KERR-McGEE CHEMICAL CORPORATION

Final Interim Predesign Work Plan

Moss-American Site
Milwaukee, Wisconsin

3 December 1991

WESTON®
MANAGERS DESIGNERS/CONSULTANTS

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LIST OF ACRONYMS/ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPAH	Carcinogenic Polyaromatic Hydrocarbon
FEMA	Federal Emergency Management Agency
FICWD	Federal Interagency Committee on Wetland Delineation
FIS	Flood Insurance Studies
FIT	Field Investigation Team
GIS	Geographic Information Systems
HASP	Health and Safety Plan
KMCC	Kerr-McGee Chemical Corporation, Inc.
MDL	Method Detection Limit
MMSD	Milwaukee Metropolitan Sanitary District
MPB	Most Probable Background
MPN	Most Probable Number
MSL	Mean Sea Level
NCP	National Contingency Plan
NPL	National Priorities List
POTW	Publicly-Owned Treatment Works
QAPP	Quality Assurance Project Plan
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RRT	Relative Retention Time
SAP	Sampling and Analysis Plan
SIM	Selected Ion Monitor
SOP	Standard Operating Procedure
SOW	Statement of Work
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WESTON	Roy F. Weston, Inc.

SECTION 1

INTRODUCTION

1.1 BACKGROUND

The United States Environmental Protection Agency (U.S. EPA), pursuant to Section 105 of CERCLA of 1980, placed the Moss-American site in Milwaukee, Wisconsin (the Facility) on the National Priorities List (NPL). The U.S. EPA conducted a remedial investigation/ feasibility study (RI/FS) for the Facility and issued the corresponding RI report on 9 January 1990 and the FS report on 24 May 1990.

On 29 May 1990, U.S. EPA published notice of completion of the RI/FS and issued the proposed plan for remedial action for the Facility. A public comment period began with issuance of the proposed plan and extended until 6 August 1990. On 27 September 1990, the U.S. EPA Regional Administrator signed the Record of Decision (ROD) which describes the remedial action plan for the Facility. Public comments that were received, and U.S. EPA's response to such comments were included in the ROD. The State of Wisconsin has expressed concurrence with the ROD.

A Consent Decree incorporating the Statement of Work (SOW) was signed by Kerr-McGee Chemical Corporation, Inc. (KMCC) on 17 July 1991. Under this Consent Decree, the Settling Defendant, KMCC will lead in developing and implementing the remedial design and remedial action plan for the Facility. This submission is the initial Work Plan for the predesign phase of the remedial design.

1.2 PURPOSE OF INTERIM PREDESIGN WORK PLAN

The SOW for the Remedial Design/Remedial Action (RD/RA) for the Facility outlines the scope of the RD/RA as five tasks, summarized as follows:

Task I:	Work Plans
Task II:	Additional Studies and Preliminary Remedial Design
Task III:	Remedial Design
Task IV:	Remedial Action
Task V:	Reports and Schedule

The first work plan to be developed under Task I is a Predesign Work Plan. The Predesign Work Plan is intended to address issues outlined in the ROD, as well as other significant issues that require clarification prior to undertaking design. A number of predesign tasks are outlined in the SOW and are intended to resolve technical uncertainties pertaining to the design of the remedial action. Results of predesign task implementation are also expected to provide technical information regarding the effectiveness of elements of the selected remedy. The SOW identifies 20 predesign tasks which fall into the following four general categories:

- Development of laboratory analytical procedures.
- Extent of contamination studies.
- River remediation.
- Former wood preserving plant remediation.

The sequence, respective timing, and schedule for conducting these various predesign tasks is of importance. Few, if any, of the predesign tasks can be conducted independently of other predesign task data findings, and technical evaluations. In addition, seasonal environmental and climatic fluctuations must be considered in scheduling and sequencing the predesign work. The draft Predesign Work Plan is required, per the SOW, to be submitted to the U.S. EPA for review 120 days after lodging of the Consent Decree. As of this Work Plan date, lodging of the Consent Decree has not been completed. The timeframes for preparation, review, comment, incorporation of revisions, and finalization/U.S. EPA approval of the Predesign Work Plan, when combined with seasonal environmental/climatic constraints, may impair or preclude the ability to initiate certain key predesign tasks during the appropriate field investigation season.

On these important bases, this Interim Predesign Work Plan has been developed to precede submittal of an overall Draft Predesign Work Plan. This interim submittal will allow for U.S. EPA review and approval, and thereby provide a plan for implementation of certain initial predesign tasks during the appropriate field investigation season and prior to final approval of the Overall Predesign Work Plan.

This Interim Predesign Work Plan is not intended to supersede the draft or Final Predesign Work Plan. Instead, this Interim Work Plan is submitted to outline the approach to conducting several key, initial predesign tasks, including:

- Developing current site topographic and property plans.

- Developing a laboratory analytical method for low detection of CPAHs in soils and sediments (Predesign Task 2).

- Determining background concentrations of CPAH in soils and sediments (Predesign Task 2 continued).

- Investigating surface water and groundwater conditions, as part of the extent-of-contamination studies on the east side of the Little Menomonee River (Predesign Task 6).

- Surveying groundwater utilization in the area surrounding the Facility (Predesign Task 8).

- Conducting initial studies of river and floodplain hydraulics (Predesign Task 10).

- Conducting a wetlands delineation (Predesign Task 15).

- Initiating work associated with conducting laboratory bench scale tests of the biological treatment system (Predesign Task 16).

- Initiating work associated with identifying and testing groundwater treatment technologies for the Facility (Predesign Task 20).

- Identifying ARARs, permits, and site access requirements associated with implementing the RD/RA for the Facility.

Sections 2 through 8 of this work plan detail the objectives, subtasks and activities, and deliverables associated with implementing these initial predesign tasks. Appendix A of this Interim Work Plan presents a proposed outline of the overall Predesign Work Plan to assist the reviewer's understanding of how this Interim Work Plan scope corresponds to the overall Predesign Work Plan scope. A presentation of the anticipated work plan implementation schedule in Subsection 1.5 further assists in relating the interim activities to the overall predesign scope.

1.3 FACILITY LOCATION DESCRIPTION

The Facility is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin, at the southeast corner of the intersection of Brown Deer

and Granville roads, at 8716 Granville Road. The Facility, as defined by the Consent Decree, includes the former Moss-American wood preserving plant property and approximately 5 miles of the Little Menomonee River. The Little Menomonee River, portions of which are defined as part of the Facility, flows through the eastern portion of the former wood preserving plant, continuing on through the Milwaukee County Parkway, to its confluence with the Menomonee River about 5 miles south. Portions of the Little Menomonee River's floodplain are included in the Facility boundary. Fifty-one acres of the former wood preserving plant are undeveloped Milwaukee County park land. Twenty-three acres are owned by the Chicago and North Western Transportation Company and used as a loading and storage area for automobile transport. The Facility is located in a moderately populated suburban area of mixed industrial, commercial, residential, and recreational use. Population in the nearby area is estimated at 2,036 persons per square mile. Figure 1-1 presents a general location map of the Facility.

1.4 OVERVIEW OF PREDESIGN SCOPE

A predesign phase of the RD has been determined to be necessary to resolve important technical uncertainties to allow design of the proposed remedial action. The SOW outlines several predesign tasks that will be implemented to obtain this information. As previously stated, these predesign tasks fall into four general categories, including:

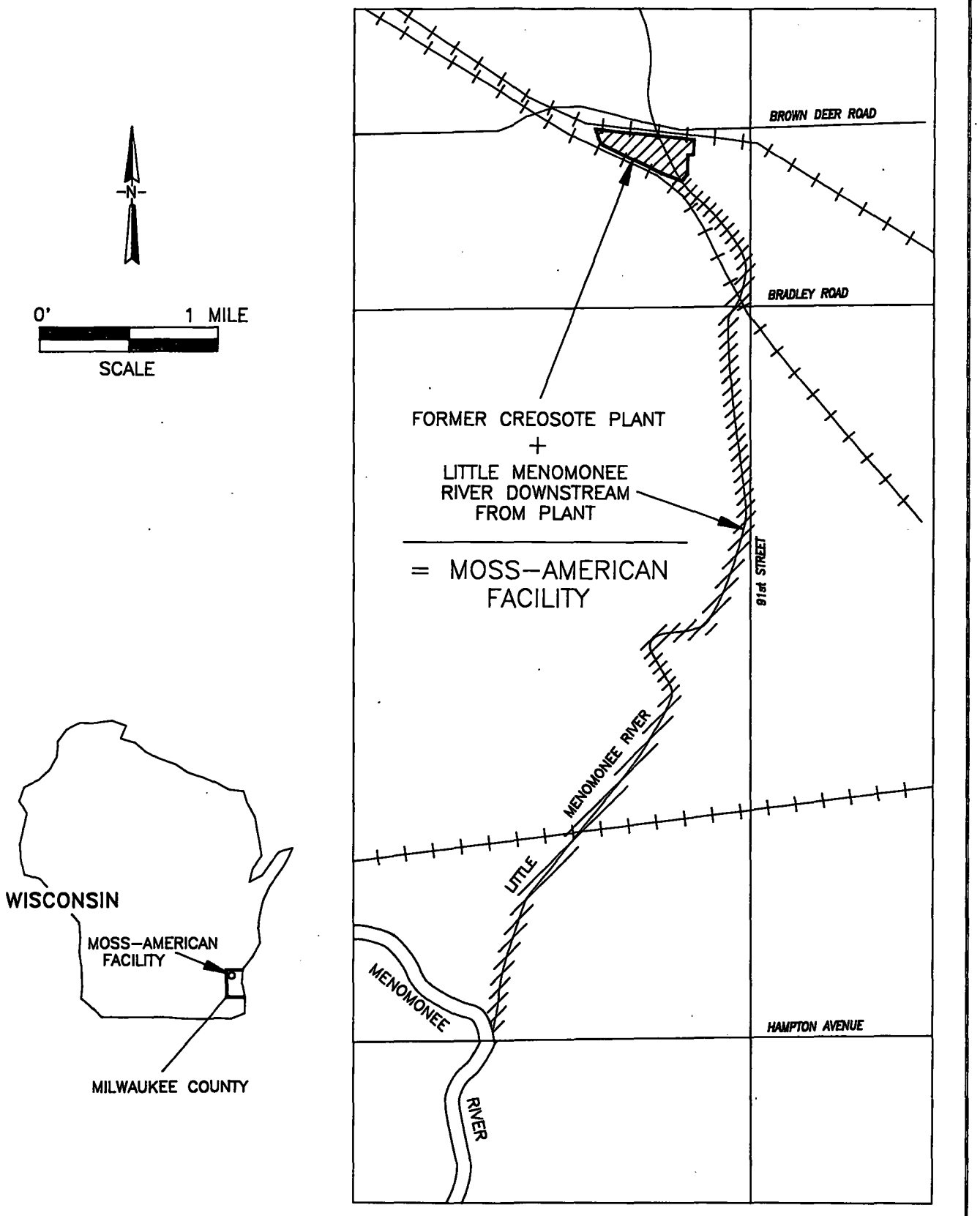
- Development of laboratory analytical procedures.
- Extent-of-contamination studies.
- River remediation.
- Former wood preserving plant remediation.

Within each of these general categories, a number of predesign tasks have been identified to be implemented. These Predesign Tasks 1 through 20 are listed below; however, they are not presented in the sequential order that they may be implemented. This Interim Work Plan and the overall Predesign Work Plan will define the scope, schedule, and sequence of task implementation.

In overview, the predesign phase of the RD will be composed of the following tasks:

Development of Laboratory Analytical Procedures

Predesign Task 1 -- Refine or Develop an Analytical Procedure to Measure CPAH Concentrations on a Rapid Turnaround Basis.



WESTON MANAGERS DESIGNERS/CONSULTANTS	Three Hawthorn Parkway Vernon Hills, Illinois 60061	FIGURE 1.–1	FACILITY LOCATION MAP MOSS–AMERICAN SITE Milwaukee, Wisconsin

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Predesign Task 2 -- Develop an Analytical Procedure for Quantification of CPAHs at Low Detection Limits and Determine Background Concentration of CPAHs in Soils and Sediments.

Extent of Contamination Studies

Predesign Task 3 -- Define the Extent of Free-Product Creosote Residues.

Predesign Task 4 -- Further define the Extent of Contaminated Sediment to be Managed.

Predesign Task 5 -- Further determine the Extent of Soil Contamination.

Predesign Task 6 -- Investigate Site Surface Water and Groundwater Conditions to Determine the Nature and Extent of Shallow Groundwater Contamination, if any, on the East Side of the Little Menomonee River.

Predesign Task 7 -- Determine the Extent of CPAH Contamination in the Floodplain Along the New River Alignment.

Predesign Task 8 -- Survey Groundwater Utilization.

River Remediation

Predesign Task 9 -- Identify and Evaluate Alternative Alignments for the Little Menomonee River.

Predesign Task 10 -- Study River and Floodplain Hydraulics.

Predesign Task 11 -- Identify and Pilot Test Stream Diversion and Dewatering Options.

Predesign Task 12 -- Pilot Test Identification of Creosote Residue in Sediments Using Visual Criteria.

Predesign Task 13 -- Define the Quantity and Physical/Chemical Quality of River Materials (Soil, Sediment, Water, Debris) to be Treated.

Predesign Task 14 -- Identify and Test Alternative Dredging Technologies for Sediment Removal from the Little Menomonee River.

Predesign Task 15 -- Conduct a Floodplain and Wetlands Assessment Consistent with the Requirements of Subsection 10.2.2 of the ROD and Subsection II.B.10 of the SOW.

Former Wood Preserving Plant Remediation

Predesign Task 16 -- Conduct Laboratory (Bench Scale) and Field (Pilot Scale) Tests of the Biological Treatment System.

