Kerr-McGee Chemical Corporation

Predesign Work Plan

Moss-American Site
Milwaukee, Wisconsin

28 April 1992
Revision 1: 20 July 1992
Revision 2: 3 August 1992
Final Version: October 1992

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Vernon Hills, Illinois

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8 October 1992

Ms. Bonnie L. Eleder (HSRW-6J)
Remedial Project Manager
U.S. EPA, Region V
77 W. Jackson Blvd.
Chicago, Illinois

Re: Final Version - Predesign Work Plan
Moss-American Site - Milwaukee, WI

Dear Ms. Eleder:

Roy F. Weston, Inc. (WESTON®) on behalf of the settling defendant, Kerr-McGee Chemical Corp. is hereby transmitting the final version of the above-referenced, U.S. EPA-approved Predesign Work Plan.

Should you have any questions regarding this transmittal, please contact us.

Very truly yours,

ROY F. WESTON, INC.

Gary J. Deigan
Senior Project Manager

Kurt S. Stimpson (djs)

Kurt S. Stimpson
Project Director

GJD/KSS/lh
Enclosure

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LIST OF ACRONYMS/ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	Consent Decree
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
LSC	Liquid Solids Contact
MDL	Method Detection Limit
MMSD	Milwaukee Metropolitan Sanitary District
MPB	Maximum 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	Selective Ion Monitor
SOP	Standard Operating Procedure
SOW	Statement of Work
TM	Technical Memorandum
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
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 (1980), placed the Moss-American site in Milwaukee, Wisconsin (the Facility) on the National Priorities List (NPL) in 1983. 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 at 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 (CD) incorporating the Statement of Work (SOW) was signed by Kerr-McGee Chemical Corporation, Inc. (KMCC) on 17 July 1991. The CD was lodged by the U.S. Department of Justice on 28 December 1991. Under this CD, the Settling Defendant (KMCC) will lead in developing and implementing the remedial design and remedial action plan for the Facility.

1.2 FACILITY LOCATION

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, a portion of which is defined as part of the Facility, flows through the eastern portion of the former wood preserving plant site, 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 light 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.

1.3 PURPOSE AND CONTENT OF PREDESIGN WORK PLAN

1.3.1 Overview of Predesign Phase Work Scope

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

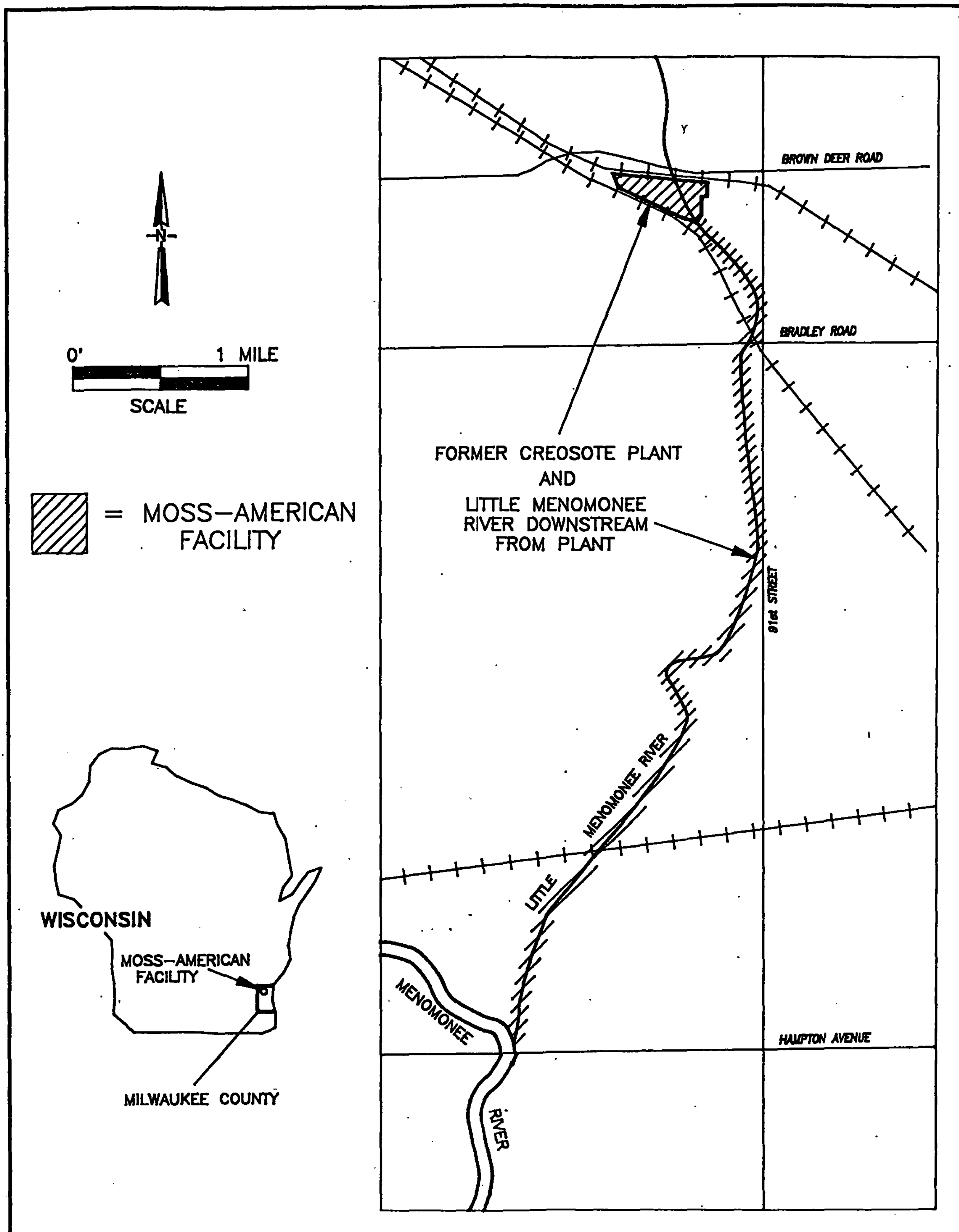
Task I:	Work Plans
Task II:	Additional Studies and Preliminary Remedial Design
Task III:	Remedial Design
Task IV:	Remedial Action
Task V:	Reports and Schedule

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 remedial 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 the 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 that fall into the following four categories:

- 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 will be implemented. Predesign Tasks 1 through 20 are listed below; however, they will not be implemented in the order they are presented. The Interim Predesign Work Plan (incorporated by reference) and this Predesign Work Plan serve to define the scope, schedule, and sequence of task implementation.

In overview, the predesign phase of the RD is comprised of the following tasks (as presented under the four general categories):



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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<u>**Development of Laboratory Analytical Procedures**</u>

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

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.

<u>**Extent-of-Contamination Studies**</u>

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.

<u>**River Remediation**</u>

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.

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.

At the completion of each predesign task, a Technical Memorandum (TM) will be submitted to U.S. EPA for evaluation. This TM will contain a summary of findings, data, and other pertinent technical information, and will provide a technical basis for the subsequent remedial design activities.

1.3.2 Predesign Work Plan Content

This Predesign Work Plan addresses each of the 20 predesign tasks described in the SOW and listed in Subsection 1.2.1. Each of the predesign tasks (except those previously addressed by the Interim Predesign Work Plan) are organized and presented in the following manner:

- Objective - a description of the predesign task objective, as stated in the SOW.
- Subtask Rationale - a brief rationale of the subtasks designed to meet the stated objective.
- Subtasks - a description of the technical approach and work scope for implementing the subtasks.

- Deliverables - a description of the resultant Predesign Task Technical Memorandum and its anticipated content.

- Schedule - a reference to the Predesign Work Plan schedule is made and other predesign tasks are highlighted that may influence the schedule.

For those predesign tasks that were included in the Interim Predesign Work Plan submittal, the objective of each predesign task is restated and a reference is made to the Interim Predesign Work Plan for a description of subtasks, deliverables, and schedule. In this manner, the detail of the Interim Predesign Work Plan is incorporated into this Predesign Work Plan by reference.

KMCC understands that the selection of sample locations and indeed all aspects of this work is subject to the approval by U.S. EPA after a reasonable opportunity for review and comment by WDNR. We trust that U.S. EPA and WDNR recognize that it is not practical, at this time, to define the scope of sampling and investigative activities during the predesign phase, without leaving some flexibility to exercise technical judgment in the field, as data and findings are obtained. KMCC's contractors will communicate such field decisions to U.S. EPA and WDNR, either directly or via U.S. EPA's oversight contractor. However, prior to the start of field work, it will be essential for KMCC, WESTON, and U.S. EPA to establish a protocol for receiving timely approvals from U.S. EPA of such field decisions and judgments.

We have assumed that in some instances, the RI data may be further confirmed by the predesign task implementation. In these instances, both RI data and predesign data may be used to meet the general task goal of obtaining additional data for purposes of performing a remedial design. Therefore, RI data will be considered, where appropriate, and incorporated into the Technical Memorandum of the various predesign tasks.

Please recall that most of the SOW and therefore Interim and Predesign Work Plans were based on the use of RI data. Most predesign tasks were designed to augment RI data. In this sense, we are using the RI data; however, until we have new data in hand to review in conjunction with the RI data, it is not possible to predict all of the situations in which the RI data may be used.

1.4 SCHEDULE OF PREDESIGN TASKS

The sequence, respective timing, and schedule of the various predesign tasks is of significance. Few of the predesign tasks, if any, can be conducted independently of other predesign task data findings and technical evaluations. As outlined in this Work Plan, interdependence exists between a number of predesign tasks. This interdependency may include data needs, resources, or specific coordination between implementation schedules. Figure 1-2 provides a graphical depiction of the necessary and logical phases of predesign task implementation. These phases of predesign work recognize the interdependency between the predesign tasks and provide a rationale for the overall Predesign Work Plan schedule. The Predesign Work Plan schedule is presented as Figure 1-3.

KMCC believes the predesign phase schedule is reasonable and realistic, given the magnitude of the predesign scope of work and the interdependence of the predesign tasks (see Figure 1-2). We have included a significant amount of task overlap in the schedule. We have also considered seasonal limitations in conducting certain predesign tasks with significant field activities. Further, until additional progress can be made and findings reported for the Predesign Task 16 Phase I treatability studies, we have provided a footnote on the schedule indicating that there is a potential that additional laboratory-scale testing will be required. This additional testing would then extend the overall duration of the predesign phase.

1.5 PROJECT ORGANIZATION

KMCC has contracted with Roy F. Weston, Inc. (WESTON®) to serve as the engineer during the predesign phase. KMCC and WESTON will develop and implement the Predesign Work Plan pursuant to the requirements of the SOW. Various subcontractors will be solicited to assist in implementing the Predesign Work Plan. All subcontractors will work under the direction of WESTON.

Figure 1-4 presents an organization chart for the Predesign Work Plan activities.

