospital Address: _____

EMS Phone: _____

Special Equipment: _____

_____

Other: _____

_____

ATTENDEES:

Name Printed:	Signature:

Meeting Conducted By:

_____ _____

Name Printed Signature

DAILY SAFETY MEETING LOG
(CONTINUATION PAGE)

Date:_____ Client:_____

Specific Location:_____ Job No._____

SAFETY TOPICS PRESENTED:

ATTENDEES:

Name Printed:	Signature:

OHM Remediation Services Corp.

COMBUSTIBLE GAS INDICATOR CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

INSTRUMENT NO.: _____ CALIBRATION GAS % LEL: _____

CALIBRATION GAS: _____ CHEMICAL MONITORED: _____

CAL GAS O_2 CONCENTRATION: _____ CONVERSION FACTOR: _____

DATE	PERSON CALIBRATING	CGI READING (% LEL)	OXYGEN READING	TOX IN PPM	REMARKS

NOTE: METER READING x CONVERSION FACTOR = LEL OF ATMOSPHERE
(Conversion factor can be found in instrument manual)

OHM Corporation

HNU-PHOTOIONIZATION DETECTOR
CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

DATE:_____
INSTRUMENT NO. _____ CALIBRATION GAS: _____
LAMP TYPE: _____ CALIBRATION PERFORMED BY:_____

TIME	WEATHER CONDITIONS (TEMP/HUMIDITY)	SPAN SETTING	READING (PPM)	REMARKS

DIRECT READING INSTRUMENT LOG

Date _____ Project _____

Operator _____ Project No. _____

Instruments _____

_____

Project Activities Being Monitored _____

_____

_____

_____

Instrument/Action Level Background Reading _____

Instrument	Time	Location/Activity	Reading	Duration	Comments

OHM Corporation

DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST

EQUIPMENT I.D. NO.: _____ EQUIPMENT NAME: _____ WEEK OF: _____

ITEM INSPECTED	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Falling Object Protective Structure (FOP)							
Roll-Over Protective Structure (ROP)							
Seat Belts							
Operator Seat Bar(s)							
Side Shields, Screens or Cab							
Lift Arm Restraining Device							
Grab Handles							
Back-Up Alarm - Working							
Lights							
Guards							
Horn							
Anti-Skid Tread Steps Clear of Mud							
Safety Signs (i.e. counterbalance swing area)							
Fire Extinguisher							
General Condition							
Fuel Connection							
Oil (full and no leaks)							
Clear Of Extra Materials							
Controls function properly							
Damaged Parts							
Hydraulic System (full and no leaks)							
Parking brake							
Lift Arm and Bucket							
Tires/Tracks							
Steering							
Inspectors Name and Employee No.							

INSTRUCTIONS - Inspect all applicable items indicated, each shift. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

HM Corporation

PORTABLE FIRE EXTINGUISHER CHECKLIST

Office/Shop Location_____

INVENTORY

Serial No.	Location	Serial No.	Location

Inspection Points

1. Fire extinguisher is in assigned location
2. Access is not obstructed
3. Fire extinguisher is fully charged
4. Lock-pin in place
5. Test tag attached and current

INSPECTIONS COMPLETED

Month	Initials	Month	Initials
January		July	
February		August	
March		September	
April		October	
May		November	
June		December	

OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO._____ YEAR_____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Face-piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspectors initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.

OHM Corporation

SAR MONTHLY INSPECTION CHECKLIST

SAR ID NO._____ EGRESS ID NO._____ YEAR_____

ITEM INSPECTED	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Connections are tight												
Face-piece in good condition												
Rubber part, hoses pliable and good condition												
Regulators function properly/without flutter or free flow												
Cylinder fully charged Pressure gauge intact												
Cylinder hydrostatic test current (due at 5 yrs)												
Unit is clean, straps in good condition												
Exhalation valve functions properly												
Cylinder recharged after inspection												
Inspectors initials and employee number												

OHM Corporation

OHM Corporation
Project Site Safety Inspection Checklist

Project Name:_____
Project Number:_____
Project Location:_____
Site Supervisor:_____
Inspector's Name:_____

MEDICAL AND FIRST AID	YES	NO
1. Are First Aid Kits accessible and identified?	____	____
2. Are emergency eye wash and safety showers available?	____	____
3. Are daily logs for first aid present and up to date?	____	____
4. Are First Aid Kits inspected weekly?	____	____
PERSONAL PROTECTIVE EQUIPMENT		
1. Have levels of personnel protection been established?	____	____
2. Do all employees know their level of protection?	____	____
3. Are respirators used decontaminated, inspected, and stored according to standard procedures?	____	____
4. Have employees been fit-tested?	____	____
5. Is defective personal protective equipment tagged?	____	____
6. Does compressed breathing air meet CGA Grade "D" minimum?	____	____
7. Are there sufficient quantities of safety equipment and repair parts?	____	____
8. Does Level D protection consist of safety glasses, hard hats, and steel toe boots?	____	____
FIRE PREVENTION		
1. Is smoking prohibited in flammable storage areas?	____	____
2. Are fire lanes established and maintained?	____	____
3. Are flammable dispensing systems grounded and bonded?	____	____
4. Are approved safety cans available for storage of flammable liquids?	____	____
5. Has the local fire department been contacted?	____	____
6. Are fire extinguishers available near refueling areas?	____	____
AIR MONITORING		
1. Is air monitoring being conducted as required by the site safety plan?	____	____
2. Are air monitoring instruments calibrated daily?	____	____
3. Is the air monitoring logbooks up to date?	____	____
4. Are user manuals available?	____	____
5. Are instruments clean and charged?	____	____

WELDING AND CUTTING (29 CFR 1926 Subpart J)

1. Are fire extinguishers present at welding and cutting operations? ____ ____
2. Are confined spaces; such as, tanks, pipelines, and trenches; tested prior to cutting and welding operations? ____ ____
3. Are Hot Work Permits available? ____ ____
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations? ____ ____
5. Are welding machines properly grounded? ____ ____
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart? ____ ____
7. Are only trained personnel permitted to operate welding and cutting equipment? ____ ____

HAND AND POWER TOOLS (29 CFR 1926 Subpart I)

1. Are defective hand and power tools tagged and taken out of service? ____ ____
2. Is eye protection available and used when operating power tools? ____ ____
3. Are guards and safety devices in place on power tools? ____ ____
4. Are power tools inspected before each use? ____ ____
5. Are non-sparking tools available? ____ ____

MOTOR VEHICLES

1. Are vehicles inspected daily? ____ ____
2. Are personnel licensed for the equipment they operate? ____ ____
3. Are unsafe vehicles tagged and reported to supervision? ____ ____
4. Are vehicles shut down before fueling? ____ ____
5. When backing vehicles, are spotters provided? ____ ____
6. Is safety equipment on vehicles? ____ ____
7. Are loads secure on vehicles? ____ ____
8. Are vehicle occupants using safety belts if provided? ____ ____

EMERGENCY PLANS

1. Are emergency telephone numbers posted? ____ ____
2. Have emergency escape routes been designated? ____ ____
3. Are employees familiar with the emergency signal? ____ ____
4. Has the emergency route to the hospital been established and posted? ____ ____

MATERIALS HANDLING

1. Are materials stacked and stored as to prevent sliding or collapsing? ____ ____
2. Are flammables and combustibles stored in non-smoking areas? ____ ____
3. Is machinery braced when personnel are performing maintenance? ____ ____
4. Are tripping hazards labeled? ____ ____
5. Are semi-trailers chocked? ____ ____
6. Are fixed jacks used under semi-trailers? ____ ____
7. Are riders prohibited on materials handling equipment? ____ ____
8. Are cranes inspected as prescribed and logged? ____ ____
9. Are OSHA approved manlifts provided for the lifting of personnel? ____ ____
10. Are personnel in manlifts wearing approved fall protection devices? ____ ____

FIRE PROTECTION

1. Has a fire alarm been established? ____ ____
2. Do employees know the location and use of all fire extinguishers? ____ ____
3. Are fire extinguisher locations marked? ____ ____

FIRE PROTECTION (Continued)

4. Are combustible materials segregated from open flames? ____ ____
5. Have fire extinguishers been professionally inspected during the last year? ____ ____
6. Are fire extinguishers visually inspected monthly? ____ ____

ELECTRICAL (29 CFR 1926 Subpart K)

1. Is electrical equipment and wiring properly guarded? ____ ____
2. Are electrical lines, extension cords, and cables guarded and maintained in good conditions? ____ ____
3. Are extension cords kept out of wet areas? ____ ____
4. Is damaged electrical equipment tagged and taken out of service? ____ ____
5. Have underground electrical lines been identified by proper authorities? ____ ____
6. Has positive lock-out system been established by a certified project electrician? ____ ____
7. Are GFCI's being used as needed? ____ ____
8. Are extension cords being inspected daily for ground continuity and structural integrity? (i.e., group pin in place, no unapproved splices) ____ ____
9. Are warning signs exhibited on high voltage equipment (250V or greater)? ____ ____
10. Is extension cord inspection documented?

CRANES AND RIGGING (29 CFR 1926.550)

1. Are cranes inspected daily? ____ ____
2. Are crane swing areas barricaded or demarked? ____ ____
3. Is all rigging equipment tagged with an identification number and rated capacity? ____ ____
4. Is rigging equipment inspection documented? ____ ____
5. Are slings, chains, and rigging inspected before each use? ____ ____
6. Are damaged slings, chains, and rigging tagged and taken out of service? ____ ____
7. Are slings padded or protected from sharp corners? ____ ____
8. Do employees keep clear of suspended loads? ____ ____
9. Are employees in the lift area wearing hard hats? ____ ____

COMPRESSED GAS CYLINDERS

1. Are breathing air cylinders charged only to prescribed pressures? ____ ____
2. Are like cylinders segregated in well ventilated areas? ____ ____
3. Is smoking prohibited in cylinder storage areas? ____ ____
4. Are cylinders stored secure and upright? ____ ____
5. Are cylinders protected from snow, rain, etc.? ____ ____
6. Are cylinder caps in place before cylinders are moved? ____ ____
7. Are fuel gas and 02 cylinders stored a minimum of 20 feet apart? ____ ____
8. Are propane cylinders stored and used outside the structure? ____ ____

SCAFFOLDING (29 CFR 1926.451)

1. Is scaffolding placed on a flat, firm surface? ____ ____
2. Are scaffold planks free of mud, ice, grease, etc.? ____ ____
3. Is scaffolding inspected before each use? ____ ____
4. Are defective scaffold parts taken out of service? ____ ____
5. Does mobile scaffold height exceed 4 times the width or base dimension? ____ ____
6. Does scaffold planking overlap a minimum of 12 inches? ____ ____
7. Does scaffold planking extend over end supports between 6 to 18 inches? ____ ____
8. Are employees restricted from working on scaffolds during storms and high winds? ____ ____
9. Are all pins in place and wheels locked? ____ ____
10. Is perimeter guarding (top rail, mid rail, and toe board) present? ____ ____

WALKING AND WORKING SURFACES

1. Are ladders a Type I or Type II? ____ ____
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? ____ ____
3. Are ladders being used in a safe manner? ____ ____
4. Are ladders kept out of passageways, doors, or driveways? ____ ____
5. Are broken or damaged ladders tagged and taken out of service? ____ ____
6. Are metal ladders prohibited in electrical service? ____ ____
7. Are stairways and floor openings guarded? ____ ____
8. Are safety feet installed on straight and extension ladders? ____ ____
9. Is general housekeeping up to OHM standards? ____ ____
10. Are ladders tied off? ____ ____

SITE SAFETY PLAN

1. Is a site safety plan available on site or accessible to all employees? ____ ____
2. Does the safety plan accurately reflect site conditions and tasks? ____ ____
3. Have potential hazards been described to employees on site? ____ ____
4. Is there a designated safety official on site? ____ ____
5. Have all employees signed the acknowledgement form? ____ ____

SITE POSTERS

1. Are the following documents posted in a prominent and accessible area?

   A. Minimum Wage ____ ____
   B. OSHA Health and Safety ____ ____
   C. Equal Employment Opportunity ____ ____

SITE CONTROL

1. Are work zones clearly defined? ____ ____
2. Are support trailers located to minimize exposure from a potential release? ____ ____
3. Are support trailers accessible for approach by emergency vehicles? ____ ____
4. Is the site properly secured during and after work hours? ____ ____

HEAVY EQUIPMENT (29 CFR 1926 Subpart O)

1. Is heavy equipment inspected as prescribed by the manufacturer? ____ ____
2. Is defective heavy equipment tagged and taken out of service? ____ ____
3. Are project roads and structures inspected for load capacities and proper clearances? ____ ____
4. Is heavy equipment shut down for fueling and maintenance? ____ ____
5. Are back-up alarms installed and working on equipment? ____ ____
6. Are designated operators only operating equipment? ____ ____
7. Are riders prohibited on heavy equipment? ____ ____
8. Are guards and safety appliances in place and used? ____ ____

EXCAVATION (29 CFR 1926 Subpart P)

1. Has a "competent person" been designated to supervise this excavation activity? ____ ____
2. Have utility companies been advised of excavation activities? ____ ____
3. Prior to opening excavations, are utilities located and marked? ____ ____
4. Has a professional engineer evaluated all excavations greater than 20 feet deep? ____ ____
5. Is there rescue equipment on-site and accessible to excavation? ____ ____
6. Is excavated material placed a minimum of 24 inches from the excavations? ____ ____
7. Are the sides of excavations sloped or shored to prevent caving in on employees? ____ ____

EXCAVATION (29 CFR 1926 Subpart P - Continued)

8. Has excavation greater than 4-feet deep been monitored for hazardous atmospheres (i.e. LEL/02 deficiency)? ____ ____
9. Are ladders used in excavations over 4-feet deep? ____ ____
10. Are ladders present every 25 feet? ____ ____
11. Are barriers, i.e. guardrails or fences placed around excavations near pedestrian or vehicle thoroughfares? ____ ____
12. Is excavation inspected daily by competent persons and documented? ____ ____

CONFINED SPACES (Proposed Regulation 29 CFR 1910.146)

1. Have employees been trained in the hazards of confined spaces? ____ ____
2. Are confined space permits available on project site? ____ ____
3. Is the contractors confined space safety procedure on the project? ____ ____
4. Has a rescue plan been established? ____ ____

PERSONNEL DECONTAMINATION

1. Are decontamination stations set up on site? ____ ____
2. Are waste receptacles available for contaminated clothing? ____ ____
3. Are steps taken to contain liquids used for decontamination? ____ ____
4. Have decontamination steps and procedures been covered by the site supervisor or safety official? ____ ____
5. Is all personal protective equipment and respiratory equipment being cleaned on a daily basis? ____ ____

EQUIPMENT DECONTAMINATION

1. Has equipment decontamination been established? ____ ____
2. Is contamination wash water properly contained and disposed of? ____ ____
3. Are all pieces of equipment inspected for proper decontamination before leaving the site? ____ ____
4. Is all equipment being cleaned on a daily basis? ____ ____

HAZARD COMMUNICATION (29 CFR 1926.59)

1. Is there a written program on-site? ____ ____
2. Is there a MSDS FOR EACH CHEMICAL present on-site? ____ ____
3. Are all containers properly labeled, as to content, hazard? ____ ____
4. Have employees been trained on chemical hazards? ____ ____
5. Are employee's trained on chemical hazards while doing non-routine tasks? ____ ____
6. Do employees (including subcontractors) know and understand the acute and chemical effects of exposure from the chemicals on-site? ____ ____
7. Have all subcontractors signed the Haz-Comm acknowledgement form? ____ ____

I have reviewed this inspection checklist with the safety inspector and fully understand the recommendation and will make every attempt to correct them immediately.

	Signature	Date
Site Supervisor:	_____	_____
Project Manager:	_____	_____
OHM Compliance Inspector:	_____	_____

OHM Remediation Services Corp.

SITE SAFETY OFFICER DAILY REPORT

DATE: _____ PROJECT NO. _____

SSO: _____ PROJECT NAME: _____

SITE SUPERVISOR: _____

Safety Meeting Topics:		
Air Monitoring Instruments	Calculated/Checked	Task Monitored
Other Activities		

OHM Site Activities

Task Performed	Protection Level	Type Air Monitoring

Subcontractor Activities

Safety Observation/Issues

OHM REMEDIATION SERVICES CORP.

Air Sampling & Analysis Log

Project No. _____ Page _____ of _____

Project Name: _____

Field Sampling ID No.	Date	Sampler's Initials	Sample Type (BZ / Area)	Air Volume (Liters)	Analyte Amount (mg.)	Concentration (mg / M / ppm)

OHM REMEDIATION SERVICES CORP.

AIR SAMPLING DATA SHEET

Project No.: _____ Field Sample ID No. _____

Project Name: _____ Sampler _____

Personnel Monitoring Data:

Employee Name: _____

Job Title / Work Duties: _____

PPE Used: _____

Work Location: _____

Area Monitoring Data

Project Activity: _____

Location: _____

Weather Conditions: _____

Pump No.		Sampling Media:	
Pre-Flow Rate (LPM)			
Post-Flow Rate (LPM)		Analyte:	
Avg-Flow Rate (LPM)		Analytical Results:	
Start Time (Min)			
Stop Time (Min)		Notes:	
Total Time (Min)			
Total Air Volume (L)			

OHM

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 03/88

No. 62119

O.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

PROJECT NAME | PROJECT LOCATION

PROJ NO | PROJECT CONTACT | PROJECT TELEPHONE NO

CLIENT'S REPRESENTATIVE | PROJECT MANAGER/SUPERVISOR

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)								REMARKS
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1					
2					
3					
4					

REMARKS

SAMPLER'S SIGNATURE

PLEASE PRESS HARD. ALL 4 PARTS MUST BE READABLE

FIGURE 7.2

CHAIN-OF-CUSTODY RECORD

OHM Corporation

APPENDIX C

MATERIAL SAFETY DATA SHEETS

Gasoline
Motor oil
Anti-fog
Bleach/detergent
Diesel fuel
Fire extinguishers
Gear lube
Grease
Liquid detergent
Breathing air
Isobutylene (calibration gas)
Isopropyl alcohol
Methane (calibration gas)
Oil (hydraulic)
Pentane (calibration gas)
Starting fluid
WD-40

MATERIAL SAFETY DATA SHEET

BAUSCH & LOMB, INCORPORATED
PERSONAL PRODUCTS DIVISION

Effective Date: August 30, 1995 Supersedes: NA

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: SIGHT SAVERS brand ANTI-FOG LIQUID
Product Code: 24, 25, 68, 69, 8565, 8569, 8570, 143060
Chemical Family: NA

For Information: 1-800-553-5340
For Emergency: 1-800-553-5340

Manufacturer: Bausch & Lomb, Inc.
Personal Products Division
P. O. Box 450
1400 N. Goodman St.
Rochester, New York 14692

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT:	CAS #	PERCENTAGE (W/V)	EXPOSURE STANDARDS/GUIDELINES* OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL	UNITS
Isopropyl alcohol	67-63-0	12	400	500	400	500	ppm
Dipropylene glycol methyl ether	34590-94-8	2	100	150	100	150	ppm

Other components considered as non-hazardous ingredients

NE = Not Established
STEL = Short Term Exposure Limit
OSHA = Occupational Safety & Health Administration

NA = Not Applicable
TWA = Time Weighted Average
ACGIH = American Conference of Governmental Industrial Hygienists

Section 3: HAZARDS IDENTIFICATION

PRECAUTIONS TO CONSIDER: This product is intended to be used to clean lenses in personal items such as eyeware, face shields, etc. This product is not intended to be ingested nor administered through any other routes of exposure. If you are sensitive to any ingredient in this product, do not use.

EYE CONTACT: This product is intended to be used per label instructions. Avoid eye contact. In the event of accidental eye contact flush with water for 15 minutes and obtain medical assistance.

SKIN CONTACT: This product is intended to be used per label instructions. Discontinue use if skin irritation develops.

INGESTION: In the event of ingestion of this product or any other untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Accidental ingestion of Sight Savers Anti-fog liquid may cause gastric and intestinal irritation. Ingestion of larger quantities may cause nausea, vomiting, headache, dizziness, abdominal pain or related gastrointestinal disturbance. Give fluids and seek medical care.

INHALATION: Normal use of this product will not present an inhalation hazard. An acute exposure to high concentrations, as from a large spill, may result in upper respiratory tract irritation and central nervous system depression. Move to fresh air and seek medical attention.

CARCINOGENICITY: None of the ingredients contained in this product are listed under IARC, NTP or 29 CFR 1910 subpart Z (as a suspect or known carcinogen).

Section 4: FIRST AID MEASURES

SKIN, INGESTION, INHALATION: Skin irritation is not expected. Should irritation develop discontinue use. This product is not intended to be ingested or taken internally. In the event of ingestion of contents or any untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Refer to the statements in sections 3 and 11.

Section 5: FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: This product is flammable.

FLASH POINT: 88° F Method: closed cup
FLAMMABLE LIMITS: Lower Flammable Limit: NA Upper Flammable Limit: NA
AUTO IGNITION TEMPERATURE: NA

HAZARDOUS DECOMPOSITION/ COMBUSTION PRODUCTS: Carbon dioxide and carbon monoxide.

Section 5: FIRE FIGHTING MEASURES - CONTINUED

FIRE FIGHTING INSTRUCTIONS: As with all fires, evacuate personnel to safe area. Normal fire fighting procedures may be used.

EXTINGUISHING MEDIA: Use foam, CO_2, dry chemical, or water fog.

Section 6: ACCIDENTAL RELEASE MEASURES

SPILL: Remove sources of ignition and absorb with vermiculite or other absorbent. Use respiratory protection and gloves.

DISPOSAL: Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waster per 40 CFR, Part 261.11

Section 7: HANDLING AND STORAGE

HANDLING/STORAGE CONDITIONS: This product is stable and non-reactive. Keep away from heat, sparks and flame.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following information assumes and pertains to situations where an event (such as warehouse storage or an industrial accident) occurs with large quantities of this product.

ENGINEERING CONTROLS: Not Applicable

RESPIRATORY PROTECTION:

Ventilation: General room ventilation

Respirator: A respirator with organic vapor cartridges should be used for spill cleanup.

SKIN AND EYE PROTECTION: Eye protection should worn to protect against splash hazards and gloves should be used to prevent prolonged skin contact during spill cleanup.

ADDITIONAL PROTECTIVE CLOTHING & EQUIPMENT: Not Applicable

HYGIENIC WORK PRACTICES: No special work practices are required.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT APPEARANCE: Purple liquid. Refer to product labeling for description.
ODOR: Slight odor of rubbing alcohol.
PHYSICAL STATE: Liquid

CHEMICAL PROPERTIES:

BOILING POINT:	212 ° F	MELTING POINT:	NA
VAPOR PRESSURE:	30 mm @ 77 ° F	VAPOR DENSITY:	NA
SOLUBILITY IN WATER:	Soluble	SPECIFIC GRAVITY:	1.0
VISCOSITY:	Same as water	EVAPORATION RATE:	<1 (i.e. Butyl Acetate = 1)
pH:	7	% VOLATILE:	100%
MOLECULAR WEIGHT:	NA	FREEZING POINT:	0 ° C or 32 ° F

Section 10: STABILITY AND REACTIVITY

GENERAL STABILITY CLASSIFICATION: This product is stable and non-reactive.

INCOMPATIBLE MATERIALS/ CONDITIONS TO AVOID: Prevent contact with strong acids and bases, as with water.

HAZARDOUS DECOMPOSITION: None

Section 11: TOXICOLOGICAL INFORMATION

TOXICITY: Under normal use of this product (per label instructions) there is low toxicity potential associated with this product.

COMPONENT	PERCENTAGE (W/V)	TOXICOLOGICAL DATA	
Isopropyl alcohol	12	LCLo	16,000 ppm/4 hours
Dipropylene glycol methyl ether	2	LD_{50}(dog)	7500 mg/kg

Section 12: ECOLOGICAL INFORMATION

Ecological effects have not been determined at this time.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 14: TRANSPORT INFORMATION

There is no unreasonable risk (health, safety or property) that this product would pose when transported in commerce. Hazard class definitions (49 CFR, Part 173) are not applicable to this product.

Section 15: REGULATORY INFORMATION

TSCA: NA

CERCLA: NA

SARA TITLE III:

- SECTION 302 (Extremely Hazardous Substances): NA
- SECTION 311/312 (Hazard Categories): NA
- SECTION 313 (Toxic Chemicals): NA

TSCA = Toxic Substance Control Act
CERCLA = Comprehensive Response Compensation, and Liability Act
Sara Title III = Superfund Amendment and Reauthorization Act

SECTION 16: OTHER INFORMATION

The information contained herein is provided upon request without warranty of any kind. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make independent determinations of the suitability and completeness of information from other sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Bausch and Lomb Incorporated recommends that use of this product is in accordance with product labeling and appropriate safety practices and handling procedures.

MATERIAL SAFETY DATA SHEET

BAUSCH & LOMB, INCORPORATED
PERSONAL PRODUCTS DIVISION

Effective Date: August 30,1995 Supersedes: NA

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: SIGHT SAVERS brand ANTI-FOG LIQUID WITHOUT SILICONE
Product Code: 68GM, 69GM, 8565GM, 8569GM, 8570GM, 143060GM
Chemical Family: NA

For Information: 1-800-553-5340
For Emergency: 1-800-553-5340

Manufacturer: Bausch & Lomb, Inc.
Personal Products Division
P. O. Box 450
1400 N. Goodman St.
Rochester, New York 14692

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT:	CAS #	PERCENTAGE (W/V)	EXPOSURE STANDARDS/GUIDELINES* OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL	UNITS
Isopropyl alcohol	67-63-0	12	400	500	400	500	ppm
Dipropylene glycol methyl ether	34590-94-8	2	100	150	100	150	ppm

Other components considered as non-hazardous

NE = Not Established
STEL = Short Term Exposure Limit
OSHA - Occupational Safety & Health Administration

NA = Not Applicable
TWA = Time Weighted Average
ACGIH = American Conference of Governmental Industrial Hygienists

Section 3: HAZARDS IDENTIFICATION

PRECAUTIONS TO CONSIDER: This product is intended to be used to clean lenses in personal items such as eyeware, face shields, etc. This product is not intended to be ingested nor administered through any other routes of exposure. If you are sensitive to any ingredient in this product, do not use.

EYE CONTACT: This product is intended to be used per label instructions. Avoid eye contact. In the event of accidental eye contact flush with water for 15 minutes and obtain medical assistance.

SKIN CONTACT: This product is intended to be used per label instructions. Discontinue use if skin irritation develops.

INGESTION: In the event of ingestion of this product or any other untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Accidental ingestion of Sight Savers Anti-fog Liquid may cause gastric and intestinal irritation. Ingestion of larger quantities may cause nausea, vomiting, headache, dizziness, abdominal pain or related gastrointestinal disturbance. Give fluids and seek medical care.

INHALATION: Normal use of this product will not present an inhalation hazard. An acute exposure to high concentrations, as from a spill, may result in upper respiratory tract irritation and central nervous system depression. Move to fresh air and seek medical care.

CARCINOGENICITY: None of the ingredients contained in this product are listed under IARC, NTP or 29 CFR 1910 subpart Z (as a suspect or known carcinogen).

Section 4: FIRST AID MEASURES

SKIN, INGESTION, INHALATION: Skin irritation is not expected. However, should irritation develop discontinue use. This product is not intended to be ingested or taken internally. In the event of ingestion of contents or any untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Refer to the statements in sections 3 and 11.

Section 5: FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: This product is flammable.

FLASH POINT: 88° F Method: closed cup
FLAMMABLE LIMITS: Lower Flammable Limit: NA Upper Flammable Limit: NA
AUTO IGNITION TEMPERATURE: NA

HAZARDOUS DECOMPOSITION/ COMBUSTION PRODUCTS: Carbon dioxide and carbon monoxide.

Section 5: FIRE FIGHTING MEASURES - CONTINUED

FIRE FIGHTING INSTRUCTIONS: As with all fires, evacuate personnel to safe area. Normal fire fighting procedures may be used.

EXTINGUISHING MEDIA: Use foam, CO_2, dry chemical, or water fog.

Section 6: ACCIDENTAL RELEASE MEASURES

SPILL: Remove sources of ignition and absorb with vermiculite or other absorbent. Use respiratory protection and gloves.

DISPOSAL: Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waster per 40 CFR, Part 261.11

Section 7: HANDLING AND STORAGE

HANDLING/STORAGE CONDITIONS: This product is stable and non-reactive. Keep away from heat, sparks and flame.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following information assumes and pertains to situations where an event (such as warehouse storage or an industrial accident) occurs with large quantities of this product.

ENGINEERING CONTROLS: Not Applicable

RESPIRATORY PROTECTION:

Ventilation: General room ventilation

Respirator: A respirator with organic vapor cartridges should be used for spill cleanup.

SKIN AND EYE PROTECTION: Eye protection should worn to protect against splash hazards and gloves should be used to prevent prolonged skin contact during spill cleanup.

ADDITIONAL PROTECTIVE CLOTHING & EQUIPMENT: Not Applicable

HYGIENIC WORK PRACTICES: No special work practices are required.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT APPEARANCE: Clear liquid. Refer to product labeling for description.
ODOR: Slight odor of rubbing alcohol.
PHYSICAL STATE: Liquid

CHEMICAL PROPERTIES:

BOILING POINT:	212 ° F	MELTING POINT:	NA
VAPOR PRESSURE:	30 mm @ 77 ° F	VAPOR DENSITY:	NA
SOLUBILITY IN WATER:	Soluble	SPECIFIC GRAVITY:	1.0
VISCOSITY:	Same as water	EVAPORATION RATE:	<1 (i.e. Butyl Acetate = 1)
pH:	7	% VOLATILE:	100%
MOLECULAR WEIGHT:	NA	FREEZING POINT:	0 ° C or 32 ° F

Section 10: STABILITY AND REACTIVITY

GENERAL STABILITY CLASSIFICATION: This product is stable and non-reactive.

INCOMPATIBLE MATERIALS/ CONDITIONS TO AVOID: Prevent contact with strong acids and bases, as with water.

HAZARDOUS DECOMPOSITION: None

Section 11: TOXICOLOGICAL INFORMATION

TOXICITY: Under normal use of this product (per label instructions) there is low toxicity potential associated with this product.

COMPONENT	PERCENTAGE (W/V)	TOXICOLOGICAL DATA
Isopropyl alcohol	12	LCLo 16,000 ppm/4 hours
Dipropylene glycol methyl ether	2	LD_{50} (dog) 7500 mg/kg

Section 12: ECOLOGICAL INFORMATION

Ecological effects have not been determined at this time.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 14: TRANSPORT INFORMATION

There is no unreasonable risk (health, safety or property) that this product would pose when transported in commerce. Hazard class definitions (49 CFR, Part 173) are not applicable to this product.

Section 15: REGULATORY INFORMATION

TSCA : NA

CERCLA: NA

SARA TITLE III:

- SECTION 302 (Extremely Hazardous Substances): NA
- SECTION 311/312 (Hazard Categories): NA
- SECTION 313 (Toxic Chemicals): NA

TSCA = Toxic Substance Control Act
CERCLA = Comprehensive Response Compensation, and Liability Act
Sara Title III = Superfund Amendment and Reauthorization Act

SECTION 16: OTHER INFORMATION

The information contained herein is provided upon request without warranty of any kind. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make independent determinations of the suitability and completeness of information from other sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Bausch and Lomb Incorporated recommends that use of this product is in accordance with product labeling and appropriate safety practices and handling procedures.

The Clorox Company
7200 Johnson Drive
Pleasanton, California 94588
Tel. (510) 847-6100

Material Safety Data Sheet

I Product: CLOROX BLEACH - FOR INSTITUTIONAL USE

Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR

Other Designations	Manufacturer	Emergency Telephone No.
EPA Reg. No. 5813-1 Sodium hypochlorite soultion Liquid chlorine bleach Clorox Liquid Bleach Clorox Germicidal Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	For Medical Emergencies, call Rocky Mountain Poison Center: 1-800-446-1014 For Transportation Emergencies, call: Chemtrec: 1 800-424-9300

II Health Hazard Data

Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.

FIRST AID: EYE CONTACT: Immediately flush eyes with plenty of water. If irritation persists, see a doctor. SKIN CONTACT: Remove contaminated clothing. Wash area with water. INGESTION: Drink a glassful of water and call a physician. INHALATION: If breathing problems develop remove to fresh air.

III Hazardous Ingredients

Ingredients	Concentration	Worker Exposure Limit
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.

IV Special Protection and Precautions

Hygienic Practices: Wear safety glasses. With repeated or prolonged use, wear gloves.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Work Practices: Avoid eye and skin contact and inhalation of vapor or mist.

Keep out of the reach of children.

V Transportation and Regulatory Data

U.S. DOT Hazard Class: Not restricted

U.S. DOT Proper Shipping Name: Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(c)(12)(iv).

EPA CERCLA/SARA TITLE III Superfund Amendment and Reauthorization Act:

	CERLA/304		
	RQ (lbs)	311/312	313
Sodium hypochlorite	100	—	—
Sodium hydroxide	1000	Yes	—

VI Spill or Leak Procedures

Small Spills (<5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations. (2) Wash down residual to sanitary sewer.*

Large Spills (>5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Not flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.

IX Physical Data

Boiling point ..... 212°F/100°C decomposes)
Specific Gravity (H_2O=1) 1.085
Solubility in Water ..... complete
pH 11.4

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DATE PREPARED 11/92

The Clorox Company
7200 Johnson Drive
Pleasanton, California 94588
Tel. (510) 847-6100

Material Safety Data Sheet

I Product: REGULAR CLOROX BLEACH

Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR

Other Designations	Manufacturer	Emergency Telephone No.
Sodium hypochlorite solution Liquid chlorine bleach Clorox Liquid Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	Notify your Supervisor Rocky Mountain Poison Center (800) 446-1014 For Transportation Emergencies Chemtrec (800) 424-9300

II Health Hazard Data

*Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.

FIRST AID: EYE CONTACT: Immediately flush eyes with plenty of water. If irritation persists, see a doctor. SKIN CONTACT: Remove contaminated clothing. Wash area with water. INGESTION: Drink a glassful of water and call a physician. INHALATION: If breathing problems develop remove to fresh air.

III Hazardous Ingredients

Ingredients	Concentration	Worker Exposure Limit
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.

IV Special Protection and Precautions

Hygienic Practices: Wear safety glasses. With repeated or prolonged use, wear gloves.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Work Practices: Avoid eye and skin contact and inhalation of vapor or mist.

Keep out of the reach of children.

V Transportation and Regulatory Data

U.S. DOT Hazard Class: Not restricted

U.S. DOT Proper Shipping Name: Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(c)(12)(iv).

Section 313 (Title III Superfund Amendment and Reauthorization Act): As a consumer product, this product is exempt from supplier notification requirements under Section 313 Title III of the Superfund Amendment and Reauthorization Act of 1986 (reference 40 CFR Part 372).

VI Spill or Leak Procedures

Small Spills (<5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations.
(2) Wash down residual to sanitary sewer.*
Large Spills (>5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*

* Contact the sanitary treatment facility in advance to assure ability to process washed-down material.

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Not flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.

IX Physical Data

Boiling point ..... 212°F/100°C (decomposes)
Specific Gravity (H_2O=1) 1.085
Solubility in Water ..... complete
pH 11.4

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DATA SUPPLIED IS FOR USE ONLY IN CONNECTION WITH OCCUPATIONAL SAFETY AND HEALTH

DATE PREPARED 11/92

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

33

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.

Other Designations: CAS No. 68334-30-5, diesel fuel.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(TM) for a suppliers list.