- Define physical/chemical characteristics of waste feed to the soil/sediment treatment system.
- Test soil washing and bioslurry treatment at the laboratory scale.
- Test soil washing and bioslurry treatment at the field scale.
- Test soil washing and bioslurry treatment in combination at the laboratory and field scale after optimal operational parameters for each system are independently defined.

Predesign Task 17 -- Define Handling, Staging, and Storage Systems for Soils and Sediments.

Predesign Task 18 -- Define Handling, Staging, Storage, and Placement Systems for Treated Soils and Sediments.

Predesign Task 19 -- Identify and Test Groundwater Collection and Extraction Technologies.

Predesign Task 20 -- Identify and Test Groundwater Treatment Technologies.

In general, at the completion of each predesign task a report or technical memorandum deliverable will be submitted to U.S. EPA for evaluation. These deliverables will contain a summary of findings, data, and other pertinent technical information. The deliverables will provide a technical basis for the subsequent remedial design activities.

This Interim Predesign Work Plan addresses aspects of Predesign Tasks 2, 6, 8, 9, 10, 15, 16, and 20, as well as other necessary preparatory work of the predesign phase.

1.5 SCHEDULE FOR WORK PLAN IMPLEMENTATION

Figure 1-2 presents the planned activities schedule for implementation of this Interim Predesign Work Plan. This schedule considers U.S. EPA review periods, submittal of additional project plans (interim QAPP, SAP, HASP), predesign task sequence and durations, and preparation of deliverables, as outlined in the Interim Predesign Work Plan. Figure 1-2 also depicts those tasks or subtasks that involve field work.

By presenting target calendar dates, this planned interim activities implementation schedule accounts for seasonal climatic and environmental conditions necessary for implementing certain predesign tasks that require field investigation and field sampling. It should be noted that an important objective of developing this Interim Work Plan (to precede the overall Predesign Work Plan) is to obtain timely U.S. EPA approval, and to conduct field activities during the appropriate field investigation season.

1.6 PROJECT ORGANIZATION AND RESPONSIBILITIES

KMCC and Roy F. Weston, Inc. (WESTON) will serve as the engineer for the remedial design work to be performed pursuant to the Consent Decree, including the predesign work tasks described within this Interim Work Plan.

KMCC has contracted with WESTON for development of the predesign and remedial design technical documents and for implementation of the interim and overall Predesign Work Plans. All subcontractors required for implementation of the associated work plans will be directed by WESTON and KMCC. Figure 1-3 presents the planned organization for conducting the predesign tasks of this work plan.

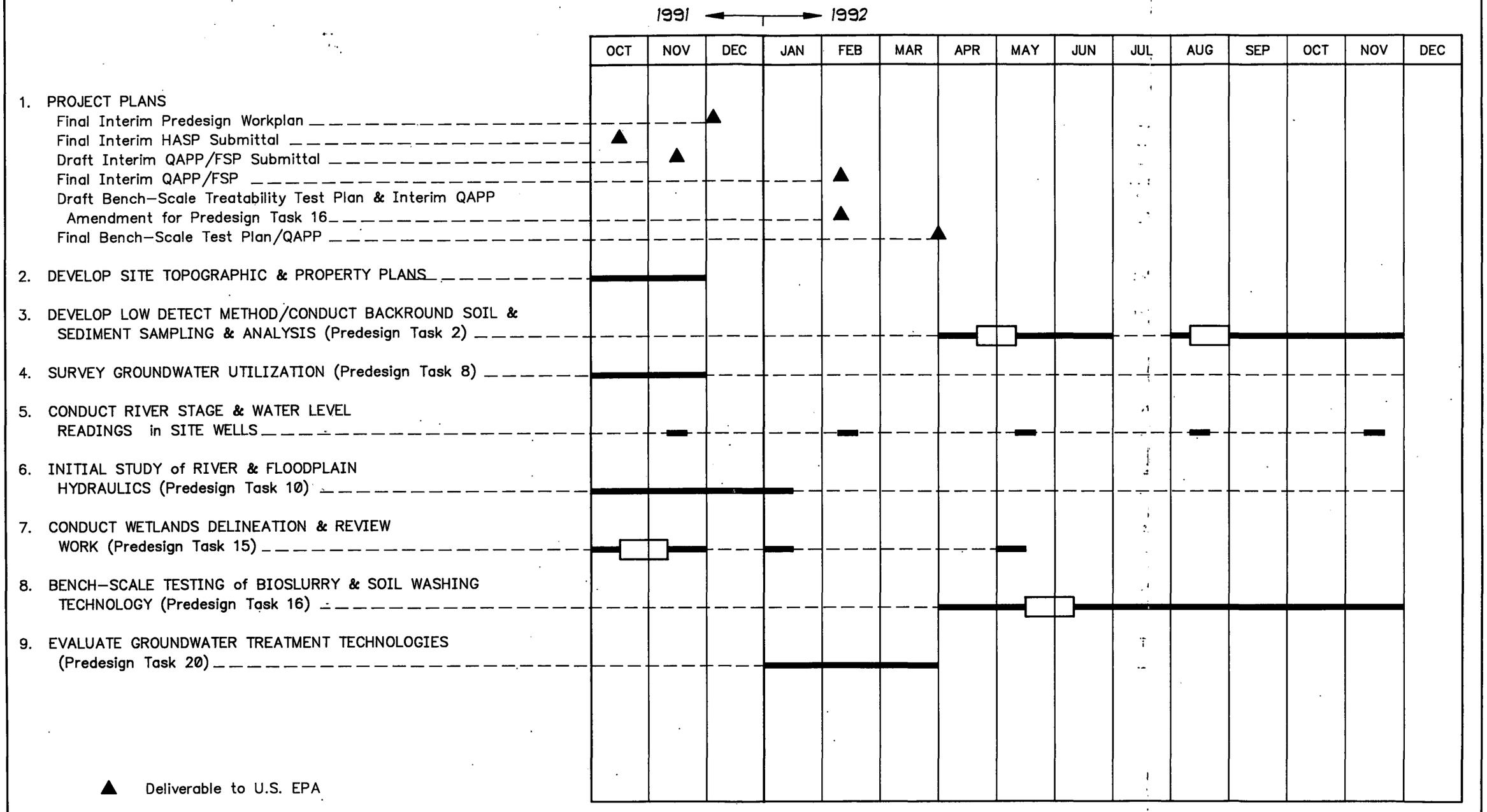

FIGURE 1-2

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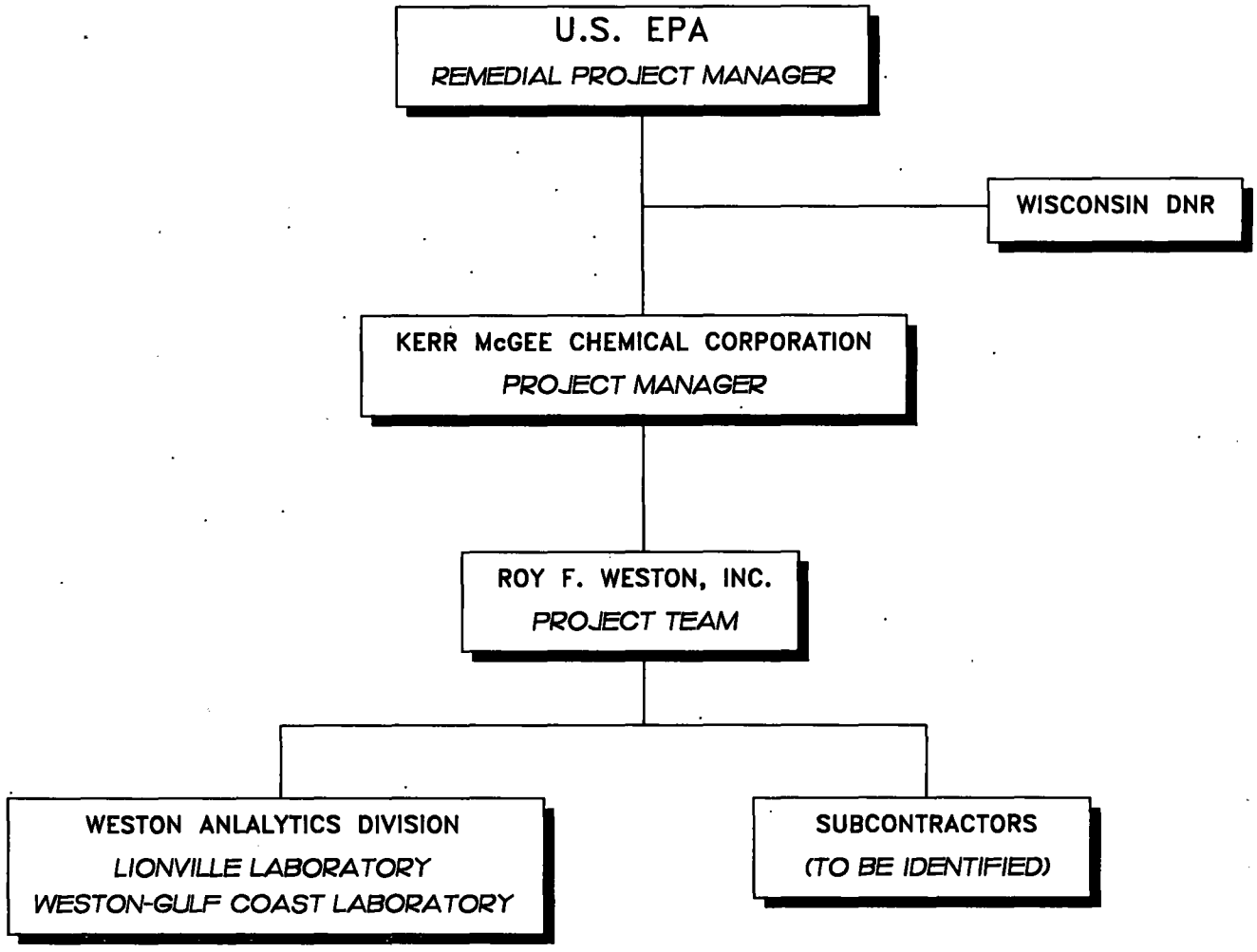
Three Hawthorn Parkway
Vernon Hills, Illinois
60061

INTERIM PREDESIGN
WORK PLAN SCHEDULE
MOSS-AMERICAN SUPERFUND SITE
Milwaukee, Wisconsin



WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

FIGURE
1-3

PROJECT ORGANIZATION CHART
PREDESIGN & REMEDIAL DESIGN
MOSS–AMERICAN SUPERFUND SITE
Milwaukee, Wisconsin

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SECTION 2

PREPARATION OF PROJECT PLANS

2.1 INTERIM QUALITY ASSURANCE PROJECT PLAN

WESTON will develop an Interim Quality Assurance Project Plan (QAPP) for submittal to U.S. EPA and WDNR. The Interim QAPP will address quality assurance and quality control protocols to be followed in implementing the subject work plan. The QAPP will be prepared in accordance with the guidelines established in the following documents:

- U.S. EPA Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, EPA-600/4 - 83-004, February 1983.

- U.S. EPA Region V. Content Requirements for Quality Assurance Project Plan, prepared by Cheng-Wen Tsai, February 1987, revised January 1989.

The QAPP will detail the organization, policies, and procedures that will be implemented as part of the quality assurance/quality control program to ensure data gathered during work plan implementation is consistent with the specific quality goals of accuracy, precision, completeness, and representativeness.

The interim QAPP will address, at a minimum, the following topic areas:

- Introduction.
- Project description.
- Project organization and responsibility.
- Quality assurance objectives for data measurement.
- Sample and document custody procedures.
- Field sampling procedures.
- Calibration procedures.
- Analytical procedures.
- Internal quality control checks.
- Data reduction, validation, and reporting.
- Performance and system audits.
- Preventive maintenance.
- Specific routine procedures to assess data precision, accuracy, and completeness.

- Corrective actions.
- QA reports to management.

2.2 INTERIM FIELD SAMPLING PLAN

A field sampling plan will be prepared by WESTON to detail sampling requirements associated with the Interim Predesign Work Plan implementation. The field sampling plan will be submitted concurrently as an appendix to the Interim QAPP. The plan will address protocols and details of sampling and analysis as it relates specifically to determining background CPAH concentrations in soils and sediments.

2.3 INTERIM HEALTH AND SAFETY PLAN

WESTON will prepare a site Health and Safety Plan (HASP) consistent with the requirements of 29 CFR 1910.120. The HASP will address safety protocols associated with implementation of the Interim Predesign Work Plan field activities, and will be developed specific to the Moss-American facility. The HASP will provide guidelines to assist in ensuring that the predesign work is performed safely and in accordance with all applicable regulatory requirements and that all persons on the Facility, the general public, and the environment are protected from any potential exposure to contaminated material. The HASP will address, at a minimum, the following topic areas:

- Contaminants of concern.
- Medical monitoring and surveillance.
- Safety personnel and responsibilities.
- Personnel training requirements.
- Site layout and work area delineations.
- Emergency and First Aid equipment.
- Personal safety and related equipment.
- Equipment and personnel decontamination.
- Activity hazards analysis.
- Safety meetings and communications.
- Emergency response and contingency planning.
- Air monitoring.
- Community health and safety.

SECTION 3

DEVELOP CURRENT SITE TOPOGRAPHIC AND PROPERTY PLAN

3.1 PURPOSE AND OBJECTIVES

Many of the predesign tasks and interim predesign tasks require accurate surveys of natural and man-made features found at the Moss-American site. The primary objective of conducting the land survey is to support subsequent predesign and RD tasks requiring information on site topography and property plans. The secondary objective of conducting the land survey in 1991 is to anticipate future predesign and RD/RA data needs that can be cost-effectively addressed by the 1991 land survey. As summarized below, information produced by the land survey will be suitable for a number of important purposes.