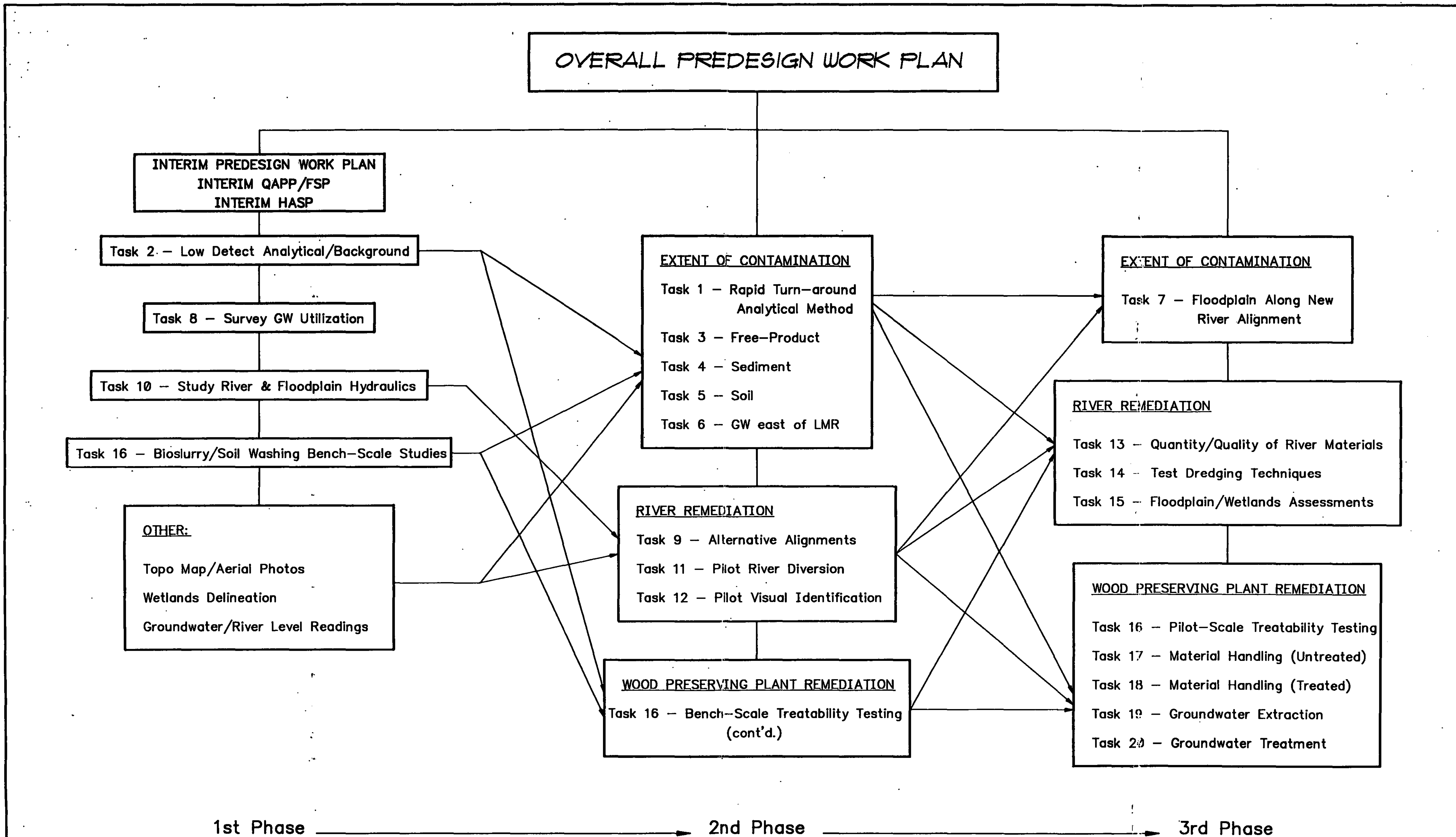

FIGURE 1–2

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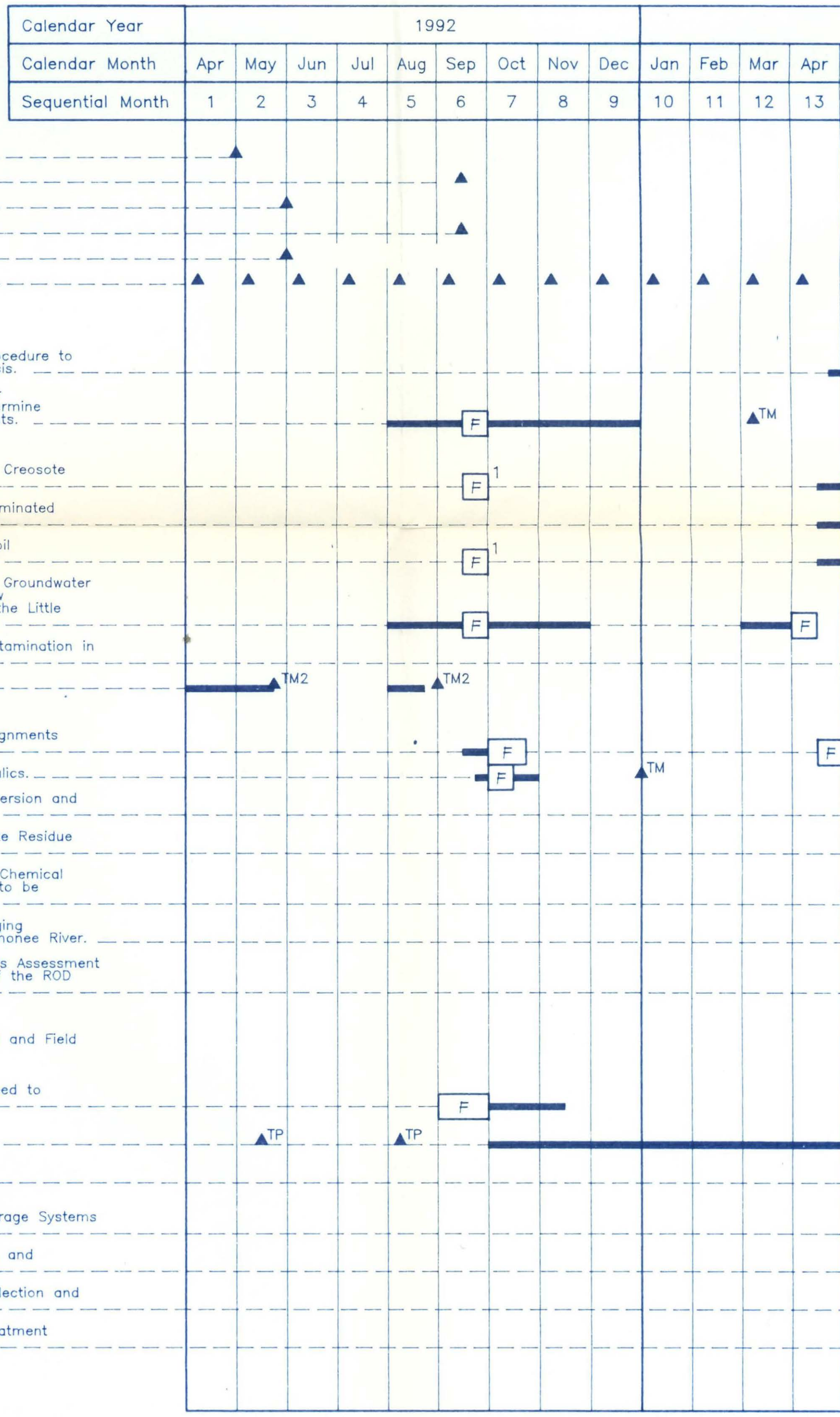
Three Hawthorn Parkway
Vernon Hills, Illinois
60061

SEQUENCE of PREDESIGN PHASES

MOSS – AMERICAN SITE
Milwaukee, Wisconsin



1. Project Plans
   - Draft Predesign Work Plan
   - Final Predesign Work Plan Approval
   - Draft Predesign QAPP
   - Final Predesign QAPP Approval
2. U.S. EPA Obtain Site Access Agreements
3. Progress Reports
4. Implement Predesign Tasks

Development of Laboratory Analytical Procedures

- Predesign Task 1 –– Refine or Develop an Analytical Procedure to Measure CPAH Concentrations on a Rapid Turnaround Basis.
- * 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.
  - Phase Ia&b Treatability Testing (Bench-Scale)
  - Phase II Treatability Testing (Field-Pilot Scale)
- 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.

LEGEND

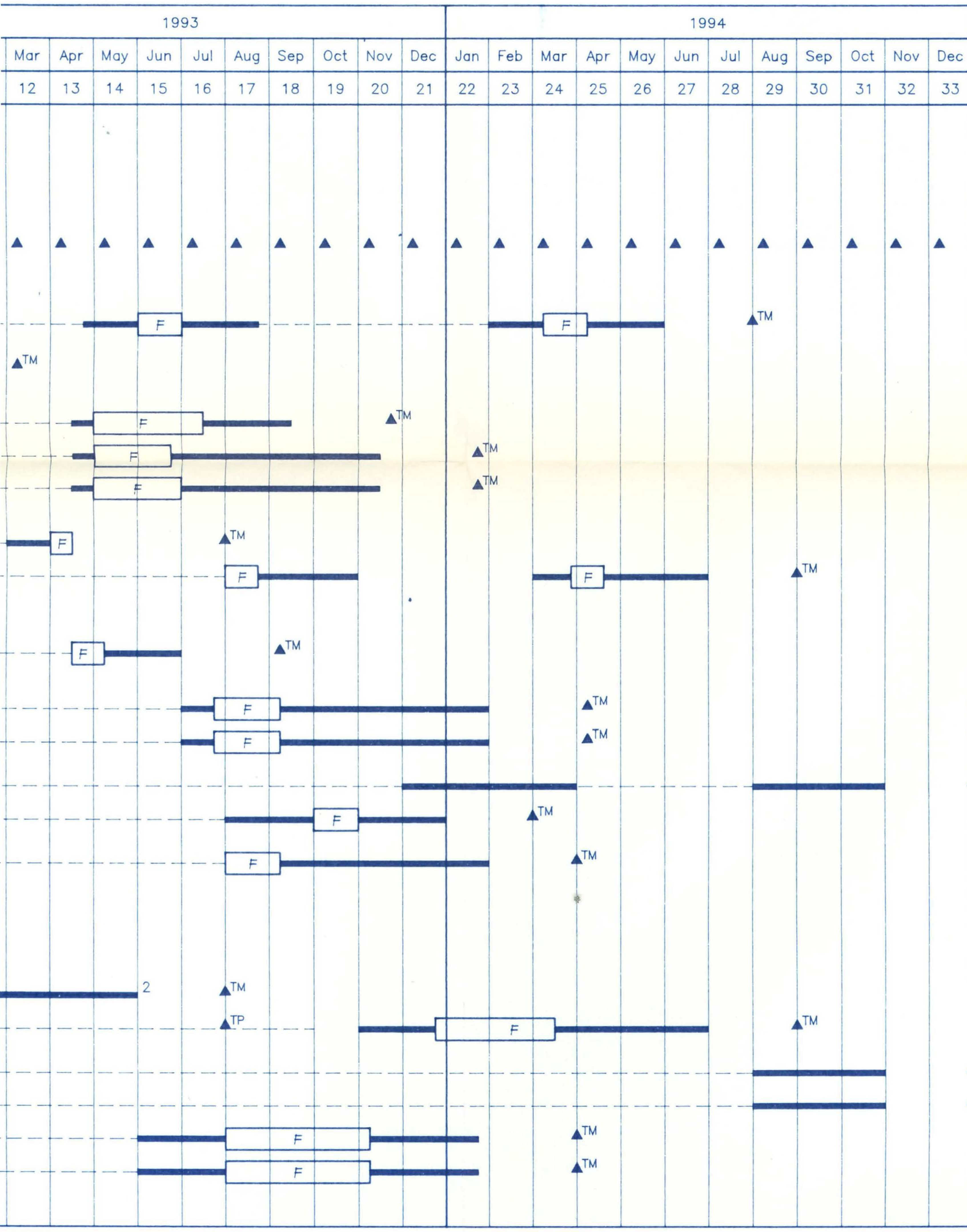
*	Denotes Tasks that have been initiated under Interim Predesign Work Plan
▲	Deliverable to US E.P.A./WDNR
TM	Technical Memorandum
TP	Test Plan
▬	Task Duration
F	Field Activity and Duration

FOOTNOTES

1. The geophysics subtask of these tasks will be conduc

2. Pending an evaluation of the results of Phase I Trea the determination may be made, in consultation with that an additional phase of laboratory-pilot testing w to undertaking a field-pilot scale program. As shown schedule for Predesign task 16 does not reflect this laboratory testing. In the event that findings from Ph testing determine the need for additional laboratory- the overall schedule for Predesign Task 16 is expecte by 6 to 8 months, from that shown above.

Draft Predesign Work Plan
Date: 30 July 1992
Revision No.: 1



s will be conducted during this period.

of Phase I Treatability Testing,
onsultation with U.S. EPA and WDNR,
-pilot testing will be necessary prior
gram. As shown above, the planned
not reflect this additional phase of
findings from Phase Ia & b treatability
onal laboratory-scale testing, then
k 16 is expected to be extended
above.