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

R	1
I	-
S	2
K	2

NFPA

HMIS
H 0
F 2
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data‡
None established	Mineral Oil Mist TWA: 5 mg/m³† STEL: 10 mg/m³	None established	Rat, oral, LD_{50}: 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.
† As sampled by nonvapor-collecting method.
‡ Monitor NIOSH, *RTECS* (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)
Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)
Specific Gravity: <0.86
Water Solubility: Insoluble

Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

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ction 6. Health Hazard Data

-cinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in oleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human :inogens (Group 3).

nm[illegible]f Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives n a[illegible]rized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and of c[illegible]dination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover ipletely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal in-/ement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also :lt in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumato- formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. .onged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on s and legs.

ilical Conditions Aggravated by Long-Term Exposure: None reported.

get Organs: Central nervous system, skin, and mucous membranes.

nary Entry Routes: Inhalation, ingestion.

te Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system ession, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid t beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).

onic Effects: Repeated contact with the skin causes dermatitis.

ST AID

s: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical ity. Consult a physician immediately.

: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been sed or if irritation persists, get medical help immediately. Wash affected area with soap and water.

ilation: Remove exposed person to fresh air and support breathing as needed.

stion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. act a physician immediately. Position to avoid aspiration.

r first aid, get appropriate in-plant, paramedic, or community medical support.

: to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe ation pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become rmal or symptoms develop, obtain a chest x-ray.

tion 7. Spill, Leak, and Disposal Procedures

/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof lation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclama- or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.

osal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

D[illegible]tions

A [illegible]dous Waste (40 CFR 261.21): Ignitable waste

CLA Hazardous Substance (40 CFR 302.4): Not listed

A Extremely Hazardous Substance (40 CFR 355): Not listed

A Toxic Chemical (40 CFR 372.65): Not listed

A Designations

Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

tion 8. Special Protection Data

;les: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

irator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if neces- use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, or vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

r: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

ilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and ictivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]

y Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

aminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this ial from your shoes and equipment. Launder contaminated clothing before wearing.

ments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, ing, using the toilet, or applying cosmetics.

ion 9. Special Precautions and Comments

ge Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static s, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools xplosion-proof electrical equipment. No smoking in storage or use areas.

neering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses : contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working tions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good nal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recom- ed. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

sportation Data (49 CFR 172.101)

Shipping Name: Fuel oil

Ha[illegible] Class: Combustible liquid

[illegible]3

Label: None

Packaging Exceptions: 173.118a

Packaging Requirements: None

Collection References: 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146

ed by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: AC Darlington, MD; Edited by: JR Stuart, MS

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17-325; 17-325-2; 17-325-3 No. 7

ANSUL® ANSUL FIRE PROTECTION MARINETTE, WI 54143-2542

MATERIAL SAFETY DATA SHEET

FORAY
QUICK IDENTIFIER (In Plant Common Name)

Manufacturer's Name:	ANSUL FIRE PROTECTION, WORMALD U.S., INC.	Emergency Telephone No.:	(715) 735-7411
Address:	One Stanton Street, Marinette, WI 54143-2542	Other Information Calls:	Same
Prepared By:	Safety and Health Department	Date Prepared:	June 1, 1989

SECTION 1 — IDENTITY

Common Name: (used on label) (Trade Name and Synonyms)	FORAY Dry Chemical Extinguishing Agent	CAS No.:	N/A
Chemical Name:	N/A This is a Mixture	Chemical Family:	Mixture
Formula:	N/A		

SECTION 2 — INGREDIENTS

PART A — HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) (chemical and common name(s)):	%	CAS No.	ACGIH TLV	Acute Toxicity Data
Muscovite Talc	Less than 5	12001-26-2	20 mppcf*	NDA
Magnesium Aluminum Silicate	Less than 10	8031-18-3	10 mg/M3	NDA

*Million particles per cubic foot

PART B — OTHER INGREDIENTS

Other Component(s) (chemical and common name(s)):	%	CAS No.	Acute Toxicity Data
Monoammonium Phosphate	Greater than 75	7722-76-1	NDA
Ammonium Sulfate	Greater than 10	7783-20-2	NDA
Methyl Hydrogen Polysiloxane	Less than 1	63148-57-2	NDA
Yellow Pigment	Less than 0.1	5468-75-7	NDA

SECTION 3 — PHYSICAL AND CHEMICAL CHARACTERISTICS (Fire and Explosion Data)

Boiling Point:	N/A			Specific Gravity (H_2O = 1):	N/A	Vapor Pressure (mm Hg):	N/A
Percent Volatile by Volume (%):	N/A	Vapor Density (Air = 1):	N/A	Evaporation Rate (= 1):	N/A		
Solubility in Water:	Slight			Reactivity in Water:	Unreactive		
Appearance and Odor:	Yellow colored powder, no characteristic odor						
Flash Point:	None	Flammable Limits in Air % by Volume:	N/A	Extinguisher Media:	N/A	Auto-ignition Temperature:	N/A
Special Fire Fighting Procedures:	NONE — THIS IS AN EXTINGUISHING AGENT						
Unusual Fire and Explosion Hazards:	None						

SECTION 4 — PHYSICAL HAZARDS

Stability:	Unstable ☐ Stable ☒	Conditions to Avoid:	N/A
Incompatibility (Materials to Avoid):	Strong alkalis, Mg		
Hazardous Decomposition Products:	NH_3 and/or PO_x may be evolved		
Hazardous Polymerization:	May Occur ☐ Will Not Occur ☒	Conditions to Avoid:	N/A

No. 5

SECTION 5 — HEALTH HAZARDS

Threshold Limit Value:	OSHA nuisance dust limit of 15 mg/M3 or ACGIH nuisance dust value of 10 mg/M3 for the eight hour time-weighted average.
Routes of Entry: Eye Contact:	Mildly irritating for a short period of time.
Skin Contact:	May be mildly irritating.
Inhalation:	Treat as a mineral dust. Irritant to the respiratory tract.
Ingestion:	Not an expected route of entry.
Signs and Symptoms: Acute Overexposure:	Transient cough, shortness of breath.
Chronic Overexposure:	Chronic fibrosis of the lung, pneumoconiosis.
Medical Conditions Generally Aggravated by Exposure:	Reactive airway
Chemical Listed as Carcinogen or Potential:	National Toxicology Program: Yes ☐ No ☒ — I.A.R.C. Monographs: Yes ☐ No ☒ — OSHA: Yes ☐ No ☒

SECTION 6 — EMERGENCY AND FIRST AID PROCEDURES

Eye Contact:	Flush with large amounts of water; if irritation persists, seek Medical attention.
Skin Contact:	Wash with soap and water; if irritation persists, seek Medical attention.
Inhalation:	Remove victim to fresh air. Seek Medical attention if discomfort continues.
Ingestion:	If patient is conscious, give large amounts of water and induce vomiting. Seek Medical help.

SECTION 7 — SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type):	Dust mask where dustiness is prevalent, or TLV exceeded. Mechanical filter respirator if exposure is prolonged.			
Ventilation:	Local Exhaust:	Discretionary	Mechanical (General):	Recommended
Protective Gloves:	N/A		Eye Protection:	Recommended as mechanical barrier for prolonged exposure.
Other Protective Clothing or Equipment:	If irritation occurs, long sleeves and impervious gloves should be worn.			

SECTION 8 — SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage:	Should be stored in original container or Ansul fire extinguisher.
Other Precautions:	Do not mix agents.
Steps to be Taken in Case Material is Released or Spilled:	Sweep up.
Waste Disposal Methods:	Dispose of in compliance with local, state, and federal regulations.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS

HAZARD INDEX:	
4 Severe Hazard	1 HEALTH
3 Serious Hazard	0 FLAMMABILITY
2 Moderate Hazard	0 REACTIVITY
1 Slight Hazard	
0 Minimal Hazard	

N/A = Not Applicable NDA = No Data Available

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Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

35

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA

HMIS
H 2
F 3
R 1
PPG†
† Sec. 8

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs
8-hr TWA: 300 ppm, 900 mg/m³
15-min STEL: 500 ppm, 1500 mg/m³

1990-91 ACGIH TLVs
TWA: 300 ppm, 890 mg/m³
STEL: 500 ppm, 1480 mg/m³

1990 NIOSH REL
None established

1985-86 Toxicity Data*
Man, inhalation, TC_{Lo}: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC_{50}: 300 g/m³/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.
† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)
Vapor Density (air = 1): 3.0 to 4.0
Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)
Water Solubility: Insoluble

Appearance and Odor: A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C)	Autoignition Temperature: 536 to 853 °F (280 to 456 °C)	LEL: 1.3% v/v	UEL: 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

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Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).
Summary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eye, respiratory and central nervous systems.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.
Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).
Aquatic Toxicity: Bluegill, freshwater, LC_{50}, 8 ppm/96 hr.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
SARA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
RCRA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. Note: Resistance of specific materials can vary from product to product.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Gasoline (*including casing-head and natural*)
DOT Hazard Class: Flammable liquid
ID No.: UN1203
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline
IMO Hazard Class: 3.1
ID No.: UN1203
IMO Label: Flammable liquid
IMDG Packaging Group: II

MSDS Collection References: 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159
Prepared by: M Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: W Silverman, MD; Edited by: JR Stuart, MS

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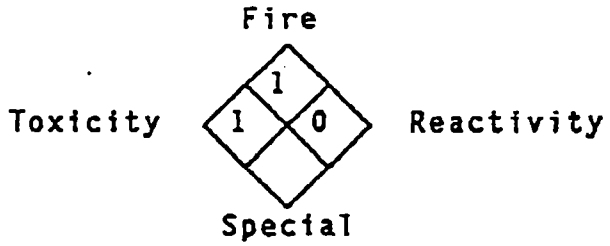
WITCO MATERIAL SAFETY DATA SHEET

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

Product Code: 473 6752

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: AMALIE REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
ONE AMALIE WAY,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon plus additives
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: liquid Odor: pungent,sulfur type
Appearance: viscous liquid Color: green to brown
Specific Gravity (water=1): .89
Boiling Point: greater than 330°C (625°F)
Melting Point: -18°C (0°F)
Solubility in Water (by weight %): 0 at 20°C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not volatile
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Less than 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none
Flashpoint: (Method Used) Cleveland open cup greater than 190°C (375°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).
Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Call a physician immediately. DO NOT induce vomiting. (Vomiting may cause aspiration into lungs resulting in chemical pneumonia.)

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.
Protective Gloves:
neoprene type
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

Product Code: 473 6752

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/20/81 Sent to:
Revision Date: 07/19/94
Supersedes : 04/01/93
Date Sent :

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

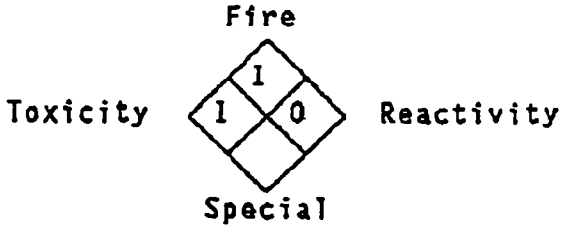
We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

Product Code: J63 7834

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon and calcium stearate
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: semi-solid
Odor: mineral oil
Appearance: grease
Color: black
Specific Gravity (water=1): .94
Boiling Point: greater than 260°C (500°F)
Melting Point: not applicable
Solubility in Water (by weight %): negligible
Volatile (by weight %): negligible
Evaporation Rate: negligible
Vapor Pressure (mm Hg at 20°C): negligible
Vapor Density (air=1): not applicable
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

Product Code: J63 7834

(Section III continued)

Flashpoint: (Method Used) ASTM D92 greater than 210°C (410°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam or Sand/Earth
Water may cause frothing.
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
not applicable
Chronic effects of overexposure:
Extended skin contact may cause dermatitis to some individuals.
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
none required
Respiratory Protection (Specify type):
none required
Protective Gloves:
rubber
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.
Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

Product Code: J63 7834

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Grease
Special Transportation Notes:

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
Partial contents are withheld as trade secret information.

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 06/18/82 Sent to:
Revision Date: 08/09/94
Supersedes : 04/01/93
Date Sent :

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

ACA Gas Inc.
6225 Oaktree Blvd.
P.O. Box 94737
Cleveland, Ohio 44101-4737

Telephone
(216) 642-6600

MATERIAL SAFETY DATA SHEET No. 12

PRODUCT NAME Compressed Air	CAS # N/A
TRADE NAME AND SYNONYMS Compressed Air; Air; Compressed Air, Breathing Quality	DOT ID No. UN 1002
CHEMICAL NAME AND SYNONYMS See last page.	DOT Hazard Class Nonflammable gas
	Formula See last page.
ISSUE DATE AND REVISIONS 25 November 1985	Chemical Family N/A

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

None listed (ACGIH, 1985-86)

SYMPTOMS OF EXPOSURE Air is nontoxic and necessary to support life. Inhalation of air in a high pressure environment such as underwater diving, caissons or hyperbaric chambers can result in symptoms similar to overexposure to pure oxygen. These include tingling of fingers and toes, abnormal sensations, impaired coordination and confusion. Decompression sickness pains or "bends" are possible following rapid decompression.

TOXICOLOGICAL PROPERTIES

High pressure effects (greater than two atmospheres of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.

RECOMMENDED FIRST AID TREATMENT

Facilities or practices at which air is breathed in a high pressure environment should be prepared to deal with the illnesses associated with decompression (bends or caisson disease). Decompression equipment may be required.

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition or matter of use.
Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

N/A

PHYSICAL DATA

BOILING POINT -317.8°F (-194.3°C)	LIQUID DENSITY AT BOILING POINT 54.56 lb/ft^3 (874 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): Above the critical temp. of -221.1°F (-140.6°C)	GAS DENSITY AT 70°F, 1 atm .0749 lb/ft^3 (1.200 kg/m^3)
SOLUBILITY IN WATER Very slightly	FREEZING POINT N/A
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.0

APPEARANCE AND ODOR
Colorless, odorless gas

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS - % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable gas		ELECTRICAL CLASSIFICATION Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

Compressed air at high pressures will accelerate the burning of materials to a greater rate than they burn at atmospheric pressure.

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)
None

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

N/A

RESPIRATORY PROTECTION (Specify type)
N/A

VENTILATION	LOCAL EXHAUST	SPECIAL
N/A	N/A	N/A
	MECHANICAL (Gen.)	OTHER
	N/A	N/A

PROTECTIVE GLOVES
Any material

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Air, compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1002

SPECIAL HANDLING RECOMMENDATIONS
Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7 and G-7.1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excesssive periods of time.

For additional storage recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7, and G-7.1.

SPECIAL PACKAGING RECOMMENDATIONS
Dry air is noncorrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation). Concentrations of SO_2, Cl_2, salt, etc. in the moisture enhances the rusting of metals in air.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

CHEMICAL FORMULA: (Continued)

Atmospheric air which is compressed is composed of the following concentrations of gases:

Gas	Molar %
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon Dioxide	0.033*
Neon	18.18×10^{-4}
Helium	5.239×10^{-4}
Krypton	1.139×10^{-4}
Hydrogen	0.5×10^{-4}
Xenon	0.086×10^{-4}
Radon	6×10^{-18}
Water vapor	Varying concentrations

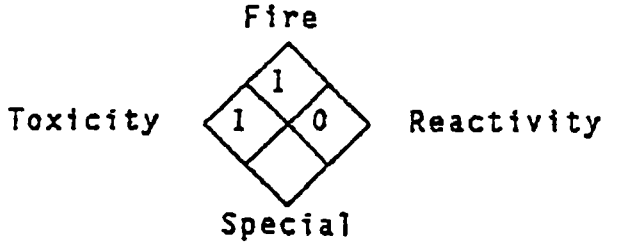
*Concentrations may have slight variations.

Compressed air is also produced by reconstitution using only oxygen and nitrogen. This product contains 79 molar percent nitrogen and 21 molar percent oxygen plus trace amounts of other atmospheric gases which are present in the oxygen and nitrogen.

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,68,100 and 150

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: liquid Odor: bland
Appearance: liquid Color: amber
Specific Gravity (water=1): .87 to .88
Boiling Point: greater than 330°C (625°F)
Melting Point: less than -18°C (0°F)
Solubility in Water-(by weight %): 0 at 20°C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not volatile
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,68,100 and 150

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none
Flashpoint: (Method Used) Cleveland open cup greater than 200°C (390°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
see COMMENTS section
Chronic effects of overexposure:
no data available
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
see COMMENTS section
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.
Protective Gloves:
neoprene type
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IX

Section 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m3 for mineral oil mist (OSHA and ACGIH).
*
STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,68,100 and 150

(COMMENTS continued)

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/24/89 Sent to:
Revision Date: 08/09/94
Supersedes : 04/01/93
Date Sent :

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME Hydrogen Cyanide TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Hydrogen Cyanide, Hydrocyanic acid CHEMICAL NAME AND SYNONYMS Hydrogen Cyanide, Formonitrile	CAS Number: 74-90-8
ISSUE DATE AND REVISIONS OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA HCN MOLECULAR WEIGHT 27.018	CHEMICAL FAMILY Cyanide compound

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Pure hydrogen cyanide is a liquid, is unstable, and must be stabilized with the addition of sulfuric or phosphoric acid. Liquid Air Corporation

(Continued on last page.)

SYMPTOMS OF EXPOSURE

Inhalation: At approximately 1 molar PPM concentration, the detection of its odor of "bitter almonds" is possible.

[illegible] levels of 20-40 molar PPM, slight symptoms of digestive irritation, mental confusion, and slowing of the breathing rate are evident after several hours of exposure. Cyanosis also appears even though the circulatory function is only slightly impaired.

(Continued on last page.)

TOXICOLOGICAL PROPERTIES

It is one of the quickest acting poisons. It hinders the vital oxydation-reduction reactions in the body resulting in anoxia affecting the central nervous system resulting in respiratory paralysis.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT

PROMPT RENDERING OF FIRST AID IS IMPERATIVE.

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN CYANIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Treatment is based on forming methemaglobin in the blood which complexes with the cyanide ion rendering it incapable of acting as a poison. It is reported that up to 20% of the hemoglobin can be converted to methemaglobin without danger of anoxia. The [illegible]ation of methemoglobin is accomplished by injecting intravenously 10 ml of a sterile 3% solution of sodium nitrate followed immediately by 50 ml of a 25% sterile solution of

(Continued on last page.)

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of this product, it assumes no liability for damage or loss of product resulting from proper (or improper) use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Hydrogen cyanide is slowly polymerized to ammonia. In the presence of moisture, cyanides, potassium and bases, this exothermic, autocatalytic reaction is accelerated. Acids retard this reaction.

PHYSICAL DATA

BOILING POINT 78.3°F (25.7°C)	**LIQUID DENSITY AT BOILING POINT** 41.7 lb/ft^3 (668 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) 12.3 psia (85 kPa)	**GAS DENSITY AT 70°F 1 atm** .071 lb/ft^3 (1.14 kg/m^3)
SOLUBILITY IN WATER @ 68°F (20°C) Bunsen coefficient = 224	**FREEZING POINT** 8.1°F (-13.3°C)

APPEARANCE AND ODOR
Colorless liquid with a bitter almond odor. Specific gravity @70°F (Air = 1.0) is .95.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -0.4°F (-18°C) Closed cup	**AUTO IGNITION TEMPERATURE** 1000°F (538°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL = 5.6 UEL = 40
EXTINGUISHING MEDIA Water, carbon dioxide		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

REACTIVITY DATA

STABILITY Unstable	X	**CONDITIONS TO AVOID** See Hazardous Polymerization below
Stable		

INCOMPATIBILITY (Materials to avoid)
Moisture, cyanides, potassium or bases

HAZARDOUS DECOMPOSITION PRODUCTS
Ammonia

HAZARDOUS POLYMERIZATION May Occur	X	**CONDITIONS TO AVOID** Pure HCN slowly polymerizes to ammonia. With incompatible materials this reaction is accelerated. Acids are added to pure HCN to retard this exothermic polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD
Do not attempt to dispose of residual or unused quantities. Return in the shipping container properly labled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation.	To prevent accumulation above the TWA.	
	MECHANICAL (Gen.)	OTHER

PROTECTIVE GLOVES
Rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Hydrocyanic acid, liquefied (RQ 10/4.54) I.D. No.: NA 1051
DOT Shipping Label: Poison gas and flammable gas DOT Hazard Class: Poison A

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area. It may also be advisible to post signs indicating that a poison is stored in this area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Most common structural materials are compatible with hydrogen cyanide. Equipment for containing HCN must be kept scrupulously dry and leak-tight.

OTHER RECOMMENDATIONS OR PRECAUTIONS Because of hydrogen cyanide's extreme toxicity, it is recommended that a continuous monitoring system with alarm be installed to monitor the atmosphere wherever hydrogen cyanide is being handled or used. The system should have sensitivity and accuracy to a level at least one half of the TWA. Earth-ground and bond all lines and equipment associated with the hydrogen cyanide system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

only offers HCN for sale as low concentrations of vapor diluted in other gases. The Ceiling Limit for hydrogen cyanide is 10 molar PPM. (ACGIH, 1984-85) TWA (skin) 10 molar PPM (OSHA, 1985).

SYMPTOMS OF EXPOSURE: (Continued)

135 Molar PPM - death within 30 minutes of exposure.

180 Molar PPM - death within 10 minutes of exposure.

270 Molar PPM - death within 5 minutes of exposure.

RECOMMENDED FIRST AID TREATMENT: (Continued)

sodium thiosulfate - both solutions injected at a rate of 2.5-5.0 ml per minute.

the victim is unconscious, assisted respiration should be started immediately on clearing the contaminated area.

For further information refer to L'Air Liquide's Encyclopedie des Gaz.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME Hydrogen Sulfide	
	TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Hydrogen Sulfide	CAS NUMBER 7783-06-04
	CHEMICAL NAME AND SYNONYMS Hydrogen Sulfide	
ISSUE DATE AND REVISIONS OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA H_2S / MOLECULAR WEIGHT 34.06	CHEMICAL FAMILY Nonmetal hydride

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

10 molar PPM; STEL = 15 molar PPM (ACGIH, 1984-85)

SYMPTOMS OF EXPOSURE

Continuous exposure to low (15-50 PPM) concentrations will generally cause irritation to mucous membranes and conjunctivae of the eyes. It may also cause headache, dizziness or nausea. Higher concentrations (200-300 PPM) can result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations of greater than 700 PPM have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue or paralysis rendering the detection of its presence by odor ineffective.

TOXICOLOGICAL PROPERTIES

Inhalation of hydrogen sulfide is highly toxic. It is also an irritant to mucous tissue, membranes and the conjunctivae of the eyes. Continued exposure renders the olfactory sensors inoperative. Toxicologically its reaction with enzymes in the blood stream inhibit cell respiration resulting in pulmonary paralysis, sudden collapse and death. This overshadows its irritant effect on mucous membranes and tissues which at worst will cause pulmonary edema or conjunctival lesions.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	I.A.R.C. Monographs	OSHA
	Yes ☐	Yes ☐	Yes ☐
	No ☒	No ☒	No ☒

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN SULFIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. RESCUE PERSONNEL SHOULD RECOGNIZE THE HAZARDS OF OVEREXPOSURE DUE TO OLFACTORY FATIGUE.

Inhalation: Extreme fire hazard when rescuing semi-conscious or unconscious persons due to flammability of hydrogen sulfide. Avoid use of rescue equipment which might contain ignition sources or cause static discharge. Move affected person to an uncontaminated area. If breathing has stopped, give assisted respiration. Oxygen or a mixture of 5% carbon dioxide in oxygen should be administered by a qualified person. Keep victim warm and calm. Seek immediate medical assistance. (Continued on last page.)

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of this product, it assumes no liability for damage or loss of product resulting from proper (or improper) use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

AG 052a4

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Hydrogen sulfide will explode or burn over a wide range of mixtures in air. It becomes dangerously reactive when mixed with concentrated nitric acid or other strong oxidizers such as sulfuric acid. Vapors will combust spontaneously when mixed with vapors of chlorine, oxygen difluoride or nitrogen trifluoride.

PHYSICAL DATA

BOILING POINT -76.4°F (-60.2°C)	**LIQUID DENSITY AT BOILING POINT** 57.11 lb/ft^3 (914.9 kg/m^3)
VAPOR PRESSURE 266.9 psia (1840 kPa)	**GAS DENSITY AT 70°F, 1 atm** .091 lbs/ft^3 (1.45 kg/m^3)
SOLUBILITY IN WATER Soluble	**FREEZING POINT** -122.3°F (-85.7°C)

APPEARANCE AND ODOR Shipped and stored as a liquid under its own vapor pressure. Vapor is colorless with a characteristic "rotten egg" odor. Specific gravity (Air=1.0) is 1.21

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) Gas	**AUTO IGNITION TEMPERATURE** 554°F (290°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL: 4.0 UEL: 44.0
EXTINGUISHING MEDIA Carbon dioxide, dry chemical or water spray		**ELECTRICAL CLASSIFICATION** NEC Class I

SPECIAL FIRE FIGHTING PROCEDURES

Shut off flow of gas. Cool surrounding fire-exposed containers with water spray. Fire fighters should use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hydrogen sulfide is slightly heavier than air so may accumulate in low spots and may "travel" a considerable distance to a flame or other source of ignition.

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	Avoid heat, flame or other sources of ignition.

INCOMPATIBILITY (Materials to avoid) Concentrated nitric acid, chlorine, nitrogen trifluoride, oxygen difluoride or other strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Oxides of sulfur

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation.	To prevent accumulation above the TWA for H_2S	
	MECHANICAL (Gen.)	OTHER

PROTECTIVE GLOVES
Neoprene or butyl rubber, PVC, polyethylene

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower, eyewash "fountains"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Hydrogen sulfide (RQ-100/45.4) I.D. No.: UN 1053
DOT Hazard Class: Flammable gas DOT Shipping Label: Flammable gas, Poison

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<750 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous (water content <-40F or C) hydrogen sulfide can be handled in carbon steel, aluminum, Inconel®, Stellite® and 304 and 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the hydrogen sulfide system. All electrical equipment should be non-sparking or explosion proof. Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not being exceeded.

Compressed gas cylinders should not be refilled except by qualified producers of
(Continued on last page.)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

Recommended First Aid Treatment: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for at least 15 minutes.

Other Recommendations or Precautions: (Continued)

compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME Isobutylene	
	TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Isobutylene	CAS NUMBER 115-11-7
	CHEMICAL NAME AND SYNONYMS Isobutene, Isobutylene, 2-Methylpropene	
ISSUE DATE AND REVISIONS OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA (iso) C_4H_8 MOLECULAR WEIGHT 56.03	CHEMICAL FAMILY Monolefin

See last page.

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH, 1984-85)

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations so as to exclude an adequate supply of oxygen to the lungs causes dizziness, drowsiness and eventual unconsciousness. It also has a very mild anesthetic effect which might cause lack of co-ordination or lessened mental alertness.

Skin and Eye Contact: It is mildly irritating to mucous membranes. Due to its rapid rate of evaporation, it can cause tissue freezing or frostbite on dermal contact.

TOXICOLOGICAL PROPERTIES

It has a very mild anesthetic effect; however, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Medical assistance should be sought immediately.

Dermal Contact or Frostbite: Remove contaminated clothing and flush affected areas

(Continued on last page.)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Isobutylene is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT 19.18°F (-7.12°C)	**LIQUID DENSITY AT BOILING POINT** 39.09 lb/ft^3 (626.2 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) = 38.43 psia (265 kPa)	**GAS DENSITY AT 70°F 1 atm** .148 lb/ft^3 (2.37 kg/m^3)
SOLUBILITY IN WATER Insoluble	**FREEZING POINT** -220.63°F (-140.35°C)

APPEARANCE AND ODOR Colorless gas with an unpleasant odor similar to that which is emitted when burning anthracite coal. Specific gravity @70°F (Air = 1.0) is 1.98.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -105°F (-76°C) Closed cup	**AUTO IGNITION TEMPERATURE** 869°F (465°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL: 1.8 UEL: 9.6
EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

If possible, stop the flow of isobutylene. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS Isobutylene is heavier than air and may travel a considerable distance to a source of ignition. Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable mixture formation in low areas or pockets.

REACTIVITY DATA

STABILITY		**CONDITIONS TO AVOID**
Unstable		
Stable	X	

INCOMPATIBILITY (Materials to avoid)
Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION		**CONDITIONS TO AVOID**
May Occur		
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD
Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air-line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation	LOCAL EXHAUST To prevent accumulation above the LEL.	SPECIAL
	MECHANICAL (Gen.) In accordance with electrical codes.	OTHER
PROTECTIVE GLOVES Plastic or rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Liquefied petroleum gas DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas I.D. No.: UN 1075

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and emptry cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS

Isobutylene is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the isobutylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

RECOMMENDED FIRST AID TREATMENT: (Continued)

with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

IME WEIGHTED AVERAGE EXPOSURE LIMIT (Continued)

TWA (OSHA, 1985) for LPG (Liquefied Petroleum Gas) is 1,000 molar PPM.

No. 14

Genium Publishing Corp.
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Schenectady, NY 12304-4690
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Material Safety Data Sheets Collection

Isopropyl Alcohol MSDS No. 324
**Note: 2 pages
Date of Preparation: 9/85 Revision: A, 10/93

Section 1 - Chemical Product and Company Identification 421

Product Chemical Name: Isopropyl Alcohol
Chemical Formula: $(CH_3)_2CHOH$
CAS No.: 67-63-0
Synonyms: Dimethyl carbinol, 2-hydroxypropane, IPA, Isohol, Lutosol, isopropanol, Petrohol, 2-propanol, *sec*-propyl alcohol, rubbing alcohol, Spectar.
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.
Vendors: Consult the latest *Chemical Week Buyers' Guide*. (73)

Section 2 - Composition / Information on Ingredients

Isopropyl alcohol, 100% vol. Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PELs
8-hr TWA: 400 ppm (980 mg/m^3)
STEL: 500 ppm (1225 mg/m^3) *

ACGIH TLVs
TWA: 400 ppm (983 mg/m^3)
STEL: 500 ppm (1230 mg/m^3)

* Vacated 1989 Final Rule Limits

NIOSH REL
10-hr TWA: 400 ppm (980 mg/m^3)
STEL: 500 ppm (1225 mg/m^3)

IDLH Level
12,000 ppm

DFG (Germany) MAK
TWA: 400 ppm (980 mg/m^3)
Category II: Substances with systemic effects
Half-life: < 2 hr

Peak Exposure Limit: 800 ppm, 30 min. average value, 4/shift

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Isopropyl alcohol is a highly flammable, volatile liquid. It is considered more toxic than ethyl alcohol, but less toxic than methyl alcohol. Inhalation can cause irritation of the eyes and respiratory tract and central nervous system depression at high concentrations. Repeated skin contact may cause dermatitis. Systemic toxicity appears to occur mostly in cases of heavy ingestion or inhalation. There is recent evidence that skin absorption may be more likely to cause systemic effects than previously thought.

Wilson Risk Scale
R 1
I 2
S 2*
K 3
*Skin absorption

HMIS
H 1
F 3
R 0

PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.
Target Organs: Eyes, skin, respiratory system.
Acute Effects
Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation. At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.
Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.
Skin: Some irritation may occur after prolonged exposure.
Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, bronchopneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.
Carcinogenicity: NTP and OSHA do not list isopropyl alcohol as a carcinogen. The IARC has studied IPA and has classified it as Class-3 (unclassifiable, inadequate human and animal evidence). There appears to be an association between the *manufacture* (strong acid process, rather than the alcohol itself) of isopropanol and paranasal sinus cancer, but this may be due to the diisopropyl sulfate or isopropyl oil by-products.
Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.
Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

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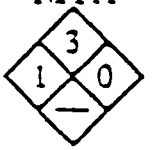
Other: Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 240 mL.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Diagnostic test: acetone in urine.

Section 5 - Fire Fighting Measures

NFPA



Flash Point: 53 °F (12 °C)
Flash Point Method: CC
Burning Rate: 2.3 mm/min.
Autoignition Temperature: 750°F (399°C)
LEL: 2 % v/v
UEL: 12.7 % v/v at 200 °F
Flammability Classification: Class 1B Flammable Liquid
Extinguishing Media: Carbon dioxide, dry chemical, water *spray* (solid streams can spread fire), alcohol-resistant foam, or fog.
Unusual Fire or Explosion Hazards: Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.
Hazardous Combustion Products: Carbon oxides and acrid smoke.
Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.
Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.
Large Spills
Containment: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.
Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10). Install electrical equipment of Class 1, Group D.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 8 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

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Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air-purifying, full facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove isopropyl alcohol from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using isopropyl alcohol, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Colorless with a slight odor and bitter taste.
Odor Threshold: 22 ppm*
Vapor Pressure: 44 mm Hg at 25 °F (77 °C)
Saturated Vapor Density(Air = 1.2 kg/m^3, 0.075 lb/ft^3): 1.274 kg/m^3 or 0.080 lb/ft^3
Formula Weight: 60.09
Density (H_2O=1, at 4 °C): 0.78505 at 68°F (20 °C)
Water Solubility : > 10 %
Ionization Potential: 10.10 eV

Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.
Boiling Point: 180.5 °F (82.5 °C)
Freezing Point: -129.1 °F (-89.5 °C)
Viscosity: 2.1 cP at 77 °F (25 °C)
Refraction Index: 1.375 at 68 °F (20 °C)
Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)
Critical Temperature: 455 °F (235 °C)
Critical Pressure: 47 atm
Octanol/Water Partition Coefficient: log Kow = 0.05

* References range from 1 to as high as 610 ppm.

Section 10 - Stability and Reactivity

Stability: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization does not occur.
Chemical Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.
Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acrid smoke.

Section 11 - Toxicological Information

Toxicity Data:*

Eye Effects:
Rabbit, eye: 100 mg caused severe irritation.

Skin Effects:
Rabbit, skin: 500 mg caused mild irritation.

Reproductive:
Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

Acute Oral Effects:
Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.
Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.
Rat, oral, LD_{50}: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

* See NIOSH, *RTECS* (NT3050000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Guppies (*Poecilia reticulata*) LC_{50} = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC_{50} = 11,830 mg/L/1 hr. BOD = 133 %/5 days.

Environmental Degradation: On soil, IPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days. Because it is soluble, removal by rain, snow or other precipitation is possible.

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
Container Cleaning and Disposal: Triple rinse containers.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Isopropanol or isopropyl alcohol
Shipping Symbols: –
Hazard Class: 3
ID No.: UN1219
Packing Group: II
Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 5 L
b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: –

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste Number (40 CFR 261.21)
RCRA Hazardous Waste Classification (40 CFR 261.21): Characteristic of Ignitability
Listed (Unlisted Hazardous Waste, Characteristic of Ignitability) as a CERCLA Hazardous Substance (40 CFR 302.4) per CERCLA, Sec. 3001
CERCLA Reportable Quantity (RQ), 100 lb (45.4 kg)
SARA 311/312 Codes: 1, 2, 3
Listed as a SARA Toxic Chemical (40 CFR 372.65); *only persons who manufacture by the strong acid process are subject: no supplier notification.*
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 73, 103, 124, 126, 127, 132, 136, 139, 148, 153, 159, 164, 167, 168, 176, 187

Prepared By _____ M Gannon, BA
Industrial Hygiene Review _____ PA Roy, MPH, CIH
Medical Review _____ T Thoburn, MD, MPH

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MATERIAL SAFETY DATA SHEET

NOTE: This Material Safety Data Sheet (MSDS) is prepared for . industrial/commercial use situations. The preparation of this MSDS may be required by law but this is not an assertion that this product presents a risk in the normal consumer use situation.

1. PRODUCT IDENTIFICATION

PRODUCT (AS LABELED):	Dove® Dishwashing Liquid
GENERAL USE:	A consumer hand dishwashing liquid
MANUFACTURER'S NAME:	LEVER BROTHERS COMPANY
ADDRESS:	390 Park Avenue New York, NY 10022
BUSINESS PHONE:	212-688-6000
DATE OF PREPARATION	8/01/95
MSDS#:	C024, Replaces version dated 2/2/95

2. COMPOSITION and INFORMATION ON INGREDIENTS

INGREDIENTS: The cleaning agents in Dove are biodegradable. Dove contains no phosphorous.