3.1.1 Preparing Mathematical Models for the Little Menomonee River

Mathematical models will be used to study the hydraulics of the Little Menomonee River throughout the Predesign work. A key element of this study is the evaluation of the shape of the river bottom, banks, floodplains, and obstructions. Using survey data, the mathematical models can accurately reflect the influence of site topography on the flow of surface water.

The land survey will supply data from metrical analysis of aerial photographs on the shape of the land, and the record search and conventional land survey will supply data on the shape of the river bottom and obstructions such as bridges and culverts.

3.1.2 Defining Wetlands for Purposes of Avoidance and Damage Mitigation

A floodplain and wetlands assessment will be conducted as part of the Predesign work. Wetlands that are difficult to inspect on foot are often readily identified in aerial photographs. Wetlands identified in the field will be located with respect to monuments set by the surveyor at intervals along the river.

Color and black-and-white infrared aerial photography performed during the aerial survey will provide images suitable for assisting in the identification of wetlands. Monuments will be placed near the river at regular intervals so they are suitable for locating wetlands. The coordinate system established by the land surveyors will be suitable for describing and relocating the boundaries of wetlands, once they are recognized.

3.1.3 Avoiding Disturbances to Adjacent Property

One of the interim predesign tasks involves collection of background samples; furthermore, looking ahead to subsequent predesign tasks, substantial additional intrusive work on the Facility will be required. The locations of investigative and construction activities will generally be constrained along physical features such as fence lines, roads, or utility corridors; however, avoiding trespass or damage to adjacent properties can sometimes be difficult due to ambiguous or misleading conditions, such as where fences are installed at the wrong location or where a landowner maintains landscaping that extends into public rights-of-way. The survey and associated topographic and property mapping will be suitable for assisting in avoiding disturbances to adjacent property and easements, particularly utilities.

The Settling Defendant understands the U.S. EPA has contracted a firm to conduct a title search of potentially affected properties. A draft copy of this title search was received from U.S. EPA in September 1991.

3.1.4 Defining Limits of Work in Contract Documents.

Although no construction work is anticipated during 1991, pilot-study construction work performed during later predesign tasks will require engineering drawings that define the intended location of the work. Elevations and plane coordinates will specify the limits of work, site control measures, and other miscellaneous site improvements.

By specifying the survey to encompass all former creosoting plant property in addition to the Little Menomonee River floodplain, the 1991 survey and mapping will be suitable for providing ground surface elevations and plane coordinates to support preparation of the future engineering drawings.

3.1.5 Evaluating Alternative River Alignments

The interim predesign tasks address initial studies of river and floodplain hydraulics, while later predesign studies will evaluate alternative river alignments for the Little Menomonee River. In addition to considering the presence of soil contamination, an important factor in selection of alternatives is the configuration of the land's surface along the potential routes of the river. The topographic mapping, aerial photographs, and property plans will be essential information in conducting predesign tasks related to the river remediation.

The upstream and downstream ends of each segment of a potential realignment will be accurately located to enable the new river alignment to tie into the old alignment. The elevations of the land through which the alternative alignments travel will be accurately determined so that the optimal design conditions may be evaluated.

3.1.6 Establishing Horizontal and Vertical Controls

A project baseline will be established and corresponding monuments will be set along the Little Menomonee River to provide reference points for conducting field investigations and engineering evaluation throughout the predesign and RD phases. This baseline may also be suitable reference for future RA activities. The horizontal and vertical control points will serve as a common reference on drawings and in the field. The control points will be readily identifiable and relocatable and constructed of concrete monuments or iron rods. The controls also serve as a time-saving aid because a subsequent surveyor in need of a horizontal or vertical datum can travel to the nearest control point rather than searching for a distant USGS control. The baseline monuments will be tied into USGS vertical datum and the state plane horizontal coordinate system.

3.2 SUBTASKS/ACTIVITIES

3.2.1 Conduct Record Search

The record search entails collection of tax maps, utility maps (e.g. gas, electric, cable, telephone, sanitary sewer, storm sewer, and potable water), bridge and culvert as-built drawings, and sewer outfall as-built drawings. The record search encompasses the entire site, from Brown Deer Road to Hampton Avenue. Provision of the title search information to be provided by U.S. EPA will be important to completing the record search.

3.2.2 Conduct Aerial Reconnaissance

Vertical aerial photographs are to be taken and analyzed. The required extent of the aerial reconnaissance falls into two areas:

Area 1 -- The first area is the entire Facility, previously defined as the former wood preserving plant property and the channel and floodplain of the Little Menomonee River from Brown Deer Road to Hampton Avenue. For the sake of convenience and consistency, the reconnaissance pilot has assumed that the floodplain extends 1000 feet to each side of the river channel. In the event that floodplain elevations extend beyond this assumed boundary, survey and topographic data needs will be assessed and the need for additional

aerial survey work will be reviewed. It is anticipated that past aerial photographic information taken beyond the boundaries of this study area will be utilized to supplement new photographic and mapping data.

Area 2 -- The second area is the upstream portion of the Little Menomonee River and its associated floodplain, extending from Brown Deer Road (the northern boundary of the site) north to Freistadt Road. The second area lies entirely outside of the defined Facility.

The aerial photography flight plans include passes for color visible spectrum film, black-and-white infrared film, and black-and-white visible spectrum film. In Area 1 the photos will be exposed and analyzed. In Area 2 the photos will be exposed, but not analyzed unless a future determination indicates that analysis is warranted.

Analysis, for purposes of topographic mapping, will include identification of the following features:

Railroads	Buildings	Lakes & Ponds
Roads	Foundations & Ruins	Rivers & Canals
Highways	Storage Tanks	Streams
City Streets	Silos & Bins	Wetlands
Alleys	Major Fences	Ditches
Trails	Cross-Country Fences	Culverts
Cemetery Drives	Retaining Walls	Bridges, Dams & Piers
Driveways	Single Tree Centers	Fences
Driveway Turn-offs	Cross-Country Poles	Wooded Areas
Parking Areas	Utility Poles	Clearings
City Walks		Orchards & Nurseries
Public Walks		Reference Points

Analysis will also include identification of 1-foot contour intervals by stereoscopic evaluation of the photos.

3.2.3 Establish Ground Control

Alignment points (as opposed to ground control points) for aerial photographs will be established to align the aerial photographs for proper mosaic assembly. Additionally, ground control points will be established to provide location (horizontal) and elevation (vertical) reference points in the aerial photographs for interpretation of elevations with respect to mean sea level (MSL) and State Plane Coordinates System. Photograph control

will be used, meaning that control points with distinctive images will be marked on the photographs for subsequent determination of location by surveyors on the ground. Ground control points will be tied to the State Plane Coordinate System.

3.2.4 Establish Baseline

Concrete and/or ductile-iron monuments will be set at 1,500-foot intervals along the Little Menomonee River at a 50-foot offset to the east of the river for use throughout the predesign and RD/RA phases. Vertical and horizontal control will be established on each monument.

3.2.5 Locate and Measure Existing Hydraulic Structures

Characterization of existing hydraulic structures will rely on as-built drawings and aerial photographs to the extent possible. After review of the paper records, certain bridges, culverts, and outfalls may be selected for measurement in the field. Using conventional land surveying methods, the field crew will measure relevant hydraulic characteristics such as width, clearance, and channel bottom cross-section for bridges and culverts. For drainage inlets and outfalls, the survey crew will note material of construction and measure crown, invert, and width.

3.2.6 Locate Utilities

Determination of the location of utilities will also rely primarily on paper records obtained during the record search and on the aerial photography. After review of the paper records, selected areas may be surveyed by a field crew to determine the location of undocumented utilities that are not visible from the air. Utility locations and verifications will be conducted throughout the predesign and RD phase as this information becomes necessary.

3.3 DELIVERABLES

3.3.1 Prepare Drawings and Photos

Orthophotographically corrected black-and-white aerial photographs will serve as the base map for the project. The base map will require 21 sheets to provide coverage of the entire site at a scale of 1 inch equals 100 feet and a sheet size of 24 by 36 inches. Four sets of overlays will be created from the base map. The first overlay will depict 1-foot contour lines of the site and permanent monuments. The second overlay will depict existing man-made

structures (excluding utilities) and their dimensions. The third set will depict property ownership and rights-of-way. The fourth set will depict utilities.

Visible spectrum color aerial photographs and black-and-white infrared photographs will also be produced at a scale of 1 inch equals 100 feet. Because the color and infrared photographs will only be used for biological and hydrological characterization, they will not be tied to the black-and-white aerial photographs.

3.3.2 Assemble Record Library

The land survey and record search will result in a sizable collection of field notes, utility maps, and as-built drawings describing physical conditions at the Moss-American site. These materials will be assembled, catalogued, and maintained for future use throughout the Predesign, Remedial Design, and Remedial Action.

3.3.3 Prepare AutoCAD Files

The overlay drawings will be stored as AutoCAD files to facilitate their eventual incorporation into Geographic Information Systems (GIS) for later uses such as evaluation of alternative river alignments, layout of equipment, and mitigation of wetlands.

SECTION 4

DEVELOPMENT OF LABORATORY ANALYTICAL PROCEDURES

4.1 DEVELOPMENT OF LABORATORY ANALYTICAL LOW DETECTION METHOD FOR CPAHs (PREDESIGN TASK 2)

4.1.1 Purpose and Objective

A low-detection-limit analytical method utilizing Selected Ion Monitor (SIM) GC/MS will be evaluated for quantifying background levels of CPAHs in soils and sediments. In addition to measuring each CPAH at 5 ppb or less, the final method must be reliable, provide data comparable to U.S. EPA methods, and be adaptable to production line procedures.

4.1.2 Subtasks

This predesign task is divided into three subtasks as summarized below:

- Subtask 1 - Evaluation of SIM GC/MS method performance and applicability for intended use.
- Subtask 2 - Conduct method detection limit (MDL) study of method.
- Subtask 3 - Preparation of standard operating procedure (SOP).

4.1.3 Method Summary

Sample Preparation

Soil and sediment samples will be Soxhlet extracted with either dichloromethane or hexane. If cleanup is required, the use of a 7.5% deactivated alumina pre-column followed by elution of 3 fractions (F1=aliphatic, F2=mono and dinuclear aromatics, F3=PAH) from silica gel will be evaluated.

Efficacy of extraction and cleanup procedures will be verified by determining the recoveries of deuterated surrogates (methylnaphthalene-d_{10}, fluorene-d_{10} and p-terphenyl-d_{14}) added to the sample prior to extraction.

Analysis of Extract

A 2 uL aliquot from a 1 mL extract containing three surrogates and three internal standards is injected. Mass spectral data are acquired over a temperature programmed run utilizing selected ion monitoring techniques. A series of nine ion descriptors is used to monitor two major masses for each target compound. Ion descriptors are switched automatically according to retention time data of internal standards obtained during calibration.

Selected ion current profiles are produced for each compound (mass) monitored at corresponding retention times. Peaks are identified as positive if they meet the following criteria:

1) The calculated relative retention time (RRT) relative to the appropriate internal standard must be within $\pm$0.005 RRT units.

2) Peaks with proper RRT, occurring at masses monitored for a given compound must maximize simultaneously ($\pm$2 scans) and produce a signal greater than 2.5 times background.

Target detection limits obtained routinely in our laboratory are 1-5 ppb in soils and 5-25 ppb in waters. GC/MS operating conditions are:

Column: DB-5 30m x 0.32mm ID - 0.25u film thickness

GC Run: Start 90^{0}C, hold 1 min, raise 9^0/min to 240^{0}C, raise 7^0/min to 280^{0}C, hold.

4.1.4 Subtask 1 - Method Evaluation

Literature research, case narratives, and laboratory method standard operating procedures will be reviewed in evaluating the use of Method 8270 in detecting low levels of CPAH in a soil/sediment matrix. Selection of extraction solvents, cleanups, and instrument settings will also be reviewed to optimize the method performance and applicability.

4.1.5 Subtask 2 - Method Detection Limit Study

The MDLs for the GC/MS SIM method will be evaluated to ensure the levels of detection of 5 ppb or less can be achieved. Definition of instrument operating conditions and QC criteria for the method will also be objectives of this study. The MDL study will follow

guidelines established in Appendix B of 40 CFR Chapter 1, Part 136. Results of the MDL study will be utilized to revise the method SOP (if necessary) and will be presented in the interim QAPP submittal.

4.1.6 Subtask 3 - Standard Operating Procedure

A standard operating procedure (SOP) for the final method will be prepared and will be presented in the interim QAPP submittal.

4.1.7 Deliverables

Deliverables for this predesign task will be presented in the interim QAPP transmittal and will include:

- A method detection limit study report.
- A final SOP for the low detection limit CPAH method.

4.2 EVALUATION OF OPTIONAL LABORATORY METHODS FOR LOW DETECTION LIMIT ANALYSIS OF CPAHs

4.2.1 Objective

Analytical methods utilizing GC-FID and HPLC - UV/fluorescence will be evaluated on site-specific samples. These methods may be used in instances where site total CPAH levels are above 100 ppb.

4.2.2 Candidate Methods

Two candidate methods will be evaluated:

- U.S. EPA Method 8310 - HPLC with UV-fluorescence detection.
- U.S. EPA Method 8100 - GC/FID after soxhlet extraction by U.S. EPA Method 3550.

HPLC quantitation limits for individual CPAHs in soils will range from 10 to 1,000 ppb with most being in the range from 10 to 100 ppb. The GC/FID method should be capable of detecting individual CPAHs at or near 100 ppb. Modification of the above methods to

achieve lower detection limits (e.g., added cleanups, larger sample volumes, and smaller extract volumes) will be evaluated. If applicable, these methods will be presented in the interim QAPP or in subsequent QAPP amendments.