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60061

FIGURE 1-3

PREDESIGN PHASE PROJECT SCHEDULE

MOSS-AMERICAN SITE
Milwaukee, Wisconsin

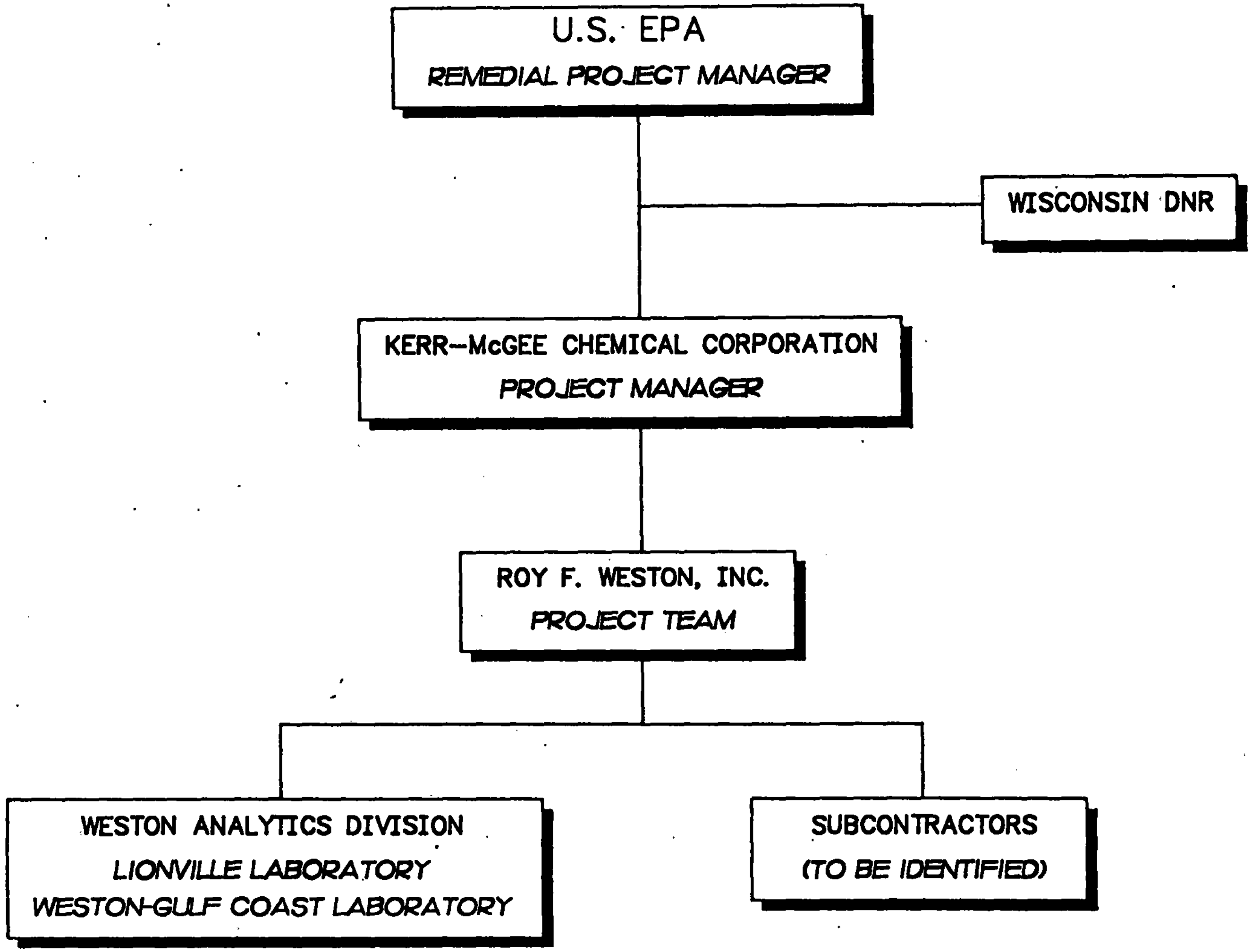

FIGURE 1-4

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

PROJECT ORGANIZATION CHART
PREDESIGN WORK PLAN
MOSS-AMERICAN SITE
Milwaukee, Wisconsin

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SECTION 2

PREPARATION OF PROJECT PLANS

2.1 INTERIM PREDESIGN WORK PLAN

KMCC and WESTON prepared an Interim Predesign Work Plan in order to obtain U.S. EPA concurrence with initiating predesign work of the SOW, in advance of the lodging date of the CD. This document, titled Final Interim Predesign Work Plan and dated 3 December 1991, is incorporated by reference into this Predesign Work Plan. Also incorporated by reference is U.S. EPA's 12 March 1992 related comment letter.

The Interim Predesign Work Plan details the approach to conducting the following predesign tasks:

- 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 studies of river and floodplain hydraulics (Predesign Task 10).
- Conducting a wetlands delineation (Leading to Predesign Task 9 and 15).
- Initiating work associated with conducting laboratory bench scale tests of the biological and soil washing treatment technologies (Predesign Task 16).
- Initiating work associated with identifying and testing groundwater treatment technology (Predesign Task 20).

The Interim Predesign Work Plan also details the approach to conducting the following related predesign work:

- Developing current site topographic and property plans.
- Identifying ARARs, permits, and site access requirements associated with implementing the RD/RA for the Facility.

2.1.1 Interim QAPP/FSP

A Draft Interim Quality Assurance Project Plan and appended Field Sampling Plan (QAPP/FSP) was submitted to U.S. EPA and WDNR on 18 November 1991. This Draft QAPP/FSP presents the organization, objectives, functional activities, and specific Quality Assurance/Quality Control (QA/QC) activities associated with conducting Predesign Task 2. The scope of Predesign Task 2 relates to the determination of background concentrations of CPAHs in soils and sediments. This determination is important in that cleanup standards are established in the SOW at either risk-based levels or area background concentrations, whichever is greater. This predesign task data is essential to designing the site remedial systems and to define the extent of remediation to be conducted at the facility. These data uses require a system of procedures to ensure a uniform and approved program of quality assurance; therefore, the Interim QAPP/FSP was developed.

U.S. EPA provided review comments on the 18 November 1991 Draft QAPP/FSP. WESTON and KMCC submitted document revisions in response to these review comments on 28 February 1992. A Final QAPP/FSP will be submitted by WESTON and KMCC following the completion of an analytical method performance study and will address comments received from U.S. EPA and WDNR on our 28 February 1992 submittal.

2.1.2 Interim Health and Safety Plan

WESTON and KMCC have prepared an Interim Health and Safety Plan (HASP) consistent with the requirements of 29 CFR 1910.120. The Interim HASP addresses safety protocols associated with implementation of the Interim Predesign Work Plan field activities, and was developed specific to the Moss-American facility. The HASP provides guidelines to ensure that the predesign tasks are performed safely, in accordance with all applicable regulatory requirements; and that all persons at the facility, the general public, and the environment are protected from potential exposure to contaminated material.

The final Interim HASP was submitted to U.S. EPA on 25 October 1991, and incorporated U.S. EPA comments dated 4 September 1991 pertaining to the Draft Interim HASP. The

Final Interim HASP is incorporated by reference as part of the Project Plans of the Predesign Work Plan.

2.2 PREDESIGN PHASE QUALITY ASSURANCE PROJECT PLAN

As required by the SOW, a predesign phase QAPP will be prepared for submittal to U.S. EPA within 30 days of the Draft Predesign Work Plan submittal.

The predesign phase QAPP will address systematic quality assurance and quality control protocols to be followed in implementing the Predesign Work Plan. The QAPP will be prepared in accordance with applicable 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 Chen-Wiu 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 that predesign data gathered in support of engineering design is consistent with the goals of accuracy, precision, completeness, and representativeness.

2.3 PREDESIGN PHASE HEALTH AND SAFETY PLAN

The Interim HASP addressed those predesign tasks that were incorporated into the Interim Predesign Work Plan and included the basic safety standards and protocols required during routine reconnaissance, site sampling, and surveying field activities. Due to the sequence, respective timing and schedule for conducting the various predesign tasks, a single HASP covering all field work to be performed is not practical or beneficial to site project personnel. Instead, individual task or multi-task-specific amendments to the Interim HASP will be prepared for those predesign activities that require field work on the facility. Those predesign tasks that will require an amendment to the Interim HASP are summarized as follows:

- HASP Amendment No. 1 - will address the predesign tasks to be implemented during the first field work season. The predesign tasks to be included in this amendment will be:

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.

River Remediation

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

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.

Former Wood Preserving Plant Remediation

Predesign Task 16 -- Conduct Laboratory (Bench 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.

- HASP Amendment No. 2 - will address the predesign tasks anticipated to be implemented during the second and third field investigation seasons. The predesign tasks to be included in the second amendment will be:

Extent-of-Contamination Studies

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

River Remediation

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 Section 10.2.2 of the ROD and Section II.B.10 of this SOW.

Former Wood Preserving Plant Remediation

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

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

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

The HASP amendments will consist of a task-specific hazards analysis that will supplement the principal information contained in the detailed Interim HASP. The HASP amendments will be submitted to U.S. EPA for review not less than 45 days prior to the planned start of field work for the predesign tasks addressed in the amendment. This period will allow U.S. EPA and WDNR reasonable opportunity to review and comment on HASP amendments prior to the start of field activities.

SECTION 3

DEVELOPMENT OF LABORATORY AND ANALYTICAL PROCEDURES

3.1 PREDESIGN TASK 1 -- REFINE OR DEVELOP AN ANALYTICAL PROCEDURE TO MEASURE CPAH CONCENTRATIONS ON A RAPID-TURNAROUND BASIS

3.1.1 Objective

As stated in the SOW:

> *"...The goal of this predesign task is to develop a new field-screening procedure for quantifying the concentration of CPAHs with accuracy and detection limits that correlate to the cleanup standards. The new field screening procedure may involve either a direct measurement of CPAHs or a surrogate measurement which is demonstrated to correlate reliably with the CPAHs. In evaluating potential analytical procedures, priority will be placed upon techniques that yield satisfactory results as rapidly as possible. Both field-based and fixed laboratory procedures may be evaluated...."*

The objective will be accomplished through the implementation of subtasks.

3.1.2 Subtask Rationale

To accomplish the objective of Predesign Task 1, the following goals will be addressed in the subtasks outlined in Subsection 3.1.3:

- Identify field screening analytical procedures.
- Identify field laboratory analytical procedures.
- Conduct laboratory and field tests of identified procedures.

After a literature review identifies potential analytical procedures, one or more procedures will be evaluated concurrently with other predesign pilot, field, and laboratory tests, including parallel analysis of samples by a U.S. EPA-approved fixed laboratory method.

As will be discussed in Subsection 4.4.3, a number of soil samples designated as "archive samples" will be collected during extent of soil contamination studies (Predesign Task 5).

These samples will be analyzed for CPAHs by standard U.S. EPA analytical methods at the laboratory and then will be used to evaluate rapid-turnaround methods identified in this predesign task. In addition, field-performed screening and laboratory analytical methods will be tested during this and other predesign tasks.

The discussion of subtasks in Subsection 3.1.3 details the work scope that addresses these goals.

3.1.3 Subtasks

3.1.3.1 Identify Potential Analytical Procedures

Several methods will be used to identify potential analytical procedures. Vendor inquiries and on-line literature databases will be reviewed for rapid-turnaround methods that have been used for CPAH analysis. The literature search will include U.S. EPA-approved procedures that have been used for similar contaminants of concern. As appropriate, advice may be solicited from U.S. EPA national and regional laboratories regarding current state-of-the-art technology in the area. The preliminary evaluation criteria in method selection will include:

- The field screening and field laboratory methods must meet or correlate with the detection limits imposed by the cleanup standards.
- The method(s) must be technically reliable.
- The field laboratory method must allow at least 10 samples to be analyzed within 8 hours.
- The field screening method results should be available on a real-time basis of within approximately 4 hours. The field laboratory results should be available within 24 hours.
- The method(s) must use available or emerging technology.
- Agency approval of the method(s) must be obtained within a reasonable timeframe.