		EXPOSURE LIMITS IN AIR*			
		ACGIH		OSHA	
CHEMICAL NAME:	CAS#	TLV mg/m³	STEL mg/m³	PEL mg/m³	CEIL mg/m³
Ammonium alkyl benzene sulfonate	1331-61-9	NA	NA	NA	NA
Ammonium alcohol ethoxysulfate	NA	NA	NA	NA	NA
Lauric-Myristic monoethanolamide	NA	NA	NA	NA	NA
Sodium aryl sulfonate	NA	NA	NA	NA	NA
Ethanol	64-17-5	1000ppm	NA	1000ppm	3300ppm

NA = Not Applicable
*See Section 12. for DEFINITION OF TERMS

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: **EMERGENCY OVERVIEW:** This product is a liquid detergent with a perfumed odor. It presents a low risk other than a possible slip hazard in the event of a spill.

POTENTIAL HEALTH EFFECTS:

CONTACT WITH SKIN: No irritation with brief contact. Possible irritation from prolonged or repeated industrial contact.
CONTACT WITH EYES: May cause mild irritation and discomfort.
INGESTION: May cause gastrointestinal irritation with nausea, vomiting, and delayed diarrhea.
INHALATION: While inhalation of a product mist is unlikely, such exposure may cause transient upper respiratory irritation.
CHRONIC HEALTH EFFECTS: None expected.
CONSUMER PRODUCT PRECAUTIONARY STATEMENT: Not for use in automatic dishwashers. Do not mix with chlorine bleach or other household cleaning products.KEEP OUT OF REACH OF CHILDREN.

4. FIRST-AID MEASURES

SKIN EXPOSURE: Rinse with water.
EYE EXPOSURE: Flush with water for 15 minutes.
INGESTION: Do not induce vomiting. Drink a glass of milk or water.
INHALATION: Move individual to fresh air.
Note: If symptoms persist, seek medical attention.

5. FIRE-FIGHTING MEASURES

FLASH POINT: No flash to 200 F..
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS(in air by volume,%): Not applicable.
FIRE EXTINGUISHING MATERIALS: Not applicable.

Water Spray: Yes
Dry Chemical: Yes
Carbon Dioxide: Yes
Halon: Yes
Foam: Yes

UNUSUAL FIRE AND EXPLOSION HAZARDS: Product is not combustible. Use appropriate fire extinguishing agent for the packaging material.

SPECIAL FIRE FIGHTING PROCEDURES: None.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Disposal is to be performed in compliance with applicable laws. Small or household quantities may be disposed of in refuse or sewer. Product contains biodegradable ingredients. Contains no phosphorous. For large (industrial) releases, prevent spill from entering a waterway. Absorbent materials may be used.

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Use personal protective equipment appropriate for the task.
STORING AND HANDLING PRACTICES: None required with normal use.
PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Use personal protective equipment when contact is likely.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINFERING CONTROLS: Use with adequate ventilation. Mechanical ventilation not normally required during normal operation.
EYE PROTECTION: Wear safety glasses.
HAND PROTECTION: Wear rubber gloves for prolonged contact.

BODY PROTECTION: None required.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: Not applicable.
SPECIFIC GRAVITY:1.032 - 1.048
SOLUBILITY IN WATER: soluble.
VAPOR PRESSURE,mm Hg @ 20 C:(approximately) 18
EVAPORATION RATE(water = 1): 1
MELTING POINT OR RANGE: < 0 C
BOILING POINT:> 100 C
pH(1% solution): 6.0 - 8.9 (as is)
APPEARANCE AND COLOR: This liquid is a pleasant smelling, slippery, opaque white solution.

10. STABILITY and REACTIVITY

STABILITY: Stable.
DECOMPOSITION PRODUCTS: None.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Do not mix with chlorine bleach.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Do not use in automatic dishwasher.

11. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not applicable.
HAZARD CLASS NUMBER and DESCRIPTION: Not applicable.
UN IDENTIFICATION NUMBER: Not applicable.
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Not applicable.
EMERGENCY RESPONSE GUIDE NUMBER: Not applicable.
MARINE POLLUTANT: Not applicable.

CANADIAN TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CLASSIFIED AS "DANGEROUS GOODS".

12. OTHER INFORMATION

PREPARED BY: LEVER BROTHERS COMPANY
NEW YORK, NY 10022

The information contained in this MSDS is based on data which is believed to be accurate. While Lever Brothers Company believes that the data contained herein comply with 29 CFR 1910.1200, they are not to be taken as a warranty or representation for which Lever Brothers Company assumes legal responsibility. They are offered solely for your consideration and verification. This MSDS is not prepared for consumer use situations.

WITCO MATERIAL SAFETY DATA SHEET

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none
Flashpoint: (Method Used) Cleveland open cup greater than 190°C (380°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).
Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.
Protective Gloves:
neoprene type
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IX

Section 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

(COMMENTS continued)

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/18/81 Sent to:
Revision Date: 08/09/94
Supersedes : 04/01/93
Date Sent :

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME Pentane	
	TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Pentane; n-Pentane	CAS NUMBER 109-66-0
	CHEMICAL NAME AND SYNONYMS Pentane; n-Pentane	NFPA 704 NUMBER (HFR) 0 4 0
ISSUE DATE AUGUST 1, 1987 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA C_5H_{12} MOLECULAR WEIGHT 72.15	CHEMICAL FAMILY Alkane

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT
600 Molar PPM; STEL = 750 Molar PPM (ACGIH 1986-87). OSHA (1985)TWA = 1,000 Molar PPM.

SYMPTOMS OF EXPOSURE Vapors may cause mild irritation of the eyes, skin or lungs. Inhalation: High concentrations of pentane so as to exclude an adequate supply of oxygen to the lungs causes dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

Contact with rapidly evaporating liquid can cause cryogenic "burns" or frostbite.

TOXICOLOGICAL PROPERTIES
Pentane is inactive biologically and essentially nontoxic; therefore, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering.

Pentane is not listed in the IARC, NTP or by OSHA as a carcinogen or a potential carcinogen.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PENTANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

Dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of this product, it assumes no liability for damage or loss of product resulting from proper (or improper) use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Pentane is flammable in air.

PHYSICAL DATA

BOILING POINT 97°F (36°C)	LIQUID DENSITY AT BOILING POINT @ 60°F (15.5°C) = 39.3 lb/ft^3 (629.4 kg/m^3)
VAPOR PRESSURE @ 100°F (37.8°C) = 15 psia (103 kPa)	GAS DENSITY AT 70°F 1 atm @ 60°F (15.5°C) = .2015 lb/ft^3 (3.228 kg/m^3)
SOLUBILITY IN WATER Negligible	FREEZING POINT -201.5°F (-129.7°C)
APPEARANCE AND ODOR Colorless liquid and vapor with mild paraffinic odor. Specific gravity (air=1) = 2.48	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) <-40° F & C (C.C.)	AUTO IGNITION TEMPERATURE Unknown	FLAMMABLE LIMITS % BY VOLUME LEL = 1.4 UEL = 8.3
EXTINGUISHING MEDIA Water (foam), dry chemical, carbon dioxide		ELECTRICAL CLASSIFICATION Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

If possible, stop flow of pentane. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)
Oxygen, other oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest Liquid Air location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest Liquid Air location or call the emergency telephone number listed herein.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Good with forced ventilation	LOCAL EXHAUST To prevent accumulation above the TWA. MECHANICAL (Gen.) In accordance with electrical codes	SPECIAL N/A OTHER N/A
PROTECTIVE GLOVES Plastic or rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Pentane
DOT Hazard Class: Flammable liquid
DOT Shipping Label: Flammable liquid
DOT I.D. No.: UN 1265

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<50 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not tamper with (valve) safety device. Close valve after each use and when empty.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no source of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS

Pentane is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the Pentane system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, (Continued on last page)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued) enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

III. HAZARDOUS INGREDIENTS

(includes IARC, NTP, OSHA and ACGIH listed carcinogens greater than 0.1%)

MATERIAL	%	CAS #	EXPOSURE LIMIT	SOURCE
Ethyl ether	40-70	60-29-7	400 ppm TWA	(3)
			500 ppm STEL	(3)
n-heptane	25-60	142-82-5	400 ppm TWA	(3)
			500 ppm STEL	(3)
Methylcyclohexane	25-60	108-87-2	400 ppm TWA	(3)
Carbon dioxide	5-10	124-38-9	10000 ppm TWA	(1)
			5000 ppm TWA	(2)
			30000 ppm STEL	(3)

NON-HAZARDOUS INGREDIENTS > 1%
None

None of the other ingredients is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

The source for exposure limits listed above are:
(1) OSHA Permissible Exposure Limit (effective 9/89)
(2) ACGIH Threshold Limit Value (1988-89 Edition)
(3) Both the OSHA PEL and ACGIH TLV
(4) Recommended by the Manufacturer

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT

Tag Open Cup: Not determined
Pensky-Martens Closed Cup: -49°F

AEROSOL FLAME EXTENSION

Greater than 18 inches

FLASHBACK

Yes

AEROSOL FIRE PROTECTION LEVEL
Level 3 Aerosol (NFPA 30B)

FLAMMABLE LIMITS IN AIR, % BY VOLUME
LOWER: 1.85
UPPER: 36.5

AUTOIGNITION TEMPERATURE
180°C

EXTINGUISHING MEDIA
Foam, alcohol foam, carbon dioxide, and dry chemical. Water may be unsuitable except as cooling medium.

SPECIAL FIRE FIGHTING PROCEDURES
Use self-contained breathing apparatus. Toxic fumes may be emitted.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Extremely flammable contents, pressurized containers. Vapors are heavier than air and may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.

V. HEALTH HAZARD DATA

EFFECTS OF SINGLE OVEREXPOSURE

SWALLOWING	May cause signs and symptoms of systemic intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness and respiratory failure due to depression of the central nervous system. Due to high volatility, may rapidly distend the stomach, causing discomfort and may make breathing difficult. May also cause pneumonitis if aspirated.
SKIN ABSORPTION	Significant absorption not expected.
INHALATION	Acts as a narcotic or general anesthetic. May cause irritation of the respiratory tract with cough and also signs and symptoms of intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness, cardiac irregularities, and respiratory failure due to depression of the central nervous system. Breathing high vapor concentrations may cause heart rate irregularities, possibly fatal, particularly in persons with heart disease.
SKIN CONTACT	May cause mild irritation, experienced as local redness.

EYE CONTACT — Exposure to liquid or high concentrations of vapor may cause irritation, experienced as redness, excess tearing, and possible swelling of the conjunctiva.

EFFECTS OF REPEATED OVEREXPOSURE

Repeated skin exposure can cause cracking and drying. Repeated inhalation may cause loss of appetite, exhaustion, headaches, drowsiness, dizziness, cardiac arrhythmia, central nervous system excitability, and psychic disturbances.

OTHER EFFECTS OF OVEREXPOSURE

May cause albuminuria and polycythemia.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE

Because of its irritating and defatting properties, this material may aggravate an existing dermatitis. Existing cardiac conditions may be aggravated if inhaled in high concentrations and may be fatal as a result of serious arrhythmia and cardiac decompensation.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARDS

None currently known.

EMERGENCY AND FIRST AID PROCEDURES

SWALLOWING — Give at least 2 glasses of milk or water if the patient is conscious. Do not induce vomiting. Call a physician immediately.

SKIN — Wash with soap and water.

INHALATION — Remove to fresh air. Give artificial respiration if not breathing. CPR may be required if cardiac arrest occurs. Oxygen may be given if necessary. Call a physician.

EYES — Immediately flush eyes with plenty of water for least 15 minutes. Seek medical attention, preferably an ophthalmologist.

NOTES TO PHYSICIAN — May produce arrhythmia, especially in a person with an irritable myocardium. Because of possible arrhythmogenic effects, sympathomimetics should be used with caution. Avoid the use of epinephrine.

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition. Artificial ventilation may be required if coma is deep and breathing shallow.

VI. REACTIVITY DATA

STABILITY Stable.

HAZARDOUS POLYMERIZATION
Will not occur.

CONDITIONS TO AVOID Heat, sparks and open flames.

INCOMPATIBILITY (Materials to Avoid)
Strong oxidizing agents.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Extremely flammable. Will burn to form carbon dioxide, carbon monoxide. May form oxides of nitrogen.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
Wear appropriate personal protective equipment and remove all sources of ignition. Contain spill using absorbent material and collect material for disposal in a container suitable for flammable waste. See Section IV, "Unusual Fire and Explosion Hazards."

WASTE DISPOSAL METHOD
Waste material is a RCRA hazardous waste due to ignitability if discarded in its purchased form. Incineration, treatment or landfilling should be carried out in accordance with applicable RCRA Federal, State, and Local regulations.

VIII. SPECIAL PROTECTION INFORMATION

(for manufacturing and bulk spill cleanup)

RESPIRATORY PROTECTION
Use NIOSH/MSHA approved chemical cartridge respirator for operations which may result in employee exposure above the Permissible Exposure Limit (PEL).

VENTILATION Use local exhaust ventilation for operations which may result in employee exposure above the PEL.

PROTECTIVE GLOVES None required under normal use. PVA (polyvinyl alcohol) gloves are recommended for operations which may result in repeated skin contact.

EYE PROTECTION Safety glasses are considered adequate for normal use.

OTHER PROTECTIVE EQUIPMENT
None required

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

- DANGER: Extremely flammable. Do not store near heat, sparks or open flame.
- Do not inhale vapors; use in well ventilated area.
- Avoid eye and prolonged skin contact.
- Do not drink or swallow contents.
- Contents under pressure; do not store at temperatures above 120°F.

OTHER PRECAUTIONS

Observe all requirements of plant, company or government regulations.

KEEP OUT OF REACH OF CHILDREN.

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No. 18

X. DEPARTMENT OF TRANSPORTATION

HAZARDOUS MATERIALS	Engine Starting Fluid
HAZARD CLASSIFICATION	Flammable Gas
IDENTIFICATION NUMBER	UN1960
LABEL(S) REQUIRED	Flammable Gas

XI. ENVIRONMENTAL DATA

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW INFORMATION

This product contains the following chemicals subject to SARA TITLE III, Section 313 reporting:

Chemical Name	CAS#	Weight %
None		

This MSDS is directed to professional users and bulk handlers of the product. Consumer products are labeled in accordance with Federal Hazardous Substances Act regulations.

While First Brands Corporation believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which First Brands Corporation assumes legal responsibility. They are offered solely for your consideration, investigation and verification. Any use of these data and information must be determined by the user to be in accordance with applicable federal, state and local laws and regulations.

If more information is needed, please contact:

R. L. Lewis
First Brands Corporation
88 Long Hill Street
East Hartford, CT 06108
(203)728-6181

No. 19

WD-40

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer:	WD-40 Company	Telephone:	
Address:	1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California 92138-9021	Emergency Only:	1 (800) 424-9300 (CHEMTREC)
		Information:	(619) 275-1400
		Chemical Name:	Organic Mixture
		Trade Name:	WD-40 Bulk Liquid

II. HAZARDOUS INGREDIENTS

Chemical Name	CAS Number	%	Exposure Limit ACGIH/OSHA
Aliphatic Petroleum Distillates	8052-41-3	70	100 ppm (PEL)
Petroleum Base Oil	64742-65-0	> 20	5 mg/M³ (TWA)
Non-hazardous Ingredients		< 10	

III. PHYSICAL DATA

Boiling Point:	300°F (minimum)	Evaporation Rate:	Not determined
Vapor Density (air = 1):	Greater than 1	Vapor Pressure:	Not determined
Solubility in Water:	Insoluble	Appearance:	Cloudy light amber
Specific Gravity (H_2O = 1):	.800 @ 70°F	Odor:	Characteristic odor
Percent Volatile (volume):	74%	VOC:	576 grams per liter

IV. FIRE AND EXPLOSION

Flash Point:	Tag Open Cup 110°F (minimum)
Flammable Limits:	(solvent portion) [Lel] 1.0% [Uel] 6.0%
Extinguishing Media:	CO_2 Dry Chemical, Foam
Special Fire Fighting Procedures:	None
Unusual Fire and Explosion Hazards:	None

V. HEALTH HAZARD / ROUTE(S) OF ENTRY

Threshold Limit Value

Aliphatic Petroleum Distillates (Stoddard solvent) lowest TLV (ACGIH 100 ppm.)

Symptoms of Overexposure

Inhalation (Breathing):	May cause anesthesia, headache, dizziness, nausea and upper respiratory irritation.
Skin Contact:	May cause drying of skin and or irritation.
Eye Contact:	May cause irritation, tearing and redness.
Ingestion (Swallowed):	May cause irritation, nausea, vomiting and diarrhea.

First Aid Emergency Procedures

Ingestion (Swallowed):	Do not induce vomiting, seek medical attention.
Eye Contact:	Immediately flush eyes with large amounts of water for 15 minutes.
Skin Contact:	Wash with soap and water.
Inhalation (Breathing):	Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

DANGER!

Aspiration Hazard: If swallowed can enter lungs and may cause chemical pneumonitis. Do not induce vomiting. Call Physician immediately.

Suspected Cancer Agent

Yes _____ No X The components in this mixture have been found to be noncarcinogenic by NTP, IARC and OSHA.

2.3/5 BULK No. 10

VI. REACTIVITY DATA

Stability:	Stable X	Unstable ____
Conditions to avoid:	NA	
Incompatibility:	Strong oxidizing materials	
Hazardous decomposition products:	Thermal decomposition may yield carbon monoxide and/or carbon dioxide.	
Hazardous polymerization:	May occur ____	Will not occur X

VII. SPILL OR LEAK PROCEDURES

Spill Response Procedures

Absorb small quantities with sand, earth, sawdust. Large quantities pump into tank.

Waste Disposal Method

Incinerate liquid, bury saturated absorbent in land fill. Dispose of in accordance with local, state and federal regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation:	Sufficient to keep solvent vapor less than TLV.
Respiratory Protection:	Advised when concentrations exceed TLV.
Protective Gloves:	Advised to prevent possible skin irritation.
Eye Protection:	Approved eye protection to safeguard against potential eye contact, irritation or injury.
Other Protective Equipment:	None required.

IX. SPECIAL PRECAUTIONS

Keep from open flame, do not take internally. Avoid excessive inhalation of spray particles. Keep from children.

X. TRANSPORTATION DATA

Domestic Surface

Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
ID No.:	UN 1268
Label Required:	NONE, for containers less than 100 Gallons

Domestic Air

Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
Label Required:	NONE, for containers less than 110 Gallons

SIGNATURE: R. Miles R Miles TITLE: Technical Director

REVISION DATE: March 1990 SUPERSEDES: April 1988

NA = Not applicable NDA = No data available < = Less than > = More than

We believe the statements, technical information and recommendations contained herein are reliable. However, the data is provided without warranty, expressed or implied. It is the users responsibility both to determine safe conditions for use of this product and assume loss, damage or expense, direct or consequential, arising from its use. Before using product, read label.

APPENDIX D

SPECIFIC HEALTH AND SAFETY PROCEDURES

SOP No. 18 Respiratory Protection
SOP No. 21 Decontamination
SOP No. 22 Heat Stress
SOP No. 24 Confined Space Entry
SOP No. 25 Pipeline Entry
SOP No. 27 Lockout/Tagout
SOP No. 29 Underground Tank Removal
SOP No. 30 High Pressure Washers
SOP No. 31 Cranes and Hoisting
SOP No. 33 Personal Lifting Safety
SOP No. 34 Slip, Trip, Fall Prevention
SOP No. 35 Safety Shower and Eye Wash Station
SOP No. 39 Solvents and Flammable Liquids
SOP No. 41 Equipment and Hand Tools
SOP No. 45 Vehicle Safety
SOP No. 51 Equipment Inspection

1. OBJECTIVE

No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained in the selection, use, care and limitations of the respirators, and the proper respirator has been selected for the task and fit tested.

2. PURPOSE

The purpose of this procedure is to provide information and guidelines for the selection, use, and care of respiratory protective equipment for all OHM Remediation Services Corp. (OHM) and contractor personnel. This procedure complies with the requirements of 29 CFR 1910.134.

3. GENERAL

3.1 The use of engineering controls should be the primary respiratory hazards method to limit employee exposure to respiratory hazards.

3.2 Respirators shall be worn when engineering controls are unsuccessful and:

- When the PEL (Permissible Exposure Limit), TLV (threshold limit value), or ceiling limit for the material exposure is approached or exceeded, as measured by sampling.
- As deemed appropriate by the regional health and safety manager.

3.3 Respirators can only be worn by individuals who have been properly trained and fit tested.

3.4 The regional health and safety manager will evaluate annually the effectiveness of the respirator program and report his findings to the vice president of health and safety.

3.5 The respirator program coordinator for each region will be the regional health and safety manager.

3.6 Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) which are appropriate for the potential hazard shall be worn.

4. SELECTION OF RESPIRATORS

4.1 Engineering controls should always be the primary control of contaminated air (i.e. elimination of source of contamination, ventilation equipment, barriers, etc).

4.2 Once the need for respirators has been established, the respirators shall be selected on the basis of the hazards to which the worker is exposed.

4.1.1 Selection criteria should include:

- The concentration of the contaminant.
- Whether the contaminant may be sufficiently toxic to be immediately dangerous to life or health (IDLH).
- The possibility of oxygen deficiency.
- The useful life of the respirator or cartridge.
- The escape routes available.
- Whether the equipment is intended for emergency use, for periodic use, or for stand-by purposes.

4.3 Characterization of the hazard and proper respirator data will be performed to determine what type respirator will be used.

5. MEDICAL SCREENING

5.1 Prior to assigning personnel tasks requiring the use of respirators, the employee shall be medically evaluated in compliance of requirements of 29 CFR 1910.134(a)(10).

5.2 Employees not physically and psychologically capable of wearing respirators shall not be assigned to such work.

5.3 The medical status of each employee is to be reviewed as outlined in Procedure 10 and as may be deemed necessary if the physical status of the employee changes.

6. FIT TESTING

6.1 Fit testing will be performed in accordance with accepted fit test procedures by the regional health and safety manager or their designated employee who has been trained and qualified to do so.

6.2 Records of fit testing shall be maintained by the employee's division office and/or corporate human resources.

7. RESPIRATOR USE INSTRUCTIONS

7.1 Respirators must be used only by those employees who have been properly trained and qualified on the specific type of respirator to be worn.

7.2 All employees whose job assignment requires the use of respirators shall be given respirator training at the time of fit testing before being assigned to the job. Retraining must be performed annually on each type of respirator worn by the individual. Training records must be kept.

7.3 Only respirators and cartridges approved for the hazardous atmosphere to be encountered will be used.

7.4 Only NIOSH/MSHA approved, respirators will be worn by an individual.

7.5 CAUTION: Full face piece or one-half face piece air-purifying respirators are not to be used where there is an oxygen deficiency. Only air-supplied full-face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists.

7.6 CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.

7.7 Contact lenses shall not be worn with full-face respirators.

7.8 A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skull caps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed. Persons with facial conditions that prevent a proper seal are not allowed to wear a full-face piece respirator until the condition is corrected. Facial conditions which may cause a seal problem include missing dentures, scars, severe acne, etc.

8. RESPIRATOR INSPECTION

8.1 Respirators shall be inspected by the user before and after each day's use and those not used routinely shall be inspected once a month.

8.2 Inspection procedure air purifying respirators (full-face piece and one half-face piece cartridge/canister respirators)

8.2.1 Examine the face piece for:

- Excessive dirt
- Cracks, tears, holes, or distortion from improper storage.
- Inflexibility
- Cracked or badly scratched lenses.
- Incorrectly mounted lens or broken or missing mounting clips.
- Cracked or broken air purifying element holder, badly worn threads, or missing gaskets.

8.2.2 Examine the head straps or head harness for:

- Breaks or cracks
- Broken or malfunctioning buckles. Excessively worn serrations on the head harness which may permit slippage.

8.2.3 Examine exhalation valve for the following after removing cover:

- Foreign material
- Cracks, tears, or distortion in the valve material.
- Improper insertion of the valve body in the face piece.
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface.
- Missing or defective valve cover.
- Improper installation of the valve in the valve body.

8.2.4 Examine the air purifying elements for:

- Missing cartridge adapter gasket
- Incorrect cartridge/canister, or filter for the hazard.
- Incorrect installation, loose connections, missing or worn gaskets, or cross threading in the holder.
- Cracks or dents in outside case or threads of filter or cartridge/canister.

8.2.5 If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connections.
- Missing or loose hose clamps.
- Deterioration, determined by stretching the tube and looking for cracks.

8.3 Inspection procedure air-supplied respirators (full-face piece air line respirators and self contained breathing apparatus (SCBA)) should be inspected as follows:

8.3.1 If the device has a tight-fitting face piece, use the procedures outlined for air purifying respirators will be followed, except those pertaining to the air purifying elements.

8.3.2 The inspection of air-supplied respirators should include checks on the following items:

- Tightness of connections
- Condition of all rubber parts
- Air cylinder (SCBA & egress) must be fully charged and the hydrotest certification must be current (SCBA cylinders-3 years/egress cylinders 5 years).
- Regulators and warning devices function properly.
- Does each unit (SCBA & egress) have a distinct identification number permanently affixed or engraved on the regulator?

8.4 A record of respirator inspections including date and inspectors initials and maintenance will be maintained for all pieces of respiratory protective equipment designated for emergency response. The SCBA inspection form follows this procedure.

9. CLEANING OF RESPIRATORS

9.1 Respirators assigned and worn by one individual must be cleaned after each day's use. Visitors's or multi-assigned respirators must be cleaned and disinfected after each use.

9.2 Extreme caution must be exercised to prevent damage from rough handling during the cleaning procedure.

9.3 After cleaning, respirators must be reassembled.

9.4 A respirator spray disinfectant is approved as disinfectant between continuous use but not for cleaning and sanitizing after each day's use.

9.5 Cleaning Procedure for Individually assigned Respirators

9.5.1 Washing: The respirator must be disassembled and washed with a mild liquid detergent in warm water. A brush should be used. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.5.2 Rinsing: The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This is very important to prevent dermatitis.

9.5.3 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); towel drying with soft clothes or paper towels.

9.6 Cleaning Procedure for Visitor or Multi-Assigned Respirators

9.6.1 Washing: The respirator must be disassembled and washed with a brush in a cleaning solution in warm water. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.6.2 Rinsing: The respirator must be immersed in a disinfectant solutions noted below for at least 2 minutes and then rinsed in clean water at 140°F maximum.

9.6.3 Disinfection: 50 ppm of chlorine in a hypochloride solution made from household bleach (2 ml. to one liter of water).

9.6.4 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); and drying in steel storage cabinets with built-in circulation fans. (Solid shelves should be replaced with steel mesh).

10. MAINTENANCE OF RESPIRATORS

10.1 Respirator maintenance shall only be performed by qualified personnel, for example site supervisors and site safety officers.

10.2 Approved replacement parts must be used. Substitution of parts from a different brand or type of respirator invalidates the technical approval of the respirator.

10.3 Maintenance performed on a self-contained breathing apparatus shall be done only by an individual who has been certified by the manufacturer.

11. STORAGE OF RESPIRATORS

11.1 When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage.

11.2 Respirators must be stored in reusable plastic bags between shifts.

11.3 The respirator storage environment must be clean, dry and away from direct sunlight. Upright cabinets and wall-mounted cases are suggested.

12. BREATHING AIR

Breathing air shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G not A, K, or L) as described in the American National Standard Commodity Specification for Air ANSI/CGA G-71-1989.

13. COLOR CODE

NIOSH recognizes the following standard color codes for respirator cartridges. The color codes can be used as a general guideline, however, personnel should refer to the NIOSH technical certification (TC) to verify adequate protection.

Acid gases	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
High Efficiency Particulate Air (HEPA) Dust, fumes, and mists (including asbestos and radioactive materials)	Magenta (Purple)
Dusts, fumes, and mists (other than asbestos and radioactive materials)	Orange

OHM Corporation

RESPIRATOR FIT TEST RECORD

Name: _____

Employee Number: _____

Date of Test: _____

Expiration Date: _____

Type of Fit Test:

☐ **Quantitative**
Protective Factor _____

☐ **Qualitative**

TESTING AGENT:

Isoamyl Acetate (Banana Oil) ☐

Irritant Smoke ☐

Saccharin ☐

RESPIRATOR DESCRIPTION

Manufacturer: _____

Model: _____

Size: _____

Test Conducted by: _____
(Please print)

Signature of Conductor: _____

I certify that I have been trained on the proper use, instructed on maintenance procedures, and have passed a respirator fit test as described above.

SIGNATURE OF EMPLOYEE: _____

COPY TO: Employee Home Division
Corporate Personnel Office (FAX Number: 419-425-6069)

OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO._____ YEAR_____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Face-piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspectors initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.

1. OBJECTIVE

All personnel, tools and equipment which have entered the contaminated area (exclusion zone) on OHM Remediation Services Corp. (OHM) job sites involving hazardous materials require decontamination upon leaving the exclusion zone as required in 29 CFR 1910.120.

2. PURPOSE

The purpose of this procedure is to describe the requirements for decontamination.

3. REQUIREMENTS

3.1 The site health-and-safety plan will include a section on decontamination with specific requirements.

3.2 Every exit from the exclusion zone requires decontamination. The exception is an emergency situation. If an employee is injured, decontaminate to the extent possible given the nature of the injury.

3.3 Large equipment such as drill rigs and heavy equipment will be decontaminated by using a steam or hot water hose wash or by detergent wash.

3.4 Personnel decontamination will vary from site to site but will always include the following steps:

- Equipment drop
- Outer boots and gloves wash/rinse (step off)
- Outer boots and gloves removal
- Suit wash/rinse/removal
- Inner glove wash/rinse
- Face piece removal, wash/rinse
- Inner glove removal
- Field wash (face, hands)

3.5 Personnel assigned to the decontamination process will assist workers and decontaminate equipment and reusable protective gear.

3.6 An on-site shower facility will be provided whenever necessary.

3.7 During hazardous waste site activities, the site safety officer or the site supervisor will verify that proper decontamination procedures are being followed. Verification of decontamination for personal protective equipment and equipment may be accomplished by direct reading monitoring instruments and/or visual inspection as it is brought out of the contamination reduction zone. In some cases wipe samples may be collected to document that the decontamination effort is affective.

1. OBJECTIVE

In work situations where heat stress may be a factor, OHM Remediation Services Corp. (OHM) will attempt to prevent heat related illness by use of work-rest schedules, physiological monitoring and/or personal cooling devices.

2. PURPOSE

This procedure describes the causes, symptoms, treatment, and prevention of heat-related illness.

3. GENERAL INFORMATION

3.1 Heat-related illnesses are caused by the body's inability to dissipate metabolic heat in conjunction with excessive environmental heat and wearing PPE.

3.2 A period of adjustment or acclimatization is necessary before maximum tolerance to heat is acquired. Most workers require 7 to 10 working days of gradually increasing workload to become fully acclimatized.

4. HEAT-RELATED ILLNESSES

4.1 **Heat rash** can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

4.2 **Heat cramps** are caused by profuse perspiration with inadequate fluid intake and salt replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can make them cramp.

Signs and Symptoms: Muscle spasm and pain in the extremities and abdomen.

Treatment: Remove affected person to a cool place and give sips of clear water or an electrolytic drink (Gatorade). It should be recommended to the person experiencing heat cramps to lightly salt their food to make up for the sodium lost when sweating. Manual pressure may also be applied to the cramped muscles.

4.3 **Heat exhaustion** is a mild form of shock caused by sustained physical activity in heat and profuse perspiration without adequate fluid and salt replacement.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist (clammy) skin; profuse sweating; dizziness; fatigue

Treatment: Remove affected person to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. CAUTION: Do not allow the affected person to become chilled -- treat for shock if necessary.

4.4 **Heat stroke** is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!!**

Signs and Symptoms: Red, hot, dry skin; body temperature of 105 degrees Fahrenheit or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in an ice/water bath (however, be careful not to over chill the victim once body temperature is reduced below 102 degrees Fahrenheit). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

5. SPECIFIC REQUIREMENTS

5.1 The environmental hazards section of site health and safety plans will address heat stress if the ambient temperature is expected to exceed 65 degrees Fahrenheit.

5.2 The site health and safety plan will discuss work-rest cycles and provisions for monitoring the level of heat stress (i.e., pulse rate).

5.3 Workers are to be advised not to drink caffeinated or alcoholic beverages because they increase the rate of body water loss.

5.4 Increased dietary salt or lightly salted (0.2 percent) water is adequate to replace lost salt. Salt tablets are not to be used.

5.5 If juice or electrolyte drinks are used, they should be diluted prior to drinking.

5.6 Thirst is not an adequate indicator of body water loss. Workers are to drink at least small amounts of water on each break.

5.7 Workers are to rest when any of the symptoms described above are present. The buddy system is mandatory, as most often the potential victim will not be aware of any symptoms. Watch out for each other.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) shall enforce this procedure as a means of protecting the health and safety of workers while entering, working in, and exiting confined spaces. Before entry, the worker will be made aware of the hazards of confined space work and the safe work practices necessary.

2. PURPOSE

The purpose of this procedure is to establish confined space entry standards for all OHM employees. This procedure meets and exceeds the guidelines in the Occupational Safety and Health Administration (OSHA) proposed Confined Space Entry standard 29 CFR 1910.146.

3. PROCEDURE

3.1 Permitting - All "permit required confined space" entries will be proceeded by the completion of a confined space entry permit. The OHM confined space entry permit follows this procedure.

3.2 Written Rescue Procedure - Prior to any confined space work, a site specific written rescue plan will be developed that addresses minimum requirements.

3.2.1 Rescue

- The equipment required to rescue an unconscious victim must be in-place before the first person enters the confined space.
- A trained stand-by person will be assigned to each confined space with a fully charged SCBA or airline and egress unit.
- The stand-by is to keep life lines clear, to maintain contact with all workers within the confined space and to summon help if needed.
- The stand-by must never enter the confined space unless relieved by rescue assistance.
- The stand-by may attempt rescue by lifeline while waiting for rescue assistance.

4. PERMIT SYSTEM

All confined space entry permits will address the following:

- Location
- Hazards-Isolation
- Lockout / Tagout
- PPE and special equipment
- Air monitoring requirements and results of such monitoring
- Personal monitoring
- Training required
- Stand-by persons to be present as alternates
- Communication procedures
- Emergency / rescue procedures
- Confined space classification
- Posting of notification

6. TRAINING

OHM will train employees involved in confined space entry and confined space rescue on the hazards associated with confined space work. This training will, as a minimum, cover the following:

- Hazard recognition
- Emergency entry and exit
- Respirator use
- First aid
- Lock-out procedures
- Safety equipment
- Rescue drills
- Permit system
- Work practices
- Communication requirements

7. TESTING AND MONITORING

7.1 Initial Monitoring - Entry into a confined space is prohibited until initial testing of the atmosphere for oxygen content and toxic gas concentration is conducted from the outside. Initial monitoring gives critical information concerning oxygen level, flammability and toxicity hazards.

7.2 Hot Work - All hot work is prohibited in confined space where monitoring indicates that there are flammable compounds in excess of 10% of the Lower Explosive Limit (LEL). The monitoring device will be intrinsically safe for flammable atmospheres or explosion proof. If hot work must be performed in the confined space, a hot work permit must be completed. Cutting gas cylinders and welding machines will not be taken into confined space.

7.3 Calibration - All monitoring equipment will be calibrated before each use and those calibrations will be logged in the equipment records. The calibration record will be kept for a minimum of one year from the date of measurement.