SECTION 5

EXTENT OF CONTAMINATION STUDIES

5.1 DETERMINE BACKGROUND CONCENTRATIONS OF CPAHs IN SOILS AND SEDIMENT (PREDESIGN TASK 2 CONTINUED)

5.1.1 Purpose and Objectives

Cleanup objectives for soil and sediment may, in many locations within the Facility, be tied to background concentrations of CPAHs. The objective of this predesign task is to determine the area background concentrations of CPAHs in soils and sediments to allow definition of cleanup objectives.

No previous efforts have studied background soil contamination in the vicinity of the Moss-American site. Previous work to determine sediment background, such as the statistical analysis of sediment background in Appendix J of the FS Report, has studied the variation of background in three watersheds in northern Milwaukee County as a normally distributed random variable without regard to any potential nonrandom influencing factors. The present analysis is, therefore, required to fill identified data gaps in the characterization of the site.

The objective of the background studies is to use enhanced sampling and statistics to overcome the limitations of the present state of knowledge of the area background. The background study should yield an improved understanding of what CPAH concentrations would have existed in the vicinity, had the wood preserving plant never operated, so that the appropriate cleanup objectives are applied consistently with the Consent Decree.

5.1.1.1 Determining Soil Background Concentrations

As part of Predesign Task 2 of the SOW, background concentrations of CPAH must be determined for soils. The SOW specifies that the present study use the Most Probable Background (MPB) method with modification to allow consideration of such factors as soil characteristics, vegetative cover, adjacent land use, and topography. The purpose of considering these soil, geographic, and demographic factors is to account for variation in CPAH background concentrations as the consequence of both natural influences and of man-made influences that are not related to the site.

5.1.1.2 Determining Sediment Background Concentrations

As part of Predesign Task 2 of the SOW, background concentrations of CPAHs must be determined for sediments. The SOW specifies that an MPB analysis be conducted that considers such influencing factors as current velocity, sediment particle size, organic carbon content, and adjacent land use. As with the influencing factors for soil contamination, the influencing factors for sediment are considered for the purpose of accounting for natural and man-made contributions to the CPAH levels.

5.1.2 Subtasks/Activities

5.1.2.1 Develop Background Field Sampling Plan

To address the purpose and objectives of this Predesign Task 2, a field sampling plan (FSP) will be developed to detail the approach, rationale, and protocols to be followed in conducting background sampling and analysis for CPAHs in soils and sediments. This FSP will be submitted to U.S. EPA and WDNR as an accompanying document to the interim QAPP (see Sections 2.1 and 2.2 of this Work Plan). The FSP will address the following aspects of the program for conducting background determinations:

- Sampling plan rationale.
- Number and type of samples.
- Field sample collection procedures.
- Responsibilities of sampling personnel.
- Sample identification.
- Sample containers and preservation.
- Sample packaging and shipment.
- Chain of custody.
- Documentation.
- Quality assurance/quality control (QA/QC) of field sampling.

The FSP will be submitted to U.S. EPA for review and approval.

5.1.2.2 Statistical Analysis

The statistical analysis will provide the mathematical description of background conditions at the Facility. The following discussion explains the steps required to develop the statistics from the laboratory results.

If the natural environment were uniformly contaminated, a single, random sample could be used to determine background. Experience indicates that soil and sediment contamination is rarely uniform but rather much more commonly randomly heterogeneous, that is, spatially variable in a way that is not easily predictable. A common statistical treatment of randomly heterogeneous contamination is to assume that it is normally distributed around a mean concentration. The mean is the most common value of contamination, but other values also appear with decreasing frequency at greater deviation from the mean. The shape of the curve in Figure 5-1 illustrates data with a normal frequency distribution. If however, external factors are known to exist that systematically influence concentration, the assumption of random heterogeneity becomes invalid. Several central values may emerge, each corresponding to the mean value for a particular environmental setting. Such nonrandom heterogeneity would be the result of environmental influencing factors that are consistent within a setting but different from one setting to another. Nonrandom heterogeneity of background contamination is particularly likely to be found at large Superfund sites such as the Moss-American site, where multiple media and large areas of varying geography are encountered.

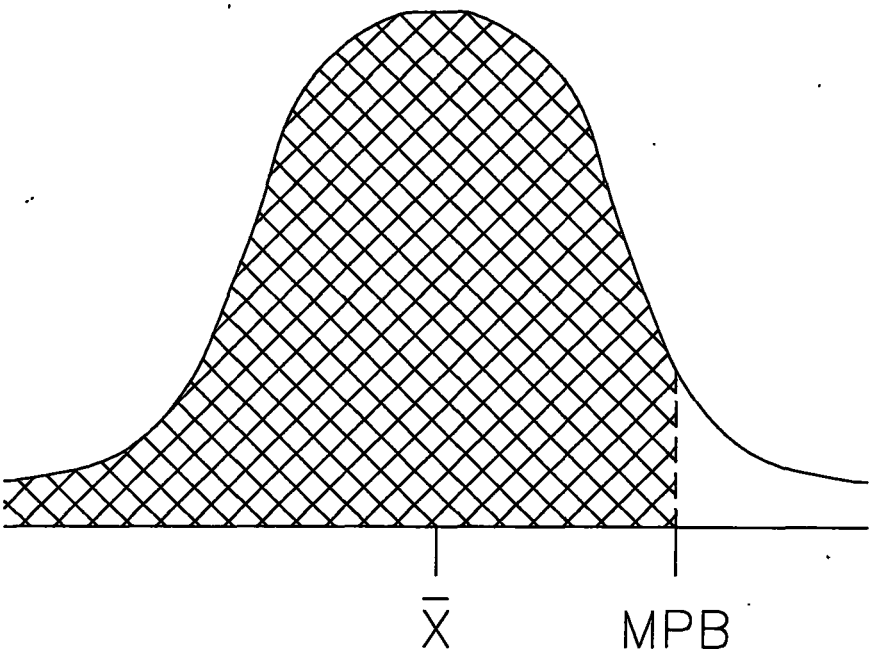
Because nonrandom background heterogeneity is likely to be present at the Moss-American site, the first step in the statistical analysis will be to separate the laboratory data describing background concentrations into data sets corresponding to the settings in which samples were collected. The statistical term for the process of separating the data is called stratification of the sample sets.

The purpose of stratification is to make use of pre-existing information to divide the target population (the entire site) into subareas that are internally homogenous. The statistics within each subarea should then be consistent with the assumptions of normal distribution. The remaining variability within each subarea will be assumed to be representative of the magnitude and variation of CPAH concentrations found within the setting from which the sample set was gathered.

The average concentration and standard deviation of concentration of each data set will be calculated. The MPB will be calculated according to the method of Appendix J of the FS Report.

5.1.3 Deliverables

Additional information regarding the procedures to be used in conducting the background sampling and analytical work will be provided in the Interim Predesign QAPP and accompanying FSP.



$$P\ (X \leq MPB) = 0.95$$

$$MPB = \bar{X} + 1.65 * S$$

WHERE:

P(X < MPB) = 0.95 => THE PROBABILITY (p) THAT A SAMPLE CONCENTRATION (x) WILL BE LESS THAN OR EQUAL TO THE MPB IS 0.95.

MPB = $\bar{x}$+1.65 X s => THE MAXIMUM PROBABLE BACKGROUND (MPB) CONCENTRATION EQUALS THE MEAN SAMPLE CONCENTRATION ($\bar{x}$) PLUS 1.65 TIMES THE SAMPLE STANDARD DEVIATION (s). ASSUMES A NORMAL DISTRIBUTION TO COMPUTE A ONE-SIDE 95% UPPER CONFIDENCE LIMIT ON THE MEAN; THUS, $Z_{\alpha=0.05} = 1.65$.

WESTON MANAGERS DESIGNERS/CONSULTANTS	Three Hawthorn Parkway Vernon Hills, Illinois 60061	FIGURE 5-1	GRAPHICAL REPRESENTATION OF MPB METHOD MOSS-AMERICAN SITE Milwaukee, Wisconsin

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Results of the background study will be conveyed in a report documenting the determination of background CPAH concentrations. The report will address the following topics:

- Introduction.
- Field methods.
- Laboratory methods.
- Statistical methods.
- Analytical results.
- Statistical results.
- Background map.

All field notes, laboratory results, and statistical calculations will be presented in appendices to the report.

The background data will be mapped to summarize the background concentrations of CPAH. Using shading or color-coding to represent various MPB concentrations at various locations, the map will illustrate the background soil and sediment concentrations for the entire Facility.

The background map will satisfy the purpose and objective of the study of background concentrations of CPAH because it will be suitable for setting removal criteria for contaminated soil and sediment. In some locations, a risk-based concentration will set the cleanup criterion. In other locations, background concentration will determine the cleanup standard.

5.2 GROUNDWATER UTILIZATION SURVEY (PREDESIGN TASK 8)

5.2.1 Purpose and Objectives

The objective of this predesign task is to survey groundwater uses in the vicinity of the former wood preserving plant. Specific objectives include:

- Determine the number and location of residential, commercial, and industrial water supply wells in the vicinity of the former wood preserving plant.

- Determine the aquifer systems which are being utilized, and if any water supply wells are identified in the vicinity.

- Collect specific water supply well information, such as well construction, pumping rates, water use, and water treatment if any wells are identified in the vicinity.

The results of the groundwater utilization survey will be used to meet the requirements of NR 112 which restricts the development of land disposal units within 1,200 feet of a water supply well. Information may also be used to identify potential impacts on groundwater supply wells in the vicinity of the former wood preserving plant. The survey will also be used to determine potential impacts which remediation activities may have on water supply wells.

5.2.2 Planned Study Area

The groundwater utilization survey will encompass an area within a one-quarter mile radius of the former wood preserving plant property boundaries, and within one-quarter mile along each side of the Little Menomonee River downstream of the former wood preserving plant.

5.2.3 Subtasks/Activities

The objectives outlined above will be accomplished using a two-phased approach. The first phase will be to gather written records concerning water supply wells in the vicinity of the Facility. Some of the information sources which may be used in the first phase are:

- Field Investigation Team (FIT) Report.
- U.S. Geological Survey.
- State Department of Natural Resources.
- State public health agencies.
- State Geological Survey.
- County/City health departments.
- County/City engineers' offices.
- Local water well drillers.
- Local water authorities.
- Facility records.
- Facility owners and employees.
- Homeowner records.

The second phase will be to conduct interviews with specific individuals to verify and, where possible, expand upon information gathered during the first phase.

5.2.4 Deliverables

The groundwater utilization survey will not require Facility access nor will it depend on data from any of the other predesign tasks. Therefore, it is anticipated that all of the survey objectives can be accomplished relatively soon after U.S. EPA approval of the Interim Predesign Work Plan. It is also anticipated that the results of the survey will be documented in a separate technical memorandum. The technical memorandum will provide the specific address of each well and information on well construction and well use. Well locations will also be displayed graphically on location map(s).

5.3 INVESTIGATE THE HYDRAULIC RELATION BETWEEN SHALLOW GROUNDWATER AND THE LITTLE MENOMONEE RIVER (LEADING TO PREDESIGN TASK 6)

5.3.1 Purpose and Objectives

There are several interrelated objectives to be accomplished by Predesign Task 6, including:

- Determining whether a hydraulic connection exists between groundwater of the former wood preserving plant site and groundwater east of the Little Menomonee River.

- Determining Facility-related groundwater impacts to groundwater quality east of the river.

An initial objective of this task is to determine the hydraulic relationship between the Little Menomonee River and shallow groundwater. Work on addressing this objective can be initiated in 1991 by implementing a program of periodic groundwater and surface water elevation measurements. This work will be conducted under the guidelines of this interim Work Plan. This information will allow determination of whether the Little Menomonee in the area of the former wood preserving plant is an influent or effluent stream relative to shallow groundwater. This study will also provide preliminary estimates related to the contribution of groundwater flow to the overall base flow of the river at the reach nearest the former wood preserving plant. This initial objective can be accomplished through certain activities which will require site access, but which are nonintrusive in nature.

The remainder of Predesign Task 6, including monitoring well installation east of the river and groundwater sampling and analysis, will be addressed in the overall Predesign Work Plan submittal.

5.3.2 Planned Study Area

The planned study area for this interim predesign task would include the reach of the Little Menomonee River in the area of the former wood preserving plant and locations at the site where existing groundwater monitoring wells have been previously installed.

5.3.3 Subtasks/Activities

The proposed activities to accomplish the stated objective consist of the installation of one staff gauge in the Little Menomonee River for the purpose of measuring the river stage adjacent to the existing monitoring well nest MW-8K/8S. Following installation of the staff gauge, river stage elevations and groundwater elevations would be measured quarterly at the staff gauges and 12 existing site monitoring wells, respectively. Additional measurements will be made as needed during unusually wet or dry periods.

The water level measurements would be evaluated in conjunction with the periodic stream gauging being conducted as part of the river hydraulics study (Predesign Task 10) to assess the surface water-groundwater relationship. The groundwater contribution to overall base flow in the river reach adjacent to the former wood preserving plant site will be estimated by calibrating discharge measurements from the river hydraulic study with discharge measurements from adjacent watersheds where continuous flow monitoring data is available. In this manner, a continuous stage/discharge plot can be projected for the reach of the Little Menomonee adjacent to the former wood preserving plant. This data can then be utilized to estimate the groundwater component of base flow by calculation from the stage/discharge plot after subtraction of the run-on and run-off contribution.

5.3.4 Deliverables

The water level monitoring program would continue through implementation of the other predesign work plan tasks, including the other subtasks associated with the investigation of site surface water and groundwater conditions on the east side of the Little Menomonee River (Predesign Task 6). The results of water level monitoring will be incorporated into a technical memorandum presenting the overall findings of this predesign task. An interim deliverable from this initial study is not planned for submittal to U.S. EPA.