The following applicable field screening methods have been identified as potential candidates:

- Ultraviolet absorbance.
- Ultraviolet fluorescence.
- Enzyme-linked immunoassay.
- Total extractable organic carbon.
- Infrared absorbance.

The following applicable field laboratory methods have been identified as potential candidates:

- Gas chromatography-flame ionization detector (GC-FID)
  Method 8100
  Method 8274

- High performance liquid chromatography (HPLC)
  Method 8310.

3.1.3.2 Conduct Laboratory and Field Testing of Analytical Methods

After the review and preliminary evaluation are completed, one or more methods will be selected for further study to establish the reliability of the method(s) and to demonstrate the ability to meet the evaluation criteria presented in Subsection 3.1.3.1. Soil samples collected during Predesign Task 5 will be used as sample materials during this study. Thus, the laboratory evaluations, as well as any field testing, will be performed with the same soil or sediment matrix that will be subjected to the rapid-turnaround analysis during RA phases.

For each rapid-turnaround field screening and field laboratory method evaluated, at least 10 samples will be analyzed in parallel by standard U.S. EPA analytical Methods 8310 or 8270 in a fixed laboratory, and the correlation between the two analytical methods will be determined.

3.1.4 <u>Deliverables</u>

The results of the literature review and analytical methods evaluation will be summarized and presented to the agency as a Technical Memorandum (TM). The TM for this task will identify the most suitable rapid-turnaround method(s) for the facility and will provide standard operating procedures (SOPs) to be followed when the method is used during subsequent stages of the remedial action. A draft TM will be submitted to the Agency for comment prior to the submission of the final TM for this predesign task.

3.1.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 1. The schedule for conducting Predesign Task 1 will be coordinated closely with the schedule for conducting Predesign Task 5 (further define extent of soil contamination).

The draft predesign TM covering this task will be delivered to the agency within 60 days of the receipt of corresponding analytical data. The final predesign TM will be delivered within 30 days after receipt of written comments from the agency on the draft TM.

3.2 PREDESIGN TASK 2(a) - DEVELOP ANALYTICAL PROCEDURE FOR QUANTIFICATION OF CPAHs AT LOW DETECTION LIMITS

As stated in the SOW:

> "... *This predesign task will explore available analytical laboratory procedures to accurately quantify CPAHs in soil and sediment. This predesign task will be implemented to allow accurate quantification of background CPAH concentrations in areas of the Little Menomonee River upstream of the Facility, tributaries to stream segments, floodplain areas, and in soils. Methods considered will be restricted to a highly controlled, fixed laboratory setting. U.S. EPA Region V national and regional laboratories will be consulted on the availability of low detection limit procedures currently accepted under the contract laboratory program (CLP) and RCRA, as well as emerging technologies....*"

A low-detection-limit analytical method, utilizing selective ion monitor (SIM) with GC/MS and standard Method 8310, will be evaluated under this predesign task. The following subtasks will be included: further evaluation of the SIM GC/MS method; administration of a method detection limit study; administration of method performance study utilizing a soil and sediment matrix; and preparation of a standard operating procedure (SOP) and a task-specific Quality Assurance Project Plan (QAPP).

The Interim Predesign Work Plan and Interim QAPP/FSP referenced in Subsection 2.1 provide additional detail on methodologies to be utilized in conducting Predesign Task 2(a). Work under Predesign Task 2(a) has been initiated in accordance with these referenced project plans.

SECTION 4

EXTENT-OF-CONTAMINATION STUDIES

4.1 PREDESIGN TASK 2(b) - DETERMINE BACKGROUND CONCENTRATION OF CPAHS IN SOILS AND SEDIMENTS

4.1.1 Objective

"This predesign task will be implemented to allow accurate quantification of background CPAH concentrations in areas of the Little Menomonee River upstream of the Facility, tributaries to stream segments, floodplain areas, and in soils....

In determining the background CPAH concentrations in sediments, Settling Defendant shall consider such factors as current velocity, sediment particle size, organic carbon content, and adjacent land use in the development of the sampling and analysis plan. Similarly, in determining CPAH background concentrations in soils, Settling Defendant shall consider soil characteristics, vegetative cover, adjacent land use, and topography."

A detailed description of the technical approach, sampling rationale, and procedures for conducting Predesign Task 2b have been presented in the Interim Predesign Work Plan and the Interim QAPP/FSP, which are referenced in Section 2 of this Work Plan.

4.2 PREDESIGN TASK 3 - DEFINE THE EXTENT OF FREE-PRODUCT CREOSOTE RESIDUES

4.2.1 Objective

As stated in the SOW:

"...During the predesign phase, the horizontal and vertical extent of the creosote layer shall be investigated through the installation of borings and monitoring wells. Prior to initiation of drilling, however, other methods of determining or predicting the distribution of free creosote residues will be evaluated. The investigation will focus around the location (MW081[I]) where free-product creosote was previously detected.... Results of this predesign task will be used to

determine the feasibility of removing the free product prior to management. The quantity, location, depth, stratigraphic setting and physical/chemical nature of the material will be defined. Feasible product recovery systems will be identified based upon these findings...."

These objectives will be accomplished through the implementation of subtasks.

4.2.2 Subtask Rationale

In order to accomplish the Predesign Task 3 objectives, the following information will be required:

- Detailed stratigraphic descriptions of subsurface materials containing free-product creosote.
- Lateral definition of free-product occurrence.
- Vertical definition of free-product occurrence.
- Physical nature of free product in subsurface.

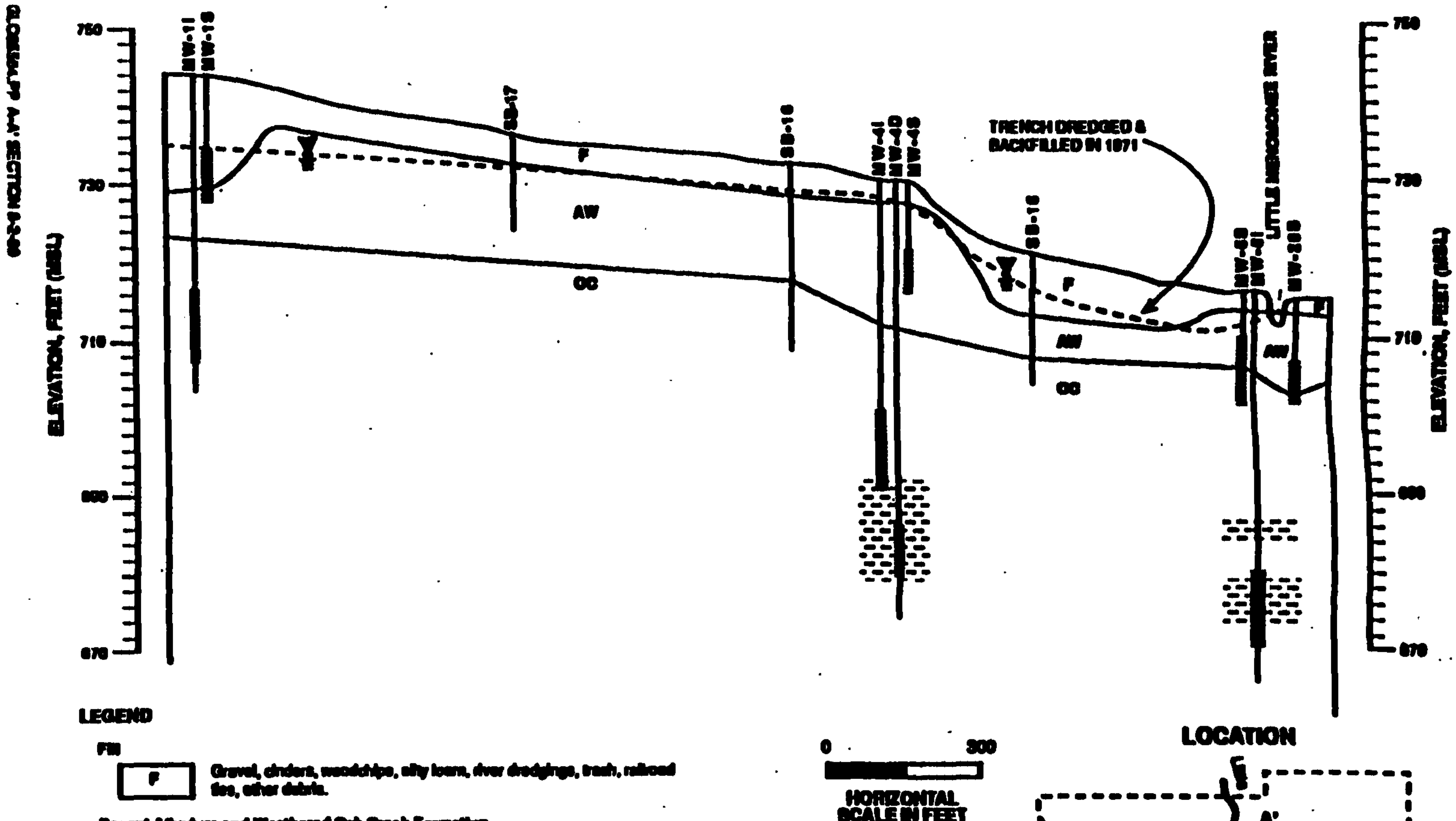
This predesign task also provides data for the following predesign tasks:

- Predesign Task 5 - Further Define the Extent of Soil Contamination.
- Predesign Task 19 - Identify and Test Groundwater Collection and Extraction Technologies.
- Predesign Task 20 - Identify and Test Groundwater Treatment Technologies.

The following subsections provide a brief description of site geology and RI findings regarding free-product occurrence at the facility. This information establishes the rationale for the subtasks presented in Subsection 4.2.3.

4.2.2.1 Site Geology

According to the RI report, the Moss-American site overlies a thin surficial water-bearing unit, which in turn overlies a thick confining bed (Figure 4-1). The surficial unit has a total thickness of approximately 10 to 25 feet and a saturated thickness of approximately 8 to 16



LEGEND

Fill

F — Gravel, cinders, woodchips, silty loam, river dredgings, trash, railroad ties, other debris.

Recent Alluvium and Weathered Oak Creek Formation

AW — Fine-grained flood deposits, sand and gravel channel deposits, brown silty clay till, with interbedded red, brown and gray lacustrine clays, silts and sands.

Oak Creek Formation

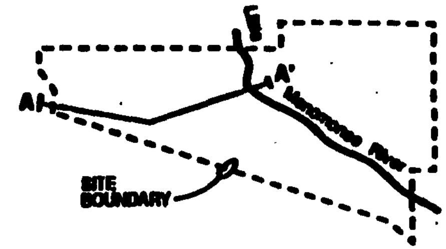
OC — Dense gray silty clay till with interbedded silts, clays and fine sands.

Laminated or thinly bedded clays, silts and fine sands

SB — SOIL BORING

MW — MONITORING WELL AND SCREENED INTERVAL

LOCATION



The depth and thickness of the subsurface strata indicated on the section (profile) were generalized from and interpolated between test borings. Information on actual subsurface conditions exists only at the specific locations indicated.

FIGURE 4-1

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

GEOLOGIC CROSS-SECTION OF
MOSS – AMERICAN SITE
(Adapted from Figure 2-4 of R.I. Report)
MOSS – AMERICAN SITE
Milwaukee, Wisconsin

feet. The unit consists of extensive fill material, alluvial deposits, and, at its base, several feet of weathered till. The low average permeability of the surficial water-bearing unit, combined with its limited saturated thickness, would not yield sufficient water to classify it as an aquifer yielding sufficient quantities for residential or commercial use. The underlying confining bed is the unweathered Oak Creek Formation, which is predominantly a dense, silty clayey till with low permeability.

4.2.2.2 Delineation of Free Product During EPA's Remedial Investigation

According to the RI report, 2 to 3 feet of free-phase creosote was present in one monitoring well (MW-8S). A layer of creosote and/or oil was also noted during development of a second well (MW-4S), but the product layer did not return following well development. Oil sheens or creosote were also noted in the groundwater in several test pits within 200 feet of the former settling ponds and in one pit in the southeast landfill. Based on these occurrences of apparent free-phase material, an area of approximately 130,000 square feet, covering parts of the former settling ponds and treated storage area, was defined by the RI as the extent of free-phase contamination (Figure 4-2).