7.4 Oxygen Requirement - The percent oxygen for entry will not be less than 19.5% for confined space entry without supplied air respirators. If elevated (greater than 22%) oxygen levels are detected, the confined space must be ventilated prior to any "hot work". Any oxygen reading above or below 20.9% will be reported to the site safety officer before further entry is attempted.

7.5 Permissible Exposure Limits (PEL) - OHM employees will be provided with and will be required to properly use protective clothing and respiratory protective equipment when contaminants in the atmosphere reach or exceed the PEL. The personal protective equipment (PPE) selected will reduce exposure to contaminants to acceptable levels.

8. LABELING AND POSTING

8.1 Any signs warning of dangers in the work area will be in English and the predominant language of any non-English reading workers.

8.2 All entrances to confined spaces at OHM facilities and on-going projects will have appropriate signs posted. The signs should include the following, if applicable:

Danger
Confined Space Entry
Entry by Permit Only

The following statements shall be added where necessary:

Respirator Required for Entry
Lifeline Required for Entry
Hot Work Permitted
or
No Hot Work

8.3 Emergency numbers will be conspicuously posted near the work area or at the telephone nearest the work area.

9. SAFETY EQUIPMENT AND PPE

The site safety officer or site supervisor will determine and list on the confined space permit the necessary safety equipment and PPE. The site supervisor will ensure that the safety equipment is properly used and is maintained in the proper working condition. These items may include, but are not limited to:

- Eye / face protection
- Head protection
- Foot protection
- Protective clothing
- Hearing protection
- Respiratory protection
- Safety bells/Alarms
- Harnesses
- Lifelines
- Wrist harnesses
- Life jackets
- Fall nets
- Barricades
- Retrieval systems

10. WORK PRACTICES

10.1 Purge and Ventilation - During purge and ventilation procedures, blower controls will be a safe distance from the confined space. Initial testing is to be conducted prior to purge/ventilation to determine what precautions are necessary. If a flammable atmosphere exists, all electrical equipment must be intrinsically safe or explosion proof. Continuous ventilation will be required when welding or painting in a confined space, or where a toxic atmosphere may form from desorption from walls, or evaporation of chemicals. Ventilation systems must not prevent egress from the area or interfere with communications.

10.2 Isolation / Lock-out / Tag-out - Each confined space will have isolation procedures specifically developed. The confined space must be completely isolated from all systems by physical disconnect, block and bleed, or blanking and tagging. Electrical systems must be de-energized and locked-out. All systems should be checked for stored energy before any entry into confined space is attempted.

10.3 Cleaning - Cleaning procedures will be reviewed and approved by the qualified person. Initial cleaning will be conducted from outside the tank whenever possible to minimize exposures to employees. Cleaning may be accomplished by flushing with water or chemical cleaners. At times the use of a "Butterworth" cleaning head may be required. In any case, gross material must be removed before entry is performed.

11. EQUIPMENT AND TOOLS

All equipment that is used in confined space will be inspected and as a minimum, will meet the following requirements:

- Hand tools will be kept clean and in proper working condition.
- Electric tools, equipment and lighting will be intrinsically safe or explosion proof for flammable atmospheres and be equipped with ground fault circuits interrupters (GFCI).
- Extension cords will be industrial quality, 3 wire and 12 gauge as a minimum.
- Cylinders of compressed gas will never be taken into a confined space, with the exception of SCBA tanks or life saving equipment.
- Ladder and scaffolding will meet or exceed OSHA requirements in 29 CFR 1910.25-28.

OHM Corporation

CONFINED SPACE ENTRY PERMIT

Project No._____ Permit No._____

Good on this Date Only:_____ From:_____ a.m. p.m. To:_____ a.m. p.m.

Location:_____ Description of Task:_____

Workers Authorized to Enter	Work Monitors	Rescue Personnel
_____	_____	_____
_____	_____	_____
_____	_____	_____

EMPLOYEE PRE-ENTRY BRIEFING

Pre-Entry Briefing Conducted by: _____ (Name) _____ (Date)

CONFINED SPACE PREPARATION

1. Is Illumination Adequate?	YES_____	NO_____	
2. Must Electrical Devices be Intrinsically Safe or Explosion Proof?	YES_____	NO_____	
3. Are Non-Sparking Tools Required?	YES_____	NO_____	
4. Are GFCI's In Use?	YES_____	NO_____	
5. Have All Power Cords and Tools Been Visually Inspected?	YES_____	NO_____	N/A_____
6. Fire Extinguisher Available at Entrance.	YES_____	NO_____	TYPE_____
7. Eye Wash/Safety Shower Available.	YES_____	NO_____	N/A_____
8. Is Rescue SCBA Available?	YES_____	NO_____	N/A_____
9. Work Area Isolated with Signs/Barriers?	YES_____	NO_____	N/A_____
10. All Energy Sources Locked/Tagged Out?	YES_____	NO_____	N/A_____
11. All Input Lines Capped/Blinded?	YES_____	NO_____	N/A_____
12. Vessel Contents Drained/Flushed/Neutralized?	YES_____	NO_____	N/A_____
13. Vessel Cleaned/Purged?	YES_____	NO_____	N/A_____
14. Ventilation Provided 30 Minutes Before Entry?	YES_____	NO_____	N/A_____
15. Communication Requirements	VISUAL_____	VOICE_____	RADIO_____
16. Level of Respiratory Protection.	B_____	C_____	D_____
17. Type of Chemical Protective Clothing Required.	TYVEK_____	SARAN_____	ACID_____
18. Type of Glove Material Required.	NITRILE_____	PVC_____	ACID_____

PRE-ENTRY ATMOSPHERIC TESTING

	Reading:	Time:	Initials:
1. Test for Oxygen Content:	_____ % O_2	_____	_____
2. Test for Flammable Concentration:	_____ % LEL	_____	_____
3. Test for Toxic Concentration:	_____ ppm of _____ (TLV = _____)	_____	_____
4. Continuous Monitoring Required?	YES_____ NO_____		

EMERGENCY/RESCUE PROCEDURES

1. Is a Site Specific Rescue Plan Required?	YES_____	NO_____
2. Are Personnel Trained for Confined Space Rescue Available?	YES_____	NO_____
3. If NO, Has an Outside Agency Been Notified?	YES_____	NO_____

4. Outside Rescue Agency Name:_____ Phone No._____

ENTRY/EGRESS REQUIREMENTS

1. Are Ladders Required for Entry?	YES_____	NO_____
2. Are Vertical Extraction/Rescue Devices Required?	YES_____	NO_____
3. Is Fall Protection Required?	YES_____	NO_____

OTHER POTENTIAL HAZARDS

1. Noise	YES_____	NO_____	CONTROL_____
2. Heat Stress	YES_____	NO_____	CONTROL_____
3. Cold Stress	YES_____	NO_____	CONTROL_____
4. Biological Agents	YES_____	NO_____	CONTROL_____

SUBCONTRACTOR NOTIFICATION

Contractor Notified of: Permit Conditions _____ Potential Hazards _____ N/A _____

PERMIT AUTHORIZATION

I certify that I have inspected the work area for safety and reviewed all safety precautions recorded on this permit.

Permit Authorized by (Signature): _____

2

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel shall not break into a pipeline until a line entry permit has been completed. The line entry permit is valid for a single work shift only.

2. PURPOSE

This procedure provides requirements for breaking into lines which contain or may contain hazardous materials in order to prevent explosion, pressure related injury, or chemical contact.

3. PROCEDURE -- PRE-ENTRY

3.1 Prior to beginning operations at a site, the potential hazards associated with line entry will be recognized and addressed.

3.2 Each line should be regarded as potentially full and pressurized with a toxic or flammable product until it is proven otherwise. Safe line entry requires investigation and pre-planning before work begins.

3.3 It is critical to determine the line contents in order to assess the products' toxic and flammable properties.

- Trace line to each end. For example, identify the pipe run between tanks or reactors.
- Check for color coding. Many plants designate line contents by their own color-coding system.
- Do not assume one plant's code is the same as another or is consistent within each plant.
- If necessary, sample line contents.

3.4 Scaffolding or manlifts used for elevated piping must be used according to manufacturer's specifications. Guardrails and tie-offs must be used.

3.5 Portable lighting must be provided if area is not sufficiently illuminated.

3.6 Any electrical lines near the work area must be de-energized prior to beginning operations. All electrical circuits are to be locked out.

3.7 The level of personal protective equipment (PPE) needed for the job, as well as any decontamination, secondary containment or spill response procedures should be determined before line entry is attempted.

4. PROCEDURE -- LINE BREAKING

4.1 Alert all employees in the work area to the hazard.

4.2 Make available an emergency drench shower and an eye wash station.

4.3 Isolate the line by closing, locking, and tagging all valves entering the line.

4.4 Lock and tag all electrical systems for pumps and automatic valves contained in the pipe run to be entered.

4.5 Remove all free product by pumping or draining. Inert or purge if applicable.

4.6 Blank or Disconnect Line -- Install some physical barrier to prevent additional product from entering the system.

4.6.1 Insert a blank or blind in a line to block it completely. This is important since valves should not be considered trustworthy. Valves have been known to leak even when fully closed.

4.6.2 Make use of double block and bleed (two closed valves within close proximity of each other with an open drain line between), if available.

4.7 Prepare for Line Entry

4.7.1 Establish exclusion zone. Zone should be sufficiently large to prevent unprotected people from contacting line material from liquid splash or vapor/gas emission.

4.7.2 Stage appropriate spill-control media at site.

4.7.3 Establish fire watch if necessary.

4.7.4 Review level of personal protective equipment (i.e., respirator, clothing, gloves, and eye protection).

4.7.5 Conduct air monitoring, including perimeter monitoring, for possible releases and explosive atmosphere survey or work area.

4.7.6 Stage appropriate working surface (i.e., ladder, scaffold, manlift, etc.)

4.8 Enter the Line

4.8.1 The best place to enter a line is at a flange.

4.8.2 Use non-sparking tools, such as brass, to loosen flange bolts if dealing with a flammable material.

4.8.3 Slowly loosen top flange bolts first. If pressurized, this will relieve it. If the line still contains fluid, the material will be noted as dripping or welling around the flange. If these conditions are noted, retighten and recheck purge procedures.

4.8.4 Because of possible leaks, no one will stand adjacent to or under a flange when opening.

4.9 The site supervisor is responsible for evaluating all safety hazards and assuring that the line entry permit is properly completed.

4.10 Line entry permits will be maintained in the project file.

4.11 A copy of the line entry permit follows this procedure.

OHM Corporation

LINE BREAKING PERMIT
(Good for One Work Shift Only)

Date_____ Time_____ a.m. / p.m. To_____ a.m. / p.m.

Project Name_____

Project Number_____ Location_____

Potential Chemical Hazards_____

Safety Precautions

1.	All emergency equipment in position? (Eyewash and safety shower, sorbent material, fire extinguishers, etc.)	Yes_____	No_____
2.	Lines drained, purged and/or washed clean of materials?	Yes_____	Not Necessary_____
3.	All valves checked for positioning and tagged?	Yes_____	Not Necessary_____
4.	All electrical equipment locked out and tagged?	Yes_____	Not Necessary_____
5.	Fire watch designated?	Yes_____	Not Necessary_____
6.	Exculsion zone roped off and signs posted?	Yes_____	Not Necessary_____
7.	Personnel wearing adequate personal protective equipment for expected hazard (consult site safety plan)?	Yes_____	Not Necessary_____
8.	LEL Survey completed?	Yes_____	Not Necessary_____
9.	Air monitoring equipment for poisonous/toxic substance available?	Yes_____	Not Necessary_____
10.	Decontamination, spill response equipment and procedure established, in place, and ready for response?	Yes_____	Not Necessary_____
11.	All personnel briefed on procedures?	Yes_____	Not Necessary_____

I Certify that all necessary precautions have been taken in accordance to the line breaking procedures.

Supervisor_____

Foreman_____

Site-Safety Officer_____

Line Breaking Crew_____

_____

OHM Corporation

LINE BREAKING PERMIT
(Good for One Work Shift Only)

Date_____ Time_____ a.m. p.m. To_____ a.m. p.m.

Project Name_____

Project Number_____ Location_____

Potential Chemical Hazards_____

Safety Precautions

1.	All emergency equipment in position? (Eyewash and safety shower, sorbent material, fire extinguishers, etc.)	Yes_____	No_____
2.	Lines drained, purged and/or washed clean of materials?	Yes_____	Not Necessary_____
3.	All valves checked for positioning and tagged?	Yes_____	Not Necessary_____
4.	All electrical equipment locked out and tagged?	Yes_____	Not Necessary_____
5.	Fire watch designated?	Yes_____	Not Necessary_____
6.	Exculsion zone roped off and signs posted?	Yes_____	Not Necessary_____
7.	Personnel wearing adequate personal protective equipment for expected hazard (consult site safety plan)?	Yes_____	Not Necessary_____
8.	LEL Survey completed?	Yes_____	Not Necessary_____
9.	Air monitoring equipment for poisonous/toxic substance available?	Yes_____	Not Necessary_____
10.	Decontamination, spill response equipment and procedure established, in place, and ready for response?	Yes_____	Not Necessary_____
11.	All personnel briefed on procedures?	Yes_____	Not Necessary_____

I Certify that all necessary precautions have been taken in accordance to the line breaking procedures.

Supervisor_____

Foreman_____

Site-Safety Officer_____

Line Breaking Crew_____

_____

OHM Corporation

LINE BREAKING PERMIT
(Good for One Work Shift Only)

Date_____ Time_____ a.m. p.m. To_____ a.m. p.m.

Project Name_____

Project Number_____ Location_____

Potential Chemical Hazards_____

Safety Precautions

1.	All emergency equipment in position? (Eyewash and safety shower, sorbent material, fire extinguishers, etc.)	Yes_____	No_____
2.	Lines drained, purged and/or washed clean of materials?	Yes_____	Not Necessary_____
3.	All valves checked for positioning and tagged?	Yes_____	Not Necessary_____
4.	All electrical equipment locked out and tagged?	Yes_____	Not Necessary_____
5.	Fire watch designated?	Yes_____	Not Necessary_____
6.	Exculsion zone roped off and signs posted?	Yes_____	Not Necessary_____
7.	Personnel wearing adequate personal protective equipment for expected hazard (consult site safety plan)?	Yes_____	Not Necessary_____
8.	LEL Survey completed?	Yes_____	Not Necessary_____
9.	Air monitoring equipment for poisonous/toxic substance available?	Yes_____	Not Necessary_____
10.	Decontamination, spill response equipment and procedure established, in place, and ready for response?	Yes_____	Not Necessary_____
11.	All personnel briefed on procedures?	Yes_____	Not Necessary_____

I Certify that all necessary precautions have been taken in accordance to the line breaking procedures.

Supervisor_____

Foreman_____

Site-Safety Officer_____

Line Breaking Crew_____

_____

1. OBJECTIVE

This procedure shall be used by OHM Remediation Services Corp. (OHM) personnel to ensure that the machine or equipment being worked on is isolated from all potential hazardous energy sources, and locked out or tagged out before an employee performs any servicing or maintenance activity where that unexpected energization, start-up or release of energy could cause an injury. Energy sources can be electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

2. PURPOSE

This procedure establishes the minimum safety requirements to ensure the proper deactivation of movable, electrically energized, pressurized equipment and systems, and systems containing hazardous materials prior to repairing, cleaning, oiling, adjusting, or similar work. This procedure complies with the requirements in 29 CFR 1910.147.

3. REQUIREMENTS

This procedure applies to all equipment that receives energy from electrical power, hydraulic fluid under pressure, compressed air, steam, energy stored in springs, potential energy from suspended parts, or any other source that may cause unexpected movement when it is necessary to perform work on that system. It also applies to similar functions performed on systems containing hazardous materials.

4. DEFINITIONS

4.1 Lockout - The placement of a lockout device on an energy isolating device, in accordance with this procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. The lockout device can be key operated or a combination device.

4.2 Tagout - The placement of a tagout device on an energy isolating device, in accordance with this procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed by the authorized person who originally placed the tagout device in position.

4.3 Authorized employee. A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment.

5. PROGRAM ELEMENTS

Prior to initiating any repairs, modifications and/or adjustments to operating equipment, these steps will be followed.

5.1 The immediate supervisor with jurisdiction over the equipment and all affected employees will be notified that the energy sources are to be deactivated.

5.2 All sources of power that must be locked out, blocked or released will be identified by the immediate Supervisor and the employee who will work on the equipment.

5.3 In order to ensure that the equipment cannot be re-energized while maintenance activities are performed, the employee will lockout / blank out all potential energy sources. (The employees will be assigned padlocks with their names or identification numbers affixed to the locks. The locks will be individually keyed to prevent another employee from removing the lock inadvertently.) If more than one employee is assigned to work on the equipment, a multi-lockout hasp will be used so that all employees working on the equipment can apply their locks and ensure their safety.

5.4 A tagout device will be affixed to all components or systems de-energized to indicate that lockout has been performed.

Prior to performing any work activities, the employee will operate the start and stop controls on the equipment to ensure that the equipment has been properly deactivated. After the test, the equipment must be in neutral or off.

5.5 After the servicing and/or maintenance is complete and the equipment is ready for normal operations, check the area around the machine or equipment. After all tools have been removed from the machine or equipment, guards have been reinstalled, remove all lockout or tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

6. SPECIAL CONDITIONS

During certain operations it may be necessary to energize the equipment for a short period of time. Employees in the immediate area will be notified and directed to stay clear of the equipment. If the operation is to be deactivated again, the employee should repeat steps 5.3 to 5.6 of this procedure before work resumes.

In some instances work will carry over to another shift. The maintenance supervisor shall affix a department lock to the equipment to ensure that it is not energized during the transition. During subsequent slight operations, employees will ensure that steps 5.2 to 5.6 are complete before work resumes on the equipment.

If the work is completed and a lock remains on the equipment, it shall not be removed until the employee responsible for the lock is found or the supervisor of the employee investigates and ascertains that the equipment is safe to operate. Unauthorized removal of a lock will subject the violator to disciplinary action up to dismissal.

7. TRAINING

Initial and annual training will be given to all employees to ensure that the purpose and function of this energy and control program are understood.

8. PERIODIC INSPECTION

Corporate health and safety will conduct an annual audit of the energy control program to ensure that the requirements of their procedures are being followed. A record of annual audits will be kept to comply with the certification requirement of periodic inspections.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will control the hazards at projects where underground storage tanks (UST) are removed by following the procedures described in this procedure.

2. PURPOSE

This procedure outlines the steps necessary to ensure the safe removal of underground tanks.

3. PROCEDURE

3.1 Visually inspect the site to ensure that the work can be safely done. Special attention must be given to safe work surfaces for equipment, the presence of overhead lines which may hinder equipment operation, and local traffic which may be affected.

3.2 Call the local utility companies to locate telephone, power, water, and sewer lines which may be in the way of excavation. Ensure they are well marked before excavation.

3.3 Locate the tank, together with piping, vents, and manways.

3.4 Sample the tank to verify that the tank contains the product which was indicated. Note liquid levels. Check for the presence of water and other contaminants.

3.5 Sample the tank vapor space with a Combustible Gas Indicator/Oxygen meter (CGI/O_2) to verify safe/unsafe conditions.

4. TANK EXCAVATION

4.1 Establish the boundaries of the exclusion zone so that unprotected personnel will not accidentally come in contact with any possible liquid splashes or vapors arising from the excavation.

4.2 Ensure that all walking/working surfaces and areas are in a safe condition. A firm footing for equipment and personnel must be established on the overburden. If not, the areas need to be stabilized. If it is possible for excavation or hoisting equipment to contact overhead power lines, then these will need to be de-energized prior to beginning operations. Note that for tracked vehicles, the proper alignment with an excavation is to have the tracks perpendicular to the excavation.

4.3 While the overburden is being removed, if free product or saturated soil is likely to be contacted, then a proper storage area for this spoil material must be designated. This area may need to be lined and diked. If free product or saturated soils are found, both toxic and flammable readings shall be taken at the work site and perimeter.

4.4 The excavation wall may have to be sloped or shored to ensure that the walls do not collapse. Remember, an excavation over 4-feet deep is often considered a confined space. There are OSHA standards for both excavations and confined space entry which are addressed in other OHM health and safety procedures.

4.5 If personnel enter the excavation, they shall use the proper protective equipment, and follow confined space entry and excavation procedures, as appropriate.

4.6 If open excavations are left unattended, proper barricades and warning signals shall be set up to actively warn all personnel of the open pit hazard. In certain areas, additional security measures may need to be instituted in the form of fences or security guards.

5. TANK REMOVAL

5.1 All products will be removed by pumping (if possible).

5.2 If the tank atmosphere is flammable, the tank shall be inserted prior to removal. This can be done by introducing nitrogen or carbon dioxide (dry ice CO_2) until the oxygen content is 8 percent or less, or "foamed" with fire fighting or vapor suppression foam to suppress vaporization, along with ventilation to below 10 percent of the lower explosive limit (LEL). Depending on the situation and product, one method may be preferred to the other.

5.3 If possible, all lines will be removed by disconnecting joints rather than cutting or burning. No hot work will be performed without a hot work permit issued after LEL testing.

5.4 The tank will then be carefully lifted and moved to the decontamination area for decontamination. Appropriate rigging equipment must be used to lift the tank from the excavation. Additionally, the shears should not be used for lifting, but only for cutting the tank since the weight of the shears approach the maximum lifting capacity of most excavators.

6. TANK DECONTAMINATION

6.1 Decontamination is required to remove residue from the tank, so the tank can be disposed of as a clean material, or shipped safely.

6.2 The tank decontamination area will be marked as an exclusion zone. Proper personal protective equipment, medical emergency equipment, splash shower, and eye wash, should be available.

6.3 Before opening the tank to permit entry for water blasting, foaming, or other cleaning methods used, the tank will again be checked for the presence of flammables and appropriate actions taken to reduce flammable levels. Confined space entry procedures apply.

6.4 Personnel will wear chemically protective suits with respiratory protection appropriate to the hazards.

6.5 A method for rinse water containment and proper disposal procedures will be established.

7. SAFETY CERTIFICATION BEFORE CUTTING TANKS

7.1 The preferred method of cutting (rendering) tanks is to use the power shears attached to a boom vehicle. The least preferred method is to use a cutting torch. A power metal chisel may also be used. The primary hazard when cutting tanks, using either the shears, cutting torch, or chisel is the possibility of igniting flammable vapors in the tank. When using the shears, the possibility of catapulting metal pieces must also be considered. Whenever tanks are cut, all unnecessary personnel should be removed from the area. The possibility of explosion of flammable vapors should always be considered.

7.2 Sample the tank atmosphere for flammables and oxygen. Before a tank can be cut with either shears, cutting torch, or chisel, the tank atmosphere must be less then 10 percent LEL or less than 8 percent oxygen. If the tank atmosphere shows flammable vapors in excess of 10 percent LEL, then some action must be taken to reduce the flammable vapor concentration or reduce the oxygen concentration to less than 8 percent oxygen.

Air monitoring equipment should respond to the specific gas encountered. Never use nonintrinsically safe equipment such as a photoionization detector (PID) in a potentially explosive environment.

7.3 If the tank atmosphere is greater than 10 percent LEL, one of these actions must be taken to make the tank safe for cutting. In any case, verification of the tank atmosphere must be made.

Ventilate the Tank: Ventilation may be used in certain literatures where the products in the tank are not particulary flammable or toxic. Ventilation will not eliminate the vapors. It is merely diluting the airborne concentration. Once ventilation is started, it should be continued for the duration of the operation.

Clean and Ventilate the Tank: Use a cleaning method such as Butterworthing with hot water, pump out liquids, and then ventilate as above.

Inert the Tank: Nitrogen from a liquid nitrogen tank, or carbon dioxide from dry ice can be used to inert the atmosphere in the tank to below the oxygen concentration necessary for combustion. Note that flammable vapors will still be present; and once the tank is cut or opened, the inert gas can be lost. The atmosphere must be diluted to less than 8 percent oxygen by volume to be completely safe for normal petroleum products. The CGI/O_2 meter must be used to verify the O_2 concentration. Measurements must be made continuously. The quantity of inert gas which must be used depends on the vapor level still is present in the tank. In practice, about 6 to 8 and perhaps as many as 10 tank volumes would be required, depending on how the material is administered. If dry ice is used, approximately, 11.5 pounds of dry ice per 100 cubic feet (15 lbs per 1,000 gallons) of tank volume is required to reduce the oxygen to 8 percent. There are several precautions which must be observed when using dry ice. The material is extremely cold - 109.3 F. Also, the CO_2 produced will be absorbed into any water present, thus effectively increasing the oxygen concentration.

Foam the Tank: If product cannot be totally removed, a method which has proven successful is to "foam" the surface of the remaining liquid with a fire fighting or vapor suppression foam. This foam blend should be 3-inches or 4-inches thick and will have the effect of suppressing vaporization of the volatile material.

The foam must be applied through a tank opening and thus the tank must be opened. After laying the foam blanket, the tank may have to be ventilated so that the vapor flammable concentration is reduced to less than 10 percent of the LEL as indicated by the combustible gas meter. In extreme cases, high expansion foam can be used to completely fill the tank. No ventilation will be necessary in this case.

7.4 When cutting tanks by any method, appropriate fire protection for the expected hazard should be available.

BEFORE ANY HOT WORK IS PERFORMED, A HOT WORK PERMIT MUST BE COMPLETED IN ACCORDANCE WITH THE HOT WORK PROCEDURE.

8. OTHER SITUATIONS

Under certain situations, the tank may need to be opened and cleaned before removal. In this case, a reordering of steps is appropriate. The steps were previously discussed:

- Remove pumpable product
- Test tank interior for flammables
- If flammable, inert and purge
- Retest atmosphere and repeat until safe
- Open tank
- Retest atmosphere for flammables and toxics
- Clean as much as possible remotely with equipment
- Allow properly protected personnel to enter for final cleaning

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel who have been trained in the proper set-up, use, and care of high pressure washers will be authorized to operate this equipment.

2. PURPOSE

This procedure describes requirements for the safe operation of the high-pressure washer.

3. PERSONAL PROTECTIVE EQUIPMENT

The following equipment will be worn by operators and assistants:

- Safety shoes or boots
- Metal foot and shin guards
- Eye protection (goggles and face shield)
- Hard hat
- Heavy duty PVC rain suit or equivalent
- Heavy chemical resistant gloves

4. OPERATION PROCEDURE

- Only trained, authorized personnel will operate the high-pressure washer.
- The lance must always be pointed at the work area.
- The operator must maintain good footing.
- The operator must have an assistant to aid in moving the hose to different areas and backing up the operator. The assistant must remain in back of the operator.

- Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet.
- The operating pressure should never exceed that which is necessary to complete the job.
- No unauthorized attachment may be made to the unit. (The trigger should never be tied down.)
- The operator should be changed at frequent intervals to avoid fatigue (at least hourly).
- Equipment should be cleaned often to avoid oil or dirt build-up, especially around the trigger and guard area.
- An assistant should always be standing by at the pressure generator to shut down the equipment and monitor the pressure.
- All users must be trained in emergency shut down procedures and general equipment maintenance.
- All lances must be made of seamless stainless steel. Do not use carbon steel which can corrode and result in weakening of the lance.
- DO NOT MODIFY THE LANCE. The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment.
- Always increase pressure slowly to inspect for leaks. All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service. Never exceed the operating pressure necessary to do the job.
- Attach a cable which connects the water supply hose to the laser wand to prevent whipping should they accidentally disconnect.
- A serious risk of infection and further complications is possible from a hydroblasting laceration. If an injection injury is suspected, the treating physician should be informed so he/she can request a surgeon who specializes in injection injuries. The specialist may have to perform surgery on the affected body part in order to remove the material (oil, particles) that was injected directly through the skin.

1. OBJECTIVE

All lifting activities performed by OHM Remediation Services Corp. (OHM) personnel using cranes and hoists shall comply with all federal, state, and local laws as well as safe practices dictated by this procedure and the crane and/or hoist manufacturers.

2. PURPOSE

This procedure describes requirements for maintenance and operation of hoisting equipment. This procedure is an overview of the guidelines of 29 CFR 1910.179, 1910.180 and 29 CFR 1926.550 which should be used as a reference.

3. REQUIREMENTS

3.1 OHM will only use cranes and other hoisting equipment that are in safe working order. All crane equipment at OHM facilities and project sites will be inspected for structural integrity, smooth operational performance, and proper functioning of all critical safety devices in accordance with the crane manufacturer's specifications. This inspection will be performed by the OHM site supervisor and/or site safety officer (SSO), and the crane operator. Inspection requirements for overhead cranes are found in 29 CFR 1910.179 (j) and for mobile cranes in 29 CFR 1926.550 (a).

3.2 All equipment not conforming to the operational and safety requirements set forth will not be put into service until all necessary repairs are made to the satisfaction of the inspection group.

3.3 Only qualified crane operators familiar with the equipment will be permitted to operate the crane. Subcontractors will supply proof of operator capability and experience to operate the crane in a safe manner. OHM reserves the right to remove from the work site any crane operator if there is question or doubt concerning the operator's capabilities.

3.4 Inspection of cranes and hoists will be recorded. A written record of the inspection will be maintained and kept for at least three years.

3.5 The crane operator will not operate the crane or hoist until everyone concerned has been instructed concerning the work to be done.

3.6 Weights of material sent to all OHM facilities shall be stenciled on the material.

3.7 All hooks, slings, and other fittings shall be of correct size for the work to be done and shall have strength sufficient to safely sustain the loads imposed on them.

3.8 Employees shall not stand or walk beneath crane booms.

3.9 In the event of emergency repair work of hoisting equipment with a suspended load, the area below the load shall be barricaded and the load blocked up or otherwise supported.

3.10 Employees are not to ride loads, hooks, headache balls, or slings suspended from hoisting equipment.

3.11 Side pulls shall be avoided in all cases. The load must be directly under the hoist.

3.12 The safety latch on the main hook of hoisting equipment must be installed and in a "closed" position.

3.13 Use of deformed or defective hooks, rings, pins, shackles, or other lifting attachments is prohibited. Wire rope shall be free of kinks, sharp bends, or twists.

3.14 Crane operations must not interfere with helicopter operations or helicopter operations must be restricted accordingly.

3.15 The crane operator shall refuse to perform any crane operation, if an unsafe condition would result.

3.16 Stringing and reeving shall be in accordance with manufacturer's recommendations.

3.17 All personnel working in and around the crane operation shall wear hard hats, safety shoes, and safety gloves at all times.

4. CRANE OPERATIONS

4.1 Crane operations shall be according to the manufacturer's directions and established construction safe work practices. At no time will crane operation be permitted out of the design specifications of the unit or the safety requirements. The following safety policies will be enforced at all times during crane operations:

4.1.1 Accessible areas within the swing radius will be barricaded to prevent employee injury.

4.1.2 Mobile crane shall operate with the outriggers fully extended and set whenever possible. If outriggers cannot be fully deployed and set, the crane capacity shall be determined by the "On Rubber" load capacity chart.

4.1.3 Only one individual will issue operational hand signals to the crane operator unless it is established that relay hand signaling for blind situations is required.

4.1.4 Load Capacity Limitations - All load weights can be estimated until reaching an estimated 75% of rated load. Loads above 75% of rated capacity must be based on actual weight. All hoisting capabilities of the crane in use will be according to the load capacity chart specified by the manufacturer. Load weight will be calculated with all rigging components considered as part of the load.

4.15 Swing Loads - Tag lines for controlling loads will be used at all times. Suspended loads, regardless of the size and weight, will not be hoisted over employees.

4.16 The operator shall not lift a load until the load is properly secured and balanced.

5. RIGGING COMPONENTS

5.1 Rigging components will be inspected daily by members of the rigging team. Only certified wire rope slings with manufactured swag or manufactured web slings will be used. Certification documents must be received and filed for all slings.

5.2 All synthetic slings and lifting chains are to be marked or tagged with its rated capacity.

5.3 Slings are not to be used with loads which exceed their rated capacity.

5.4 Wire-rope slings are to be immediately removed from service if any of the following conditions are present:

5.4.1 Six (6) randomly distributed broken wires in one rope lay, or three (3) broken wires in one (1) strand in one (1) rope lay.

5.4.2 Wear or scraping of one-third (1/3) the original diameter of outside individual wires.

5.4.3 Kinking, crushing, bird caging, or any other damage resulting in distortion of the wire-rope structure.

5.4.4 Evidence of heat damage.

5.4.5 End attachments that are cracked, deformed, or worn.

5.4.6 Hooks that have been opened more than 15 percent of the normal throat opening, measured at the narrowest point, or twisted more than 10 degrees from the plane of the unbent hook.

5.4.7 Corrosion of the rope or end attachments.

5.4.8 Ten percent reduction in rope diameter.

5.5 Tag lines will be used to guide loads. Tag lines will be free of knots.

5.6 Crane Operators shall:

5.6.1 Not operate the crane if physically or mentally unfit or taking medication that could affect coordination or sight.

5.6.2 Warm up the crane mechanical components by checking the functional operation of all clutches, brakes, etc.

5.6.3 Plan each heavy or unusual lift with the rigger(s).

5.6.4 Ensure the crane is shut down in accordance with the posted operating procedure, before leaving the crane cab.

5.6.5 Not leave the controls while a load is suspended.

5.6.6 Shutdown crane during nearby helicopter operations (boom in cradle or pointed away from landing area).

5.6.7 Know the weight of the load to be lifted prior to lifting.

5.6.8 Weight indicators or scales shall be used to determine true load weight if the estimated weight is in excess of 75 percent of the cranes rated capacity.

5.6.9 Not use cranes for dragging a load unless rigged for a vertical pull and equipped with a weight indicator.

5.6.10 Ensure that three full wraps of wire rope remain on the hoisting drum unless otherwise specified by the crane manufacturer.

5.6.11 Stop or restrict crane operations during bad weather or poor visibility.

5.6.12 Not refuel the crane with the engine running.

5.6.13 Ensure the crane has a boom angle indicator which is functional and visible from the operator control station.

5.6.14 Ensure the proper load chart is posted and visible from the operator control station.

5.6.15 Ensure each crane has posted operating instructions.

5.6.16 Ensure crane load weight indicators are functional and calibrated in accordance with the manufacturer's recommendations.

5.6.17 Ensure an operable anti-two blocking device is installed on all cranes.

5.6.18 Ensure crane cab is kept clean.

5.6.19 Ensure slipping and tripping hazards are removed from work area.

6. RIGGING PRACTICES

The Rigger shall:

6.1 Stay from under the boom/load when there is tension on the load line and when there is no tension on the load line except for the minimum time necessary to hook/unhook the load.

6.2 Stop a load from being lifted when it is unsafe.

6.3 Wear leather or other hard surface gloves when handling wire rope.

6.4 Ensure safety latches are closed, shackle pins are screwed all the way in, and hooks without latches are secured.

6.5 Ensure sling angles are not less than 30 degrees from the horizontal.

7. RIGGING PRACTICES/EQUIPMENT

7.1 Multiple part lines shall not be twisted while lifting/lowering.

7.2 Shackles shall be used with all pad eyes.

7.3 Fiber rope or "soft line" shall be used only for tag lines.

7.4 Wire rope clips shall be placed with the U-bolts on the short end of the rope.

7.5 When less than all legs of a multi-legged sling are used, the other leg(s) must be secured before lifting.

7.6 Chain slings shall not be used unless the have an identification tag with the rated capacity and identification number.

7.7 All slings shall be immediately inspected if subjected to shock or impact loading.

7.8 Slings shall be used according to manufacturer specifications and properly stored when not in use.

8. LIFT STRATEGY PLAN

In order to address different types of lifts, a lift strategy plan has been established by OHM. Under this plan, OHM will use the crane's load capacity and specific rigging requirements to classify the lift. Under these guidelines various lift strategies will be followed.