SECTION 6

RIVER REMEDIATION PREDESIGN STUDIES

6.1 STUDY RIVER AND FLOODPLAIN HYDRAULICS (PREDESIGN TASK 10)

6.1.1 Purpose/Objectives

The overall purpose of this task is to analyze the river and floodplain hydraulics in preparation for evaluating various alternative river realignments and designing the new river channel. The actual development and evaluation of alternatives will be conducted as part of Predesign Task 9 - Identify and Evaluate Alternative Alignments for the Little Menomonee River and will be detailed in the subsequent overall Predesign Work Plan submittal. Predesign Task 10 will be accomplished within this interim work plan in four separate subtasks: 1) Collect Watershed Data; 2) Hydrologic Analysis; 3) Hydraulic Analysis; and 4) Floodplain Mapping. The specific objectives to be accomplished within each of these subtasks are as follows:

Collect Watershed Data

- Obtain cross-sectional geometry of the existing stream channel and floodplain;
- Identify stream channel characteristics (slope, roughness, etc.).
- Identify stream characteristics (flow range, velocity, etc.).
- Identify watershed hydrologic characteristics -- existing and future (basin size and shape, runoff coefficients, land use, vegetation, soils, etc.).

Hydrologic Analysis

- To determine the flow/frequency relationship for the Little Menomonee River.

Hydraulic Analysis

- To determine the water surface elevations (flood stage) for various frequency flood events.

- To determine the hydraulic characteristics (spatially) within the river's floodplain.

- To specifically identify areas prone to flooding every two years and that have sluggish movement of flood waters or ponding that yields sediment deposition.

- To identify all hydraulic structures in the Little Menomonee River floodplain (outfall structures, storage facilities, culverts, bridges, etc.) and assess their current relationship to the hydraulics of the river.

Floodplain Mapping

- To enter all pertinent hydraulic data into a geographic information system for mapping and alternative analysis.

6.1.2 Subtasks

Collect Watershed Data

Data will be collected to execute a hydrologic and hydraulic analysis of the Little Menomonee River and its floodplain. The data collection effort will begin with a detailed literature review of all work that has been done in the Little Menomonee River watershed including work completed as part of the Feasibility Study. We will specifically investigate the following sources of data:

- The Federal Emergency Management Agency (FEMA) has conducted Flood Insurance Studies (FISs) for the communities through which the Little Menomonee River traverses. From these studies, data will be collected on the watersheds hydrologic and hydraulic characteristics and computer modeling for analysis of flood events on the Little Menomonee River.

- United States Geological Survey (USGS) maintains flow recording gauges on watersheds in the region that are similar to the Little Menomonee River watershed. Flow/frequency data will be collected for these gauges and used to project the flows in the river basin based on the ratio of tributary drainage areas.

- As part of the Feasibility Study, the U.S. EPA collected hydrologic and hydraulic data for the river. This data will be utilized wherever possible.

- As part of the overall predesign phase, an aerial topographic firm will prepare an aerial topographic map of the study area at the scale of 1" to 100' with contour intervals of 1 foot (see Section 3). Using this data, cross-section data will be generated to supplement data gathered from existing reports.

- In conjunctions with the groundwater tasks, stage/flow gauges will be installed on the Little Menomonee River in the vicinity of the Facility (see Subsection 5.3).

Hydrologic Analysis

To study the hydraulic characteristics of the Little Menomonee River channel and floodplains one must first understand the hydrology of the watershed. The magnitude of the flow and its frequency and duration are important factors which influence the level of flooding experienced on the river. Using statistical assessments of gauged watersheds and comparing them to the Little Menomonee River based on the similarity of the watersheds, will enable a prediction of the flow/frequency/duration relationship for the Little Menomonee River. The following steps will be utilized to predict the relationship to be used in the hydraulic analysis:

- Obtain flow station data for a gauge in a similar watershed, one of comparable size, shape, land use and topographic features. Conduct statistical analysis such as Log-Pearson II to identify the flow/frequency/duration relationship on that watershed. Tabulate the watershed characteristics to be compared to the Little Menomonee River.

- Delineate drainage areas to selected points of interest along the river channel and tabulate the watershed characteristics upstream of those selected points.

- Proportion flows obtained from similar watershed gauge to points of interest in the Little Menomonee River watershed based on a ratio of drainage area.

- Compare a single flow event on the gauged stream to the flow recorded at the gauge to be installed on the river.

- Compare the flows predicted on the Little Menomonee River based on proportional drainage areas to the flows used in the FEMA FISs.

- If necessary, make appropriate changes to the proportional approach to estimating flows on the Little Menomonee River.

- Tabulate 2-, 5-, 10-, 25-, 50-, and 100-year flood events at the points of interest in the Little Menomonee River watershed.

Hydraulics Analysis

Based on the hydrologic analysis, the flow/frequency/duration relationship will be known. Utilizing the flows generated in that task, a determination of the floodplain depths and velocities will be made. The following steps will be utilized to make these determinations:

- Rerun the FIS hydraulic model obtained from FEMA to verify the capability of reproducing the hydraulic modeling results used for the FIS report;

- Identify the location of cross-sections and stream crossings modeled on the topographic aerials.

- Evaluate the need for additional cross-sections to better define the flood characteristics along the length of the Little Menomonee River to be rerouted.

- To the extent possible based on the input constraints of the model, vary the hydraulic characteristics across the cross-section to make them as site specific as possible.

- Run the revised version of the model with the additional cross-sections and the more site-specific roughness characteristics.

- In order to bracket the entire range of flooding conditions, from the bank-full conditions to the 100-year event, supplement the flooding events by pulling additional frequency storms off of a probability plot of the flow frequency data.

- Identify all of the discharge, storage or conveyance structures that are impacted by or impact the flood waters of the Little Menomonee River and determine their relationship to the river hydraulics.

Floodplain Mapping

The results of the hydraulic modeling will be plotted on the aerial topographic base maps. The following steps will be completed as part of this task:

- Delineate the floodplain for selected storm events (2-year and 100-year).
- Create a grid overlay which identifies flooding characteristics within cells surrounding elevation/station point on the cross-sections (i.e. depth, velocity, frequency, duration, etc.) for two selected flood events.
- Determine areas of inundation for various storms and identify areas of ponded or sluggish current which may be subject to sediment deposition.

6.1.3 Deliverables

A technical report, complete with maps and modeling printouts, will document the findings of the study of river and floodplain hydraulics predesign task. Information will be formatted to facilitate its use in evaluating the various alternative river realignments. Specific content items that will be incorporated into the technical report will include:

Data Collection

A report section will be provided that summarizes all data utilized to conduct the study of river and floodplain hydraulics task work effort. This section will summarize the data extracted from other sources and reference the source. It will also describe the methodologies used to derive original data.

Hydrologic Analysis

The principle deliverable for the hydrology task will be a table of flow estimates for selected points of interests along the Little Menomonee River for flood events ranging from the 2-year to the 100-year events. A report section will be provided which will describe the methodology used to determine the flows on the Little Menomonee River.

Hydraulic Analysis

Computer printouts, flood profiles (side views of the stream channel and flood water surface elevations), and maps delineating the areal extent of flooding for selected flood events will comprise the principle part of the deliverable for this task.

Floodplain Mapping

The deliverable which will be most directly used in the alternatives task evaluation is a grid overlay which will identify spatial flooding characteristics. In addition, a map will be prepared which identifies areas prone to flooding with ponded or sluggish water which may be subject to sediment deposition.

6.2 CONDUCT WETLANDS DELINEATION (LEADING TO PREDESIGN TASK 15)

6.2.1 Purpose and Objectives

In accordance with the ROD and Consent Decree, floodplain and wetland assessments must be conducted in conjunction with the predesign and RD phases. Predesign Task 15 within the SOW was developed to address the need to complete the floodplain and wetland assessments. The broad, overall objective of these assessments are to:

- Provide baseline ecological information on each river and floodplain segment.
- Provide a basis for a comparative evaluation of environmental impact of various stream corridor options.
- Provide a basis for assessing potential environmental impacts of construction in accordance with the applicable regulations, guidance and policy.
- Provide the basis for development of plans to mitigate impacts to the floodplain and wetlands.

An important subcomponent of this predesign task is the delineation of wetlands within the boundary of the former wood preserving plant and the floodplain of the Little Menomonee River. In order to assure that the objectives of Predesign Task 15 and the RD as a whole are met in as timely a manner as possible, the wetland delineation will be conducted under this Interim Predesign Work Plan. The balance of the Floodplain and Wetland Assessment will be conducted under the overall Predesign Work Plan. The decision to proceed with the

wetlands delineation was based primarily on the desire to provide important data to other predesign tasks, go to the field during this field investigation season, and thereby assure that other predesign tasks are not delayed pending the completion of the entire Predesign Task 15.

6.2.2 Study Area

The study area for the floodplain and wetlands assessment will encompass the floodplain of the Little Menomonee River for its approximately 5-mile course below the former wood preserving facility, the immediate area surrounding the former wood preserving plant, and that part of the river north of the site for approximately 4 miles to Freistadt Creek, including the Little Menomonee Creek. The delineation of wetlands will be limited to the Moss-American site and the portion of the Little Menomonee River downstream from the site.

The study area is shown on the base map (Figure 6-1). Included are wetland areas shown on U.S. Fish and Wildlife National Wetlands Inventory (NWI) maps and State of Wisconsin Wetlands Inventory mapping, hydric soils, and the 100-year floodplain (FEMA maps). There are obvious differences in these parameters which are sometimes used for guidance in estimating the extent of wetlands. In addition, a preliminary survey of the Little Menomonee River and floodplain in June 1990 revealed that the extent of wetlands are greater than that indicated by the NWI or State of Wisconsin wetlands maps. Two additional field investigations (Section 6.2.3.3) have identified wetlands on a larger portion of the Little Menomonee River floodplain than available wetlands maps indicate. A more detailed investigation, incorporating accepted methods to delineate wetlands, is required. The 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989 Federal Manual) will serve as the document to be used in identifying and delineating jurisdictional wetlands.

6.2.3 Wetlands Delineation

6.2.3.1 Wetlands Definition

Wetlands are defined by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (CE, 33 CFR 328.3 and U.S. EPA, 40 CFR 230.3) as:

> "Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life

SOURCE:
- BASE MAP ADAPTED FROM USGS 7.5 MINUTE QUADRANGLE MAPS MENOMONEE FALLS AND WAUWATOSA, WISCONSIN - PR.1976
- U.S.DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE SOIL SURVEY OF MILWAUKEE AND WAUKESHA COUNTIES WIS. 1971.
- FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP 550278 - 1982
- STATE OF WISCONSIN PUBLISHED WETLAND MAPS

BROWN DEER ROAD
MOSS AMERICAN SITE
GRANVILLE RD.
GRANVILLE ROAD
CHICAGO AND NORTH WESTERN
BRADLEY ROAD
WAUWATOSA RD.
CHICAGO MILWAUKEE, ST. PAUL AND PACIFIC
GOOD HOPE ROAD
FOND DU LAC AVE.
RTE. 45
MILL ROAD
CHICAGO AND NORTH WESTERN
RTE. 41
SILVER SPRING DR.
RTE. 100
TIMMERMAN AIRPORT
HAMPTON AVE.

PRELIMINARY
ENVIRONMENTAL FACTORS
INFLUENCING RIVER REALIGNMENT
LITTLE MENOMENEE RIVER
MILWAUKEE CO. WISCONSIN

LEGEND:
- Hydric Soils
- State Listed Wetlands
- 100 Year Floodplain

FIGURE 6-1

NORTH

2000 1000 0 2000
Scale in Feet

in saturated soil conditions, including swamps, marshes, bogs, and similar areas."

The delineation of wetlands using the 1989 Federal Manual is based upon the three parameter approach (vegetation, soils, and hydrology). Under normal circumstances, all three of these parameters must meet the wetland criteria for an area to be classified as a wetland. The following is a brief description of the wetland criteria for each of these parameters.

Hydrophytic Vegetation

Hydrophytic vegetation consists of any plant that is especially adapted, either physiologically or morphologically, to survive or thrive in oxygen depleted saturated soil conditions for at least part of the growing season. Since most plant species tolerate a range of growing conditions, individual species may not necessarily be restricted to either wetland or upland communities. The United States Fish and Wildlife Service (USFWS) has developed a classification that assigns wetland indicator classes to species according to the following scheme (Reed, 1988):

Plant Affinity for Wetland Conditions

Classification	Probability of Occurrence in Wetlands
Obligate (OBL)	> 99%
Facultative Wet (FACW)	67 - 99%
Facultative (FAC)	34 - 66%
Facultative Upland (FACU)	1 - 33%
Upland (UPL)	< 1%

An obligate classification is given to plants that are found growing in saturated soil conditions 99 percent of the time, and is usually assigned to plants that are obligated by constraints of physiological evolution to have their roots in wet soils or water. An upland classification is assigned to plants that are found in unsaturated soils 99 percent of the time, and is usually assigned to plants growing on high elevations where depths to the water table are great. The remaining classes of the scheme are all intermediate, with facultative wet plants growing in lower elevation or areas with wetter soils than facultative or facultative upland. Plants categorized in this broad category are adaptable to a variety of conditions and are not a reliable indicator of the wetland or upland classification. This classification

scheme is to be used only as a guide to plant affinities for saturated or oxygen depleted soils.

If obligate (OBL) species comprise all dominants in the plant community, and if hydrological modifications are not present, then the area may be designated as wetland without the need for further examination of soils and hydrology. Similarly, an area is considered upland if it is dominated by UPL species. However, if a mixture of facultative (FACW, FAC, FACU) plant species dominate the area, the results of the vegetation sampling are inconclusive and the area will be considered wetland only if hydric soils and wetland hydrology are also present.