Monitoring well MW-8S is screened across a 5-foot interval in the surficial unit. (Figure 4-1, which is adapted from the RI report and shows a 10-foot screen for MW-8S, is believed to be incorrect.) The bottom of the screen extends to the contact between the surficial unit and the underlying Oak Creek Formation. According to the boring log for the well, the surficial unit at this location consists of thin interbeds of silt, clay , and sand. A silty sand layer of approximately 2 feet in thickness intersects the top of the well screen and may be the probable source bed for the creosote that accumulated in the well. The well logger noted that the sand layer had "oil in seams." The top of this sand is approximately 7 feet below the ground surface.

Monitoring well MW-4S is also screened across a 5-foot interval in the surficial unit. The bottom of the screen extends to a depth of approximately 14 feet below ground surface. According to the boring log for MW-4S, the surficial unit at this location consists of sand and gravel fill underlain by thin layers of sand, clay and silt. The log notes that both a silty sand layer from a depth of 2 to 6 feet and a silt layer from 10 to 12 feet "contains oil or creosote." The silty sand layer was also described by the log notes as black, possibly from creosote tar and/or oil. The bottom of the screen coincides with the top of a silty clayey layer that also was noted as having "oil and creosote on some surfaces." The fact that a product layer was observed during well development but did not return to the well following development may indicate that the source bed for the creosote at this location is the black silty sand above the well screen. In addition, the creosote observed on the soil may not

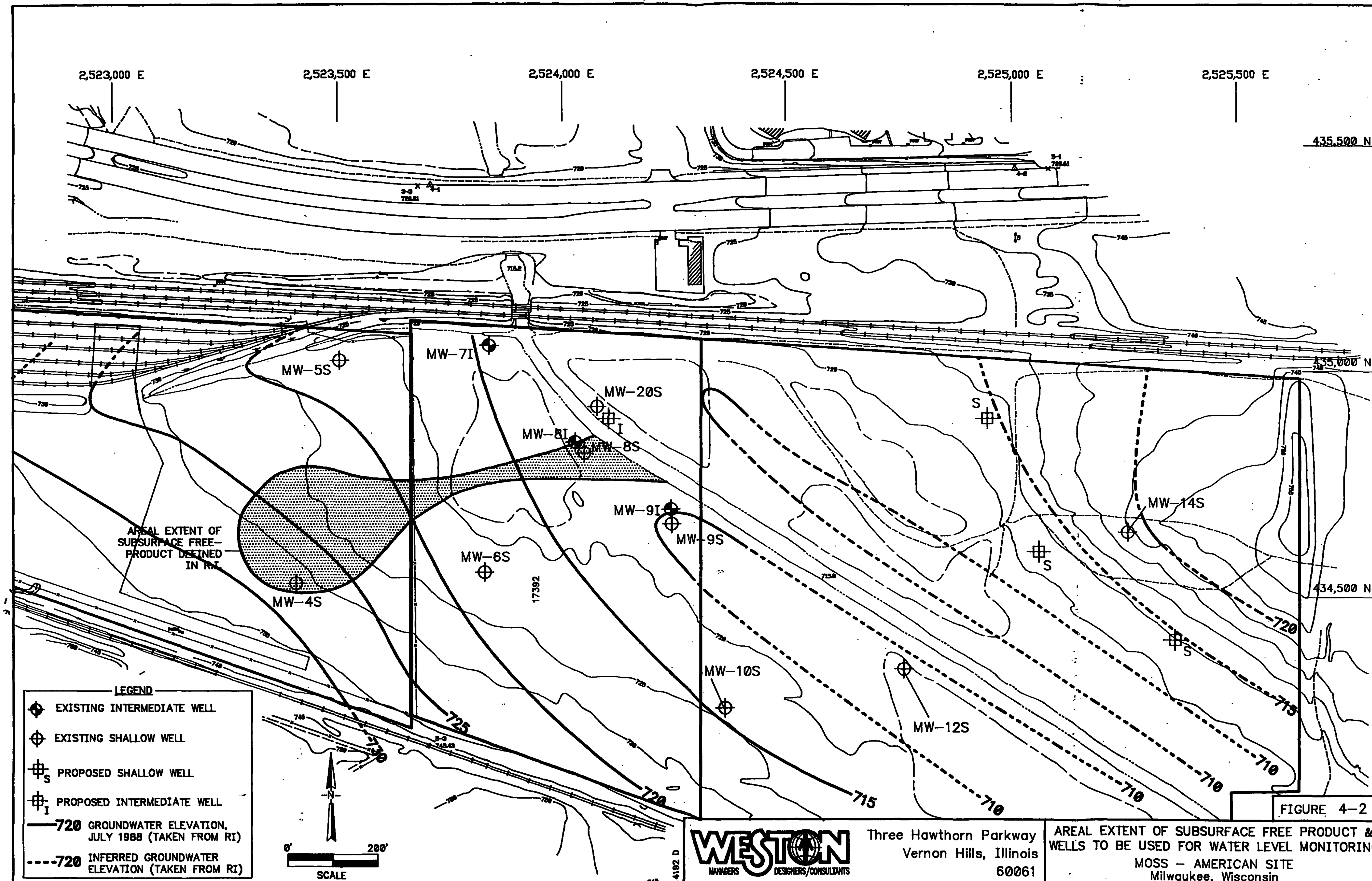


FIGURE 4-2

AREAL EXTENT OF SUBSURFACE FREE PRODUCT & WELLS TO BE USED FOR WATER LEVEL MONITORING
MOSS – AMERICAN SITE
Milwaukee, Wisconsin

have been mobile, and therefore did not migrate to the well screen and into the well. Clarifications to these interpretations and technical uncertainties will be sought by the scope of Predesign Task 3.

4.2.3 Subtasks

Four subtasks will be conducted to accomplish the objectives of this predesign task:

- A geophysical survey, using the technique of direct current (DC) resistivity.
- Placement of multiple soil borings with detailed field logging and soils description, based on the results of the geophysical survey.
- Conversion of selected soil borings into temporary monitoring wells.
- Obtaining several rounds of product thickness measurements and field testing of free-product mobility.

Each of these planned subtasks is discussed in Subsections 4.2.3.1 through 4.2.3.4. The term "free-product creosote" is used herein to refer to recoverable liquid creosote contained in subsurface pore spaces.

4.2.3.1 Geophysical Survey by DC Resistivity

A subsurface direct current (DC) electrical survey will be conducted in the area suspected to contain free-product creosote. Local changes in DC resistivity are expected if a layer of free product is present in the subsurface environment. Although the minimum detectable thickness of a free-product layer is a function of site-specific conditions, it is expected to be within the range of 1 to 10 inches.

The geophysical survey will be conducted utilizing a DC resistivity application. The resistivity application to be used is the DC Schlumberger array. The geophysical data acquisition will consist of electrical profiles and electrical soundings. A brief overview of the approach to utilizing the DC Schlumberger array follows. A brief description of data acquisition, data processing, data interpretation, and data presentation is also included.

DC Resistivity

DC resistivity methods are used to investigate the distribution of the electrical potential or potential gradient of a direct current in the ground. To accomplish this procedure, current is passed through the ground by current electrodes, and the potential difference is measured between the potential electrodes. The resistivity of the medium is calculated from the ratio of the electric-field intensity (i.e., the potential) to the density of the current (current electrodes).

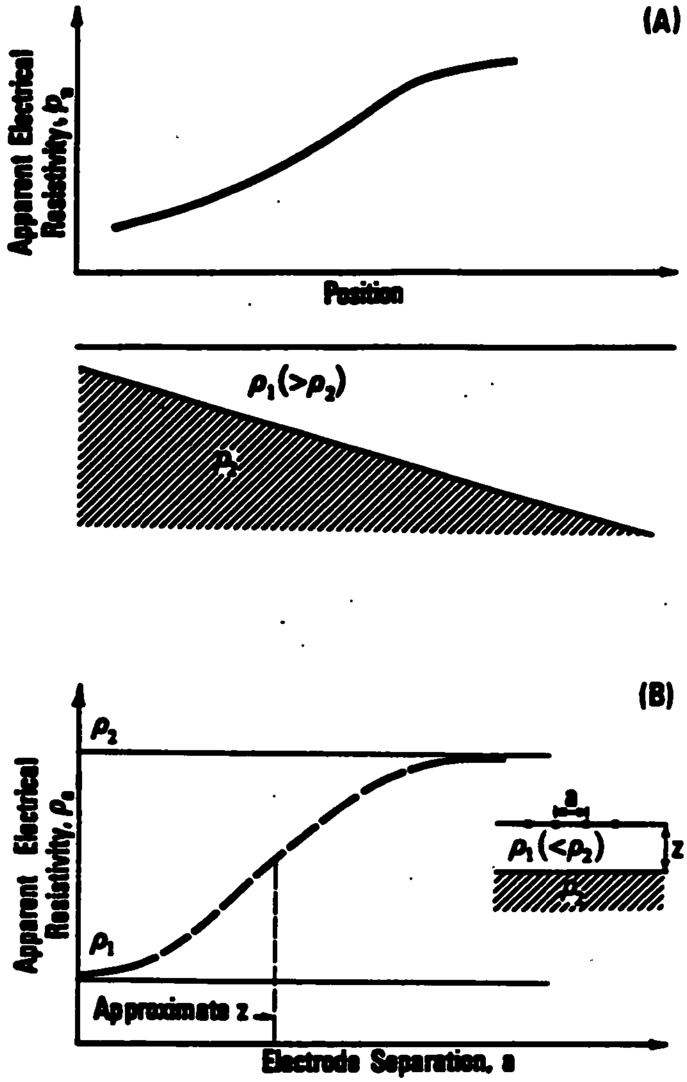
DC resistivity methods have proven useful in practice and serve to solve many geological engineering problems. Various types of geological media differ from one another, e.g. porosity, mineral content, chemical content, etc. These general differences influence the resistivity of geological media. Figure 4-3 is a schematic diagram showing the effects of electrode spacing over geological media with an upper layer of high resistivity and a lower layer of low resistivity.

Because the free-product creosote is an insulator rather than a conductor, apparent resistivity values will be high in the soil medium containing the free product and low in soil areas absent of free product. Therefore, in a conductive geological environment, DC resistivity will be used to delineate the major boundaries of the free product. In addition, approximate thickness calculations of the free product will be made from the resistivity data.

Locating Non-Conductors by Resistivity Profiling

In this predesign task, the target of interest at the Moss-American site is free-product creosote residue which can be characterized as an insulator. The presence of a hydrocarbon product in the pore structure of a geologic medium, displacing water, should increase the resistivity of that medium substantially. Therefore, as discussed previously, the apparent resistivity measurements over the free-product area should be significantly higher than the apparent resistivity measurements in the absence of the free product.

Locating sufficiently large resistivity inhomogeneities is not difficult. However, the effect of a relatively thin non-conductor (free product creosote residues) on the apparent resistivity curves is usually moderately distorted by the host medium (subsurface soil strata). For these reasons, the most suitable profiling method to use to locate thin non-conductors is the middle gradient method. Utilizing this method, the current electrodes remain stationary and the resistivity curve reflects the changes in the resistivities in the vicinity of the measuring electrodes.



(A) Profiling. When electrode separation is large compared with depth to interface, the influence of ρ_2 is relatively large; when the electrode is small compared with depth to interface, the influence of ρ_2 is small. (B) Depth Sounding. For infinitesimally small electrode spacing the true ρ_1 is obtained while for infinitely large electrode spacing the true ρ_2 is obtained; but for spacing in between, an apparent resistivity ρ_a is obtained, where $\rho_1 < \rho_a < \rho_2$.