8.1 General Lifts - General lifts are small scale hoisting activities which require daily rigging inspection. To distinguish what items are considered general lifts, the load capacity chart of the specific crane in use will be the criteria. General lifts for this plan are those lifts that do not exceed the crane's load capacity rating in its least stable, but safe operating position.

8.2 Major Lifts - Major lifts are lifts that require the attention of the OHM Site Safety Officer (SSO) or his designated representative to review the lift and rigging operations during the actual lift. Major lifts are those that are less than 75 percent of the crane's upper load rating on the load capacity chart. Major lifts may also include those lifts with unusual configurations that require special attention in rigging.

8.3 Critical Lifts - Critical lifts are those lifts which exceed 75 percent of the crane's load capacity rating. Critical lifts will not be enacted until an overall lift review detailing all weight calculations and lift strategy has been held.

Direct supervisory and safety supervision by OHM will be mandatory for all major and critical lifts.

9. OTHER CRANE SAFETY EQUIPMENT

9.1 A 5 pound A:B:C dry chemical or equivalent fire extinguisher shall be within the area of the crane cab.

9.2 Cranes without cabs shall have the fire extinguisher located within 25 feet of the crane.

9.3 All equipment and material hoists operating on rails, tracks, or trolleys shall have positive stop or limiting devices to prevent overrunning.

10. DESIGNATED CRANE OPERATORS

Cranes shall be operated only by the following personnel:

10.1 Crane operators qualified or designated by documented training and experience.

10.2 Trainee crane operator while under the direct supervision of an OHM qualified crane operator.

10.3 Maintenance personnel and inspectors when it is necessary in the performance of their duties.

10.4 Contract crane operators meeting operator qualification requirements equivalent to OHM crane operator requirements.

11. QUALIFICATIONS FOR CRANE OPERATOR POSITIONS

11.1 Physical Requirements:

11.1.1 Vision:

- Minimum vision of 20/30 in one eye and 20/50 in the other eye with or without eye correction.
- Satisfactory depth perception.

11.1.2 Hearing:

- Have hearing, with or without a hearing aid, adequate for the specific operation.

11.1.3 Medical History:

- Disabling medical condition(s) is sufficient for disqualification.
- Employee shall notify their supervisor of any physical condition that may affect safe crane operations.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) employees will use the proper lifting techniques and will utilize mechanical means when an objects' weight or bulk cannot be safely lifted by manual means.

2. PURPOSE

This procedure provides the proper lifting technique to be used by OHM employees. By utilizing proper technique, OHM employees can avoid debilitating lower back injuries.

3. REQUIREMENTS

3.1 Use mechanical material handling equipment whenever practical; however, mechanical lifting equipment shall be used only by qualified personnel.

3.2 If the material must be lifted manually, the following procedures apply:

3.2.1 Make certain that the load lifted can be safely handled. Consider the size, weight, and shape of the load. If necessary, get help.

3.2.2 Warm up for the lift by bending, stretching, and turning.

3.2.3 Do not attempt to lift more than 60 pounds.

3.2.4 Ensure proper lifting technique as follows.

- Place feet about shoulder width apart.
- Place one foot alongside the object being lifted and the other foot in front of the object.
- Bend at the knees to grasp the load.
- Maintain slight arch in the back when positioning over load.
- Draw the load close to the body, keeping the arms and elbows tucked into the side of the body.

- Take a firm hold on the load with the palms of the hands, not just the fingers.
- Maintain same slight arch in the back.
- Lift gradually, using your leg muscles. Make sure you draw the load close to your body.
- Do not twist the body when lifting. If you have to change direction, turn with your feet, not your trunk.
- Carry the object close to the body and watch where you are going. Do not carry objects in a manner that obstructs your vision.
- Avoid throwing or dropping objects. When lowering, maintain a firm grip. Watch out for pinching of the fingers. Use your leg muscles to lower the object by bending at the knees, and keeping your back straight.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) employees and contractors shall attempt to identify and eliminate situations where injuries or "near misses" could occur from slip, trip, or fall hazards.

2. PURPOSE

This procedure describes work practices that will reduce or eliminate slips, trips, and falls and thereby reduce or prevent the injuries associated with these types of accidents. The intent is to prevent injuries and maintain an efficient and healthy workforce.

3. REQUIREMENTS

3.1 Personnel shall keep the working area clean and orderly. Tools must not be left lying on the floor or decking where they present tripping hazards during a job or after a job is completed.

3.2 Small, loose items such as, disconnected joints of pipe, wood chips, other small objects and debris shall not be left lying around in any place, particularly in areas where personnel walk.

3.3 Walkways and grating shall be kept in good condition. Openings in walkways shall be repaired immediately, if possible. If not immediately repaired, the section must be roped off or closed until repairs can be made.

3.4 Holes in gratings shall be covered or surrounded by an adequate guard rail.

3.5 Oil spills and slippery spots shall be cleaned up immediately.

3.6 Extra precautions must be taken when walking on steel decking or catwalks during wet weather.

3.7 Personnel shall not take dangerous shortcuts. They shall avoid jumping from elevated places.

3.8 Personnel must always position themselves properly when using tools.

3.9 Personnel shall not walk or climb on piping, valves, fittings or any other equipment not designed as walking surfaces.

3.10 Stairways, walkovers or ramps shall be installed where personnel must walk or step over equipment in the course of their normal duties.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) shall provide suitable facilities for quick drenching or flushing of the eyes and body within the work area for immediate emergency use where the eyes or body of any person may be exposed to injurious chemicals.

2. PURPOSE

This procedure describes the types and locations of safety showers and eyewash stations and addresses the requirements found in 29 CFR 1910.151(c) and the American National Standards ANSI Z358.1-1990 for emergency eyewash and shower equipment.

3. REQUIREMENTS

3.1 EYEWASH STATIONS - Eyewash stations shall be located throughout company facilities and job sites for emergency first aid in case of chemical splashes to the eyes and skin. The general requirement for emergency eyewash stations are as follows:

- Flush both eyes simultaneously
- Freeze protection when possibility of freezing conditions exist
- No sharp projections in operating area of unit
- Nozzles protected from airborne contaminants
- Self-contained unit shall be constructed of materials that will not corrode in the presence of flushing fluid
- Unit shall deliver not less than 0.4 gpm for 15 minutes.
- Valves must have "stay open" feature allowing both hands free to open eyelids

- Valves must be capable of being turned on in 1 second or less
- Valve activator shall be large enough to be easily located and operated by user.

Installation Requirements:

- Unit is positioned so water nozzles are 33-45 inches from the floor and 6 or more inches from the wall
- Supply line for plumbed units shall provide an uninterrupted supply of potable water at a minimum of 30 lbs. per square inch of pressure.
- Eyewash units shall be in an accessible location, located no further than 100 feet from the hazard. Where strong caustics or acids are present, the distance should be 10 feet or less.
- Identify location with a highly visible sign in a well lit area.

3.2 DRENCH SHOWERS - Drench showers shall be located throughout company facilities and at project sites for emergency use in case of chemical splash to the face, head and/or body. The general requirement for drench showers is as follows:

- The height of the drench shower had should be at least 82 inches and not more than 96 inches from standing level.
- The water spray pattern should be a minimum of a 20 inch diameter, 60 inches from standing level.
- The center of the water spray should be 16 inches from any obstruction
- The drench shower should deliver 30 gallons per minute, meeting the water spray pattern.
- The control valve should stay on once activated, and should be able to be activated from "off" to "on" in one second.

- Drench showers should be located 10 seconds or 100 feet from the hazard. In situations where strong caustics or acids are present, the distance should be 10 feet or less.

- The drench shower should be identified with a sign and should be located in a well lit, brightly painted area.

3.3 INSPECTION - To simplify the maintenance and record-keeping, an individual at the project site or department should be assigned the task of checking all eyewash devices on a weekly schedule and records of those inspections be kept on the device. The flushing solution should also be checked and replaced per the manufacturer's instructions. Trash or debris should be removed from any eyewash basins at this time.

3.4 MAINTENANCE - Each plumbed emergency eyewash device should be activated weekly to test the equipment and flush plumbed lines of any bacterial or sediment build-up. For self-contained eyewash units, follow the manufacturer's instructions. ANSI Standards recommend that all emergency eyewash devices be checked on a weekly basis in order to ensure proper working conditions as well as adequate levels of flushing solution.

1. OBJECTIVE

It is the intent OHM Remediation Services Corp. (OHM) to protect employees against exposures to, and fires involving solvents and flammable or combustible liquids. All employees who may work with such materials must be familiar with and comply with the provisions of this procedure.

2. PURPOSE

This procedure outlines general precautions that are to be taken by personnel when handling solvents and flammable or combustible liquids. Precautions and required personal protective equipment (PPE) for specific chemicals are included in Material Safety Data Sheets (MSDS). This procedure is an overview of 29 CFR 1910.106. If questions arise concerning flammable or combustibles or the labeling of flammable or combustible liquid containers, reference should be made to the above standard. In the event of a conflict between the referenced standard and the MSDS, the more stringent requirement will prevail.

3. DEFINITIONS

3.1 Hydrocarbon solvents are compounds consisting solely of hydrogen and carbon atoms. They are flammable in varying degrees and may leave a combustible residue or oily film.

3.2 Alcohols are hydrocarbon derivatives in which one or more hydrogen atoms have been replaced by a hydroxyl group (oxygen-hydrogen). They are flammable, water soluble, and leave no film.

3.3 Ketones are hydrocarbon derivatives containing oxygen atoms. They are flammable, water soluble, and dissolve some materials not affected by hydrocarbons or alcohols.

3.4 Halogenated hydrocarbons are organic compounds containing chlorine, fluorine, and/or other halogens. They are primarily non-flammable and leave no oily residue. Depending on their boiling point, they are used cold or in heated vapor degreasers. When exposed to flames, hot surfaces, or welding arcs, vapors of these materials decompose into highly toxic and corrosive vapors, such as phosgene or hydrogen chloride.

3.5 Flammable solvents are classified according to flashpoints and boiling points.

3.6 TLV is the acronym for threshold limit value. Atmospheric contaminants in the form of gas or vapor are generally expressed as parts per million (ppm) by volume denoting parts of the material in 1,000,000 parts of air. Threshold limit values are the occupationally acceptable limits set by the American Conference of Governmental Industrial Hygienists to which most employees may be continuously exposed during their 8 hour working days without any adverse effect on their health.

3.7 Boiling point is that temperature at which a liquid boils and is an indicator of the relative vapor concentration present over liquids at any given temperature. (The higher the boiling point, the lower the vapor concentration.)

3.8 Flash point is that temperature at which sufficient flammable vapors are evolved from a liquid to obtain ignition. (The lower the flash point, the more flammable the solvent.)

3.9 Flammability limits denote the range, in percentage by volume, of the material with air which will burn.

3.10 Positive ventilation is venting provided by ducting and fans or blowers as opposed to comfort or natural ventilation.

3.11 Safety containers are of welded seam construction with excess pressure relieving closure and wire mesh screens to prevent the propagation of flame into the container. Safety containers are painted red (some with one yellow stripe). The container must be plainly labeled as to contents. Containers must be National Fire Protection Association or Underwriters Laboratory approved.

4. SOLVENTS

4.1 Skin contact should be avoided. All solvents remove protective oils from the skin on contact, increasing the possibility of dermatitis and infection. Some solvents may be absorbed through the skin to produce systemic effects.

4.2 Repeated skin contact can cause a person to become sensitized to a given solvent.

4.3 All solvents have varying adverse effects if ingested. Hydrocarbon liquids produce respiratory complications if allowed to enter the lungs.

4.4 Vapor concentrations above a given solvent are difficult to predict, depending on the method of dispensing, agitation, temperature, air movement, and confinement. In any case, the concentration will be directly proportional to the area of the surface wetted under a given set of conditions.

4.5 Some of the solvent vapors may be detected by odor before the TLV is reached. However, this is not a reliable method for protection against overexposure, since some solvents paralyze the sense of smell.

4.6 Miscellaneous solvent supplies in work areas shall be reduced to the minimum amount necessary for daily operation.

4.7 Solvent containers for bench use shall be of smallest practical size and shall provide a method of dispensing without pouring (by wetting cloth, squeeze bottle, or plunger type safety container).

4.8 All wiping cloths used for solvents shall be placed in a closed container immediately after use.

4.9 Disposition of all solvent wastes must be by an environmentally approved method.

4.10 Spills shall be cleaned up immediately using respiratory protection. Clear the area of other persons as necessary.

4.11 No solvent shall be used in a fashion to permit skin contact with the liquid. In most instances this means that gloves must be worn.

4.12 Solvent contaminated clothing must be removed at once.

4.13 All use of solvent not in positively ventilated equipment or in an outside area shall require the use of respiratory protection.

4.14 When using solvents inside a pit or confined area, regardless of quantity, personnel must wear adequate respiratory and contact protection and comply with confined space entry procedures.

4.15 Containers of solvents shall be labeled with an appropriate warning label.

4.16 The following precautions must be observed when opening full drums of solvents or chemicals:

- When opening full drums, all personnel in the immediate area must wear chemical goggles and a face shield.
- When removing the bung, the barrel must be in an upright position and a proper bung wrench used. The bung is to be loosened one turn, internal drum pressure allowed to reach atmospheric pressure, after which the bung may be removed. Never place your face above a bung when opening.

5. FLAMMABLE AND COMBUSTIBLE LIQUIDS

5.1 Definitions

- Class I Flammable Liquids: Includes those having a flash point below 100°F.
- Class II Combustible Liquids: Includes those having a flash point at or above 100° F, but below 140° F.
- Class III Combustible Liquids: Includes those having a flash point above 140° F, but below 200° F.

5.2 Handling and storing of flammable or combustible liquids in closed or approved safety containers and avoiding exposure of the liquid surface to air are of fundamental importance in preventing potential fires or employee exposure.

5.3 Signs for flammable or combustible liquids are as follows:

- Flash point of 20° F or below: "DANGER! EXTREMELY FLAMMABLE."
- Flash point from 20° F to 100° F: "WARNING! FLAMMABLE."
- Flash point from 100° F to 200° F: "CAUTION! COMBUSTIBLE."

6. HANDLING AND DISPENSING

6.1 Drums or other containers containing flammable and combustible liquids should be stored in compliance with 29 CFR 1910.106 (d). All drums are to be electrically grounded. Drip trays are to be provided under drum spigots.

6.2 A bond (metal-to-metal grounding strap) is to be established between the container and drum prior to filling a container from the storage drum. Drums are to be equipped with an approved type safety faucet and flexible metal hose. A pressure-vacuum relief vent is required for drums of flammable or combustible liquids.

6.3 Except in unusual cases as approved by the site safety officer, the maximum amount of flammable or combustible solvent (used for cleaning purposes) at any work station is limited to one quart.

6.4 Rags, kimwipes, etc. that are contaminated with flammable or combustible liquids are to be placed in a safety container equipped with a fusible link lid.

6.5 All containers of flammable or combustible liquids must be properly identified as to contents.

6.6 Spill containment is required for all drum dispensing areas.

6.7 All manually handled flammable or combustible liquids shall be handled in approved safety cans of not more than 5 gallons capacity, having a spring closing and flush arrestor and so designed that it will safety relieve internal pressure when subjected to heat or fire exposure.

6.8 Where flammable or combustible solvents must be used in wash containers, such as for paint sprayer cleaning, the container must be provided with self-closing or fusible link closure.

6.9 Flammable liquids in portable containers excess to the daily supply must be stored in approved flammable liquid storage cabinets maintained closed with the door latched each time after use.

6.10 Containers of flammable or combustible liquids shall be labeled with an appropriate warning label.

6.11 NO SMOKING signs are to be posted in areas where flammable or combustible liquids are stored, dispensed, or used.

6.12 Additional information and requirements for handling and storage of specific flammable or combustible liquids are included in the MSDS's or site safety plans.

6.13 A suitable storage area must be designated for flammable or combustibles on temporary job sites.

7. PAINT SPRAY BOOTHS

7.1 Spray booths are power-ventilated structures designed to enclose spraying operations, confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system. Spray booths must be built to the specifications of 29 CFR 1910.107 (b), have electrical and other sources of ignition designed to conform with 29 CFR 1910.107 (c), and have ventilation designed to conform with 29 CFR 1910.107 (d).

7.2 The storage of flammable and combustible liquids shall be in conformance with 29 CFR 1910.106 and .107 (e). The quantity of flammable liquids kept in the vicinity of spraying operations shall be the minimum required for the operations and should ordinarily not exceed a supply for one day or one shift.

7.3 The room will have an automatic sprinkler system conforming to the requirements of 29 CFR 1910.159 and .107 (f). Special emphasis must be given to keeping sprinkler heads free of paint spray and residue. An adequate supply of suitable portable fire extinguishers shall be installed near all paint spray operations.

7.4 Spray booths shall not be used alternately for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second used material.

7.5 "NO SMOKING" signs in large letters on contrasting color background shall be conspicuously posted at all spraying areas and paint storage areas.

7.6 The OHM facility safety compliance coordinator will perform air movement testing and monitoring quarterly to insure that at least 100 fpm of air movement is maintained. The OHM facility safety compliance coordinator will also establish respirator requirements for painting.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) equipment and hand tools used at OHM facilities and project sites will be in good operating condition with all cords and safety guards in place.

2. PURPOSE

The purpose of this procedure is to describe the basic guidelines for the safe operation of hand and power tools used in OHM shops and project sites. This procedure is an overview of 29 CFR 1910.242 and .243.

3. REQUIREMENTS

3.1 All hand tools and power tools shall be in good repair and will be used only for the task for which they were designed.

3.2 Any tool that is damaged or defective will be tagged "out-of service" and will be repaired or destroyed.

3.3 Surfaces and handles shall be kept clean and free of excess oil to prevent slipping.

3.4 Sharp tools shall not be carried in pockets.

3.5 Upon completion of a job, tools will be cleaned and returned to the tool box or storage area.

3.6 Wrenches shall have a good bite before pressure is applied. Brace yourself by placing your body in the proper position so that in case the tool slips you will not fall. Make sure hands and fingers have sufficient clearance in the event the tool slips. Always pull on a wrench, never push.

3.7 When working with tools overhead, the tools will be placed in a holding receptacle or secured when not in use.

3.8 Throwing tools from place to place, from person to person, or dropping them from heights is not permitted.

3.9 Only non-sparking tools will be used in atmospheres which exhibit fire or explosive characteristics.

3.10 All tools should be inspected prior to start-up or use to identify any defects.

3.11 Powered hand tools should not be capable of being locked in the "on" position.

3.12 Power nailing or stapling tools must only be capable of activation when in contact with the work surface. All such power devices must have a safety interlock.

3.13 Loose clothing, long hair, loose jewelry, rings and chains will not be worn while working with power tools.

3.14 Cheater pipes will not be used.

3.15. In applications where injury to the operator might result if motors where to restart after power failure, provisions shall be made to prevent machines from automatically restarting upon restoration of power.

4. GRINDING TOOLS

4.1 The work rest for a grinder should be no more than 1/8 inch from the wheel and the tongue guard no more than 1/4 inch from the wheel. Frequent inspections are necessary to insure proper distances are maintained.

4.2 Work or tool rests should not be adjusted while the grinding wheel is moving.

4.3 Inspect the grinding wheel for cracks, chips or defects. Remove the wheel from service if any defects are found.

4.4 Goggles shall always be worn when grinding and a transparent full face shield may be worn in conjunction with the goggles.

4.5 The side of a grinding wheel shall never be used unless the wheel is designed for side grinding.

4.6 Grinding wheels are rated for specific speeds. Rating should be checked when installing a new wheel.

4.7 Grinding aluminum is prohibited.

5. POWER SAWS

5.1 Circular saws will be fitted with blade guards.

5.2 Damaged, bent or cracked saw blades will be immediately removed from service and destroyed.

5.3 Hand fed table saws will be fitted with a splitter to prevent the work from squeezing the blade and kicking back on the operator.

5.4 Hand held circular saws will be equipped with a lower guard which covers the blade to the depth of the teeth. The guard should freely return to the fully closed position when withdrawn from the work surface.

6. WOOD WORKING MACHINERY

6.1 Dust, chips and shavings are to be removed from the machines by brush or vacuum only. Do not use compressed air.

6.2 The on-off switch must be located to prevent accidental start up. The operator should be able to shut off the machine without leaving the work station.

6.3 Planers and joiners shall be guarded to prevent contact with the blades.

6.4 A push stick will be used when the cutting operation requires the hands of the operator to come close to the blade. Also, small pieces will require the use of a push stick.

6.5 Saw blades will be adjusted so that the blade only clears the top of the cut. The blade should never extend more than one-eighth of an inch above the top of the cut.

6.6 Automatic feed devices should be used whenever feasible.

7. PNEUMATIC TOOLS AND EQUIPMENT

7.1 Tool retainers will be installed and remain in operation on pneumatic impact tools to prevent the tool from being ejected from the barrel during use.

7.2 Safety lashing or tie wire will be used to secure connections between tool/hose/compressor if they are of the quick connection (Chicago fittings) type.

7.3 Hose should not be laid in walkways, on ladder or in any manner that presents a tripping hazard.

7.4 Compressed air should never be used to blow dirt from hands, face or clothing.

7.5 Compressed air should be reduced to less than 30 psi and be exhausted through a chip guarded nozzle if it is to be used for cleaning purposes. Proper respiratory, hand, eye and ear protection must be worn.

7.6 Never raise or lower a tool by the air hose.

8. EXPLOSIVE-ACTUATED FASTENER TOOLS

8.1 Explosive-actuated tools must comply with the requirements of the American National Standards Institute (ANSI) standard A 10.3 - 1970.

8.2 Explosive-actuated tools will be operated, repaired, serviced and handled only by individuals that have been trained by a manufacturer's representative and possess the proper license.

8.3 An explosive-actuated tool should never be used in a flammable or explosive atmosphere.

8.4 The operator must wear goggles or a full face shield as well as safety glasses.

8.5 All explosive-actuated tools must not be able to be fired unless the tool is pressed against the work surface with a force of at least 5 lb. greater than the weight of the tool.

8.6 The tool must not be able to fire if the tool is dropped when loaded.

8.7 Firing the tool should require two separate operations, with the firing movement being separate from the motion of bringing the tool to the firing position.

8.8 Never fire into soft substrate where there is potential for the fastener to penetrate and pass through, creating a flying projectile hazard.

8.9 Do not use explosive-actuated fasteners in reinforced concrete if there is the possibility of striking the re-bar. Nor should the tool be used on cast iron, glazed tile, surface hardened steel, glass block, live rock or face brick.

8.10 An explosive-actuated tool should be loaded only prior to the intended firing moment. Never load and leave an explosive-actuated tool unattended.

9. CHAIN SAWS

9.1 Inspect the saw prior to each use and periodically during daily use.

9.2 A chain saw must be operated with both hands at all times.

9.3 Never cut above chest height.

9.4 A saw chain should not move when the saw is in the idle mode.

9.5 Before a cut is initiated, the operator must first clear an escape path and have firm footing.

9.6 The saw must be shut off when carrying through brush and slippery surfaces. The saw may be carried while idling no more than 50 feet.

9.7 The operator of the saw must don all the applicable protective gear. This may include, but is not limited to, loggers safety hat, safety glasses, steel-toed boots, protective leggings, and hearing protection.

9.8 Saws should be fitted with an inertia break and hand guard.

10. HAND OPERATED PRESSURE EQUIPMENT

10.1 Pressure equipment such as grease guns, paint and garden sprayers shall be directed away from the body and other personnel in the area. The person operating any equipment such as this, which has a potential for eye injury, must wear protective goggles.

10.2 The noise produced when using certain types of pressure equipment may require the use of hearing protection.

10.3 Never allow the nozzle of a pressurized tool to come in contact with any body parts while operating. There is potential for injection of a chemical directly into the users body, resulting in severe injury or death.

10.4 Each operation must be evaluated for the need for respirator use.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) is greatly concerned about safe operation of motor vehicles. Motor vehicle usage presents the most significant work risk to employees. United States Department of Labor statistics indicate that motor vehicle deaths and injuries continue to be the number one cause of work-related death and serious injury. Accordingly, it is essential that OHM have an effective vehicle safety program.

2. PURPOSE

This section establishes requirements for safe operation of vehicles and equipment. This procedure is an overview of the guidelines in the proposed OSHA Motor Vehicle Safety Standard 29 CFR 1910.140.

3. RESPONSIBILITIES

3.1 The driver of a Company owned, rented or leased vehicle is responsible for:

- Operating the vehicle in a safe and legal manner.
- The safety of passengers.
- Reporting immediately any motor vehicle that is found to be defective or not operating properly.

3.2 The regional health and safety manager or site safety officer (SSO) is responsible for the following:

- Ensuring that all vehicle accident reports are processed and the required number of copies submitted to local, state, and federal agencies, to the resource manager and to the insurance carrier.
- Assuring that appropriate individuals, including the corporate vice president of health and safety are notified by telephone of accidents that involve fatalities or multiple serious injuries.

- Assuring that all accidents are documented and investigated. The investigation should be of sufficient depth to determine the cause and action required to prevent recurrence. Copies of all motor vehicle investigations shall be forwarded to the regional resource manager.

- Ensuring that during the selection process for leased or purchased vehicles, consideration is given to obtaining vehicles with essential safety devices. Such devices include anti-locking brakes, air bags, both front and rear seat shoulder harnesses, and all season traction tires. Each motor vehicle must be equipped with safety kits. Shoulder safety belts must not be attached to doors.

4. SEAT BELTS

OSHA has determined that the use of seat belts in motor vehicles can significantly reduce the number and seriousness of occupational motor vehicle accidents, including crashes, by requiring employers to ensure that each employee uses occupant safety belts. Accordingly, all OHM employees driving motor vehicles on company business (including rental cars, pick-up trucks, personal vehicles which are used for company compensated business travel, etc.) shall ensure that all occupants use seat belts at all times.

5. STATE AND LOCAL LAWS

5.1 All drivers shall drive OHM vehicles in accordance with the law.

5.2 Drivers shall not operate OHM vehicles which are known to be defective or not in compliance with the law.

5.3 Drivers of OHM vehicles are personally liable and responsible for the consequences of state and community violations.

5.4 The use of devices designed to identify active police speed detection systems (i.e. radar detectors) is prohibited in all OHM owned, leased and rented vehicles and in personal vehicles used for company compensated business travel.

6. SAFE DRIVING PRACTICES

6.1 Personnel shall operate vehicles in a defensive manner, i.e., being always on the alert and trying to anticipate what might occur under the existing conditions and driving in such a manner as to avoid hazards.

6.2 Personnel operating vehicles shall be considerate of, and courteous to, the traveling public and/or pedestrians and should yield the right-of-way to avoid accidents.

6.3 Personnel shall drive at speeds consistent with posted speed limits and prevailing conditions, such as weather, traffic and road conditions.

6.4 Personnel shall drive at all times with sufficient space around the vehicle to provide time to see conflicts arising, to react quickly, and to stop. The five keys to defensive driving will help accomplish a good space cushion.

- Aim high in steering.
- Get the big picture.
- Keep your eyes moving.
- Leave yourself an out.
- Make sure they see you.

7. GENERAL SAFETY RULES

7.1 Blind Curves - Slow down and sound horn when approaching a blind curve.

7.1 Driver's License - Operation of a vehicle without a valid operator's license is prohibited. Personnel operating vehicles regulated by the United States Department of Transportation (DOT) shall have a current commercial drivers license (CDL).

7.3 School Buses - Obey school bus laws. Slow down and prepare to stop when approaching school buses, children on foot or on bicycles.

7.4 Emergency Vehicles - Give ambulances, fire fighting equipment and other vehicles the right-of-way during emergencies and lend assistance if required.

7.5 Gasoline - Gasoline and other flammable/combustible liquids shall not be carried in or on vehicles other than in permanent gas tanks or in approved safety cans. Approved safety containers must be properly secured when being carried in the back of pick-up trucks.

7.6 Laws and Regulations - Learn and obey all local, state, and federal laws.

7.7 Parking - Equipment and vehicles shall be parked off roads and highways whenever possible. When it is not possible, the vehicle shall be marked by red lights or flares at night and red flags during the day. Wheels should be blocked or chocked.

7.8 Passing - Do not pass when visibility is restricted for any reason.

7.9 Pedestrians - Be constantly alert for pedestrians. Remember they have the right-of-way.

7.10 Slow Down - Slow down and use caution at blind intersections and crossings when visibility is limited or when passing work crews.

7.11 Smoking - Smoking is prohibited in all OHM owned, leased or rented vehicles.

7.12 Speeding - Speeding is strictly prohibited.

7.13 Thumbs Up - Keep thumbs up when driving. Do not grasp the steering wheel with thumbs inside the spokes.

7.14 Visibility - Make sure all windshields, side and rear windows, mirrors and lights are clean before moving vehicles.

7.15 Warning Signs and Traffic Signals - Be alert for and strictly obey all directional and warning signs and signals.

7.16 Seat Belts - If unit is equipped with seat belts, operator and passengers must keep seat belts fastened at all times during operations.

8. DOT REGULATED VEHICLES

8.1 All OHM personnel operating a DOT regulated vehicle must hold a valid CDL from their state of residence.

8.2 Air Hose and Couplings - Periodically check air hoses and couplings and compressor hoses for worn or damaged parts. Do not crimp air hose to disconnect couplings; shut off air at the valve.

8.3 Backing Up - Never start or back up equipment or vehicles until you are sure the way is clear. If necessary, have another person guide you safely. Back up alarms, when required, must be working and audible over the surrounding noise.

8.4 Ear Protection - Ear plugs or other approved ear protection shall be worn when necessary. Use of ear plugs in cars or trucks on public highways may be against local laws.

8.5 Fueling and Repair - No fueling or repair shall be made to equipment while it is in operation. The motor shall be turned off and the bucket, blade, gate or boom shall be lowered to the ground or blocks.

8.6 Housekeeping - Operators should keep deckplates, steps, rung and hand rails on equipment free of grease, oil, ice, and mud. The inside of the cabs shall also be kept clean and free of flammable items.

8.7 Inspections - Equipment and vehicles shall not be used until known defects or discrepancies are corrected. Inspections shall be made at the start of each shift and defects or discrepancies shall be reported to the supervisor immediately.

8.8 Jumping - Jumping on or off equipment is prohibited. When climbing on or off equipment or vehicles, face the unit and use secure hand and foot holds to prevent slips and falls. Always look where you are stepping.

8.9 Know your Equipment or Vehicle - It is your responsibility to be thoroughly familiar with all features and manuals and if you are in doubt as to correct operating techniques or safety features, ask your supervisor at once.

8.10 Overloading - Avoid overloading vehicle beds and equipment buckets and beds. Excessive material can damage the unit and falling material can cause serious injury.

8.11 Power Lines - When operating trucks, cranes, shovels or other units, always use caution around power lines and maintain a minimum safe clearance of 10 feet or more depending upon the voltage.

8.12 Riders - Only authorized persons will be permitted to ride in equipment or vehicles.

8.13 Securing Loads - The operator of the vehicle is responsible for ensuring that their load is secure and will not shift during transport.

8.14 Long Hauls - On long hauls, binders should be checked periodically (at least during each rest or service stop) to make sure they are still secure and tight.

8.15 Overhanging and Oversize Loads - When it is necessary to transport overhanging or oversize loads, the appropriate signs and red flags and red lights will be used. When necessary, use flag cars.

8.16 Safety Chains - Safety chains of sufficient size and strength shall be installed on all trailers being towed.

8.17 Safety Hooks - Use safety hooks with latches on all winch truck cables.

8.18 Side Roads and Railroad Tracks - Stop and look both ways before crossing railroad tracks or before driving onto a highway from a side road.

8.19 Stopping - Do not stop vehicles in the middle of the road to talk to occupants in another vehicle. Always pull to the side or off the road to maintain a clear, safe road.

8.20 Turn signals - Always use turn signals, emergency and other signals as appropriate when turning, stopping, passing, or performing other vehicle operations.

8.21 Vehicle Maintenance - It is the driver's responsibility to see that his vehicle is in good mechanical condition before and during operation. Special emphasis should be placed on ensuring the brakes, lights, horn, windshield wiper, tires and steering assembly are in good order. Defects must be reported and corrected immediately.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will inspect all equipment before use to ensure that it is proper working order and free from all safety deficiencies.

2. PURPOSE

The procedure provides for the systematic inspection of tools and equipment thereby ensuring periodic maintenance and if necessary, the removal from service units which are found to be defective. OHM shall maintain a comprehensive equipment inspection plan that meets the requirements for portable tools and heavy equipment as found in 29 CFR 1926, Subpart I (1926.300 -.305) and 29 CFR 1910, Subpart P (1910.241-.247) and 29 CFR 1926, Subpart O.

3. PORTABLE TOOL REQUIREMENTS

3.1 All hand and power tools used at OHM facilities or project sites, whether furnished by OHM or the employee, shall be maintained in a safe condition. Each OHM supervisor is responsible for periodically inspecting all tools in the work area.

3.2 All tools shall be used in strict compliance with the manufacturer's instructions and only for the use intended.

3.3 Power tools shall be equipped and used with guards in place.

3.4 Any tools having reciprocating, rotating, or moving parts shall be guarded.

3.5 OHM supervisors shall ensure that unsafe hand tools are removed from service. Unsafe tools include, but are not limited to:

- Wrenches, with jaws sprung which slip when used.
- Impact tools (hammers, drift pins, wedges, chisels) with mushroomed heads.
- Wooden handles which are cracked, splintered, duct taped, and/or loose on the tool.

3.6 Electric power operated tools shall be approved double insulated, or grounded. Electric cords shall not be used for hoisting or lowering electric tools.

3.7 Pneumatic power tools shall be secured to the hose by a positive means to prevent accidental disconnection. Pneumatic hoses shall not be used for hoisting or lowering tools.

3.8 Fuel powered tools shall be stopped while being refueled, serviced or, maintained. When fuel powered tools are used in confined spaces, adequate ventilation shall be provided.

3.9 Tools which are not serviceable shall be immediately removed from service and repaired, or destroyed.

4. HEAVY EQUIPMENT REQUIREMENTS

The equipment operator is responsible to make daily inspections of their equipment and to note any deficiencies. These deficiencies, no matter how small, should be reported immediately to the site supervisor. In this way, many potential breakdowns of your machine or safety hazards can be avoided by corrective maintenance.

4.1 Check the engine oil level. If low, add enough to bring the level to the full mark.

4.2 Check the coolant level. Add water coolant if level is low.

4.3 Check fuel level. Refill if necessary.

4.4 Check tires for proper inflation, worn spots, cuts or breaks and objects imbedded in or between the tires. Correct or report conditions when found.

4.5 Check under the vehicle for signs of oil, water, fuel, or other leaks. If leaks are seen, report them to your supervisor.

4.6 Check head, tail, and clearance lights. If any are burned out, damaged, or missing, report them at once.

4.7 Check batteries at least once a week for proper electrolyte level, leaks, and loose connections.

4.8 Report any change in steering play or vibration in the steering mechanisms.

4.9 Check the horn. If inoperative, have it repaired.

4.10 Check the condition of the windshield, rear view mirrors and other glass. Report broken, cracked or missing glass. Clean all dirty or wet glass. Adjust rear view mirrors.

4.11 Check belts on air compressor, generator, water pump, and any other. If loose or torn, report to your supervisor.

4.12 Check special equipment such as wrenches, jacks, fire extinguisher, etc. Report any that are missing or unserviceable.