Hydric Soils

Hydric soils are soils that are saturated in a major part of the root zone for a significant period during the growing season. Soils are considered hydric when they are either: 1) somewhat poorly drained soils that have a seasonal high water table less than 0.5 feet from the surface; or 2) poorly or very poorly drained soils that have a seasonal high water table less than 1.0 or 1.5 feet from the surface depending on soil permeability. This high water table must be present for a week or more during the growing season (Soil Conservation Service, 1987). Soils that are ponded or flooded for long or very long duration during the growing season are also classified as hydric. All organic soils (histisols) and mineral soils with an organic layer 8 inches or more in thickness are hydric soils.

In the field, mineral soils are examined with a Munsell Soil Color Chart. Soils are considered hydric when they are gleyed (i.e., blue-gray cast) or when the top of the B soil horizon has a Munsell chroma value of 2 or less (if mottling is present). Low chroma values are indices of the degree of chemical soil reduction as a result of anaerobic soil conditions. Soils are generally examined to a depth of 20 inches.

These criteria allow most soils to be classified as either hydric or nonhydric. Exceptions are those soils which are sandy, or are deeply colored as a result of their parent materials. These soils must be evaluated more carefully under the procedures outlined by the Federal Manual (FICWD, 1989). Sandy soils may be considered hydric if organic materials have accumulated above or in the surface horizon. Dark vertical streaking in subsurface horizons caused by the downward movement of organic matter also indicates a hydric soil. This may be associated with an organic layer located at the average depth of the water table.

The Soil Conservation Service has developed State- and County-based (1987a and 1987b, respectively) lists of hydric soils series. Unlisted soils series are generally considered to be

nonhydric. However, some phases of unlisted soil series may contain hydric inclusions and thus may be associated with wetlands. These cases must be individually verified in the field. Alluvial soils may not show hydric characteristics due to their recent formation, but may be considered to be hydric for the purposes of wetland delineations (FICWD, 1989).

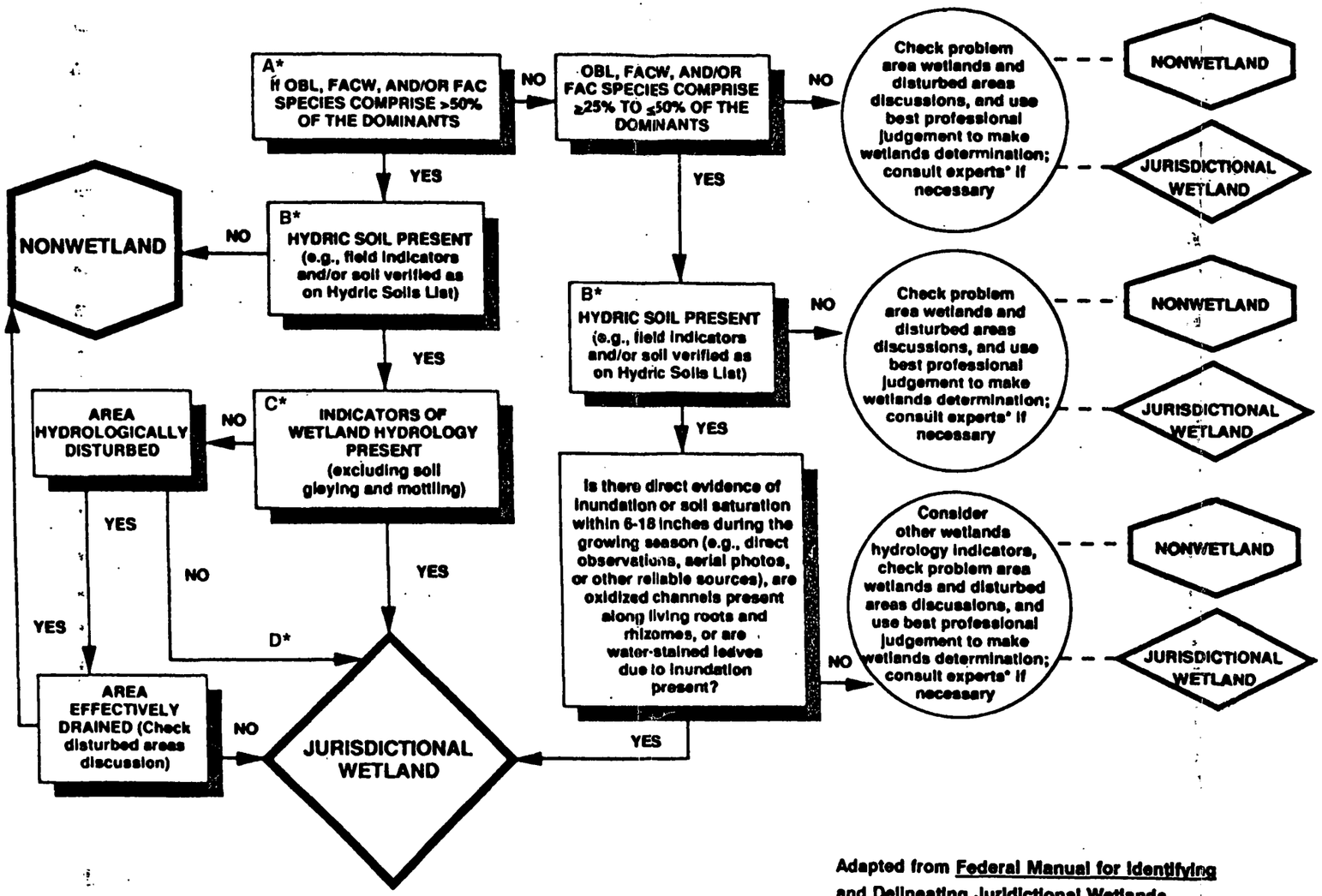
Wetland Hydrology

The term "wetland hydrology" encompasses all hydrologic characteristics of areas that are permanently or periodically inundated or have soil saturation for a significant period (usually a week or more) during the growing season. The depth to saturation (seasonal high water table) for an area to be classified as having wetland hydrology depends upon soil permeability and classification. Wetland hydrology may be indicated by visual observation of saturation or inundation; however, indirect indicators may also demonstrate that the soil is saturated during the growing season. These include drainage patterns, buttressing (swollen tree base), oxidized root channels, water-stained leaves, sediment deposits, drift lines (debris in tree limbs from high water flow), and historic records.

6.2.3.2 Field Procedures

The procedures to be followed in making the wetlands determinations are summarized in Figure 6-2. In some cases, best professional judgment may be used to make determinations. The detailed procedures are to be found in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, a cooperative publication of the Fish and Wildlife Service, the Environmental Protection Agency, the Department of the Army, and the Soil Conservation Service, in January 1989.

In summary, the process requires an appropriately qualified and experienced field team to first review available information on the area to be delineated, including National Wetland inventory maps, aerial photographs, historical records, prior biological surveys, etc. Once in the field, transects will be established at appropriate intervals and two or more sampling plots identified along the transect. The vegetation is identified and classified as hydrophytic or not, soils are sampled and compared with hydric soil characteristics and any available county maps. Evidence of wetland hydrology is sought including evidence of flooding, standing water, or water table close to the surface. The boundary of the wetland is recognized by finding the interface where hydrophytic vegetation and hydric soils give way to well drained soil types and upland vegetation. At this point, a flag is placed in the ground to indicate the boundary and its location marked on the base map.



Adapted from Federal Manual for Identifying and Delineating Juridictional Wetlands

A.* Identify dominant plant species and note wetlands indicator status.

B.* Examine soils to a depth of 20 inches using a hand auger or soil probe. If hydric soil characteristics (see wetlands manual) are present at 10 to 12 inches or the B horizon, whichever is encountered first, hydric soils conditions exit.

C.* Examine the area for water, either ponded or flowing on the surface, or within the depth of the soil auger hole.

D.* If indicators of wetlands hydrology are not present, the wetlands manual allows hydrology to be inferred from the soils information (including soil mottling and gleying).

WESTON MANAGERS DESIGNERS/CONSULTANTS	Three Hawthorn Parkway Vernon Hills, Illinois 60061	FIGURE 6-2	WETLANDS IDENTIFICATION FLOW DIAGRAM MOSS–AMERICAN SUPERFUND SITE Milwaukee, Wisconsin

REV.

The field team will use the quadrant transect sampling procedure based on the intermediate-level On-site Determination Method described in the Federal Manual.

A series of baselines, which are roughly parallel to the wetland boundary, will be established for sections of the Little Menomonee River. Baselines will be divided into approximately equal segments. Transects will be established perpendicular to the baseline within each segment.

Each transect is walked to assess the vegetation and plant communities along it. Sample plots are then located on the transect so as to represent the recognized communities. It is especially important to locate sample plots in wetland and upland areas either side of what may be the transition area between these two conditions.

At this point in the process, the field team makes an assessment of conditions to determine whether normal wetland conditions are present or whether the area represented by the sample plot has been disturbed.

Sampling and recording of vegetation is done on field record sheets such as the inventory data form shown in Figure 6-3. To ensure proper sampling, a 5-foot radius sample plot is used for bryophytes and herbs and a 30-foot radius sample plot is used for trees, saplings, shrubs, and woody vines.

Within each vegetative stratum (herbs, shrubs, trees, etc.), the cover class is estimated as a percent area covered by each species as follows:

T = <1% (none)
1 = 1 - 5% (3.0)
2 = 6 - 15% (10.5)
3 = 16 - 25% (20.5)
4 = 26 - 50% (38.0)
5 = 51 - 75% (63.0)
6 = 76 - 95% (85.5)
7 = 96 - 100% (98.0)

The figures in parentheses are the midpoints of the range of percentage cover. The midpoint figures are used to rank the species within each stratum and are then summed for all species in each stratum. The total midpoint values are multiplied by 50 percent to give a number that represents the dominance. The dominant species on the field sheets are classified for their indicator status, (i.e., FAC, FACW, or OBL wetland or upland species).

FIGURE 6-3

WETLANDS INVENTORY DATA FORM[1]

Project/Site: _____ Plant Community Name/Flag #: _____

Date: _____ Observer: _____ Signature: _____

VEGETATION

	Plant Species	Indicator Status	Stratum[2] Cover[3]		Plant Species	Indicator Status	Stratum Cover
1.				11.			
2.				12.			
3.				13.			
4.				14.			
5.				15.			
6.				16.			
7.				17.			
8.				18.			
9.				19.			
10.				20.			

Percent of dominant species that are OBL, FACW, and/or FAC _____

Is the hydrophytic vegetation criterion met? Yes _____ No _____

Rationale: _____

_____

SOILS

Series/phase: _____ Subgroup: _____

Is the soil on the hydric soils list? Yes _____ No _____ Undetermined _____

Profile Description:	Depth	Matric Color	Mottle Color
	_____	_____	_____
	_____	_____	_____

Otherhydricsoilindicators: _____

Is the hydric soil criterion met? Yes _____ No _____

Rationale: _____

FIGURE 6-3
(Continued)

WETLANDS INVENTORY DATA FORM[1]

HYDROLOGY

Depth to free-standing water _____; depth to saturation _____
List other field evidence of surface inundation or soil saturation.

_____

Is the wetland hydrology criterion met? Yes _____ No _____
Rationale: _____

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes _____ No _____
Rationale for jurisdictional decision: _____

_____

[1]Data form adapted from Federal Manual for Identifying and Delineating Jurisdiction Wetlands, 1989.
[2]Statum: Ca - canopy; Sb - subcanopy; Sp - sapling; Sh - shrub; Hb - herbaceous
[3]Cover class midpoint: T = <1% 1 = 5% (3,0); 2 = 6-15% (10.5); 3 = 16-25% (20.5); 4 = 26-50% (38.0); 5 = 51-75% (63.0); 6 = 76-95% (85.5); 7 = 96-100% (98).

In any sample plot where all dominant species are OBL wet or all dominant species are OBL wet and FACW and the wetland boundary is abrupt, hydric soils can be assumed. Where this is not the case, a soil auger will be used to sample soil to a depth of at least 18 inches. The soil is compared against a Munsell chart for the color and gleying indicative of hydric conditions. The sample will also be compared to the soil descriptions for the soil mapping unit on the county soil survey map. If the soil sample does not match the description in the map, a check is made for hydric soil indicators below the A-horizon (surface layer) and within 18 inches for organic soils and poorly drained mineral soils with low permeability rates (<6.0 inches/hr), within 12 inches for poorly and very poorly drained, coarse-textures (sandy) mineral soils with high permeability rates (≥ 6.0 inches/hr), and within 6 inches for somewhat poorly drained soils. In areas that have been altered or disturbed, a more elaborate investigation will be undertaken to assess the current and past situation and condition of the soils.

The wetland hydrology criterion will be easily recognizable in many areas of the Little Menomonee River floodplain but typically is indicated by standing water, saturated surface layers, water in the 18-inch soil sample hole, water lines and debris from flood events, and the dominant status of OBL wet FACW or FAC wetland plant species. Historical records for the area and flood insurance maps will also provide indications.

The determination of the boundary between wetland and upland areas requires experienced wetland delineators. The procedure is most difficult when conditions allow both wetland and upland plant species to be present in the transition zone. In this case, the procedure just described is repeated at additional sample plots along the transect without the requirement to fill out new data sheets. When the boundary is found, its position will be marked with a flag and the position of the flag marked on the base map.

This process will be repeated throughout the floodplain of the Little Menomonee River and upon completion, the wetland delineation line marked by the flags will be surveyed and the surveyed line drawn on the base map.

The description given here is general in nature and does not preclude the use of other methods to determine wetland boundaries (Section 6.2.3.3).