FIGURE 4-3

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Three Hawthorn Parkway
Vernon Hills, Illinois
60061

RESISTIVITY PROFILING AND SOUNDING CURVES
MOSS - AMERICAN SITE
Milwaukee, Wisconsin

Geophysical Data Acquisition, Processing, and Interpretation

The geophysical resistivity data acquisition will be initiated with vertical electrical soundings. The sounding data will be used to establish depth control, and will also be used to determine the electrode spacings for the resistivity profiling measurements. Vertical electrical soundings are used to characterize the vertical changes in geology. When the target of interest is recognized from the vertical soundings, the current electrodes will be set constant and horizontal profiles will be initiated.

During the initial sounding measurements, apparent resistivity values will be calculated and plotted so as to evaluate the integrity of the geophysical formats. These formats include electrode spacing, current source, current value, array orientation, and other factors. Resistivity soundings are used to detect vertical changes in apparent resistivity. Often, the direction of expansion of the electrode array is constrained by geological and/or non-geological effects.

The depth of current penetration is controlled in part by the distance between the current electrodes. The current electrodes of a Schlumberger array are moved in logarithmic intervals. Logarithmic intervals may cause the voltage drop to become too small to be accurately measured; in this instance, the potential electrodes must then be moved farther apart. When the potential electrodes are expanded, then overlap measurements will be made. The overlap measurements account for ground inhomogeneities that might be encountered by the new location of the potential electrodes.

In the field notebook, each sounding will be identified by location, orientation, and array type. The general environment will be clearly described, and any peculiarities, such as the reasons for the choice of a particular orientation, will be documented. Documentations of changes in current strengths, voltage levels, etc. will be made.

During the resistivity measurements, array parameters are kept constant along a traverse. Therefore, documentation of array type and electrode spacing, current settings and voltages ranges, will be listed on page headers of the field log. Station numbers, resistance and other remarks however, will be recorded at each individual station. Current ranges and voltage ranges will be noted, if they vary. Specific comments will be made in the field logs regarding changes in soil type, vegetation or topography, as well as non-geological effects.

Resistivity profilings are used to detect lateral changes in apparent resistivity. The resistivity profiling spacings will be determined after several resistivity sounding transects are completed at the study areas of the Moss-American site. The resistivity profilings will be made with the potential electrode spacings being one-third of the current electrode spacings.

Once the geophysical measurements are fully implemented, the potential difference will be recorded along with the current value for each type of measurement. These values are used to calculate the apparent resistivity of the local geology. The data will be stored on a computer and preliminary geophysical models will be calculated. The data processing will involve electronic and geologic noise removal where applicable. In addition, data will be deconvoluted where applicable.

Upon completion of the data acquisition and data processing, the data will be used to calculate final inverse geophysical models. Solving for the inverse problem is achieved by describing the geometric character of a body using the observed subsurface data. These geophysical models will then describe the local subsurface geology. The geophysical measurements will be used to characterize the geometric properties for the creosote and the site geology.

4.2.3.2 Soil Borings

The information obtained from the geophysical survey will be used to assist in selecting soil boring locations to best define the area(s) where free product creosote is present. Final soil boring locations will be selected using RI report results, professional judgment, as well as geophysical results. Regardless of geophysical results, several borings will be located in the vicinity of MW-8 and MW-4, the two locations where free product was documented in the RI. A maximum of 20 soil borings is anticipated. For maximum efficiency, boring locations conducted under Predesign Task 5 (Define Extent of Soil Contamination) will be used for this subtask where appropriate. Following completion, boring locations will be surveyed or located remotely via a global positioning system (GPS).

The borings will be advanced with 3.25-inch inner diameter (ID) hollow stem augers and will be sampled continuously with a standard split-spoon sampler. It is anticipated that the borings will not exceed 15 feet in depth, based on the occurrences of free product creosote identified by the RI boring data. Logging of the borings will be performed with careful attention to both lithologic description and discrimination between free product and immobile creosote residues. Specifically, a high potential for free product will be assigned to soil samples in which coarse-grained materials are observed to be saturated with creosote oil. In contrast, partial creosote residue saturation in low permeability soils and simple creosote staining will be considered evidence of immobile creosote residue.

If potential free product is encountered in a split-spoon sample core, the borehole will not be advanced beyond the depth of the soil layer containing the free product. This procedure will ensure that there are no pathways created for downward migration of the free product.

Photographs will be taken to document occurrences of free product in the split-spoon sample cores.

The drill rods, hollow-stem augers, and split-spoon samplers will be steam-cleaned between boreholes. Between samples at a borehole location, the split-spoon samplers will be cleaned with an Alconox solution and a potable water rinse. More rigorous decontamination of the split-spoon samplers is unnecessary because there will be no soil samples collected for analysis as part of this subtask.

Upon completion of each borehole, it will either be abandoned or converted to a temporary monitoring well, as specified in Subsection 4.2.3.3. The abandonment procedure will consist of backfilling with Volclay grout or equivalent as the hollow-stem augers are withdrawn from the borehole. If saturated conditions are present in the borehole, the Volclay grout will be emplaced using a tremie pipe.

4.2.3.3 Temporary Monitoring Well Installation

Temporary monitoring wells will be installed to evaluate free product mobility at locations determined from the results of the soil boring and geophysical survey subtasks. It is anticipated that 10 temporary monitoring wells will be installed for this purpose. Well construction will comply with Wisconsin Administrative Code NR141. The wells will be constructed of Schedule 40, 2-inch diameter PVC casing and screen. Five-foot or 10-foot screens will be installed at the depth(s) where potential free product is observed during the soil boring subtask. The size of the screen openings will be 0.020 inches ("20-slot"), with an intake area of 12.80 square inches per foot of screen length. The large slot size will allow maximum conductance for free product. The anticipated depth of installation for the temporary wells is from 10 to 20 feet below grade. The 10-foot screen will be used in the deeper boreholes and will maximize the potential for interception of potential free-product layers. The wells will be installed inside 3.25-inch ID augers and the augers will be slowly withdrawn as a sand pack is placed around the well screen. The sand pack will consist of 0.039- to 0.047-inch (1.0 to 1.2 mm) diameter particles, which is the recommended size range for 20 slot screens. This conforms to ASTM D-5092, Design of Groundwater Monitoring Wells, 1990. The borehole diameter will be approximately 6 inches, as compared to the 8 inches conventionally used for installation of a 2-inch diameter well. The smaller borehole diameter will minimize the distance between the aquifer material and the well, which should shorten the time of free product recharge during mobility testing.

As noted in Subsection 4.2.3.2 in this Work Plan, upon encountering free product, the borehole will be advanced to the lower extent of the soil layer containing the free product. The lower part of the well screen will be emplaced at this depth, and the well construction will be as follows:

- Coarse silica sand filter pack from 6 inches below screen bottom to 2 feet above screen top.
- Basal layer of filter pack seal consisting of fine silica sand to 2 feet above coarse sand filter pack.
- Top layer of filter pack seal, consisting of bentonite granule to 5 feet above fine sand.
- Annular space seal consisting of bentonite granule above filter pack seal to 5 feet below ground surface.
- Bentonite surface seal above the annular space seal, extending to the ground surface with a topsoil cover.
- Lockable protective cover pipe with an appropriate 2.5-foot stick up and penetrating into but not through the annular surface seal.

Should the well depth be too shallow to accommodate all of the above, one or more of the following adjustments may be made consistent with NR 141:

- Coarse sand filter pack to only 6 inches above well screen.
- Bentonite granules (filter pack seal/annular surface seal) of minimum 2-foot thickness.
- Surface seal shortened to whatever thickness will allow for the 2-foot seal to be placed.

Per NR 141, granular bentonite can be used in shallow wells whenever the water table is expected to be at 7 feet or less. The design of a free-product monitoring well is shown in Figure 4-4.

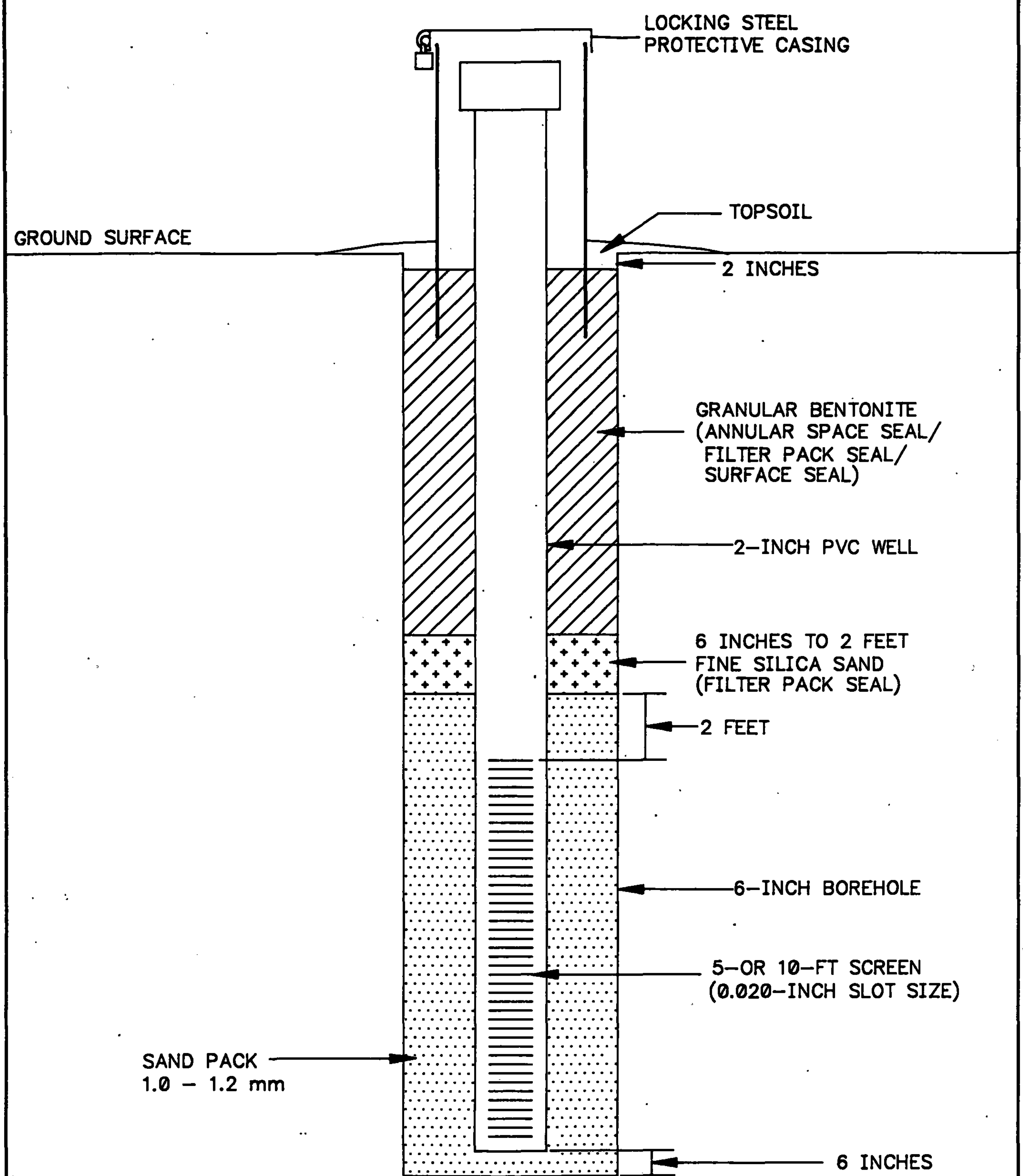
If free product is encountered, a maximum of three samples of the aquifer material will be collected and analyzed for grain size. Grain size analysis will not be run on contaminated soil. Since samples of aquifer material will be collected from all soil borings, grain size analysis will be run on those uncontaminated samples deemed most similar in terms of soil type and texture to the samples containing free product. This information will be used to select the appropriate well screen slot size and sand pack particle size to be used during construction of potential future product recovery wells.