4.13 Check the tracks for any loose bolts, nuts, proper adjustment, unusual wear patterns, cracks etc.

4.14 Check for any worn or frayed cables.

4.15 Check the boom, buckets and gantry for cracks, bent members, worn teeth and cutting edges.

4.16 Check fluid level of the hydraulic system.

4.17 Check for dirty or inoperative air cleaners and filters.

4.18 Check for proper brake operation.

4.19 Check to make sure the equipment is equipped with a back-up alarm and the alarm is working properly.

4.20 Make a complete walk-around inspection of your unit. In this manner you may detect damage before you put the machine to work.

4.21 When walking up to or around the unit, observe its condition and notice if anyone or anything is on or under it. By checking now, you may prevent injury or damage when you start out.

4.22 If applicable, drain water off of the lubricating oil sump daily.

4.23 In cold weather, bleed the air tank and, if equipment is equipped, use the alcohol injector pump.

APPENDIX E

AIR MONITORING PLAN

AIR MONITORING PLAN

FOR REMEDIAL ACTION

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

JUNE 1996

RUST PROJECT NO. 89892.300

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LIST OF ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
AMP	Air Monitoring Plan
ARARs	Applicable or Relevant and Appropriate Requirements
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CHSP	Construction Health and Safety Plan
CMP	Construction Management Plan
COCs	Contaminants of Concern
CQAP	Construction Quality Assurance Plan
DQO	Data Quality Objectives
GC	Gas Chromatography
KICs	Key Indicator Compounds
MDL	Method Detection Limits
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MVPS	Minivol Portable Sampler
NAAQS	National Ambient Air Quality Standards
NIST	National Institute of Standards and Technology
O&M	Operation and Maintenance
OHM	OHM Remediation Services Corporation
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PAM	Portable Aerosol Monitoring
PC	Percentage Complete
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limits
PR	Percentage Recovery
QA	Quality Assurance
QC	Quality Control
QA/QCP	Quality Assurance and Quality Control Plan
RA	Remedial Action

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

RAWP	Remedial Action Work Plan
RD	Remedial Design
RFP	Request for Proposal
ROD	Record of Decision
RPD	Relative Percentage Difference
Rust	RUST Environment & Infrastructure
RWWTS	Remediation Waste Water Treatment System
Site	Ciba McIntosh Superfund Site
SOP	Standard Operating Procedure
SOW	Statement of Work
SSO	Site Safety Officer
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

The Air Monitoring Plan (AMP) prescribes minimum procedural and equipment requirements for perimeter and site air monitoring during the remedial action (RA) at the Ciba McIntosh Superfund Site (Site), Operable Units 2 and 4. The AMP has been prepared in accordance with Section IV, Task III, Paragraph A.5(f) of the Statement of Work (SOW) for RD/RA Consent Decree, Operable Unit 2 (OU2) and Section IV, Task III, Paragraph A.5(f) of the SOW for RD/RA Consent Decree, Operable Unit 4 (OU4). Additional requirements for personnel monitoring are presented in the Construction Health and Safety Plan (CHSP).

The AMP has been prepared for Ciba-Geigy Corporation (Ciba) by Rust Environment & Infrastructure (Rust) in cooperation with OHM Remediation Services Corporation (OHM). This AMP has been prepared to comply with Ciba's Request for Proposal (RFP), OHM policies and procedures, and applicable state and Federal OSHA regulations. Changes to the AMP must be approved by the OHM Health and Safety Director. All OHM site personnel, site visitors, and subcontractor personnel are subject to the provisions of this AMP. Operating conditions can be expected to change as the work progresses, requiring some modification of the AMP. As appropriate, addenda will be provided by the AMP Supervisor/Manager, (or Program Supervisor/Manager) OHM Site Safety Officer (SSO) and/or the Health and Safety Director.

This AMP has been prepared for the RA of OU2 and OU4. In addition, contaminated surface soils from Operable Unit three (OU3), the floodplain, will be excavated and backfilled into OU2. The RA includes:

- excavation, thermal treatment and backfill of soils in OU2 (sites 1 through 7, 9 and 11)
- excavation, thermal treatment and backfill of soils in OU4 (site 8)
- construction of a slurry wall along the toe of the bluffline in site 8
- backfill of OU3 soils into OU2
- stabilization of exposed iron slurry at site 8

The AMP has been developed in conjunction with the Remedial Action Work Plan (RAWP), of which the CHSP is an appendix, and the Construction Management Plan (CMP), included as Appendix A to the RAWP.

This AMP addresses perimeter and work area air monitoring activities. Details of the personnel monitoring plan are contained in the CHSP. The objectives of the AMP are to:

- detect, characterize, and quantify the potential airborne release and transport of particulate (dust) contaminants and volatile organic compounds (VOCs) during the on-site remedial activities
- determine appropriate levels of worker personal protective equipment (PPE)
- comply with project specifications and Applicable or Relevant and Appropriate Requirements (ARARs)
- determine the need for, and effectiveness of, control measures

The information gathered from this program will be used to determine the appropriate level of PPE, as well as initiate the implementation of contingency measures in the event of an action level exceedance.

The OHM project manager and the SSO will be responsible for implementing and documenting this AMP.

2.0 AIR MONITORING MEASURES

Descriptions of the air monitoring methods and equipment are provided in the following sections.

2.1 PERIMETER MONITORING

Perimeter air monitoring will be performed during the RA to assess the potential for off-site migration of contaminants. Table 2-1 gives the average maximum concentration levels of contaminants of concern (COC) found in Site soils, the calculated vapor phase COC concentration and the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for each of the thirteen COCs. The soil particulate/vapor phase ratios indicate that the primary mechanism for off-site migration is through the adherence of COCs to dust particles generated during remedial activities. Therefore dust concentrations, rather than COC concentrations, will be measured and used as a surrogate parameter for Site emissions. The results obtained will trigger contingency plans to reduce off-site migration of contaminants as required.

The COCs present at the site can be classified into three groups based on molecular structure and physical properties. The three representative groups or compound classes are given in Table 2-1. Combining the information from Table 2-1 with the OSHA PEL values indicates that the thirteen COCs can be tracked by sampling and monitoring the air for three representative COCs, one from each of the representative groups. Three representative COCs, or Key Indicator Compounds (KICs), will be used to track the emission behavior of all COCs. The compounds chosen as KICs are gamma-BHC, DDT and atrazine. These COCs were selected as KICs because they:

- represent the classes of COCs dictating remediation
- have established regulatory human health exposure limits
- were detected in Site soils
- are stable enough to be measurable with adequate sensitivity with existing methodology

The initial perimeter monitoring will examine particulate samples collected for these three KICs and establish a relationship between airborne dust levels and KICs.

2.1.1 Perimeter Airborne Dust Action Levels

Table 2-2 gives the calculated "internal standard" incremental dust levels based upon the maximum COC concentrations in soils and the OSHA PEL values. Incremental dust levels refer to the difference between dust concentrations at the downwind fence line or facility boundary and the upwind (i.e., background) dust concentration. Background dust levels will be determined by daily readings upwind of active work areas. If the SSO determines that the background is consistent and has been adequately characterized, the frequency may be reduced.

Any 24-hour average reading showing a dust concentration above the 24-hour National Ambient Air Quality Standard (NAAQS) for particulate matter of 150 $\mu g/m^3$ or incremental dust levels above the "internal standard" values given in Table 2-2, will trigger the improved dust control practices described in Section 3.0.

2.1.2 Equipment

Airmetric Minivol Portable Samplers (MVPS) will be used to obtain airborne dust concentrations at the property line perimeter.

2.1.3 Location

The property line perimeter monitors will be placed at the locations indicated on Figure 2-1. Five monitoring stations will be established at the facility property line (PL1-PL5). Two monitors will be located upwind of the remediation areas and the remaining three will be located downwind.

2.1.4 Frequency

Perimeter monitoring will be performed in three phases: background, startup, and operations and maintenance (O&M). During the initial 14-day background phase, ten daily 24-hour time integrated samples will be collected at the property line monitors for particulate and KICs analysis.

Upon startup of excavation of contaminated soil, 14 additional days of sampling will be conducted at the same locations and frequency of the background sampling phase. Analytical data from the first ten excavation days will be used with the baseline data to determine the particulate and KIC airborne levels during excavation.

During O&M, the results of the background and startup property line perimeter and remediation work area perimeter monitoring for particulate and KICs will be examined to establish the relationship between these parameters. The remediation work area perimeter monitoring for dust concentrations will be compared to the action levels in Table 2-2. The SSO may change the frequency of property line perimeter monitoring during the O&M phase once the relationship between remediation work area perimeter dust concentrations and property line perimeter dust and KICs concentrations has been established. The SSO will use discretion in determining the property line perimeter monitoring frequency.

2.1.5 Meteorological Station

OHM will monitor and record wind speed, wind direction, and rainfall with a 3 meter (or equivalent) meteorological station. These data will assist in predicting potentially dusty conditions and in interpreting air monitoring results.

2.2 REMEDIATION WORK AREA PERIMETER MONITORING

Remediation work area perimeter monitoring will be performed at each remediation area to detect airborne emissions of particulate (dust) in conjunction with scheduled personnel health and safety monitoring.

2.2.1 Equipment

Airmetric Minivol Portable samplers and Portable Aerosol Monitoring (PAM) will be used to obtain airborne dust concentrations at the remediation work area perimeter.

In the event that the remediation work area action levels defined in Table 2-2 are exceeded, OHM will either implement dust control measures or require that employees upgrade to a higher level of respiratory protection.

2.2.2 Location

Five monitoring stations (RA1-RA5) will be established at the remediation work area perimeter of OU2 and OU4. Three stations will be established at OU2; two to the south and one to the north of

OU2. The remaining two stations will be established at OU4; one to the south and one to the north of OU4.

2.2.3 Frequency

Remediation work area perimeter monitoring will be conducted along with Portable Aerosol Monitoring (PAM) measurements at the same frequency as property line perimeter monitoring. This data will be used to establish background levels for these parameters and to provide a baseline for the excavation monitoring phases.

Once the relationship between remediation work area perimeter MVPS particulate monitoring and PAM measurements has been established during background and startup phases, PAM measurements will be conducted during O&M excavation and activities involving contaminated soil movement. The SSO will use discretion in determining the frequency of the remediation work area perimeter PAM measurements during the O&M phase.

2.3 RECORD KEEPING

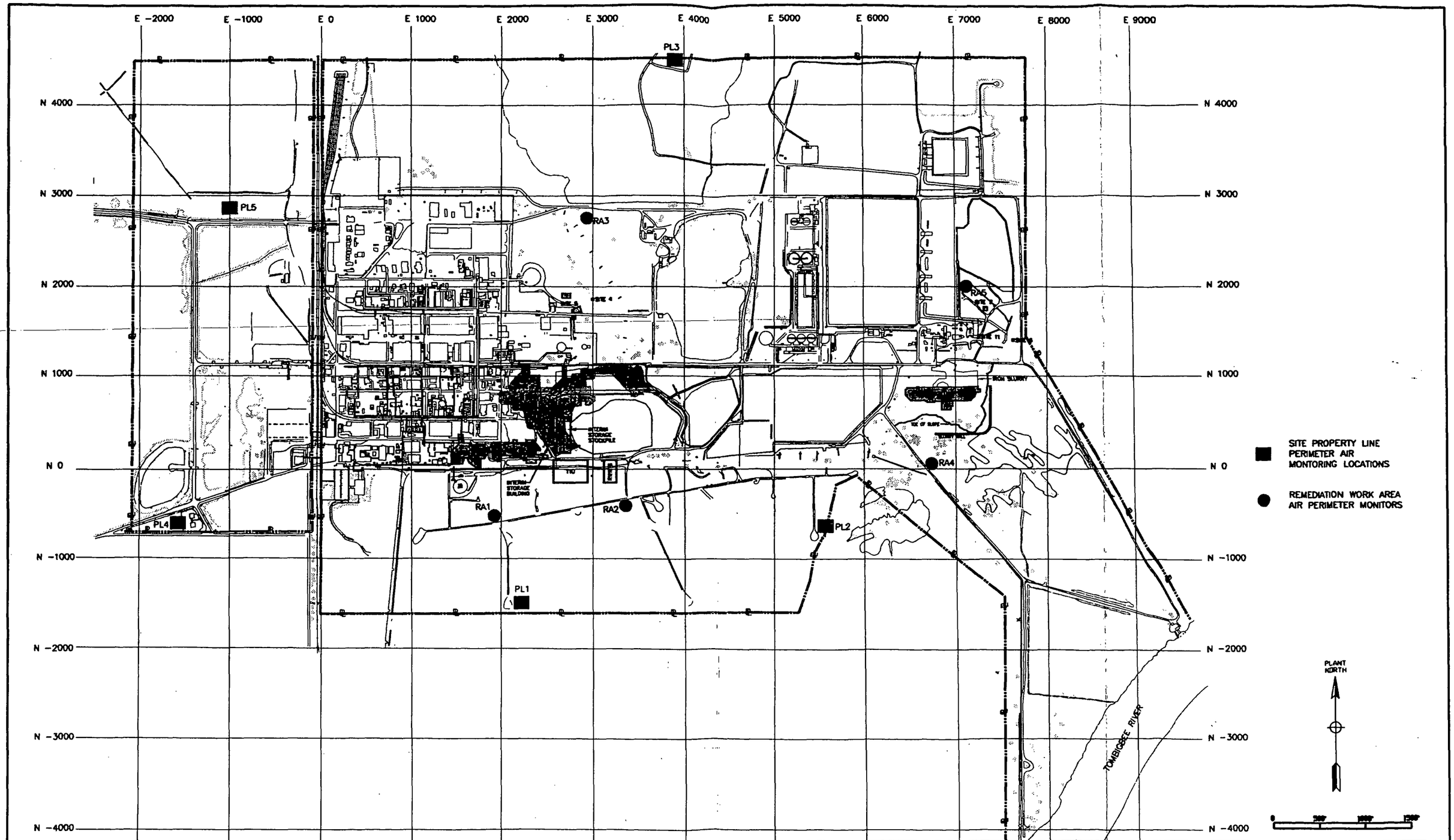
OHM will maintain an air monitoring log, which shall be available to Ciba upon request. The air monitoring log shall include, but is not limited to, the following information:

- date and time of monitoring
- air monitoring station number and location
- instrument, model number, serial number
- calibration/background levels
- results observed
- operator (Sampler) signature
- AMP Supervisor/manager and/or SSO signature
- interpretation of the data an any further recommendations shall be made by the AMP Supervisor/manager and/or SSO

2.4 NOTIFICATION OF OFF-SITE EXCURSIONS

In the event property line perimeter monitoring indicates that surrogate dust may have migrated off-site at levels exceeding the values in Table 2-2, OHM will follow the existing Ciba McIntosh plant policy. OHM will notify the Ciba Plan Production Engineer at extention 2601. A rotating staff of Ciba Plant Production Engineers provide 24 hour per day, seven day per week coverage for the Facility. Ciba Plant Production Engineers include Jim Crocker, Charles Maples, Charles Meinhardt and Andy Mello (all can be reached at extention 2601). Appropriate offsite notifications will be made by the Ciba Plant Production Engineer.

Indication of off-site migration of surrogate dust at levels exceeding the values in Table 2-2 will trigger the improved dust control practices described in Section 3.0.



ciba
Ciba-Geigy Corporation

RUST ENVIRONMENT & INFRASTRUCTURE
GREENVILLE, SOUTH CAROLINA

FIGURE 2-1
AIR MONITORING LOCATIONS

McIntosh, Alabama Superfund Site
Operable Units 2 and 4

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TABLE 2-1
COC AIR PATHWAY ANALYSIS DATA

Contaminant of Concern (COC)	Compound Class	Molecular Weight (g/g-mole)	Site Soil Level (1) (ppm)	Vapor Pressure (mmHg)	Vapor Phase Level (2) (mg/m³)	OSHA PEL (mg/m³)
α-BHC	Chlorinated Cyclohexane isomers	291	26,031	2.5E-05	1.0E-02	–(3)
β-BHC		291	5,227	2.8E-07	2.3E-05	–(3)
δ-BHC		291	610	1.7E-05	1.6E-04	–(3)
γ-BHC		291	2,373	9.4E-06	3.5E-04	0.5
DDT	Bis(chlorophenyl) alkenes/alkanes	355	5,322	1.9E-07	2.0E-05	1.0
DDD		320	2,077	1.0E-06	3.6E-06	–(3)
DDE		319	5,299	6.6E-06	6.1E-04	–(3)
Chlorobenzilate		325	373	2.2E-06	1.5E-05	–(3)
Diazinon(4)	Substituted Triazines	304	1,178	1.4E-04	2.7E-03	0.1
Atrazine		217	2,194	6.6E-07	1.7E-05	5.0
Bladex		241	169	1.6E-09	3.6E-09	–(3)
Simazine		202	191	8.0E-09	1.3E-08	–(3)
Prometryn		241	525	1.0E-06	6.9E-06	–(3)

(1) Site Soil Levels are the average maximum COC levels detected in surface and subsurface soils - "Remedial Design Data Acquisition Report for OU2 and OU4", Appendix A of the FDR.

(2) Maximum calculated saturation value in sealed head space over soil COC mixture. Vapor Phase Level = [VP mm/760 mm][MW g/g-mole][1,000 mg/g][g-mole/24.1L][1,000 l/m³][ppm Soil/10⁶].

(3) OSHA PEL standards not established for this COC.

(4) Diazinon is not a true substitute for triazine; it does, however, exhibit many characteristics of this compound class.

TABLE 2-2
ALLOWABLE DUST LEVELS[1]

Contaminant of Concern (COC)	Site Soil Average Maximum[2] (mg/kg)	OSHA PEL (mg/m^3)	"Internal Standard" Incremental Dust Level ($\mu g/m^3$)[4]
α-BHC	26,031	--[3]	--
β-BHC	5,227	--[3]	--
δ-BHC	610	--[3]	--
γ-BHC	2,373	0.5	210,000
DDT	5,322	1.0	190,000
DDD	2,077	--[3]	--
DDE	5,299	--[3]	--
Chlorobenzilate	373	--[3]	--
Diazinon	1,178	0.1	85,000
Atrazine	2,194	5.0	2,300,000
Bladex	169	--[3]	--
Simazine	191	--[3]	--
Prometryn	525	--[3]	--

(1) References: Threshold Limit Values, ACGIH, 1994-1995.

(2) Site Soil Levels are the average maximum COC levels detected in surface and subsurface soils. Where "average maximum" is an average of the maximum COC levels detected in all analysis of each area from the Remedial Design Data Acquisition Report for OU2 and OU4, Appendix A of the FDR.

(3) OSHA PEL standards not established for this COC.

(4) Incremental Dust Level refers to the net excavation dust level (downwind-upwind). Where the "Internal Standard" Incremental Dust Level = ([PEL mg/m^3][1/Site Soil Level mg/kg][10^9 $\mu g/kg$].

3.0 DUST CONTROL MEASURES

Descriptions of the dust control methods and equipment are provided in the following sections.

3.1 GENERAL

Although OHM will conduct operations and maintain the project site so as to minimize the creation and dispension of dust (below prescribed levels), there is a possibility that particulate emissions may exceed actions levels established in Table 2-2. Dust control measures will be used throughout the Site as needed, especially during excavation, backfilling and grading activities.

3.2 CONTROLS

The following are control measures that will be initiated to minimize the liberation of dust due to Site activities during the RA.

3.2.1 Traffic Speed

Traffic speeds will be in accordance with County, Local, State and Federal regulations and will generally be at least five miles per hour (5 mph) below posted speed limits to minimize dust generation.

3.2.2 Material Handling

Stockpiled material including excavated and borrow material will be piled in a fashion which minimizes dust generation as follows:

- slopes of stockpiled material in the prevailing wind direction will be minimized to the extent practicable
- stockpiles will be constructed, if possible, with their length perpendicular to the prevailing wind direction
- stockpiled feed material will be covered to minimize dust generation during remediation during remediation activities as presented in the Materials Handling Plan (Appendix D of the RAWP).

3.2.3 Material Transport

During transportation of excavated or borrow material, trucks will be tarped as necessary to control dust emissions or odors.

3.2.4 Dust Suppression

Dust suppression will be implemented when directed by the SSO or designee and/or Ciba to prevent, mitigate, or reduce dust resulting from remediation activities. Dust suppressants will be applied when:

- access roads, haul routes, and exposed ground surfaces are dry and wind or vehicular traffic result in visible dust generation
- exposed surfaces of material stockpiles are dry and wind or handling activities result in dust generation
- dust generation is visible during excavation activities on the project site
- hauling of excavated or borrow material results in visible dust generation in truck beds
- dust generation is visible during placement of materials in stockpiles or fill areas
- trigger levels listed in Table 2-3 are exceeded

3.2.5 Dust Suppressant Applications

Dust suppressants will be applied in the manner described below:

- apply water via a mobile broadcast applicator in a controlled manner to minimize the generation of dust from vehicular traffic and wind erosion on non-paved road surfaces and exposed ground surfaces
- apply water via a mobile applicator in a controlled manner to minimize dust generation from exposed surfaces of material stockpiles, excavation activities and other activities involving the movement of soil and debris
- the application of water as a suppressant will vary depending on moisture conditions and surface types. Care will be taken to prevent any suppressant waters from ponding, migrating or disrupting any portions of the work activities

River water and treated water from the Remediation Waste Water Treatment System (RWWTS) will be evaluated for use as dust suppressants.

3.2.6 Excavation and Transfer Procedures

OHM will implement excavation and transfer procedures which minimize the creation and dispersion of dust. These practices include the following:

- minimizing transfer and drop distances (i.e., from heavy equipment fixtures such as buckets to the truck bed)
- gentle and deliberate operation of heavy equipment
- minimizing the use of stockpiles as a means of limiting the potential for dust formation
- use of water sprays if necessary when transferring soils from trucks to the Interim Storage Facility at the Site

3.3 EMISSIONS CONTINGENCY MEASURES

In the event that perimeter air monitoring results indicate concentrations of particulate in ambient air are in excess of action levels presented in Table 2-2, OHM will implement dust control measures and notify Ciba. The SSO will inspect the Site to assist in determining the cause of the elevated levels in the ambient air. OHM will attempt to implement changes in operating procedures in order to reduce, control or eliminate the elevated levels. If control measures are not successful, operations will be curtailed or halted until effective controls can be implemented and/or dust concentrations return to acceptable levels.

Respiratory protection equipment may be upgraded, in accordance with the CHSP, if the SSO deems this necessary. If warranted, off site personnel and local emergency response personnel may be notified in the event of an uncontrolled release which poses a health and safety risk beyond the parameters of the job site.

4.0 QUALITY CONTROL

Details of the quality assurance and quality control program to be implemented for samples taken from property line perimeter and remediation work area perimeter monitoring are presented in the following sections.

4.1 PERIMETER MONITORING SAMPLES

The Ciba McIntosh AMP Quality Assurance and Quality Control Program (QA/QCP) has incorporated the Site Construction Quality Assurance Plan (CQAP) objectives in terms of the quality (i.e., accuracy, precision, completeness, and representativeness) of the generated data and to maintain the quality of the data within predetermined tolerance limits

QA and QC are complementary activities. QA activities address delegation of program responsibilities to individuals, documentation, data review, and audits. The objective of QA procedures is to permit an assessment of the reliability of the data. QC activities address the sampling procedures, sample integrity, analysis methods, maintenance of facilities, equipment, personnel training, and the production and review of QC data. QA procedures will be used during sampling and analysis to maintain the quality of data within predetermined limits. QA/QC samples allow personnel to: (1) evaluate the degree of site variation, (2) determine whether samples were cross-contaminated during sampling or handling, (3) assess if a discrepancy in sample results is due to laboratory handling or analysis procedures, and (4) evaluate the sampling procedures.

Guidelines and recommended procedures for achieving quality assurance and quality control as part of the QA/QCP were extracted from USEPA's five-volume series, "Quality Assurance Handbook for Air Pollution Management Systems" and the principles given in Volume I of this Handbook forms an appropriate basis for the Ciba McIntosh Superfund Site AMP QA/QCP. USEPA guidelines recommend the following 11 QA elements:

1. Data Quality Objectives
2. Site Selection and Sampling Procedures
3. Calibration Procedures
4. Analytical Equipment and Procedures
5. Data Reduction, Validation, and Reporting
6. Internal Quality Control
7. Performance and System Audits
8. Preventative Maintenance
9. Procedure to Evaluate Data Precision, Accuracy, and Completeness
10. Corrective Action
11. Reports

Most of these QA elements and information are presented in the site CQAP and/or earlier AMP sections. This section describes the specific actions that will be taken to ensure that the AMP data are of known, defensible, and sufficient quality. The remaining essential elements of this QA/QCP are described below.

Details of the AMP QA/QCP to be implemented for the property line perimeter and remediation work area perimeter monitoring air monitoring samples to be taken are presented in the following sections.

4.2 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative and quantitative statements specified to ensure that data of known and appropriate quality will be obtained. The DQOs for the Ciba McIntosh AMP involves performance criteria and limits for both quantitative and qualitative measurements as presented in Table 4-1 and 4-2.

4.2.1 Precision

Precision goals for sampling and analysis depend on the types of samples and analysis to be performed and the ultimate use of the analytical data.

Precision will be evaluated by the analysis of duplicate matrix spiked samples and duplicate samples. The relative percentage difference (RPD) of the values obtained for the matrix spike (MS) sample and matrix spike duplicate (MSD) sample will be calculated. A precision limit of +/- 30% has been set for this QA/QCP.

Additional control limits for precision will be summarized and documented in the individual Standard Operating Procedures (SOPs) and results outside these control limits will be identified by data qualifiers. Should the sample concentration of a matrix spiking compound in the sample be greater than, or equal to, four times the spiking concentration, the data will be reported without a data qualifier.

Measurement data for this project will include field data as well as laboratory analytical data. The field measurement and analytical laboratory data include monitoring of meteorological parameters, particulate/KIC sample collection and measurements, routine portable monitoring and contingency monitoring. The objective for precision of field data collection methods is to achieve and maintain the factory equipment specifications for the field equipment.

The objective for precision for laboratory data is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated most directly by recording and comparing multiple measurements of the same parameter on the same exact sample under the same conditions. It is expressed in terms of RPD and is calculated as follows:

$$RPD = \frac{|X_1 - X_2|}{|X_1 + X_2|/2} \; x \; 100\%$$

where:
- X_1 = Analyte concentration of first duplicate
- X_2 = Analyte concentration of second duplicate
- X = Average analyte concentration of duplicate one and two

Acceptable levels of precision for the overall sampling and analysis methods in this type of program can be both site- and/or system- specific and will, where necessary, be verified as a part of the start-up process.

The verification of precision levels for each sampling and analysis method will be based on the analysis of replicate samples. One sample set will be duplicated via a second co-located sampler and the samples collected will be analyzed as individual samples. Comparison of the duplicate samples and the analysis results will permit the determination of precision levels for both particulate and KICs.

4.2.2 Accuracy

The objective for accuracy of field measurements is to achieve and maintain factory equipment specifications for the field equipment.

The accuracy of analysis must be sufficient to determine if a significant (measurable) change in the concentration of target compounds has occurred during a test run. Surrogate compound recovery also will be used to indicate analytical accuracy. Control limits and compounds will be specified in the individual SOPs and recoveries outside the specified control limits indicate potential bias of the results and standard USEPA data qualifiers (flags) will be used to indicate the problem.

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on samples of similar matrix and concentration of contaminants. Accuracy is determined by analyzing a sample and its corresponding matrix spike sample. Accuracy is expressed as percentage recovery (PR) and is calculated using the following formula:

$$PR = 100(A - B)/C$$

where:

A	=	Spiked sample result
B	=	Sample result
C	=	Spike added

If the analytical data fail to meet the QA/QCP objectives described and corrective measures have been taken, the report will include a discussion of why the data failed to meet the objectives and a description of the limitations and usefulness of the data.

The following corrective actions may be taken for data that do not meet QA/QCP objectives: (1) a verification that the analytical measurement system was in control, (2) a thorough check of all calculations, (3) and, if sufficient quantity of sample is available, reanalysis of the affected samples if authorized by the QC and project management. Any data having apparent QA/QC problems will be flagged, then the problem will be investigated, and standard USEPA data qualifiers (flags) will be used to help describe any non-conformance with the data.

If the problem can be corrected for a set of sample results the data will be corrected and the flag will be removed. The reason for the problem will be determined and correction action will be taken to prevent the recurrence of the problem.

If the data cannot be corrected the flag will remain and corrective action will be taken to prevent recurrence.

The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and QC spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined. The concentration of the analyte relative to the detection limit is also a major factor in determining the accuracy of the measurement. The practical quantitation level for most analyses is generally stated in the analytical method. At or above this level, the spike recoveries will be expected to range from 70 to 130 percent. The accuracy of gas chromatography (GC) analyses is compound- and matrix-dependent. Thus matrix spike recovery is used to determine the effect of the matrix, and a laboratory control sample is used to determine accuracy of the analyses. Presently, accuracy for the QA/QCP has been established at +/- 40%.

4.2.3 Representativeness

Samples taken must be representative of the population. Where appropriate, the population will be statistically characterized to express the degree of which the data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process, or an environmental condition. Two types of blanks will help to establish representativeness. The first type is a trip blank which will consist of a filter for the particulate/KIC analysis which will remain sealed and will accompany the samples at all times. A trip blank will be used for 5% of all samples ("0" if field blanks are used in lieu of the trip blanks) transported from and to the analytical laboratory.

The second type is a field blank, which is collected to ensure that the sampling hardware which captures the pollutants has not been compromised. A field blank is defined as a particulate/KIC filter

which is handled like a sample in the field, except for actual sample collection, and transported to the laboratory for analysis. One field blank will be collected for not less than 5 percent of the sampling events or fraction thereof.

Finally, sample selection and handling procedures will obtain the most representative sample possible. Representativeness of specific samples will be achieved by the following:

- collect samples from locations representing the site condition
- use appropriate sampling procedures and equipment
- use appropriate analytical methodologies for parameters and detection limits required
- analyze within the appropriate holding time as specified in the SOPs

To assess the representativeness of the sample collection procedures, some samples will be collected in duplicate as collocated samplers. One duplicate will be given a "coded" or false sample identifier, and both it and the original sample will be analyzed by the respective laboratories as discussed in section 4.8. Comparisons of the results from the original sample and its coded field collocated sample will allow an evaluation of the representativeness of the sampling.

4.2.4 Comparability

All data will be calculated and reported in units consistent with other organizations reporting similar data. The specific objectives of this project for comparability are:

- to demonstrate tractability of standards to NIST or USEPA sources
- to use standard methodology
- to report results from similar matrices in consistent units
- to apply appropriate levels of quality control within the QA/QCP

By using traceable standards and standard methods, the field and laboratory analytical results can be compared to other studies performed similarly.

4.2.5 Completeness

The completeness of the data is the amount of valid data obtained from the field and laboratory measurement systems compared to the amount of data expected from the systems. At the end of each sampling event, an assessment of the completeness of the data will be performed and, if any data

omissions are apparent and, if feasible, an attempt will be made to resample the parameter in question. The specific objective for completeness for this project shall be greater or equal to 80% of the possible amount of data. It is expressed in terms of percentage complete (PC) and is calculated as follows:

$$PC = \frac{V}{N} x\ 100\%$$

where:

V	=	number of valid results
N	=	total number or results

4.3 SITE SELECTION AND SAMPLING PROCEDURES

As documented in Section 2.1.3 Location and in Figure 2-1, there will be a total of ten (10) designated sampling/monitoring stations, five (5) property line perimeter stations (PL1 through PL5) and five (5) remediation area work perimeter stations (RA1 through RA5) that will be utilized to document and characterize the presence or absence of fugitive emissions that could move from the remediation areas to the site and in turn the surrounding community. The approximate location of each of the sampling/monitoring stations serve a specific objective in the monitoring program and were based in part upon the Local Climatological Data Summary for Mobile, AL for predominate wind direction and speed from the calendar years 1988 through 1992. The windrose in the PDR is presented in Figure 4-1. Exact locations of each station may vary somewhat due to conditions encountered when physically placed.

Table 4-3 identifies the monitoring parameters and methods suggested to support the perimeter air monitoring program.

4.4 CALIBRATION FREQUENCY

Calibration frequency for each field and analytical laboratory monitoring system is delineated in each of the individual SOPs for the equipment or method specified and the calibration procedures will address: (1) the maximum allowable time between calibrations and calibration checks, (2) the quality and source of calibration standards (as a general rule, calibration standards are certified to between four and ten times the accuracy of the equipment being calibrated), (3) the tractability of standards

to NIST Standard Reference Materials or equivalent Commercial Certified Reference Materials, (4) the documentation of calibration results, and (5) a statement of the appropriate environmental conditions needed to ensure that the equipment is not adversely affected by its surroundings (e.g., adverse temperatures, humidity, vibration, lighting, chemical emissions, radio frequency interferences, or electrical voltage fluctuations).

Table 4-4 outlines the recommended field equipment calibration frequencies for each of the field monitoring systems used as part of the AMP.

4.5 ANALYTICAL EQUIPMENT AND PROCEDURES

USEPA approved methods or when necessary equivalent methods will be selected for the analysis of samples collected at the designated air monitoring stations. Table 4-5 outlines the analytical equipment for each of the groups of contaminants identified in the standard procedures.

For each measurement, regardless of the type of analytical instrumentation/method involved, the precision and accuracy of the determination will be calculated. Assessment of the accuracy and precision for each measurement will be based on prior knowledge of the measurement system and as needed or required on method-validation studies using replicates, spikes, standards, 3- to 5-point calibration curves, recovery studies, and other requirements.

4.6 DATA REDUCTION, VALIDATION, AND REPORTING

The specific program procedures for data reduction, validation, and reporting will be discussed in the individual SOP. These procedures will specify, where necessary: (1) all equations and statistical approaches used to reduce the measurement data, (2) the method for treating blanks during data reduction, (3) the method for treating cases of undetected compounds in the statistical calculations, (4) the methods used to identify and treat outliers (5) the criteria for flagging and calibrating data, and (6) the units for reporting results. In general, all reduction of sample field data will be performed by the field technician(s) and sent along with the collected samples to the laboratory where further analyses will be conducted. Once these analyses have been completed a report will be sent to the QC Manager for further validation and the data will be combined into a single file for both daily and monthly reporting.

As specified daily and monthly air sampling reports will be submitted which document the data (time-integrated and real-time) acquired from the AMP and will include both pollutant and meteorological monitoring.

Deliverables will include which analytical methods were used along with sample preparation methods and results will be accompanied by a master list identifying precisely which QC sample ID number corresponds to each QA sample ID number.

The following are minimum data reporting requirements which will be part of the monthly air sampling report where required:

- tabular presentation sample: IDs, dates, results, QC, etc.
- cooler receipt forms and/or narratives for all shipments
- reporting of analyte detected concentration, matrix interferences and dilution factors
- internal quality control reporting to include laboratory blanks, surrogate spike samples matrix spike samples, laboratory duplicates and laboratory control samples
- reporting of field collocated samples and field blanks, etc.

Data validation involves carrying out a series of QA/QC checks on the data package which will at a minimum consist of:

- routine checks will be made during the processing of data
- internal consistency of the data set will be evaluated
- checks for consistency of the data set over time will be performed
- checks may be made for consistency with parallel data sets
- USEPA data qualifiers will be used to flag suspected inaccurate data, etc.

4.7 INTERNAL QUALITY CONTROL

The CQAP and AMP QA/QCP have been developed to insure the quality of the data collected. These plans include reasons for selecting sampling sites, the number of samples, and specified sampling times. Also, the sampling sites will be well defined, and the written procedures where required will be available for sampling methodology, labeling, container preparations, field blanks, storage, pretreatment, and transportation to the analytical laboratory, etc., will be identified in respective SOPs.

Field blanks and/or trip blanks are a part of the sampling QC program to demonstrate matrix effects caused by the time and conditions when the samples were collected, transported and stored prior to analysis.

The calibration and preventive maintenance of field equipment are also documented in each method as part of the QC program.