6.2.3.3 Off-Site Determination

The 1989 Federal Manual includes a section describing methods for off-site determination of wetlands using appropriate maps and site-specific information confirming hydrophytic vegetation, hydric soils, and/or wetland hydrologic conditions. The validity of using this

method is based upon the accuracy of available information. For the Little Menomonee River the following information is available for use in delineating wetlands:

1. U.S. Fish and Wildlife Service National Wetlands Inventory Maps.

2. 100-year Floodplain (FEMA maps).

3. U.S.D.A. Soil Conservation Service Soil Survey report.

4. State of Wisconsin Wetlands Inventory Mapping.

5. Black-and-white infrared photographs of the Little Menomonee River taken in 1991.

6. Topographic survey of the Little Menomonee River floodplain (available in November 1991).

7. Report prepared by the U.S. Environmental Protection Agency summarizing the results of a field investigation of the Little Menomonee River during September 1990. The report includes mapping of the approximate wetland boundaries and wetland plant communities.

8. Field investigation by WESTON during October 1991 to assess the potential for delineation of wetland boundaries and plant communities using available mapping sources and field verification.

9. WESTON is also evaluating the river and floodplain hydraulics (Section 6.1).

Review of this information has indicated that the boundaries of wetlands can be delineated using a combination of the off-site and on-site determination methods identified in the 1989 Federal Manual. Therefore, wetland boundaries will be determined using the information identified above. Field investigations of the site during 1992 will assess the accuracy of these delineations and allow for revisions, if necessary.

6.2.4 Deliverables

Maps of the wetland boundaries for the study site will be prepared following methods previously outlined. Information and data resulting from this wetlands delineation subcomponent of Predesign Task 15 is a necessary component of several Predesign Tasks.

A deliverable in the form of a Technical Memorandum will be prepared upon full completion of Predesign Task 15 for submittal to U.S. EPA. An interim deliverable to U.S. EPA is not planned at this time.

SECTION 7

FORMER CREOSOTING FACILITY REMEDIATION PREDESIGN STUDIES

7.1 INITIATE LABORATORY (BENCH-SCALE) TESTING OF THE BIOLOGICAL TREATMENT SYSTEM (PREDESIGN TASK 16)

This section of the Interim Predesign Work Plan outlines the initial phase of activities to be conducted in the evaluation of soil and sediment treatment systems of the selected remedy. Initial activities will include two principal components:

- Evaluation of potential remedial treatment process options and the development of protocols for experimental evaluation of those options, and
- Initiation of bench-scale treatability testing for contaminated soils.

These are initial subtasks of Predesign Task 16.

Subsection 7.1.1 outlines the overall test program encompassed by Predesign Task 16. Subsection 7.1.2 presents activities to be conducted under the context of this interim work plan.

7.1.1 Purpose and Objectives of Predesign Task 16

Predesign Task 16 has two main objectives: (1) assess the feasibility of the proposed soil washing and bioslurry systems for contaminated soils and sediments at the Moss American site, and (2) determine key design and operational parameters and anticipated performance of those systems. The soil washing and bioslurry systems must initially be evaluated individually and subsequently as a combined process for treating soil and sediments. The following specific objectives must be met in order to attain the two main broad objectives of this predesign task:

- Assess feasibility of individual soil washing and bioslurry treatment systems.

Soil Washing Component

- Determine whether a soil washing step will significantly contribute to the economics of the proposed soil treatment system or overall remedial action implementation.

- Determine the resulting feed conditions for the bioslurry treatment system (soil quantity, physical/chemical characteristics) following an initial soil washing step.

- Evaluate the effect of the soil washing step (which generally results in separation of feed soils by particle size) on the post-treatment material handling and disposal aspects (Predesign Task 18) of the Remedial Action.

Bioslurry Treatment Component

- Determine the degree of treatment which be can reliably expected to be achieved in a bioslurry treatment system under achievable operating conditions at the Facility.

- Evaluate treatment process reliability in terms of performance under anticipated variations in operating conditions at the site.

- Evaluate treatment effectiveness relative to the remedial objectives and evaluate the potential need for additional or alternative treatment steps or processes.

- Evaluate the potential effect of analytical capabilities and limitations, as determined in Predesign Task 1 on process monitoring and performance verification.

- Determine design and operating parameters and anticipated performance of the soil remedial treatment system.

Soil Washing Component

- Determine feed conditions, achievable separation efficiency, reagent (surfactant) requirements, process operating conditions, treated product characteristics, and waste streams which may require additional management.

Bioslurry Treatment System

- Evaluate biodegradation kinetics and contaminant removal efficiencies.
- Evaluate and select bioslurry reactor operating conditions.
- Determine treated product characteristics and waste streams which may require additional management.

Overall Soil/Sediment Remedial Treatment System

- Evaluate overall treatment process throughput rate and determine soil treatment schedule.
- Consider the potential interface with an impact upon other RA activities (including all soil excavation and disposal tasks).
- Determine required support systems (e.g., process water/wastewater treatment) and interface with other remedial systems (including remedial construction tasks and water treatment tasks).
- Develop process flow diagram, mass balance, concept design, capital and operating cost estimates, and overall schedule for soil treatment.

In working toward these important Predesign Task 16 objectives, a number of initial subtasks are proposed to be conducted within this Interim Predesign Work Plan. These subtasks and activities will assist in expediting, to the extent practical, information and data sought by this task.

7.1.2 Interim Predesign Subtasks/Activities

The intent of Predesign Task 16 Interim activities is to develop, at an early stage in the overall Remedial Design phase, a determination of the feasibility of soil washing/bioslurry treatment for meeting the specified soil cleanup goals at the site. In order to support the expeditious remediation of the site, the selection and evaluation of treatment process options will focus upon the use of process components and equipment which are currently commercially available at the field scale and which have demonstrated performance with similar wastes and/or contaminant matrices. Predesign Task 16 Interim Activities will encompass two principal subtasks:

Subtask 1 - Remedial Treatment Process Evaluation

Subtask 2 - Bench-Scale Soil Treatability Testing

These subtasks will proceed concurrently during Predesign Task 16 Interim activities. This approach is being adopted in order to maximize the likelihood of establishing the performance of the treatment processes under conditions which will or may prevail during actual implementation. Activities under Subtasks 1 (Treatment Process Evaluation) are devoted to optimizing the selection of appropriate treatability test conditions. In addition to supporting Interim Predesign Subtask 2, the information developed in these tasks will form the basis for any subsequent bench and/or field scale testing which may be conducted during the Predesign and RD phases of the Remedial Action.

Subtask 1 - Remedial Treatment Process Evaluation

Subtask 1 activities will focus upon the evaluation of potential design and operating criteria for the full scale treatment system and the evaluation of potential soil washing and bioslurry treatment process options to meet those criteria. Based upon this definition of treatment process goals, constraints and options, specific test plans and protocols will be developed to provide thorough and realistic evaluation of achievable treatment performance. These activities form the basis of the Predesign Work Plan. Data from these activities will also be used to focus the test protocols in the concurrent bench-scale feasibility testing conducted under Subtask 2.

Subtask 1 activities include:

- Preparation of task-specific sections of the interim and overall SAP, QAPP, HASP (Subtask 1.1).

- Initial evaluation and determination of potential remedial treatment system design and operating conditions (Subtasks 1.2, 1.3, and 1.4).

- Evaluation and selection of treatability test conditions and protocols based upon evaluation of potential design and operating conditions.

Subtask 1.1 Prepare Task-Specific Sections of the Interim Predesign SAP, QAPP, and HASP

Subtask 1.2 Review Existing Treatability Data

This subtask will review, evaluate, and summarize existing recent soil treatment performance data for similar residues, matrices and conditions. In conducting this review, consideration will be given to optimizing the treatability testing protocol, and anticipating treatability testing and/or analytical problems.

Subtask 1.3 Potential Soil Treatment Process Options

This subtask will evaluate equipment and/or process options which may be used in the remedial treatment system to determine their potential suitability and to determine data/information requirements for process selection which can be addressed in treatability testing. These activities will consist of a focused evaluation of commercially available components and/or processes for the purpose of conducting and optimizing treatment process testing.

For the soil washing system, an evaluation of process options will be made to determine potential equipment types and sources, operating parameters, potential performance, and data requirements for process/equipment specification.

For the bioslurry soil treatment system, a similar evaluation of process options will be made to determine potential equipment types and sources, operating parameters, potential performance, and data requirements for process/equipment specification.

Subtask 1.4 Evaluate Treatability Test Conditions to be Considered

Subtask 1.4 activities will refine the array of laboratory conditions to be examined based upon projected remedial design and operating conditions. The findings from this task will be incorporated into the Predesign Work Plan and the subsequent laboratory and/or pilot phase test protocols as appropriate. If preliminary treatability screening conducted during

Subtask 2 proves successful, additional laboratory and perhaps, pilot scale testing will be conducted. Development of an effective and reliable remedial treatment system will require that such testing be conducted under conditions which may be expected to occur during Remedial Action.

In accomplishing this, Subtask 1.4 will involve:

- Developing a preliminary remedial treatment system design basis to guide selection of treatability test conditions: considering cleanup criteria, performance standards, and potential or desired throughput rates.

- Evaluating potential variability in process operating conditions during Remedial Action to ensure that to the extent possible, treatability testing is conducted under conditions likely to be encountered during implementation. Items to be included in this evaluation are variations in contaminant concentrations, variations in soil characteristics, and potential effects of the overall remediation schedule in determining sequencing of contaminated materials requiring treatment.

Treatability testing data requirements and data quality objectives will be developed to ensure that the resulting data fulfill the intended end uses. Sampling/analytical methods, SOPs, and the need for modifications to SOPs will be evaluated. Data reduction, data manipulation, and analysis goals and requirements will also be evaluated. Pass/fail criteria will be established for determining the treatment process feasibility.

Potential equipment and support requirements for bench-scale biological system testing will be evaluated, with consideration given to:

- Availability, cost, lead time for procurement, and compatibility.

- Support requirements.

- Health and safety requirements.

Subtask 1.5 Determine Data Requirements and Interrelationships with Other Predesign Activities

This subtask will assist in optimizing the effectiveness of the treatability evaluation by determining data requirements which may be fulfilled during other predesign tasks.

Specifically, the extent of contamination predesign studies may provide important soil characterization data for the biological and soil washing system studies. Useful data will include determination of contaminant concentrations and contaminant distribution, and soil physical properties (e.g., particle size distribution) which may affect treatment system design, operation, and performance.

Coordination of data from other predesign tasks will include:

- Evaluating material handling and material quantification studies with respect to potential biological and soil washing system throughput rates.

- Utilizing laboratory analytical procedure development to assess in conducting additional pre-, interim, and post-treatment soil and sediment characterizations.

- Providing data output from biological and soil washing studies to assist in executing other predesign tasks. Potentially applicable output may include the characteristics of treated soils and sediments which require redisposal, and the characteristics of treatment process sidestreams which may require treatment/management.

Subtask 2 Initiate Phase I Laboratory Scale Treatability Testing

Laboratory scale (Phase I) treatability testing of soil washing and bioslurry treatment options will be initiated. Testing to be conducted during these Interim Predesign activities will focus on the feasibility of the proposed process for meeting the established cleanup criteria for CPAHs. This testing will be conducted using composited samples of contaminated soils from the Facility. It is intended that the feasibility evaluation will be conducted using site soils exhibiting representative (average) contaminant levels.

Representative samples of contaminated soils will be collected from the site. Sample selection and location will be based upon existing RI/FS site characterization data and additional data from other predesign activities as it becomes available. Sample locations and compositing schemes for obtaining representative soils for treatability testing will be detailed within the forthcoming QAPP and SAP submittals.

The slurry medium for full scale operations will consist of water (surface and/or groundwater) from the Facility. Therefore, water samples from the site will be collected concurrently with soil sampling for use as the medium for soil washing/bioslurry preparation in treatability tests.

Soil samples will be characterized prior to initiating treatability testing to evaluate properties or conditions which may affect or determine the results of the treatability test. Factors and properties which will be considered will include:

- Contaminant distribution and variability, to assess the potential effect of such variations in treatability performance and to evaluate potential effects on statistical interpretation of treatability test results.

- Other physical/chemical properties such as particle size distribution, organic carbon content and the presence of other contaminants which may interfere with the treatment processes.

- Other parameters which may affect biological activity such as macro- and micro-nutrient levels and pH.

Indigenous microbial activity levels in the soil samples/composites will be characterized to determine the potential need for microbial acclimation, stimulation or augmentation. Parameters and procedures to be used in this effort may include the following:

- Estimation of microbial population/viability and determination of PAH/CPAH degradation capabilities, using aerobic plate counts or most probable number (MPN) methods.

- Microbial respirometry, under endogenous and stimulation (substrate) conditions, using methods such as manometry or electrolytic respirometry.

Batch soil washing experiments will be conducted with soil samples/composites. Treatability test protocols will be specified in a subsequent deliverable, as outlined in 7.1.3. Potential parameters which may be used as variables in soil wash testing may include:

- Available or potentially applicable washing agents (e.g., aqueous solutions, surfactants, etc.).

- Soil wash reactor operating conditions (e.g., residence time, temperature, physical/mechanical manipulation).

The chemical and physical characteristics of treated soil and sediment residuals will be evaluated to determine whether bioslurry protocols or results may be affected by the initial soil washing step.

Batch bioslurry treatability testing will be conducted on site soil composites to evaluate potential contaminant removal efficiencies, batch treatment kinetics, and operating conditions. Treatability test protocols will be specified in a subsequent deliverable, as described in 7.1.3. Protocols for the initial Phase I feasibility determination during Interim Predesign activities will focus upon those test parameters most critical to process performance demonstration. If the initial process feasibility determination is positive, process optimization parameters will be considered for subsequent test phases as appropriate. Potential operational parameters to be used as variables in Phase I bioslurry treatment testing may include:

- Slurry proportions (percent soil by volume/weight).
- Reactor operating parameters (aeration rate, temperature, etc.).
- Microbial population factors.