Periodic product thickness measurements will be taken in the wells that contain free product, using a weighted cotton string or cotton rope. After the measurements have been obtained, the free product will be evacuated gently with a clear Teflon bailer and containerized. A thin layer of free product will be left in the wells being evacuated, so as not to disturb the free-product connection between aquifer, sand pack, and well screen. Written descriptions of the free product removed from each well will be recorded in a field logbook. Follow-up measurements will be taken to determine the rate of free-product influx into the wells. This technique will constitute a field test of free-product mobility. Another major objective of the mobility testing will be reproducibility of results. Up to five rounds of product thickness measurements and product evacuation are anticipated. However, the frequency of the measurements and mobility testing will be adjusted depending on the rate of free-product influx into the wells. Data collected during this subtask will target the most probable zones for free product removal. In conjunction with the aquifer testing data obtained in Predesign Task 19 (Identify and Test Groundwater Collection and Extraction Technologies), the mobility testing data will be used to design a free-product recovery system, if such a system is determined to be necessary.

4.2.4 Deliverables

The results of this task, including the geophysical data and interpretation, will be presented in a Predesign Task 3 Technical Memorandum. The contents of the memorandum will include the following:

- Boring/well construction logs.
- Map showing areal extent of free product.



NOTE: DIMENSIONAL ADJUSTMENTS WILL BE MADE IF WELL LENGTH CANNOT ACCOMODATE ABOVE DIMENSIONS

NOT TO SCALE

49692 C

FIGURE 4-4

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Three Hawthorn Parkway
Vernon Hills, Illinois
60061

DESIGN FOR FREE-PRODUCT MONITORING WELL
MOSS-AMERICAN
Milwaukee, Wisconsin

- Geologic cross-sections showing interpreted horizontal and vertical extent of free product.
- Volumetric estimate of free product.
- Table(s) summarizing results of field mobility testing.
- Preliminary calculations of potential rates of free-product extraction, if recoverable free product is determined to be present.

The results of this task will be used to design a free product recovery system. Free product may be extracted as liquid with extraction wells and/or trenches. If required, design and testing of a free product recovery system will be performed as part of Predesign Task 19 - Identify and Test Groundwater Collection and Extraction Technologies.

4.2.5 Schedule

Figure 1-3 depicts the implementation schedule for Predesign Task 3. The Draft Technical Memorandum (TM) for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

4.3 PREDESIGN TASK 4 - FURTHER DEFINE EXTENT OF-CONTAMINATION IN RIVER SEDIMENT

4.3.1 Objective

As stated in the SOW:

> *"...Additional sediment sampling will be conducted to refine the estimated volume of sediment to be treated. The approach to, and extent of, sediment sampling may be affected by results of other predesign tasks. For example, one predesign task is pilot-scale stream diversion/dewatering. The objective of the stream diversion/dewatering pilot test (Predesign Task 11) is to determine effective, feasible and implementable methods of dewatering the contaminated stream bed. The ability to dewater the stream bed successfully will allow a more accurate determination of the physical characteristics and distribution of creosote residues. Information thereby obtained will allow more effective planning and implementation of sediment extent-of-contamination studies.... This predesign*

task will allow the Settling Defendant to make an accurate determination of the distribution and volume of contaminated sediments within the Little Menomonee River. This information will be necessary to evaluate materials handling techniques, transportation and stockpiling requirements and will be used to determine waste feed characteristics for the treatment system...."

This objective will be accomplished through the implementation of subtasks.

4.3.2 <u>Subtask Rationale</u>

The stretch of the Little Menomonee River between the former wood preserving plant property near Brown Deer Road and the confluence with the Menomonee River was subjected to extensive investigation during the RI. Over 290 samples were collected and field-screened for extractable organics (EO). Over 60 samples were analyzed for PAHs by GC/FID. An additional 16 samples were analyzed for PAHs by GC/MS at a CLP laboratory. In addition, numerous field observations were recorded in the RI along this stretch of the Little Menomonee River. At 73 locations during the RI, river sediments were physically disturbed and visible evidence of an oily response was categorized as either "high," "medium," or "low." There were 11 locations that were characterized as having a "high" oily response. Samples were collected for PAH analysis at seven of these high response locations. Only one sample (SD-062) designated as having a high response; was reported to contain CPAHs above the sediment cleanup criterion (388 mg/kg) for old reaches of the Little Menomonee River. Of all sediment samples analyzed for CPAHs at all RI sampling locations along the river, only two samples (SD-062 and SD-312) were determined to be above the risk-based cleanup standard (388 mg/kg) for old reaches of the Little Menomonee River. It is noted, however, that the sediment cleanup criteria in the old channel includes visible contamination as well as the 388 mg/kg standard. The evaluation of visible contamination will be addressed in Predesign Task 4 and in Predesign Task 12.

Taken collectively, the RI sediment data indicate that there may be numerous locations (in the Little Menomonee River between the former wood preserving plant and the Menomonee River) that may contain "oily" or visibly responsive sediments, but there has been little evidence that these oily sediments are above the CPAH cleanup standard for old reaches of the Little Menomonee River. Reaches of the Little Menomonee River that are not relocated (e.g., underneath bridges) have a sediment cleanup criterion of 3 mg/kg or background, whichever is greater. Therefore, the subtasks of Predesign Task 4 will be conducted to extend the information base on sediment contamination and examine in greater detail the relationship between visibly contaminated sediments and the distribution of CPAHs. This examination will provide further basis for defining the quantity and expected locations of sediments in the Little Menomonee River that will require management during the remedial action.

4.3.3 Subtasks

The subtasks of this predesign task include:

- Systematic sediment sampling and analysis along cross-sectioned intervals of the Little Menomonee River.

- Sediment sampling and analysis during the pilot river diversion/dewatering task.

As discussed below, part of the Predesign Task 4 sediment sampling and analysis effort will be closely coordinated with the scope of Predesign Task 11 (Pilot River Diversion) and Predesign Task 12 (Pilot Visual Identification), which are further described in Subsections 5.4 and 5.5 of this work plan.

4.3.3.1 Systematic Sediment Cross-Sectioning, Sampling, and Analysis

In this subtask, sediment samples will be collected from the Little Menomonee River between Brown Deer Road and the confluence with the Menomonee River. Samples will be collected at station intervals of 300 feet down the length of the river. At each station, three sediment core samples will be collected, using a core sampler that will retrieve an intact sediment core. The sediment cores will be positioned at 1/4, 1/2, and 3/4 of the width of the river. The sampling equipment may include a stainless steel coring device equipped with a translucent PVC liner. Core samples will be advanced from the top of the sediment layer to a hard pan layer of the river bed. The sediment core samples will be examined in the field by the environmental sampler to note physical features, particle types, sediment depth, and other pertinent and/or distinguishing information. All three core samples at each sample site shall be composited into one sample and analyzed for CPAHs by either U.S. EPA Method 8310 or Method 8270. At the discretion of the field team leader, additional sediment cores will be collected and frozen to allow subsequent visual examination and preparation for analysis. Certain sediment sample cores will also be photographed and/or archived for future reference or additional chemical/physical analysis. Additional discretionary sediment cores will be collected at the direction of the field team leader in order to record or preserve information on sediment distribution that is believed to be important for remedial design, but not specified within this Work Plan. The number of such discretionary cores is unknown at this time.

4.3.3.2 Sediment Sampling and Analysis Conducted During Pilot-Scale River Diversion (Predesign Task 11) and Pilot Visual Identification (Predesign Task 12)

Additional sediment characterization, mapping, and sampling and analysis efforts will be conducted under Predesign Task 4 in coordination with the Pilot-Scale River Diversion and Dewatering (Predesign Task 11) and the Pilot-Scale Identification of Creosote Residue in Sediments Using Visual Criteria (Predesign Task 12). Predesign Task 11 will evaluate and implement a temporary method for diverting and dewatering the main base and tributary flows of the existing Little Menomonee River channel. The location selected for the pilot-scale river diversion will include a segment of the river prone to sediment deposition. It is also anticipated that a section(s) of approximately 200 to 400 linear feet of river bed will be exposed by the river diversion for a period of one to two weeks. Subsection 5.3 provides a detailed description of the planned pilot-scale river diversion task.

After the river has been diverted, sediment sampling and analysis will be coordinated with the requirements of Predesign Task 12 (Visual Identification). It is anticipated that at least 20 grab samples will be collected at uniform intervals down the length of the dewatered river segment and will be analyzed for CPAHs by Method 8310 or Method 8270. Approximately one-half (10) of the sediment samples will be collected from visibly contaminated sediments and approximately one-half (10) of the sediment samples will be collected from areas that are not visibly contaminated. This distribution of samples is approximate, however, because it is dependent on visible indications of contaminant distribution, the occurrence of sediments, and other factors that cannot be determined until after the specific river bed segment is dewatered. Procedures to be employed during the sampling of sediments from the dewatered reach are fully described in Subsection 5.4, Predesign Task 12.

4.3.4 <u>Deliverables</u>

The results of the field activities and subsequent data analysis associated with this task will be summarized and presented to the Agency as a TM. WESTON and KMCC anticipate that the TM for this task will describe the distribution of CPAHs found during this phase of sampling and analysis, and compare these results to the information collected on the river sediments during the RI. This information will be used to further define the location, volume, and accuracy of visual identification of sediments requiring remediation.

A Draft TM will be submitted to the Agency for comment prior to the submission of the Final TM for this predesign task.

4.3.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 4.

The Draft Predesign TM for this task will be delivered to the Agency within 60 days of the receipt of the analytical data. The Final Predesign TM will be delivered within 30 days after receipt of written comments from the Agency on the Draft TM.

4.4 PREDESIGN TASK 5 - FURTHER DEFINE THE EXTENT OF SOIL CONTAMINATION

4.4.1 Objective

As stated in the SOW:

> *"A sampling and analysis plan will be developed to thoroughly characterize the extent of CPAH contamination in the following areas:*
>
> - *The former pit and ditch area.*
> - *The sludge disposal area (also known as the Northeast Landfill).*
> - *The solid waste pile.*
> - *The dredge spoils disposal area.*
> - *The areas where the depth of contamination was not completely defined....*
>
> *The results of this predesign task will be used to quantify the volume of soil to be excavated, stockpiled, treated, replaced, and covered."*

This objective will be accomplished through the implementation of subtasks.

4.4.2 Subtask Rationale

CPAH analytical results for former wood preserving property soils are shown in the RI Figure 3-9 (for surface soils) and Figure 3-11 (for subsurface soils) (CH2M HILL, 1990). Summarizing RI surface soils findings, 27 of 40 investigative samples had analytical results above the respective risk-based CPAH soil cleanup standard. Only five of the 27 samples with results above the cleanup standard were located outside of areas that were designated as also being visibly contaminated. Summarizing RI findings for the subsurface soils, five of the 30 investigative samples had analytical results above the CPAH cleanup standard.

None of those five samples were located outside of the boundaries of areas that had also been designated as being visibly contaminated.

This RI data summary assists in determining the requirements of this predesign task and in establishing the rationale for the subtasks of Predesign Task 5. The subtasks outlined in Subsection 4.4.3 will accomplish the following goals:

- The horizontal and vertical extent of certain site areas that are expected (from historic operating practices) to contain CPAH concentrations above the risk-based cleanup standards will be more accurately defined.

- A systematic soil sampling and analysis plan will be implemented throughout the site. This plan will recognize contaminant distribution patterns established by RI data, and define soil contamination exceeding visible and CPAH risk-based cleanup standards.

- The soil sampling and analysis plan will be limited to evaluation of soils present above the site groundwater table in order to define soil excavation and remedial treatment system process quantities.

Field investigative activities under this predesign task are designed to consider both the cleanup standard of visibly contaminated soil and the applicable risk-based CPAH concentration cleanup standard.

Two additional goals are to be addressed by this predesign task. One goal is to identify, delineate, and document areas of the facility that do not require remediation consistent with the CD's cleanup criteria. This information will be used to identify areas of the facility which will be considered as uncontaminated support zones. A second goal of this predesign task is to determine the CPAH content of contaminated soils in order to assist during the process design phase. Extent of soil investigations in this predesign task will be conducted at various locations throughout the facility from the ground surface to a depth not exceeding the seasonal high water table. CPAH-contaminated soils present below the seasonal high water table will be addressed by groundwater and/or free-product recovery remedial systems and, therefore, will not be investigated under this predesign task.