In order for air monitoring data to be useful, it must be of acceptable quality. Major elements of the program which help insure this are the availability of evaluated measurement methodology, satisfactory performance in collecting the air-pollution monitoring data, and the documentation of all activities and results. Included in this program are: (1) review and revision of existing sampling and analytical methods for a specific analyte or class of compounds; (2) preparation of written step-by-step procedures; (3) documentation of QA procedures; (4) review, revision, and documentation of calibration procedures prior to and during field sampling and analysis; (5) preparation of preventive maintenance procedures; and (6) maintenance of chain-of-custody procedures for data collection, sample handling, analysis, and reporting.

Trip blanks, involving one clean sampling device will accompany a certain percent of the samples to the field and back to the laboratory to serve as a field blank. The average amount of material found on the trip blank will be reviewed and documented in comparison to the amount found on the actual samples and, if the trip blank level is greater than 25 percent of the sample amount, data will be identified as suspect.

During 50% of the sampling events, at least one set of co-located samples (two or more samples collected simultaneously) will be collected. If agreement between co-located samples is not within +/- 40%, the reason for non-agreement will be investigated and documented.

Table 4-6 outlines traditional QC sample types for field monitoring.

Other QC field activities are outlined in Table 4-7 for holding times.

4.8 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits are the primary way achievement of the QA goals and objectives is evaluated. The scope and schedule for auditing each primary measurement system or parameter, as well as the personnel conducting the audits, have been specified throughout the CQAP and AMP

QA/QCP. Performance audits are used to quantitatively evaluate the accuracy of the data being generated, typically by evaluating the recovery of certified reference materials through the sampling and analytical systems. System audits address, in qualitative terms, the capabilities of the measurement system for generating data that meet QA objectives for representativeness and comparability. Such things as adherence to established sampling and analytical procedures, sample custody, and equipment maintenance will be addressed in a system audit.

As identified earlier, a sampling monitor (identified as the QA monitor) will be operated on co-located at one of the designated monitoring stations and used at a 50% frequency. This station will be moved on a periodic basis to any of the other sampling stations and operated in the same manner as the other monitors. At the end of the sampling event, the samples acquired from the co-located QA monitor will be recovered and analyzed in the same manner as the designated monitors.

Table 4-8 outlines performance audits that will be performed on the sampling systems.

To maintain objectivity, performance and system audits will be conducted by the field technician in the presence of the QC manager and all materials and supplies used in the audit will be different from those used during routine operation and calibration of equipment. Performance audits will be conducted at least once every three to six months. However, a more frequent schedule may be recommended if results are highly variable from one audit to the next. A system audit will be conducted before or shortly after the system becomes operational and will be repeated regularly thereafter (e.g., quarterly or semi-annually).

4.9 PREVENTIVE MAINTENANCE AND CORRECTIVE ACTION

4.9.1 Preventive Maintenance

All field equipment, instruments, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and, as necessary, revisions to the maintenance schedules will be made to reflect actual field experience,. All maintenance, routine and corrective, will be documented in the a log book and be traceable to the specific equipment.

4.9.2 Corrective Action

Procedures will be established to assure that conditions adverse to quality including malfunctions, deficiencies, deviations, and errors are promptly investigated, documented, evaluated, and corrected.

When a significant condition, adverse to data quality, is noted at the project site, laboratory, or subcontractor locations, its cause will be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and the corrective action planned will be documented in accordance with the procedure on the appropriate form and reported to the QC manager. Implementation of corrective action will be verified by documented follow-up action.

Corrective actions may be initiated:

- when predetermined acceptance standards are not attained
- when procedures or data compiled are determined to be faulty
- when equipment or instrumentation is found to be faulty
- when samples and test results cannot be traced with certainty
- when quality assurance requirements have been violated
- when designated approvals have been circumvented
- as a result of system and performance audits
- as a result of a management assessment

4.10 EVALUATING DATA PRECISION, ACCURACY, AND COMPLETENESS

Section 4.7 outlines the procedures and requirements which will be initiated to evaluate data quality in terms of the precision, accuracy, and completeness of all primary measurement parameters. These procedures will specify the methods used to gather data for evaluating the precision and accuracy and all equations used in subsequent calculations. Calculation procedures given in 40CFR, Part 58, Appendix B are used to express precision in terms of the upper and lower probability limits of the percent differences between the known and observed concentration values. An alternative expression for precision, in this case, is the relative standard deviation (i.e., standard deviation divided by the mean, expressed as a percentage) of successive precision check results.

For measurement methods that require integrated sampling and analytical laboratory analysis duplicate (collocated) sample results will be used for determining data precision. To obtain precision data, collocated samplers will be located at the site at 50% of the sampling frequency. Equations for expressing precision in terms of the upper and lower probability limits of the percent difference of duplicate sample results are given in 40CFR, Part 58, Appendix B. Alternatively, precision can be expressed as the relative percent difference of duplicate sample results, or pooled standard deviation.

Accuracy determinations for manual methods will be performed by spiking sampling media with known quantities of target analyses and measuring their recovery through the extraction and analytical systems. Media spikes will be prepared by laboratory individual not involved in the operational activities associated with sample collection or analysis. The accuracy of the measurement data will be expressed as the percentage of the spiked amount recovered in the analysis.

Data completeness for both automated and manual methods should be expressed as the percentage of valid data relative to the amount of data that was expected to be obtained under correct normal conditions.

As identified in Section 4.7, precision, accuracy, and data completeness values have been documented as part of the CQAP and the AMP QA/QCP.

Finally, data validation is the systematic review of measurement data for outlier and error detection and for validation of AMP data collected there are three levels of validation: (1) preliminary consistency check and outlier identification, (2) review of data collection processes, and (3) analysis of data for consistency between data sets, between monitoring devices, and to formally identify outliers. Data found to be questionable at any of these levels will be investigated, and an explanation will be sought for the unusual readings.

Level 1. Qualified field technicians and/or chemists will perform a preliminary visual check for noticeably improbable data, peaks or spikes in the data, obvious trends in the data that might result from monitoring equipment malfunction, and other data irregularities. These personnel will also compare data points that share deterministic relationships (e.g., high wind speed readings, wind direction, ambient temperature, etc.) to identify irregularities. These reviews are performed as the raw data are collected and/or shortly collection so that investigations can quickly determine the initial validity of the readings.

Level 2. Qualified personnel will review chain-of-custody, maintenance, calibration, and analysis records to detect any problems with laboratory or field processes or equipment parameters which might lead to non-standard sampling intervals, insufficient sample volume or other problems that may negate the sampling event or create questionable results.

Level 3. Qualified personnel will analyze data for subtle yet unacceptable abnormalities. They assess the consistency of data collected over time and by different monitoring devices at the same site. They also use methods to identify outliers in the data that require investigation.

The AMP data will be subject to various stages of the three level validation program. Not all data will be taken to the Level 3 due to its applicability. Level 1 and 2 review is applicable to both time-integrated and real-time data. These levels involve a quality control review by each data collector or generator, and an independent review of the entire data set by the project or AMP QC manager for improbable data, peaks or spikes, obvious trends, data relationships with other parameters (particulate, KICs, wind direction), maintenance, calibration and analysis records.

Level 3 data review can include surrogate recovery analysis for KICs, and instrument control charts. Examples of some variables to be documented and reviewed under a Level 3 for KICs are: (1) methods and procedures employed, (2) sampling, extraction, and analysis date conformity, (3) detection limits: MDLs, PQLs, CRDLs, etc.), and (4) Results: sample, USEPA qualifiers/flags, duplicates, method blanks, matrix spikes, matrix spike duplicates, laboratory control sample, surrogates, etc.)

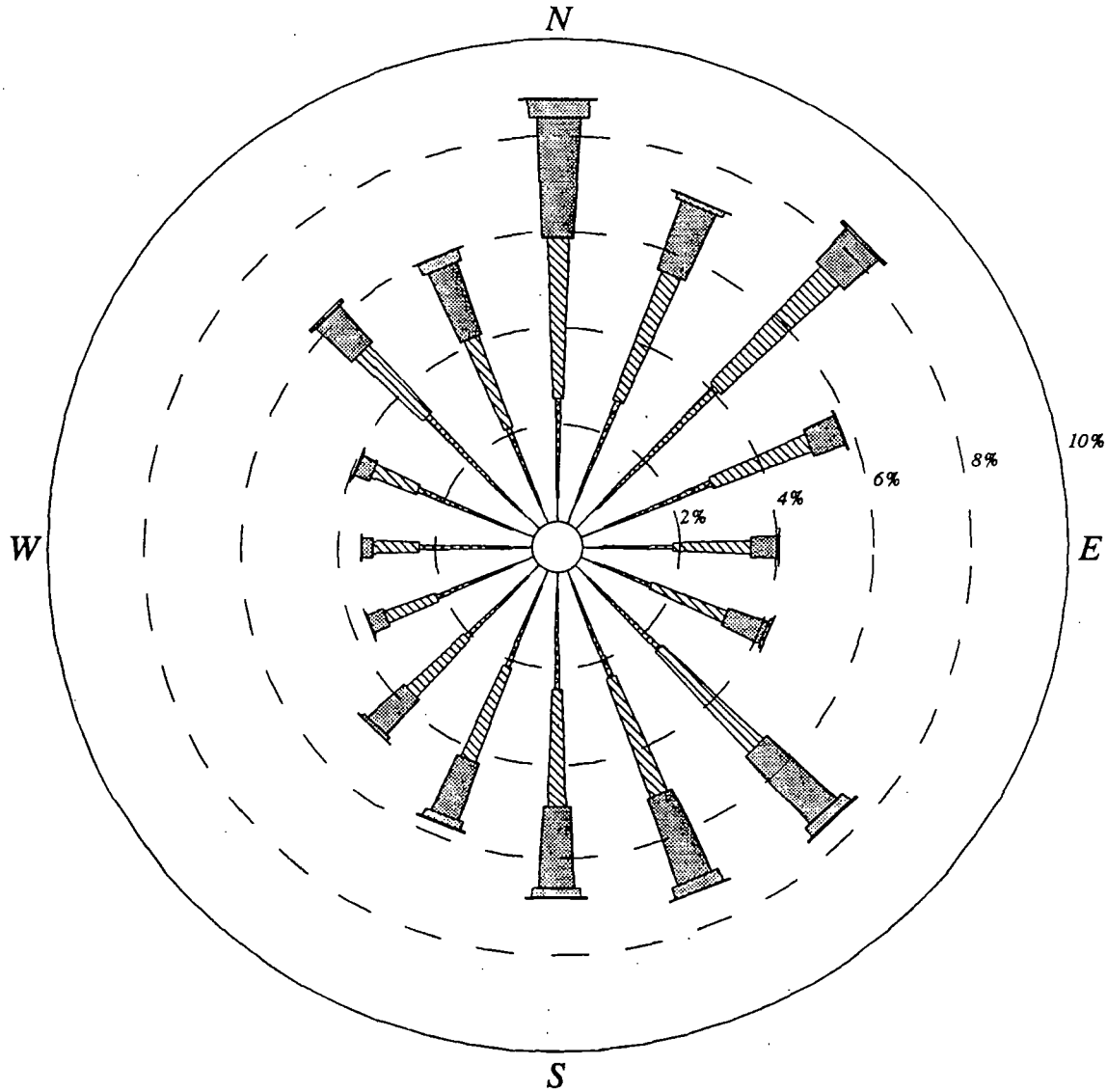
4.11 CORRECTIVE ACTION

A plan for initiating and implementing corrective action will be developed and outlined in the individual SOPs as part of the AMP QA/QCP. Each individual plan will specify where necessary: (1) conditions that will require corrective actions; (2) personnel responsible for initiating, approving, implementing, and evaluating the resolution of corrective actions; and (3) specific corrective action procedures used when predetermined control limits are exceeded. Corrective actions are usually instrument-specific. Equipment manuals and USEPA-approved standard operating procedures will be consulted for guidance on insuring implementation of the plan.

FIGURE 4-1
WINDROSE

MOBILE, AL 1988-1992

January 1-December 31; Midnight-11 PM



CALM WINDS 5.77%

WIND SPEED (KNOTS)

NOTE: Frequencies indicate direction from which the wind is blowing.

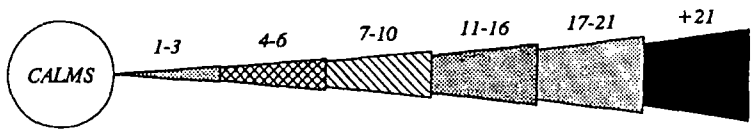


TABLE 4-1

QUANTITATIVE MEASUREMENTS

CRITERIA	LIMITS
Replicate Precision	+/- 30%
Audit Accuracy	+/- 40%
Data Completeness	80 %

TABLE 4-2

QUALITATIVE MEASUREMENTS

CRITERIA	LIMITS
Representativeness	Documented
Comparability	Documented

TABLE 4-3

MONITORING PARAMETERS AND METHODS

PARAMETER	REFERENCE METHOD[1]
MVPS	Minivol Portable Sampler, Airmetrics, Springfield, OR
Portable Aerosol Monitor (PAM)	To Be Determined
Key Indicator Compounds (KICs)	USEPA Compendium Methods Modified TO-10, TO-13, or To Be Determined

[1] or approved equivalent method.

TABLE 4-4

FIELD EQUIPMENT AND CALIBRATION FREQUENCIES

INSTRUMENT	MULTIPLE POINT	SINGLE POINT/ZERO
Meteorological Station	3,8,7	2
MVPS	6,8,7	2
Portable Aerosol Monitor (PAM)	TBD	To Be Determined

Calibration Frequency Codes
1-Daily, 2-Weekly, 3-Monthly, 4-Annually, 5-No calibration necessary, 6-Every Use, 7-When single point or zero/span check is outside control limits, 8-Upon installation or removal from service, before and after maintenance/repair

TABLE 4-5

ANALYTICAL EQUIPMENT

METHOD	CLASS	EQUIPMENT
USEPA Compendium of Methods or Equivalent SOP	KICs	Gas Chromatograph -Electron Capture -Mass Spectrometer
Minivol Portable Sampler Methods	particulate	Gravimetric

TABLE 4-6

TYPES OF QC SAMPLES

QA/QC SAMPLE TYPE	SUGGESTED FREQUENCY	RESPONSIBILITY	APPLICATION
Co-located samples for MVPS/KICs	50% of sampling events at one sampling location	Field Tech	Determine variation due to sample collection and/or conditions
Flow checks of samplers (single point)	All sampling events	Field Tech	Verify initial flow calibration to laboratory standard curve
Field blank for filters	Not less than 5% of trip numbers	Field Tech	Used to detect contamination during field operations and shipping
Trip blank for filters	5% of trip numbers (0 if field blank used in lieu of trip blank)	Field Tech	Used to detect contamination during shipping
Lot blank	1 per event per lot	Laboratory	Used whenever a fresh lot of sampling media is started
Reagent/method blank	1 per reagent blank per batch	Laboratory	Used to insure reagents are clean
Surrogate spike	Every sample	Laboratory	Used to verify that bias results are not being reported high or low due to problems with specific analysis

TABLE 4-7

MAXIMUM HOLDING TIME

SAMPLE TYPE	TIME	PRESERVATION
MVPS	1 month	None
KIC Analysis	ext. 14 days/anal. 40 days	Cool 4° C

TABLE 4-8

SAMPLING SYSTEM PERFORMANCE AUDITS

INSTRUMENT	TYPE	FREQUENCY	CRITERIA
MVPS	Flow Audit Leak Check	Every use	+/- 10% of set point SOP Specification
Meteorological Station	Wind Direction Wind Speed	Quarterly	Wind Direction +/- 5% Wind Speed +/- 0.2 m/s

APPENDIX F

SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

I HAVE READ THE SITE-SAFETY PLAN FOR THIS SITE AND FULLY UNDERSTAND ITS CONTENTS.

NAME	DATE

APPENDIX D

MATERIALS HANDLING PLAN

MATERIALS HANDLING PLAN

FOR

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

JUNE 1996

RUST PROJECT NO. 89892.300

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LIST OF ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
AMP	Air Monitoring Plan
ARARs	Applicable or Relevant and Appropriate Requirements
APCS	Air Pollution Control System
CHSP	Construction Health and Safety Plan
Ciba	Ciba-Geigy Corporation
CKD	Cement Kiln Dust
CMP	Construction Management Plan
CQAP	Construction Quality Assurance Plan
DRE	Destruction and Removal Efficiency
EPS	Excavation Performance Standards
FDR	Final Design Report
IQAT	Independent Quality Assurance Team
MHP	Materials Handling Plan
O&M Plan	Operations and Maintenance Plan
OHM	OHM Remediation Services Corporation
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit Two
OU3	Operable Unit Three
OU4	Operable Unit Four
PDP	Performance Demonstration Plan
PDR	Preliminary Design Report
PFDR	Prefinal Design Report
PRP	Potentially Responsible Party
POHC	Principal Organic Hazardous Constituent
PSVP	Performance Standards Verification Plan
PVC	Polyvinyl Chloride
RA	Remedial Action
RAPs	Remedial Action Plans
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
Rust	Rust Environment & Infrastructure
RWWTS	Remediation Wastewater Treatment System
SCC	Secondary Combustion Chamber
Site	Ciba McIntosh Superfund Site
SOW	Statement of Work
TTU	Thermal Treatment Unit
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this Materials Handling Plan (MHP) is to provide a detailed plan of action for site preparation, excavation, thermal treatment unit (TTU) feed handling, treated solids handling, fill, backfill and regrading, wastewater handling and refuse management the Ciba McIntosh Superfund Site (Site). The MHP has been prepared for Ciba-Geigy Corporation (Ciba) by Rust Environment & Infrastructure (Rust) in cooperation with OHM Remediation Services Corporation (OHM).

This MHP has been prepared for the remedial action (RA) at Operable Unit Two (OU2) and Operable Unit Four (OU4) of the Site. In addition, contaminated surface soils from Operable Unit three (OU3), the floodplain, will be excavated in accordance with OU3 design documents and backfilled into OU2. The RA includes:

- excavation, thermal treatment and/or backfill of OU2 soils which consist of sites 1 through 7, 9 and 11
- excavation, thermal treatment and backfill of OU4 soils which consists of site 8
- construction of a slurry wall outside the toe of the bluffline in site 8
- stabilization of exposed iron slurry at site 8

The MHP has been developed in conjunction with the Remedial Action Work Plan (RAWP) of which this MHP is an appendix, Construction Management Plan (CMP) and the Construction Health and Safety Plan/Contingency Plan (CHSP) included as Appendices A and C respectively to the RAWP.

2.0 COORDINATION WITH OTHER PLANS

The following plans, in conjunction with design specifications and drawings, have requirements directly associated with material handling activities. The requirements of these plans will not be repeated in the MHP, but are hereby incorporated by reference.

2.1 PERFORMANCE STANDARDS VERIFICATION PLAN

The Performance Standards Verification Plan (PSVP) contains requirements and procedures for sampling and analysis related to excavation verification and treated solids from the TTU. This document should be reviewed in detail for work involving verification that the excavation and treated solids meet Performance Standards.

2.2 CONSTRUCTION HEALTH AND SAFETY PLAN

The Construction Health and Safety Plan (CHSP) contains safety requirements for each RA task, as well as delineation of work zones and monitoring requirements. This document should be reviewed prior to beginning each RA task.

2.3 CONSTRUCTION QUALITY ASSURANCE PLAN

The Construction Quality Assurance Plan (CQAP) contains testing, inspection and analytical requirements associated with all phases of the RA. This document should be reviewed to determine QA requirements prior to beginning each RA task.

2.4 AIR MONITORING PLAN

Requirements for air monitoring during material handling activities are contained in the Air Monitoring Plan (AMP) and which is part of the CHSP. The AMP should be reviewed for air monitoring requirements during material handling tasks.

ADEM Section 335-3-4-.02(3) allows the Director of ADEM to order fugitive emissions of dust, fumes, gases, mist, odors, and vapors from buildings and equipment which create a nuisance or violate any rule or regulation to be enclosed and ventilated to a control device before discharge into the atmosphere.

Due to the potential for airborne migration of dust, remediation activities will be designed to minimize dust emissions. Dust control techniques may include the application of dust suppressants (such as water), controlled loading techniques, covering truck beds and material stockpiles, and enclosure of certain material handling operations.

A feed preparation building will be utilized to control fugitive emissions from mixing, screening, and sizing material prior to thermal treatment. The feed preparation building will be equipped with an air handling system utilizing particulate filters and granular activated carbon to control emissions. Alternately, air may be routed to the Secondary Combustion Chamber (SCC) combustion air blowers.

3.0 SITE PREPARATION

This section presents the measures that will be taken to clear and grub the Site, insure access to the Site and control erosion and stormwater run-off.

3.1 CLEARING AND GRUBBING

Clearing and grubbing of vegetation and trees will be required at several sites, including the TTU location and site 3. These activities will take place prior to the beginning of any construction or excavation. Below-ground parts in contaminated areas such as tree roots will be chipped and fed to the TTU.

3.2 SITE ACCESS

Main access to the Site will be provided by the existing plant roads. Haul routes may be established as required to optimize material handling. All roads outside of the excavations will be designated as "clean roads". All vehicles will be decontaminated prior to leaving the exclusion zones.

3.3 EROSION AND RUN-OFF CONTROL

Various measures will be implemented to control potential erosion and sedimentation during the RA. Generally, the following methods will be applied to control erosion and sedimentation, as necessary:

- silt fencing around disturbed areas and stockpiles
- placement of a mortar-cellulose (Posi-Shell) cover material over stockpiles or disturbed areas
- placement of straw bales or check dams across drainage swales to capture sediments
- regular maintenance of erosion control systems to remove sediments and ensure proper performance
- seeding and stabilization of disturbed areas

Run-off from contaminated areas will be minimized by constructing low perimeter berms around each contaminated area prior to beginning excavation activities. The berm will be sufficiently close to the excavation to minimize the area inside the berms, thus reducing the amount of contaminated stormwater. The stormwater berms will be located to provide sufficient area for stockpiles and equipment access inside the berm as required for operations. The berms will be subject to being

relocated during excavation activities depending on the shape of the excavation and the need for additional stockpile areas inside the containment berms. Generally, the interior of the bermed area will be sloped to drain into the excavation areas.

Stormwater which enters the excavation area from either internal run-off or direct rainfall will be either pumped or trucked to the Remediation Wastewater Treatment System (RWWTS) equalization tanks. Contaminated water will be treated in the RWWTS as required. The rate the stormwater is removed from the excavation area will depend on the following factors:

- remaining volume of the equalization tanks
- schedule for backfilling the excavation area
- amount of rainfall received or anticipated versus RWWTS capacity
- need for further excavation in the area
- need for TTU cooling water

Stormwater will remain in the excavation areas unless RA activities require removal of stormwater. Stormwater will be removed from excavation areas to allow removal of soils or to facilitate backfilling. Soil will be excavated in relatively level increments. The excavation areas will be gently sloped to allow stormwater to be pumped from the area. The interim storage stockpile and the TTU process area will each be bermed to contain run-off.

Run-on to the excavation areas will be minimized by the perimeter berms as discussed above. In addition, shallow perimeter ditches or swales may be required to direct stormwater around the excavation areas depending on the topography. Also, major drainage features which currently traverse excavation areas will be permanently or temporarily relocated to direct stormwater around the excavation areas. Existing drainage patterns and slopes will be maintained to the extent possible.

4.0 EXCAVATION

Details of the RA sequencing and plans for site excavations are given in the sections below.

4.1 SEQUENCING

The following sequence of steps will generally be followed when excavation is to be performed in an area:

1) Alert McIntosh plant personnel in advance of any excavation activities to coordinate any utility, traffic or other issue that may affect plant operations.

2) Delineate haul road routes and maximum extent of area to excavated or used for temporary stockpiling.

3) In areas to be excavated or used for stockpiling, and along haul roads, install erosion and sedimentation measures in accordance with the Erosion Control and Run-Off Control Plan.

4) Construct haul roads.

5) Excavate surface soils above subsurface excavation areas,
   a) place soils requiring treatment in Interim Storage Stockpile and
   b) place soils to be backfilled subsurface in temporary stockpile.

6) Excavate overburden and/or layback and place in temporary stockpile for backfilling.

7) Excavate subsurface soil and transport to Interim Storage Stockpile.

8) Repeat the previous two steps until all subsurface soils requiring treatment have been removed.

9) Confirm that excavation Performance Standards have been met.

10) Surface soils adjacent to an excavation will generally be excavated last and placed directly into the excavation without being placed in a temporary stockpile.

Additional information regarding excavation related activities are described in subsequent sections of the Material Handling Plan and/or related Remedial Action Work Plans.

4.2 VOLUMES

Estimates of the volume of soils exceeding Excavation Performance Standards (EPS) and requiring excavation is given in Table 4-1. The table gives the estimated volumes by site and also delineates between surface and sub-surface soils. The table is further subdivided into surface soils that may be used as sub-surface backfill elsewhere on the Site and those which will be thermally treated. Sub-surface soils exceeding EPS will be thermally treated.

4.3 LIMITS

Excavation limits for all sites are shown on Drawings 89892-NP-01 through 89892-NP-05 included as Appendix H to the Final Design Report (FDR). Based on the excavation coordinates on these drawings, soils requiring excavation will be staked. Some soils beyond the required excavation limits will be removed to access the soils requiring excavation or to maintain stable side slopes.

Once the excavation has reached the predetermined limits for a site, the excavation will be topographically surveyed to confirm that the excavation limits have been attained.

Trackmounted hydraulic excavation equipment will primarily be used for the excavation work. Based on excavation depths not exceeding 20 feet, the majority of the excavation will be performed with the equipment located on existing grade. However, in large excavations it may be necessary to excavate a bench from which the equipment can be operated. Front-end loaders and dozers will be used adjacent to the excavation to load, stockpile, segregate, and further handle the excavated material.

4.4 STABILITY

Excavation stability is an important safety consideration, even though personnel will not be permitted to enter the excavations without an entry permit. Maintaining stable side slopes assures that equipment will not slough into the excavation. Any soil below EPS which might be removed to maintain side slope stability will be stockpiled separately and later backfilled into the completed excavation.

Excavation stability will generally be maintained by sloping the excavation perimeter to a stable angle of repose.

Sheet piling may be installed in site 9 adjacent to existing plant facilities and utilities whose location will preclude sloping of the excavation perimeter. In these areas, a sheetpile retaining wall may be constructed to permit removal of the contaminated soil at the subsurface excavation boundaries. Sheetpile construction will be based on the following:

- depth of excavation
- geotechnical properties of soils
- depth of groundwater
- anticipated loading conditions outside the limits of excavation

If needed, a subsurface investigation program will be developed to obtain the necessary geotechnical information prior to sheetpile installation.

Sheet piling may be left in place at the completion of the project. Following backfilling of the excavation, Sheet piling to be left in place will be cut off approximately 2 feet below final grade. Sheet piling left in place will be noted on the final grading plans.

4.5 DEWATERING

Water may be encountered in several of the excavation sites. The majority of this water is expected to be perched water and stormwater which falls directly within the limits of the excavations.

Perched water and stormwater will be removed as necessary to allow excavation to progress. A system of trenches and sumps will be maintained in the excavation bottom to facilitate water removal. The excavation bottom will be maintained in a stable condition by regularly removing water from sumps as it accumulates. Water removed from the excavations will be transported by piping or tanker truck to the RWWTS for treatment.

4.6 MATERIALS HANDLING

Several steps of material handling will occur at the excavation sites prior to treatment and/or backfilling of the excavated material. The material handling approach at the excavation sites is described below.

4.6.1 Overburden and Layback

Overburden and layback are soils below the EPS that will nevertheless be excavated. Overburden is defined as soils that must be removed to access other soils requiring excavation; layback is defined as soils that must be removed for stability of the excavation. Overburden and layback will be considered "clean" and will be stockpiled for use as backfill at the site from which they were excavated. A stockpile of overburden and layback material will be maintained adjacent to the excavation to minimize material handling.

4.6.2 Soils Requiring Thermal Treatment

Excavated materials requiring thermal treatment may be transferred to one of two central locations for pre-treatment: the Interim Storage Facility or the Feed Preparation Building. The selection will depend upon pre-treatment requirements such as the material's need for conditioning, drying, and admixtures. Scheduling issues, such as the availability of feed ready for thermal treatment and the availability of heavy equipment for transportation, will also influence where the excavated materials are transferred.

The Interim Storage Facility will serve as an area for spreading and drying of feed, as well as an area for feed storage. The Interim Storage Facility will consist of the Interim Storage Stockpile and the Interim Storage Building. The Feed Preparation Building will serve as an area for final sizing and conditioning of feed as well as an area for addition of feed admixtures. A discussion of the material handling activities at each of these locations is presented on Section 5.0.

4.6.3 Debris

Debris will be divided into five broad categories. Some debris may be classified in more than one category and a field determination will be made to determine the appropriate category. Following is a description of the five categories of debris:

- Debris Too Large to be Excavated - This category includes objects which remain in the excavation because they are too large to be removed with the available equipment.

- Recyclable Debris - This category primarily includes metal objects which are in satisfactory condition to be decontaminated and sold as scrap metal. Decontamination procedures will consist of removal of loose soils by manual means

and steam cleaning of the object to remove visible residue. Any water from the decontamination procedure will be collected and routed to the RWWTS.

- Debris Not Compatible with Thermal Treatment - This category includes objects whose shape, length or size would likely create problems for the classification and/or size reduction equipment. These objects will be returned to the excavation after any loose soils have been removed.

- Debris Compatible with Thermal Treatment - This category includes debris which is not covered by any of the above categories and which will be processed through the feed preparation equipment and into the TTU.

- Other Debris - This category would include objects which would not fit any of the above categories. No such debris is anticipated at this time and would be handled on a case by case basis.

Debris may be removed from the feed stream at any time during excavation or handling. Debris larger than two inches in size may be removed from the feed by either manual or mechanical means. Manual removal may occur any time and will allow for the segregation of debris which might otherwise damage or hinder the operation of equipment. Smaller debris which can be easily handled by mechanical means will be removed by the two-inch power screen. This flexibility will allow for the use of good judgement and will result in minimizing downtime associated with the operation of the TTU feed system.

Debris greater than two inches in size will be classified according to its compatibility with thermal treatment by visual inspection. If the debris is determined to be compatible with thermal treatment, it will be processed through the shear shredder for size reduction and subsequently re-introduced to the feed. If the debris cannot be processed through the shear shredder, it may be removed for further size reduction by hydraulic shears, jackhammers or other devices.

4.7 DRUM HANDLING

Damaged and undamaged drums may be encountered during the excavation of the different sites. The largest number of drums are expected to be encountered in site 3. A smaller number of drums are expected in sites 7 and 8. This section describes the drum handling activities that will be performed as drums are encountered at the excavation. Crushed drums will be handled as metal debris.

4.7.1 Excavation

Drum handling equipment will be utilized to remove drums from the excavation as they are encountered. The following equipment will be utilized to handle drums:

- tracked hydraulic excavator (trackhoe)
- drum grappler attachment for trackhoe
- front-end loader with drum handling attachments
- rubber tired forklift

When drums that apparently have their structural integrity are encountered, the trackhoe operator will carefully excavate the surrounding soil to expose the drum. Drums will be examined to determine their structural integrity. Undamaged drums will be removed from the excavation and subsequently logged, sampled and staged as described in the next section. Damaged drums may be considered as part of the feed to the TTU and treated as discussed in Section 5.0.

Undamaged drums will be examined to determine if they are empty. Drums containing less than one inch of material will be staged for decontamination and subsequent recycling. Decontamination will be performed according to Ciba's drum decontamination policy. Drums containing more than one inch of material will be logged, sampled and staged as described in the next section.

4.7.2 Logging, Sampling and Staging

A field observation data sheet will be completed for each undamaged drum containing more than one inch of material. The following information will be logged on the field observation data sheet:

- drum depth in excavation
- drum location
- excavation site
- ID number
- drum integrity
- overpack/transfer status
- any identifying marks

Following logging, each undamaged drum with more than one inch of material will be opened and sampled. Drums showing no signs of pressure will be opened manually using non-sparking tools.

Drums exhibiting signs of pressure will be opened remotely using a trackhoe with a piercing point. Samples will be drawn from each drum and tested at the on-site laboratory for waste compatibility screening. After the samples are drawn, any leaking drums will be overpacked.

Following sampling, each drum will be staged based upon its chemical category as determined by the screening. Drums will be staged in the TTU area on concrete pads that provide containment for any spills. Any collected drainage will be transferred to the RWWTS. Drums will remain in the staging area until a determination is made for their final disposal. This may involve treatment at the TTU or shipment off-site to a permitted facility for disposal.

4.8 IRON SLURRY STABILIZATION

Samples of the iron slurry material have been collected and analyzed for potential leachability of site-specific metals. The Toxicity Characteristics Leaching Procedure (TCLP) was selected as the criterion to be used to identify locations within the iron slurry in need of treatment. The results of TCLP testing show that metals in the iron slurry area are basically immobile and do not represent a risk to groundwater.

The iron slurry may still require stabilization to prevent sloughing into the excavation areas. Excavation along the northern edge of site 8 may encounter the iron slurry. At site 8, excavation slopes will be laid back at about a 2:1 (horizontal:vertical) inclination. If encountered, the iron slurry will be removed to a depth of approximately two feet and placed at the crest of the slope. The iron slurry will be stabilized by the addition of approximately two percent cement. Additional mix water will be added, as required.

After the cement and water has been added and mixed, the stabilized material will be pushed down the slope and tracked-in with a bulldozer until the material is compacted. A plan view of the area that may potentially contain iron slurry requiring stabilization is presented in Drawing No. 89892-NP-09 (FDR, Appendix H). A section showing the described geometry is presented in Drawing No. 89892-SW-03 (FDR, Appendix H).

Slope stability calculations were performed to investigate if adequate factors of safety exist for the situation where soft iron slurry materials are encountered. This slope condition is expected to represent the worst-case scenario for site 8. The calculations were performed using the software PCSTABL 5M, written by Purdue University. In the analysis, circular failure modes were investigated using the Simplified Bishop method. Material unit weight and shear strength parameters

were conservatively estimated using available geotechnical information and experience with similar conditions. Both short term (total) and long term (effective) analyses were performed, although because of the short term nature of the slope, only total stress conditions are expected to exist. Computer outputs, presenting details of the analysis, are presented in (FDR, Appendix G).

The results of the analyses indicate that both the short term and long term safety factors are about 1.5. These are considered acceptable safety factors. In the analysis, the unconfined compressive strength of the stabilized material was assumed to be about 33 psi. This compressive strength is expected to be easily achievable with the addition of 2 percent cement. Specifications for Soil and Iron Slurry Stabilization are contained in Section 02245 of the project specifications (FDR, Appendix H).

4.9 SAMPLING AND ANALYSIS

Post-excavation performance sampling will be performed for sites 1, 3 and 4 during the Phase I RA. The PSVP outlines the procedure for taking post-excavation samples at these sites. Analytical results from these verification samples will be combined with existing data and incorporated into a statistical analysis. The statistical procedure for evaluating the verification samples is described in the PSVP (FDR, Appendix D).

In addition to soil samples collected during the confirmation of the PSVP, the following samples will be collected during the Phase I and Phase II excavation activities:

- soil/bentonite mixture during installation of slurry wall
- cement mixture during installation of stabilized area at site 8
- excavated drum content samples (if required)

Methods of analysis and targeted compounds are delineated in the CQAP.