In as much as water from the site (surface and/or groundwater) will be used as the slurry medium for full scale implementation, bioslurry treatability testing will also utilize water collected from the site as the slurry medium. The characteristics of the selected water source, including any potential changes in characteristics due to water sample storage, etc., will be evaluated for their potential effect on process performance. In addition, the aqueous phase residual from bioslurry testing will be characterized for parameters which may affect its reuse in the bioslurry process and/or subsequent discharge/disposal.

The performance of bioslurry treatment will be evaluated in relation to the process variables tested. A determination or recommendation concerning process feasibility will be developed. If a positive determination or recommendation is made, process evaluation criteria for subsequent bench/pilot scale testing will be refined to reflect the findings of batch treatability testing. New issues/concerns will be identified and addressed as necessary. The test plan for subsequent bench and pilot scale phases will be modified and refined as appropriate.

7.1.3 Deliverables

As additional information and findings are obtained during the Subtask 1 process evaluation step and as specialty contractor procurements are completed, a bench-scale test protocol will be developed to further detail the work scope and procedures for the treatability testing on soils. This protocol will be submitted to U.S. EPA for review and approval prior to the start of laboratory testing. The bench-scale test protocol submittal will also define procedures,

protocols, and sampling methods for obtaining the soil and water media from the site for the treatability studies.

At the completion of the Phase I laboratory-scale treatability testing of soils, a deliverable, in the form of a Technical Memorandum, will be prepared for submittal to U.S. EPA. This deliverable will detail the findings of the process evaluation (Subtask 1) and the laboratory-scale treatability testing (Subtask 2).

7.2 EVALUATE GROUNDWATER TREATMENT TECHNOLOGIES (LEADING TO PREDESIGN TASK 20)

7.2.1 Purpose and Objectives

The overall purposes and objectives for the Predesign Task 20 related to groundwater treatment are as follows:

- Conduct predesign studies of groundwater treatment technologies to allow design of a treatment facility.
- Conduct groundwater treatment system predesign studies to determine whether the groundwater treatment system can be made sufficiently flexible to cost-effectively, accommodate wastewater from the soil and sediment washing and bioslurry systems during the remedial action.
- Develop a pilot-scale groundwater treatment plant without formal bench-scale testing.
- Support other Predesign and RD/RA implementation tasks, i.e., provide an acceptable means for treating and disposing of waters generated on-site during Predesigned and RD tasks (pump tests, dewatering studies, pilot-scale bioslurry reactor) and future RA tasks (construction dewatering, decontamination waste, etc).

In working toward accomplishing these objectives, a number of engineering evaluation subtasks are proposed to be accomplished within this Interim Predesign Work Plan. The portion of the Predesign Task 20 activities that are planned to be conducted following interim work plan approval are defined in the following subtasks. It is not proposed that any testing of groundwater treatment systems be conducted under this interim plan. Testing programs will be defined in subsequent work plan submittals. In order to clearly show the

relationship of this predesign task to the overall predesign effort other interrelated tasks and activities that will be supported or coordinated are also delineated below.

7.2.2 Subtasks/Activities

The following subtasks will be conducted under this interim work plan:

Subtask 1. Prepare task-specific Sections of the Interim and overall Predesign SAP, QAPP, and HASP.

Subtask 2. Determine discharge permit requirements, including definition of limitations, permitting procedures and requirements, and implications to schedule:

- Identify Milwaukee Metropolitan Sanitary District (MMSDs) pretreatment standards and determine the district's willingness and/or ability to accept the pretreated groundwater, including flow and quality.

- Identify effluent standards for direct discharge to the Little Menomonee River (or its tributary); identify and review other relevant permitted discharges to river/tributaries; conduct preliminary discussion with agencies.

- Identify any VOC emission standards and ARARs/permitting requirements and procedures.

This subtask will be closely coordinated with the work to be conducted in Section 8.2 of this work plan in order to identify technical and design issues of ARARs and perhaps, permit requirements, related to the groundwater treatment system design.

Subtask 3. Review and identify applicable technologies.

- Review available groundwater treatment technologies and their effectiveness for removal of specific contaminants of concern, including the following:

  - Gravity oil-water separation.
  - Dissolved air flotation.
  - Chemical coagulation and settling.
  - Metal precipitation (hydroxide or sulfide).
  - Biological treatment.
  - Air stripping.

- Filtration (gravity, pressure, or continuous backwash).
- Ultraviolet/ozone/peroxide treatment.
- Activated carbon adsorption.

- Research and review relevant past projects and experience on the wood-preserving chemical industry and on the design of groundwater remediation treatment facilities.

- Identify feasible technologies for both the temporary treatment system as well as the anticipated long-term treatment system.

Subtask 4. Define necessary support and coordination with other RD/RA tasks to be conducted:

- Laboratory analytical procedures/capabilities (Predesign Task 2).

  - Define analytical support requirements for characterization of background concentrations in groundwater, including analyses of all potential parameters stipulated under ARARs/permit requirements.

- Extent of contamination and groundwater studies (Predesign Tasks 3, 4, 5, 6).

  - Coordinate with these tasks to assure that determination of background CPAH concentrations in groundwater is included in the extent of contamination studies.

- Groundwater utilization survey (Predesign Task 8).

  - Review data on available water supply wells in the vicinity of site.
  - Review any available data on existing water supply treatment methods and their effectiveness in removal of CPAHs.

- Treatment of waste streams from soil washing/bioslurry testing (Predesign Task 16):

  - Coordinate with this task during the laboratory bench-scale testing phase to provide preliminary determination of flows and characteristics of waste streams to be further treated in the pilot groundwater treatment facility.

Subtask 5. Define the scope of necessary support and coordination with other Predesign and RD tasks to be conducted in 1992 and subsequent years:

- Laboratory analytical procedures/capabilities (Predesign Tasks 1 and 2).
  - Define analytical support requirements for the temporary and the pilot groundwater treatment facility.
- Evaluation of the extent of free-product creosote residue at the former wood processing plant (Predesign Task 3).
  - Coordinate with this task to define groundwater sampling and analysis requirements.
- Extent of CPAH contamination in river sediment, former wood preserving facility soils, and floodplain soil (Predesign Tasks 4, 5, and 7).
  - Coordinate with these tasks to determine the quantities and characteristics of any contaminated water or drainage from these sources that may need to be collected for treatment.
- Groundwater east of Little Menomonee River (Predesign Task 6).
  - Coordinate with this task to define groundwater sampling and analysis requirements.
- Former wood preserving plant groundwater studies (Predesign Task 8).
  - Coordinate with this task to define groundwater sampling and analysis requirements for the former wood preserving plant and to determine the volume or flow rate of contaminated groundwater that needs to be collected for treatment.
- Pilot (construction) test of stream diversion and dewatering studies (Predesign Task 11).
  - Coordinate with this task to determine the potential need for treatment of contaminated water during the stream diversion pilot test and the sediment removal/dewatering pilot test.

- Alternate dredging technologies for sediment removal (Predesign Task 14).
  - Coordinate with this task to determine potential need for treatment of any contaminated water emanating from pilot test dredging.
- Soil washing/bioslurry testing (Predesign Task 16).
  - Coordinate with this task to define flows, characteristics, and variability of various waste streams from the soil washing/bioslurry pilot testing that need to be further treated in the groundwater treatment facility.
- Storage systems for untreated and treated soil, sediment, and debris (Predesign Tasks 17 and 18).
  - Coordinate with these tasks to define any potential need for treatment of surface runoffs from these storage systems.
- Testing of groundwater collection and extraction technologies (Predesign Task 19).
  - Coordinate with this task to define groundwater sampling and analysis requirements and the need for treatment of contaminated groundwater during extraction testing.
- Other decontamination wastewaters (generated from all Predesign and RD/RA activities).
  - Define the quantities and characteristics of other decontamination wastewaters that need to be collected for treatment.

Subtask 6. Analyze the groundwater related data obtained during the interim predesign activities and use them to aid in developing additional data needs for defining the necessary treatment for various waste streams.

7.2.3 Deliverables

Information and data resulting from these subtasks will be compiled for internal use in further planning and implementing Predesign Task 20. A deliverable, in the form of a technical memorandum, will be prepared upon full completion of Predesign Task 20 and will

be submitted to U.S. EPA. An interim deliverable to U.S. EPA is not planned at this time. The information and data to be compiled following completion of the interim subtasks will include:

- Task-specific sections of the QAPP, HASP, and SAP.
- Discharge permit requirements.
- Identification of applicable/feasible groundwater treatment technologies.
- Description of support and coordination with other Predesign and RD/RA tasks.
- Identification of additional activities (including necessary support and coordination with other Predesign and RD/RA tasks) needed in 1992 to further define sources, flows, and characteristics of contaminated groundwater, waste streams from the soil washing/bioslurry system, and other contaminated water that need to be collected for treatment.

7.2.4 Assumptions and Technical Uncertainties

The following assumptions and technical uncertainties are presented for consideration by U.S. EPA, to facilitate technical exchange, and to be resolved during the Predesign and RD phases of the project:

- The RI/FS Reports indicate that benzene is the only contaminant that is not meeting the groundwater quality standards. There is a need to confirm that the limitations for all other parameters as given in NR 140 of the Wisconsin Administrative Code are being met and to determine if additional groundwater treatment beyond what has been proposed in Alternative 3A of the ROD may be necessary.
- Alternative 3A as described in the FS Report and the ROD proposes that oil-water separation and carbon adsorption are the main process to be used for treatment of groundwater. Carbon may not be particularly effective for removal of benzene since carbon's adsorption capacity for benzene is quite low.

- If benzene is the only parameter of concern, it may be more feasible and cost-effective to treat the groundwater separately from other waste streams by air stripping with consideration of vapor-phase emission control.

- If groundwater analytical data suggest that the groundwater does not meet some of the parameters (besides benzene) as specified in the NR 140, then other treatment processes (in addition to those proposed in Alternative 3A) may be necessary.

- The FS Report and the ROD indicate effluent limits of only four parameters (ethylbenzene, TCDD, chloroform, and total CPAHs) for discharge to the Little Menomonee River and mention only total VOCs of 5 mg/L for discharge to the Jones Island POTW. No mention was made of the need to remove heavy metals in the FS Report. Typically, heavy metals removal is required for most cases of pretreatment prior to discharge to POTWs and for direct discharge to most surface waters to avoid the toxicity problems. If this proves to be the case for the Facility, additional heavy metals removal facilities may be necessary to meet the pretreatment or direct discharge requirements.

- The contaminated soils contain high concentrations of arsenic. This arsenic may be carried over in the soil washing and bioslurry fluids which are to be combined with the contaminated groundwater for treatment. The treatment facilities, as proposed in Alternative 3A as well as most other conventional treatment methods, are probably not effective toward removal of arsenic. Additional treatment by activated alumina adsorption may be necessary. This may require additional treatability tests to confirm its effectiveness.

SECTION 8

IDENTIFICATION OF ARARs, PERMITS, AND SITE ACCESS REQUIREMENTS

8.1 PREDESIGN AND RD WORK PLAN IMPLEMENTATION

8.1.1 Compliance with ARARs

During the initial stages of the predesign phase, a review of potential ARARs will be conducted. This review will serve to identify which predesign tasks must address ARARs during planning and implementation. This review will also establish the substantive technical requirements of the ARARs as they relate to design standards and criterion that must be considered in establishing data and planning for the RD.

8.1.2 Access Requirements

Concurrent with development of topographic and property plans, as described in Section 3 of this work plan, a records search and compilation will be conducted. This records search will serve to identify all landowners within, abutting and/or adjacent to the Facility. U.S. EPA has entered into a contract to have a title search performed and will provide the information outlined above. This information will be evaluated with respect to the planned predesign and remedial design to be undertaken. This review will identify specific and/or potential access requirements necessary on and off the Facility and the nature of access agreements required (i.e., temporary, long-term, intrusive, etc.).

The conveyance of the facility and institutional controls (Item V.9 of Consent Decree) and such access agreements which are essential to the implementation of the predesign phase will be attained in accordance with the provisions and requirements of the Consent Decree.

8.1.3 Permits

An evaluation of potential permitting requirements associated with the predesign and RD/RA phase will also be conducted during the initial stages of predesign. It is not anticipated that permits will be required for any predesign or RD/RA work conducted within the Facility boundary, as defined by the Consent Decree and as documented in the Preamble of the National Contingency Plan (NCP). However, a permitting evaluation will consider potential predesign and RD/RA work that may necessitate off-Facility access and

associated permit requirements. Such permit requirements at the local, state, and federal levels will be identified for future incorporation into the RD and RA work scope.

8.1.4 Deliverable

At the completion of the initial evaluation of ARARs, permitting, and site access requirements, as described in Subsections 8.2.1 through 8.2.3, a preliminary plan for satisfying ARARs, permit, and access requirements will be prepared for submittal to U.S. EPA. This plan will present the findings of the evaluations and their relevance to the predesign and RD tasks, and to the extent possible, their potential relevance to RA activities.

REFERENCES

Brower, J.E. and J.H. Zar. 1984. *Field and Laboratory Methods for General Ecology.*

Wildlife Techniques Manual. 1980. Sanford D. Schemitz, Ltd., 4th Edition, Wildlife Society.

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Public Comment Feasibility Study Report, Moss-American site Milwaukee, Wisconsin, 24 May 1990, CH2MHILL.

APPENDIX A

PRELIMINARY OUTLINE OF OVERALL DRAFT PREDESIGN WORK PLAN

Moss-American Site
Draft Predesign Work Plan

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