4.10 RECORD KEEPING

For each sample collected, the following information will be recorded in a field logbook:

- sample date
- sample time
- name of person collecting sample
- locations of samples
- sample identification number

A chain of custody form will be prepared as described in the CQAP. The back copy of each chain of custody form will be retained and kept on-site. The following documentation will be maintained on-site for each sample collected:

- field logbook
- completed chain of custody form (sampler's copy)
- federal Express or other shipper bill of lading (sender's copy) if samples are shipped off-site
- sample analytical results when received from laboratory

TABLE 4-1
VOLUME ESTIMATES OF SOILS
EXCEEDING EXCAVATION PERFORMANCE STANDARDS

Site	Surface Volume (Cu. Yds)		Subsurface Volume (Cu. Yds) Requiring Thermal Treatment	Total Volume (Cu. Yds.) Requiring Thermal Treatment
Destination	Subsurface Backfill	Requiring Thermal Treatment		
1	2,620	408	9,256	9,664
2	3,801 (5)	0	0	0
3	21,738 (3) (4)	1,104 (3)	4,740 (1)	5,844
4	15	0	1,119	1,119
5	416	0	0	0
6	16	0	0	0
7	0	59	2,311 (2)	2,370
8	0	0	42,244	42,244
9	3,191 (3)	1,717 (3)	39,533	41,250
10	0	0	0	0
11	30	0	0	0
Total	31,827	3,288	99,203	102,491

(1) This volume is revised from Table 3-1 of the IDR to include subsurface subsites 3C and 3E.

(2) This volume is revised from Table 3-1 of the IDR to include additional excavation.

(3) The Site 3 and Site 9 surface excavation volumes were transposed in Table 3-1 of the IDR.

(4) Volume is revised from Table 3-1 of the IDR to include the existing stockpile in Site 3.

(5) Portions of this material may not be excavated. Clean fill may be placed over this material to achieve Performance Standards.

5.0 TTU FEED HANDLING

5.1 INTERIM STORAGE STOCKPILE

The Interim Storage Stockpile will serve to provide a surge volume of feed, thereby allowing the excavation activities to be independent of TTU operations. Drawing 89892-PF-01 (FDR, Appendix H) presents a schematic flow of materials through the Interim Storage Stockpile. The Interim Storage Stockpile will be located in site 3 and will allow excavation of select sites to be conducted during the erection of the TTU. The size of the stockpile area will be approximately 160 feet by 300 feet. The estimated capacity of the Interim Storage Stockpile is approximately 24,000 cubic yards of material.

Depending on scheduling considerations, feed may be routed to the Interim Storage Stockpile before pre-treatment or after pre-treatment in the Interim Storage Building. If the heavy equipment required for transport of material is temporarily unavailable, feed may be stockpiled prior to pre-treatment. A large supply of feed ready for thermal treatment may necessitate stockpiling after pre-treatment. In some cases, such as before the TTU is erected, it is possible that feed may be stockpiled before and after pre-treatment. Stockpiled feed will be covered with a mortar-cellulose slurry (e.g., Posi-Shell) or tarps to minimize fugitive emissions and rainwater infiltration.

Stockpile areas in uncontaminated areas will be lined with an appropriate geomembrane to prevent any contaminant migration. To prevent damage to the liner, a low ground pressure tracked dozer will be used to spread the feed. In addition, the dozer will be consistently operated in such a manner as to keep a protective layer of soil between it and the liner. Debris and any other material which could puncture the liner will be placed in an area with a protective layer of soil on top of the liner. Liners will not be used in stockpile areas where contaminated soil is present and where excavation for thermal treatment is scheduled.

Stockpile areas of untreated or contaminated materials will be designed to contain stormwater. The stockpile areas will have earthen berms and be graded to drain to sumps located along the perimeter. Collected stormwater will be routed to the RWWTS described in Section 8 for treatment prior to discharge.

5.2 INTERIM STORAGE BUILDING

The Interim Storage Building will provide an area for spreading and drying of feed. The building will be a roofed structure approximately 270 feet long by 100 feet wide. Drawing 89892-PF-01 (FDR, Appendix H) presents a schematic representation of the flow of materials through the Interim Storage Building. Inside the building, soils will be prepared to achieve a uniform heat and moisture content. A dozer and tractor with disc will be used to accomplish the conditioning and drying operation. Wet soils will also be afforded the opportunity to air dry while inside the building. The latter is a simple, inexpensive way to level the heat and moisture load on the TTU and improve material handling. Feed containing odorous or volatile materials will be transported directly to the Feed Preparation Building.

5.3 FEED PREPARATION BUILDING

From the Interim Storage Facility, the feed will be transported to the Feed Preparation Building. The Feed Preparation Building will be an enclosed structure with a concrete floor and concrete lined blending pits. The size of the building will be approximately 100 feet by 225 feet. Drawing 89892-PF-02 (FDR, Appendix H) presents a schematic representation of material handling operations inside the Feed Preparation Building. The building will serve as an area for feed conditioning, classification and size reduction. Any required admixtures will also be added in the Feed Preparation Building.

The Feed Preparation Building will be maintained under a slightly negative pressure, and any emissions resulting from operations will be treated by the air handling system. The air handling system will be designed to control particulate and volatile organic emissions from the building. The system will be designed to provide approximately one air exchange per hour inside the building. Level B Personal Protective Equipment (PPE) will be required for access inside the building.

5.3.1 Feed Conditioning Pits

Two concrete lined pits in the Feed Preparation Building will be used to receive feed from the Interim Storage Facility and as an area for final conditioning operations.

Feed requiring additional conditioning to achieve a uniform heating value or moisture content will be mixed in the pits with a backhoe. Any admixtures required will also be added to the feed and conditioned in the pits using a backhoe. If additional conditioning is not required, the pits will serve as a stockpile area for the remaining operations in the Feed Preparation Building.

5.3.2 Admixtures

Cement kiln dust (CKD) may be conditioned with the feed to reduce surface moisture and improve material handling properties. Visual and/or analytical means will be used to check feed for the desired moisture content as it is received. If the feed moisture content is too high, CKD will be added to the feed. The CKD will be stored in silos and added to the feed via screw feeders. A backhoe or similar device will be used for blending CKD with the feed.

5.3.3 Size Classification

The maximum feed particle size for efficient thermal treatment is approximately two inches. To achieve a feed that is consistently this size, a two-inch power screen will be employed in the Feed Preparation Building to remove oversized materials. The power screen will consist of a feed hopper, clay delumper, belt conveyor and a vibratory screen.

Conditioned feed will be transferred by front-end loaders from the pits to the power screen feed hopper. Material will be fed to the delumper and the belt conveyor for transfer to the vibratory screen. Material greater than two inches in diameter will be separated by the vibratory screen and stockpiled for size reduction. Screened feed will be transferred to the weigh belt conveyor and fed to the TTU.

5.3.4 Size Reduction

Oversized material separated by the two-inch power screen will be fed to a shear shredder located within the Feed Preparation Building for size reduction. The shredder will employ a series of cutter knives mounted on two counter-rotating shafts to reduce oversized material to the required two inch size. Any material which cannot be effectively reduced in size will be removed from the shredder and stockpiled for further handling as described in Section 5.3.5. Sized material will be fed back to the two inch power screen for size classification. Screened material will be fed to the TTU; any oversized material will be routed back to the shear shredder.

5.3.5 Segregation of Debris

Debris may be removed from the feed stream at any time during excavation or handling. Debris larger than two inches in size may be removed from the feed by either manual or mechanical means. Manual removal may occur any time and will allow for the segregation of debris which might otherwise

damage or hinder the operation of equipment. Smaller debris which can be easily handled by mechanical means will be removed by the two-inch power screen. This flexibility will allow for the use of good judgement and will result in minimizing downtime associated with the operation of the TTU feed system.

5.4 PROCESSED FEED STOCKPILE

The materials passing the two-inch power screen will be accumulated into the Processed Feed Stockpile. This material will be fed to the TTU and will be sampled as described in Section 5.5.

5.5 FEED SAMPLING AND ANALYSIS

Feed samples will be collected and analyzed during the performance demonstration and for the first month of operations. The following subsections present the planned sampling and analytical procedures.

5.5.1 Performance Demonstration Feed Samples

Soils will be collected and stockpiled for each of two test conditions. Feed samples will be collected and analyzed as listed in Table 5-1. Test condition 1 will be performed with typical site soils. Naphthalene will be spiked as a surrogate principal organic hazardous constituent (POHC) and the test will be performed at low kiln and SCC temperatures. The primary purposes of this test are to set the low temperature limits in the kiln and SCC and to set the maximum solids feed rate.

Naphthalene will be analyzed to determine its concentration (if any) in the feed stockpile. If any naphthalene is detected, the mass feed rate will be calculated and added to the spiked rate of naphthalene for proposes of calculating the destruction and removal efficiency (DRE) of the POHC (see the Performance Demonstration Plan (PDP) for additional discussion of naphthalene spiking and calculation of DRE).

Test condition 2 will be performed using high concentrations of metals and chlorine. Metals and Polyvinyl chloride (PVC) will be spiked as necessary to achieve desired feed rates. The primary purposes of this test are to set the high temperature limits in the kiln and SCC and to set the maximum feed rates of chlorine, arsenic, cadmium, chromium and lead.

Soil concentration of metals will be analyzed to determine if spiking is necessary. The FDR contains requirements for spiking the high temperature test condition soils with metals if analytical results indicate that the metals concentrations in the prepared feed are less than maximum. The PDP presents the specific procedures for spiking, sampling and analysis during the performance demonstration.

The maximum mass feed rate of each metal in pounds per hour during the performance demonstration will be used to establish the maximum operating feed rate allowed for each metal. The limiting feed rate will set operating soils feed rates as discussed in Section 5.5.2 below.

Feed heating value, ash and moisture content data are used solely for process optimization purposes.

5.5.2 Routine Operation Feed Samples

During the first month of operations, grab samples will be collected from the prepared feed stockpile on a weekly basis. These samples will be analyzed for chlorine, chromium, cadmium, arsenic and lead. The results will be used to calculate the maximum allowable feed rate of soil based on the demonstrated maximum feed rates of metals and chlorine.

The calculation will be made as follows:

$$M_{total} = \frac{M_m}{(C_m)(2000)}$$

Where:	M_{total}	=	Total mass feed rate of solids as limited by specific parameter tested.
	M_m	=	Mass feed rate of specific parameter during the performance demonstration in lbs/hr.
	C_m	=	Concentration of specific parameter in feed sample expressed in lbs metal/total lbs.

As an example, assume 100 lb/hr of lead (including lead in the soils and spiked lead) was fed to the TTU during the performance demonstration. This becomes the maximum feed rate limit for lead during operations. Also assume that a weekly grab sample is collected from the prepared feed

stockpile and the analysis indicates a lead concentration of 100 ppm. The maximum feed rate of this soil as limited by lead concentration would be:

$$X = \frac{100\ lb/hr\ lead}{\frac{100\ lb/hr\ lead}{1{,}000{,}000\ lb\ soil}\ x\ (2000)}$$

$$X = 500\ tons\ soil/hour$$

This calculation will be performed for each metal and chlorine and the lowest calculated feed rate would limit operations.

Feed sampling and analysis will be conducted only for the first four weeks of operations for:

- chlorine
- arsenic
- chromium
- cadmium
- lead

The procedures that will be used for sampling and analyzing soils are presented in the CQAP.

5.6 RECORDKEEPING

For each feed sample collected, the following information will be recorded in a field logbook:

- sample date
- sample time
- name of person collecting sample
- locations of samples
- sample identification number

A chain of custody form will be prepared as described in the CQAP. The back copy of each chain of custody form will be retained and kept on-site. The following documentation will be maintained on site for each sample collected:

- field logbook
- completed chain of custody form (sampler's copy)
- Federal Express or other shipper bill of lading (sender's copy) if samples are shipped off-site
- sample analytical results when received from laboratory
- calculations documenting maximum feed rate based on metals concentration as described in Section 5.5.2 above

TABLE 5-1
PERFORMANCE DEMONSTRATION FEED SAMPLE REQUIREMENTS

Parameter	Test 1	Test 2
Naphthalene	Yes	No
Chlorine	No	Yes
Chromium	No	Yes
Cadmium	No	Yes
Beryllium	No	Yes
Arsenic	No	Yes
Lead	No	Yes
Heating Value	Yes	Yes
Ash	Yes	Yes
Moisture	Yes	Yes

6.0 TREATED SOLIDS HANDLING

Thermally treated solids from the TTU will be handled using a series of conveyors prior to being stored in the Treated Solids Stockpile Area to await confirmation that the treatment Performance Standards have been attained.

Thermally treated solids will be separated from the TTU off-gases in the discharge breaching of the rotary kiln and will fall onto a dry ash drag conveyor. The thermally treated solids will be wetted with scrubber blowdown to lower the temperature and increase the moisture to a level that sufficiently reduces the potential for dusting. If necessary, process water may also be used for wetting. Steam generated by re-wetting of the hot solids will be vented back into the kiln discharge breaching and will intermingle with the off-gases as they are moved through the cyclone, SCC, and the air pollution control system (APCS).

The dry ash drag conveyor will discharge through a double dump valve assembly onto another conveyor. The double dump valve assembly will serve as an airlock to minimize air infiltration into the cyclone and SCC, which will be under a slight negative pressure.

The majority of thermally treated solids entrained with the off-gases exiting the kiln will be removed in the hot cyclone. These solids, along with collected solids from the SCC, evaporative cooler, and baghouse will be combined with the thermally treated solids from the kiln discharge breaching by a series of conveyors. After being combined, the thermally treated solids will be transported by a radial stacking conveyor to the Treated Solids Stockpile Area.

Particulate will be removed from off-gases from several points in the APCS, including the SCC, evaporative cooler, and each baghouse compartment. Particulate which collects in the bottom of the SCC will be removed via a screw conveyor. A slide gate valve will be installed at the discharge end of the SCC bottom conveyor to minimize infiltration of ambient air. Screw conveyors will also be used to remove particulate from the bottom of the evaporative cooler.

Finally, particulate will collect in the bottom hoppers below each of the baghouse modules and will be removed with screw conveyors. The series of baghouse conveyors will be placed in configuration compatible with the TTU and APCS layout and will eventually transfer the collected particulate to the point at which they are combined with the thermally treated solids from the TTU, hot cyclone, and SCC.

The thermally treated solids will be staged in the Treated Solids Stockpile Area to await testing to determine whether or not the applicable treatment Performance Standards (i.e., PESTAN or Summer's) have been attained.

If the thermally treated solids do not pass the treatment Performance Standards, they will be transferred via a front end loader from the stockpile area to the Feed Preparation Building to be reintroduced as feed to the TTU.

Under normal conditions, the scrubber blowdown will be used for cooling and re-wetting of the thermally treated solids as they are conveyed to the Treated Solids Stockpile Area. When not used for this purpose, scrubber blowdown will be pumped to the RWWTS.

6.1 SEGREGATION OF BATCHES

The feed bins are sized to hold 24 hours of treated solids production. The discharge conveyor will be moved at approximately the same time each day to segregate daily "batches" of treated solids.

6.2 SAMPLING AND ANALYSIS OF TREATED SOLIDS

Each "batch" will be sampled at a defined location at a minimum of 6 hour intervals over a typical 24 hour operating day. The samples will be composited for analysis.

A batch may be defined as less than a typical 24-hour operating day if changes in the process or processing rates that cannot be anticipated at this time occur.

The treated solids samples will be collected from the product conveyor from a point on the conveyor after addition of the water for cooling of treated solids and before deposition into the pile. Samples will be collected every six hours for subsequent compositing on a daily basis.

For normal operations, four samples will be collected per 24-hour operating shift. These samples will be composited into a composite representing the 24-hour batch. During some conditions, the TTU may be operated for greater than 24 hours to produce a batch. For example, the system may be shut-down during part of the time, then restarted. Alternately, the TTU may be operated at less than 24 hours to produce a batch. During upset conditions, the radial stacker may be moved to another bin so that the bulk of the batch will not be compromised. In any event, the individual samples representing a batch will be composited for analyses.

The composite samples will be separated into 3 fractions. In accordance with the PSVP, the first sample results will determine if the second two are analyzed. If the first sample exceeds treatment standards, the second two may be analyzed. If both of these meet performance standards, the batch will be considered to pass.

6.2.1 Sample Collection Methods

The PSVP contains procedures for sample collection.

6.2.2 Equipment Decontamination Methods

The PSVP contains procedures for equipment decontamination.

6.2.3 Sample Control and Documentation

The PSVP contains procedures for sample control and requirements for documentation.

6.2.4 Sample Designation

The PSVP contains procedures for identification of samples.

6.2.5 Chain Of Custody Procedures

The CQAP contains chain of custody procedures.

6.2.6 Analytical Parameters

The PSVP contains analytical requirements. Samples will be collected and analyzed daily throughout operations. For nine consecutive days, samples will be analyzed for gamma-BHC. On the tenth day, the full list of Treatment Performance Standards (for both OU2 and OU4) will be analyzed. The analytical results for each batch will only be applied to the batch sampled.

6.3 DETERMINATION OF BACKFILL OPTIONS

There are three sets of performance criteria established for treated solids. The standards are based on backfill requirements for the three different site area categories:

- OU2 Summer's areas (sites 1, 4 and a portion of 9)
- OU2 PESTAN areas (sites 2, 3, 5, 6, 7, 11 and a portion of 9)
- OU4 Summer's area (site 8)

Table 6-1 presents the maximum concentration of contaminants that can be backfilled into each of these areas. Treated solids may be backfilled into any area provided it meets all of the backfill standards for that area. The backfill of treated solids will be confined to the areas of OU2 and OU4.

For example, for nine days out of ten, only gamma-BHC will be analyzed. If the treated solids gamma-BHC concentration is less than 0.1 mg/kg, the batch may be backfilled anywhere on site. If the treated solids gamma-BHC concentration is greater than 0.1 mg/kg but less than 3.7 mg/kg, the material may only be backfilled into PESTAN areas (sites 2, 3, 5, 6, 7, 11, and a portion of site 9). Alternately, the material may be retreated to meet all performance standards.

Similarly, on the tenth day when all parameters are analyzed, the material may only be backfilled into areas for which all backfill standards are met.

6.4 INTERIM STORAGE STOCKPILES

It is likely that treated soils will be produced prior to having an excavation area completed for backfill. In this event, treated solids may be stockpiled within the TTU battery limits or in the area in which it will eventually be backfilled. The following conditions will be met:

- materials which meet all backfill Performance Standards may be stockpiled anywhere on site without requirement for liners or collection of run-off

- materials which meet backfill Performance Standard for only some of the areas may only be stockpiled in areas for which the backfill Performance Standards are achieved without requirement for liners of collection of run-off

6.5 RECORDKEEPING

For each feed sample collected, the following information will be recorded in a field logbook:

- sample date
- sample time
- name of person collecting sample
- locations of samples
- sample identification number

A chain of custody form will be prepared as described in the CQAP. The back copy of each chain of custody form will be retained and kept on-site. The following documentation will be maintained on site for each sample collected:

- field logbook
- completed chain of custody form (sampler's copy)
- Federal Express or other shipper bill of lading (sender's copy) if samples are shipped off-site
- sample analytical results when received from laboratory
- disposition of batch (i.e. was returned for re-treatment, was moved to stockpile in site 9, was backfilled into site 3, etc.)

TABLE 6-1
SUBSURFACE PERFORMANCE STANDARDS FOR BACKFILL

Parameter	OU2 Summer's[1] (mg/kg)	OU2 PESTAN[2] (mg/kg)	OU4 Summer's[3] (mg/kg)
alpha-BHC	0.4	15.6	NA
beta-BHC	1.7	15.2	NA
delta-BHC	0.3	15.4	NA
gamma-BHC	0.1	3.7	0.1
Chlorobenzilate	20.9	34	NA
Diazinon	1.0	1.0	0.36
DDD	675	750	NA
DDE	1,653	1,725	NA
DDT	503	750	NA
Atrazine	NA	NA	3.6
Bladex	NA	NA	2.0
Prometryn	NA	NA	38.5
Simazine	NA	NA	3.7

1. Sites 1, 4 and a portion of 9.
2. Sites 2, 3, 5, 6, 7, 11 and a portion of 9.
3. Site 8.

7.0 FILL, BACKFILL AND REGRADING

Treated solids and borrow used as backfill material will be placed into the excavation by end dumping from haul trucks. Clean overburden stockpiled adjacent to the excavation may be either pushed into the excavation by bull-dozers or front-end loaders. The backfilled material will be placed into the excavation in lifts and then compacted. The lift thicknesses and compactive effort will vary depending on the intended use of the area being backfilled.

At a minimum, the backfill will be compacted adequately to control post-construction settlement. The specific backfilling requirements will be based on:

- intended use of each excavation area
- depth of excavation being backfilled
- geotechnical properties of the materials being used as backfill

The upper six inches of backfill will consist of material capable of supporting vegetative growth.

Specification Section 02210 (FDR, Appendix H) contains requirements for fill, backfill and regrading.

7.1 DETERMINE MATERIAL SUITABILITY

Material will only be backfilled into an excavation if it meets applicable backfill standards as determined in Section 6.3. Overburden and layback excavated from a site area but not requiring treatment will be assumed to meet the applicable standards for subsurface fill in that area without performing analytical testing. In order to move the overburden and fill from one type of area to an area with more stringent backfill standards, sampling and analyses will be performed to determine material suitability.

7.2 SURFACE FILL

Fill material for the construction of berms, roads, foundations and other earthen structures will consist of uncontaminated soils suitable for the application. The soils will be tested, approved, and obtained from excavated clean soils stockpiles, off-site sources, or borrow area(s) on-site as approved by Ciba. Borrow materials will meet the performance criteria listed in Table 7-1.

7.3 SUBSURFACE BACKFILL

Backfill material placed in the excavation areas shall be in conformance with the PSVP. Backfill material for excavated areas shall be from the following sources:

1) Thermally treated soils that meet the treatment Performance Standards

2) Layback and overburden soils excavated solely to provide access to underlying contaminated soils or to provide slope stability.

3) Surface soils which do not meet surface excavation Performance Standards but to meet subsurface excavation Performance Standards. These soils must be backfilled at depths of 1 foot or more below the ground surface.

4) Soils used to create the working platform and mixing area for the construction of the slurry wall after the installation of the wall.

5) Borrow soils suitable for the application from on-site or off-site locations approved by Ciba.

6) Soils stockpiled in site 3 from a previous excavation project that have been tested and meet subsurface excavation Performance Standards for PESTAN sites.

7) Soils excavated from OU3 which meet subsurface Performance Standards.

Backfill standards for subsurface fill are presented in Table 6-1.

Generally, fill materials will be placed in layers approximately one foot in loose depth. Prior to compaction, each layer of backfill or fill material will be moistened or aerated as necessary to provide an acceptable moisture content for the fill material. However, when underground utilities or their supports are encountered, backfill beneath these utilities must be placed in loose 6 inch lifts and mechanically compacted. This is especially critical beneath the 42" cooling water line through site 9.

7.4 REGRADING

Areas within the limits of excavation, including adjacent transition areas, will be uniformly graded. The finished surface will be smooth, compacted and sloped to allow for positive drainage of surface water from the site. The grade may be slightly higher or lower than existing conditions depending on the final soil balance. Existing drainage patterns will be maintained to direct run-off to the same areas unless otherwise approved by Ciba.

7.5 REVEGETATION

After backfilling operations have been completed, approximately 6-inches of soil cover will be placed over the disturbed areas to support vegetative growth. The disturbed areas will then be seeded with suitable native grasses to provide vegetation to control erosion.

7.6 RECORD KEEPING

Records will be maintained on-site as follows:

- analytical results from any samples collected to verify excavation meets performance standards
- analytical results from any backfill or surface fill materials placed in the excavation
- survey of excavation bottom and sides prior to backfill
- list of materials backfilled into excavation (i.e. overburden and layback from excavation area, treated solids meeting PESTAN standards, etc.)

TABLE 7-1
PERFORMANCE STANDARDS FOR BORROW SOILS

PARAMETER	MAXIMUM CONCENTRATION (mg/kg)
alpha-BHC	0.4
beta-BHC	1.7
delta-BHC	0.3
gamma-BHC	0.1
DDT	503
DDD	675
DDE	1,653
Chlorobenzilate	20.9
Diazinon	0.36
Prometryn	38.5
Simazine	3.7
Atrazine	3.6
Bladex	2.0

8.0 WASTEWATER

A discussion of wastewater sources and the techniques that will be used to collect and treat the wastewater is provided in the sections below.

8.1 SOURCES

Wastewater will be generated from a variety of remedial activities. The primary wastewater sources will be:

- perched groundwater and stormwater collected in open excavations
- contaminated stormwater from feed preparation treatment and stockpile areas
- equipment decontamination water and wash water
- blowdown from the thermal treatment unit scrubber

A more detailed description of the sources is presented below.

8.1.1 Open Excavations

Perched groundwater may be encountered in some of the soils and materials to be excavated. In addition, while earthen berms will be provided around excavation areas to prevent influx or outflow of stormwater, some contaminated stormwater may be generated from direct contact with the excavation areas.

8.1.2 Contaminated Stormwater

Stormwater exposed to contaminated materials will be controlled during material handling and treatment activities. Stormwater which does become contaminated will be collected for transfer to the RWWTS.

8.1.3 Decontamination Water and Wash Water

Decontamination water will be generated from washing of equipment and personnel exiting designated exclusion zones. Metallic debris encountered during excavation may also be decontaminated, if it is considered suitable for recycle as scrap metal. Decontamination of the

equipment and debris may consist of pressure washing or steam cleaning. The wash water will be collected in sumps in the decontamination areas for transfer to the RWWTS.

8.1.4 Scrubber Blowdown

The TTU will have a caustic scrubber for treatment of acid gases. Blowdown of the spent caustic stream will be necessary on a periodic basis to maintain the dissolved solids concentration within acceptable limits. The blowdown will normally be used for rewetting the thermally treated solids. Unused blowdown will be discharged to the RWWTS for treatment.

8.2 COLLECTION AND TREATMENT

Wastewater from all of the above described sources will be collected and pumped directly to the RWWTS. If direct pumping is determined to be impractical in some locations, the wastewater will be pumped into tanker trucks or drums on a periodic basis and transported to the RWWTS.

The TTU will be a net consumer of water. Wastewater from the above sources will be reused in the thermal treatment process to the maximum extent possible. The wastewater will be treated, if necessary, prior to reuse.

When the TTU water demand is less than the volume of wastewater generated, the excess wastewater will be pumped or trucked to the headworks of the WWTF following any necessary treatment. Location of the WWTF is shown in Drawing No. 89892-NG-03 (FDR, Appendix H). Wastewater will be treated to the levels presented in Table 8-1 prior to discharge to the WWTF.

Exposure of contaminated media to stormwater will be controlled during remedial activities. The proposed control measures are discussed in Section 3.3 and 4.5. All contaminated stormwater will be contained, collected, and treated in the RWWTS.

8.2.1 Remediation Wastewater Treatment System Description

Drawing 89892-PF-06 (FDR, Appendix H) presents a process flow diagram for the proposed on-site RWWTS. The treatment system will be located adjacent to the TTU. The system will be designed to meet the treatment levels given in Table 8.1.

8.3 SAMPLING AND ANALYSIS

Wastewater samples will be collected from the following locations during Phase I and Phase II activities:

- RWWTS influent
- between lead and lag carbon units
- RWWTS effluent

Methods of analysis and targeted compounds are delineated in the CQAP.

8.4 RECORD KEEPING

For each sample collected, the following information will be recorded in a field logbook:

- sample date
- sample time
- name of person collecting sample
- locations of samples
- sample identification number

A chain of custody form will be prepared as described in the CQAP. The back copy of each chain of custody form will be retained and kept on-site. The following documentation will be maintained on-site for each sample collected:

- field logbook
- completed chain of custody form (sampler's copy)
- Federal Express or other shipper bill of lading (sender's copy) if samples are shipped off-site
- sample analytical results when received from laboratory

TABLE 8-1
WASTEWATER TREATMENT LEVELS FOR DISCHARGE TO THE CIBA WWTF

COMPOUND	TREATMENT LEVEL (ug/L)
Ametryn	630.0
Aniline	10.0
Arsenic	50.0
Atrazine	3.0
Alpha-BHC	0.6
Beta-BHC	2.0
Delta-BHC	0.2
Gamma-BHC	0.2
Bladex	14.0
Benzene	5.0
Carbon tetrachloride	5.0
Chlorobenzene	5.0
Chlorobenzilate	140.0
Chloroform	5.0
Cresols (m-, p-)	10.0
DDD	10.0
DDE	10.0
DDT	10.0
Diazinon	6.0
Methyl Ethyl Ketone	10.0
Naphthalene	10.0
Prometryn	28.0
Simazine	1.0
Toluene	2000.0

9.0 MANAGEMENT OF GENERATED WASTES

A discussion of the plan for management of solid and liquid wastes generated during the RA is presented in the sections below.

9.1 SOLID WASTES

Solid wastes generated during the RA will be classified as potentially contaminated or non-contaminated. While the TTU is operational, potentially contaminated solid wastes will be fed to the TTU. After the soils have been thermally treated and the TTU is decontaminated, some potentially contaminated solid wastes may remain. Examples of potentially contaminated solid wastes which may remain following thermal treatment of soils include:

- used kiln refractory
- used scrubber packing
- used geomembrane liners
- used baghouse filters
- spent carbon
- used PPE
- used sample jars

In addition, solid wastes which were not used in contaminated areas may remain following thermal treatment of soils. Examples of non-contaminated solid wastes include:

- equipment foundations
- air monitor platforms
- temporary fencing
- office waste

Potentially contaminated solid wastes will be disposed of at a permitted facility approved by Ciba. Non-contaminated wastes will be disposed according to approved Ciba McIntosh Site Procedures.

9.2 LIQUID WASTES

Liquid wastes generated during the RA will be classified as contaminated or non-contaminated. Contaminated liquid wastes will be pumped or trucked to the RWWTS for treatment prior to

discharge to the Ciba WWTF. Examples of contaminated liquids and a description of the RWWTS is given in Section 8.0.

Non-contaminated liquid wastes generated during the RA are expected to include sanitary waste. Portable chemical toilets will be brought on site for collection of sanitary waste. A contractor will be used service the chemical toilets as needed.

9.3 RECORD KEEPING

Records will be kept of all wastes sent off-site for disposal. Records will include a description and nature of the waste, any chemical analyses performed and the name of the off-site disposal facility.

APPENDIX E

EROSION AND RUN-OFF CONTROL PLAN

EROSION AND RUN-OFF CONTROL PLAN

FOR

CIBA MCINTOSH SUPERFUND SITE
OPERABLE UNITS TWO AND FOUR
WASHINGTON COUNTY, ALABAMA

JUNE 1996

RUST PROJECT NO. 89892.300

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1.0 EROSION AND RUN-OFF CONTROL

This plan outlines measures necessary to control soil erosion and surface water run-off during construction and after completion of Remedial Activities. The goal of the erosion and run-off control methods will be to minimize the amount of surface water run-off into active work areas, to prevent contaminant migration from the exclusion zones, and to stabilize restored areas.

The Material Handling Plan included as Appendix D to the RAWP addresses handling of stormwater collected during Remedial Action activities.

2.0 EROSION AND RUN-OFF CONTROL MEASURES

The sequence of construction activities for all erosion control measures will generally follow this plan. Prior to mobilization into an area or subsite silt fencing or straw bales will be installed down-gradient of areas to be disturbed. The remaining erosion control measures such as diversion berms, and stone check dams will be installed prior to intrusive activities beginning in an area.

The following measures will be used to control soil erosion and site run-off during remediation activities:

- temporary seeding
- erosion control blanket and netting
- silt fencing
- straw mulch
- diversion berms
- straw bales
- stone check dams

2.1 TEMPORARY SEEDING

During construction activities temporary seeding of grass will be used to stabilize to the soil and thereby minimizing surface erosion.

2.2 SILT FENCING

A geotextile silt fence will be employed down gradient of site activities to prevent off site migration of soil and to minimize down gradient erosion. The lower edge of the silt fence will be installed in a vertical trench and covered with backfill. The silt fence will be utilized in those areas with minor drainage or central slopes with a uniform flow of water over the surface.

A typical filter fabric (silt fence) detail is shown on Drawing 89892-ND-01(Final Design Report, Appendix H), Stormwater Management Details.

2.3 STRAW MULCH

Straw or hay mulch will be used as a primary form of cover to provide moisture and heat retention during the vegetative restoration of the disturbed areas. Mulching will also reduce the velocity of run-off if used in conjunction with other erosion control measures (e.g., silt fencing, stabilized strawbales, etc.). Mulching will be utilized on gentle slopes where the probability of excessive run-off will not be expected. Straw mulch will be applied evenly by hand over the areas of concern.

2.4 DIVERSION BERMS

Berms will be utilized to prevent run-on from crossing the active exclusion zone areas. This will limit the volume of water passing over excavation areas. The channeling of this water to preferred locations will minimize site erosion.

Silt fences and diversion berms will be inspected routinely. If damaged, they will be repaired, replaced or redesigned in order to prevent repetitive occurrence.

2.5 STRAW BALES

Straw or hay bales will be used to reduce the velocity of run-off at lower gradient perimeters of shallow excavation. Where necessary, straw or hay bales will be stabilized using wooden stakes and shallow trenches.

Straw or hay bales will be utilized in conjunction with other erosion control measures as needed (e.g., silt fencing, diversion ditches, etc.).

2.6 STONE CHECK DAMS

The placement of stone check dams in drainage ditches may be necessary in areas where excessive slopes and related high velocities would cause erosion. The check dams spacing will vary intervals depending on the slope and the drainage area of the ditch.

A typical straw bale detail is shown on Drawing 89892-ND-01 (FDR, Appendix H), Stormwater Management Details.

3.0 RESTORATION ACTIVITIES

After remediation activities are complete in each area, the excavated area will be backfilled and regraded. Revegetation of final grades will be performed in accordance with the Specification Section 02210 - Fill, Backfill and Regrading (FDR, Appendix H).

APPENDIX F

TEMPORARY FACILITIES PLAN

42" CHILLED WATER
30" CHILLED WATER
SITE 9
SITE 3
SITE 1
SITE 2
RCRA CAP
INTERIM STORAGE FACILITY
INTERIM STORAGE STOCKPILE
THERMAL TREATMENT UNIT
TREATED WATER TANK
CONTAMINATED WATER SURGE TANKS
FEED PREP. BLDG. (225' x 100')
DECON PAD
OFFICE
DEBRIS HANDLING
PERSONNEL DECON. FACILITY
MCC TRAILER
84" SWS
OXYGEN SYSTEM
BERM
WATER TREATMENT UNIT
MAINTENANCE
HEALTH & SAFETY
HAUL ROAD
TTU CONTROL ROOM
POWER-LINE R/W
C.B.# 70-1 S.1+04.00 E.22+59.00
C.B.# 80-1 S.1+04.00 E.29+92.37
S.1+04.00
T.P. S0+22.10 E35+31.47
W.E. 33.5

LEGEND

UNIT OF SURFACE SOILS EXCEEDING SURFACE EXCAVATION PERFORMANCE STANDARDS

CRUSHED STONE OR SHELL

PLANT NORTH

0 100' 200' 300'

NO.	REVISIONS	MADE	CHK	DATE
0	ISSUED FOR FINAL DESIGN			08-04-98

NAMES	DATES
DRAWN: J.A. JORDAN	
DESIGN:	
CH'KED:	
PE:	
APP'D:	
APP'D:	
APP'D:	

TEMPORARY FACILITIES PLAN

ciba

Ciba-Geigy Corporation
McIntosh, Alabama Superfund Site
Operable Units 2 and 4

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

RUST ENVIRONMENT & INFRASTRUCTURE
GREENVILLE, SOUTH CAROLINA

PROJECT NUMBER 89892 | DATE
RUST DWG NUMBER | FILE NUMBER
CLIENT DWG NUMBER | SHEET NUMBER

The drawings, specifications and other documents prepared by the Engineer for this project are instruments of the Engineer's service for use solely with respect to this project and