4.4.3 Subtasks

The subtasks for this predesign task include the following:

- Further define boundaries of specific site areas.
- Conduct soil sampling and analysis.

4.4.3.1 Further Define Boundaries of Specific Site Areas

Under this subtask, various former process and disposal areas of the site will be more accurately defined in terms of their horizontal and vertical boundaries. This effort will assist in further defining extent of soil contamination in the following areas:

- Former pit and ditch area.
- Northeast landfill area.
- Solid waste pile.
- Dredge spoils disposal area.
- The areas where the depth of contamination was not completely defined.

A combination of historical aerial photograph reviews and geophysical surveys will be utilized to accomplish this subtask. Boundaries of the former process and disposal areas will then be transferred to site plans and topographic maps which will be used to define the extent of soil contamination under Predesign Task 5.

Historical aerial photographs have been retrieved from a number of sources including the Southeast Wisconsin Regional Planning Committee (SEWRPC) and the United States Department of Agriculture (USDA). These photographs are being interpreted and their features will be transposed to the site sampling maps.

A subsurface electromagnetic survey examining changes in AC conductivity will be conducted to attempt to identify the boundaries of the Northeast Landfill. Changes in conductivity are expected at the boundaries of the fill material, as compared to the undisturbed, native materials. The boundaries of the landfill will be delineated by physically traversing the probable landfill location with a terrain conductivity meter. After preliminary mapping from aerial photographs is completed, the geophysics field scope will be conducted, as outlined in the following subsections. A similar subsurface electromagnetic survey may be conducted in the former "Pit and Ditch" area.

<u>Electromagnetic Geophysics</u>

For this predesign task, a geophysical survey will be conducted utilizing an AC conductivity application in one or more of the previously listed former process and disposal areas. The conductivity application to be used is an electromagnetic-induction approach. The geophysical data acquisition will consist of measurements made in both the vertical dipole and the horizontal dipole orientations. A brief description and an overview of the electromagnetic-induction approach follows, as well as a brief description of data acquisition, data processing, data interpretation, and data presentation.

Terrain Conductivity Meter

The voltages induced by an alternating current (AC) can be used to directly locate conductors in the geological subsurface. Basically, primary electrical and magnetic fields are induced in the subsurface, and these primary fields create secondary electrical and magnetic fields. The secondary fields are dense in the proximity of a conductor. For the Moss-American Site, the EM34 terrain conductivity meter will be used. The terrain conductivity meter can measure ground conductivity over typical ground which allows the detection and mapping of areas of conductivity contrast.

Field Operations

Prior to implementing electromagnetic surveys over the study areas, the terrain conductivity meter will be calibrated. The calibration procedures are standard and these procedures will be performed at least once each day. If electromagnetic interferences are encountered, the procedures will be performed more than once each day. The calibration procedures will involve electronic nulling, receiver compensation and gain check, and general instrument maintenance.

Transects will be decided by the geophysicist, based on the dimensions of the study areas. In general, the goal is to traverse over the area, with the initial few meters being outside of the landfill or in an undisturbed area.

Apparent conductivity is read directly from the receiver component in millimhos/meter in either the horizontal or vertical dipole orientation. At each measurement station, the transmitter operator will be positioned and remain stationary. The receiver operator will be positioned to maintain the proper separation between the transmitter and receiver coils. The receiver operator will maintain the sensitivity range such that the apparent conductivity reading is over the upper 70 percent of the meter scale. The terrain conductivity meter has an accuracy of ±5 percent.

All spacings between transects and measurement stations will be in units of meters because the intercoil spacing cables are in meters. For the final report, this spacing can be converted to feet for convenience.

Occasionally, electrical interferences will be encountered from either cultural sources (e.g., 50/60 Hz power lines, industrial sources) or from atmospheric electricity. Cultural noise will often manifest itself as continuous variations in the receiver component. These variations must be averaged out by the geophysicist.

In areas where intense cultural noises exist, the geophysicist will check the terrain conductivity meter for overloading effects. This will be accomplished by decreasing the sensitivity scale of the receiver component.

Atmospheric noise will usually appear as sporadic deflections in the receiver component. These noises are more severe when measurements are made in the horizontal dipole orientation. To compensate for atmospheric noise, the geophysicist will record all measurements in the vertical dipole orientation for the duration of the atmospheric noise.

The depth of penetration for the terrain conductivity meter is controlled by intercoil spacing, frequency, and dipole orientation. The intercoil spacings are 10, 20, and 40 meters. The frequencies are 6,400, 1,600, and 400 Hz, respectively. The dipole orientations are horizontal and vertical. The minimum depth of penetration (7.5 meters) is achieved at 10m intercoil spacing in the horizontal dipole orientation. The maximum depth of penetration (60 meters) is achieved at 40m intercoil spacing in the vertical dipole orientation. At the Moss-American Site study areas, two coil orientations and all three intercoil spacings will be implemented selectively.

All transects and apparent conductivity data will be documented in the field notebook. The apparent conductivity data will be listed for respective intercoil spacings and coil orientation. All other pertinent information will be documented, including weather conditions, soil type, and azimuth. Finally, a listing of the transects and apparent conductivity data will be stored on magnetic tape.

<u>Data Processing and Data Interpretation</u>

Upon the completion of each transect, the apparent conductivity data will be checked for integrity. Corrections may be necessary for those data measured over topographical highs.

The apparent conductivity data will be interpreted by curve-matching. Basically, this means that the observed data will be plotted and compared with theoretical curves. From these curves, layered-earth models can be derived. These layered-earth models will be used to characterize the local geology at the Moss-American study areas. The geophysical models will be presented as geoelectric cross-sections and contour maps where applicable.

4.4.3.2 Soil Sampling and Analysis Plan

This subtask will be comprised of the following activities: establishing a systematic site grid system by survey methods, collecting soil sample cores to various depths at each location, describing the physical nature and composition of each sample core, and conducting laboratory analysis on select discrete and/or composite samples.

The location of the data collection points is designed to systematically investigate the entire site, while at the same time provide an additional level of investigation into suspected and/or previously delineated areas of contamination. This approach incorporates information obtained from:

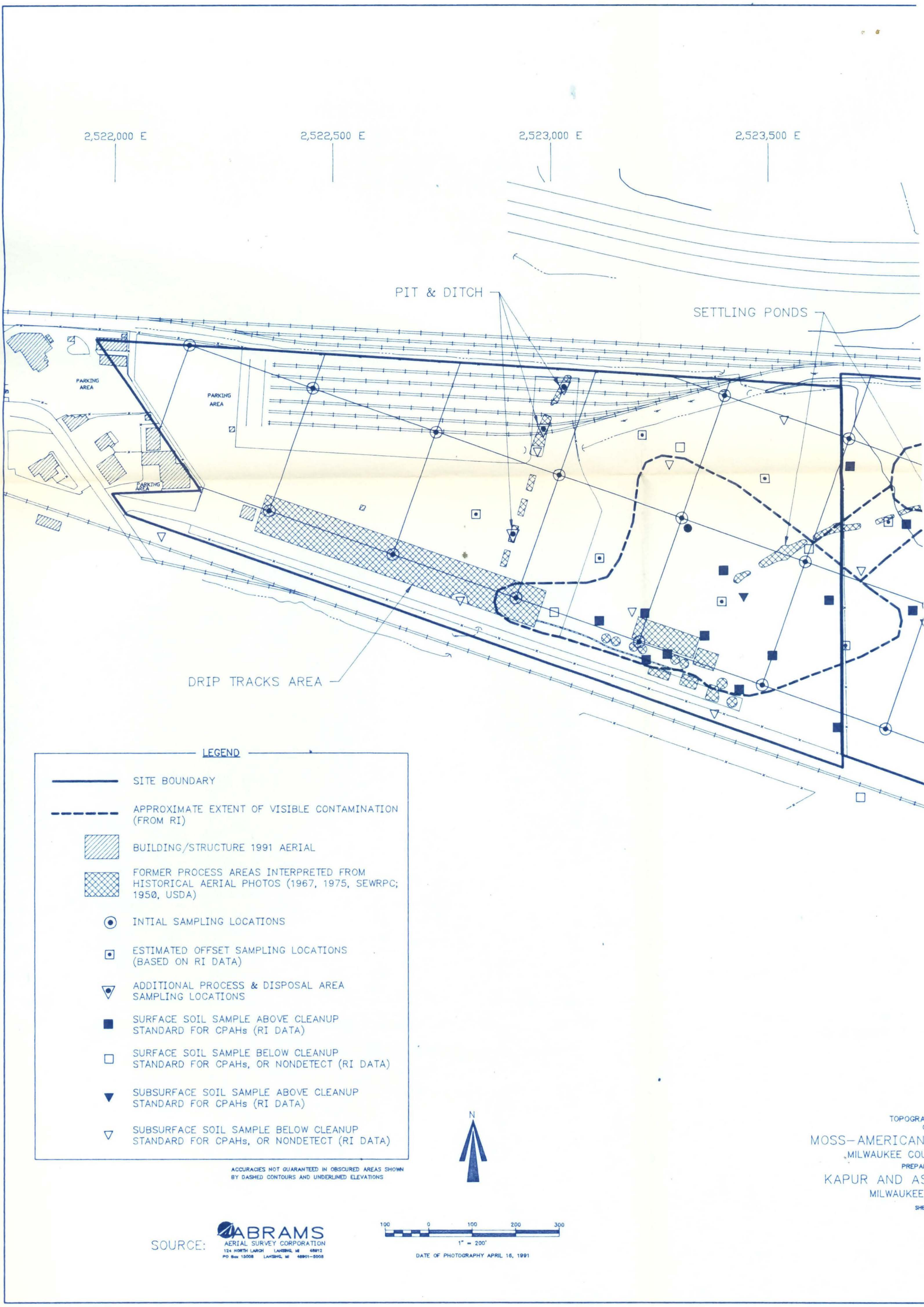
- Historical aerial photographs of process areas.
- Results of the RI.
- Results obtained during these extent of contamination studies.

<u>Sampling Grid/Sampling Scheme</u>

Sampling locations will be selected at the nodes of a square grid (300 ft x 300 ft) encompassing the former wood preserving facility property (Figure 4-5). The initial sampling grid contains 38 sampling locations. At each sampling location, a standard split-spoon sampling device will be advanced, ahead of the auger, down to the water table. The field team will record the appearance of the split-spoon samples, with particular attention given to the extent of visibly contaminated materials. Examples of the types of expected soil core strata that are likely to be encountered by this investigation are illustrated in Figure 4-6.

If no visible evidence of creosote contamination is obtained at a given sampling location (Figure 4-6, Example A), a composite soil sample will be collected to be uniformly representative of the 0- to 4-foot split-spoon sample strata and analyzed for CPAHs.

If visible evidence of creosote contamination is seen at a given sampling location (Figure 4-6, Example B), then a composite soil sample will be collected to be uniformly representative of a field-determined and field-measured zone beneath the contaminated layer and analyzed for CPAHs. Within the zone of visible contamination, a composite sample will be collected for CPAHs analysis. At the discretion of the field team leader, a composite sample of the material above a stratum of visible contamination will also be collected and analyzed for CPAHs, if there is a reasonable expectation that the overlying materials may be below the cleanup criterion. If no sample is collected from this shallow



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PIT & DITCH
SETTLING PONDS
PARKING AREA
PARKING AREA
PARKING AREA
DRIP TRACKS AREA
LEGEND
SITE BOUNDARY
APPROXIMATE EXTENT OF VISIBLE CONTAMINATION (FROM RI)
BUILDING/STRUCTURE 1991 AERIAL
FORMER PROCESS AREAS INTERPRETED FROM HISTORICAL AERIAL PHOTOS (1967, 1975, SEWRPC; 1950, USDA)
INTIAL SAMPLING LOCATIONS
ESTIMATED OFFSET SAMPLING LOCATIONS (BASED ON RI DATA)
ADDITIONAL PROCESS & DISPOSAL AREA SAMPLING LOCATIONS
SURFACE SOIL SAMPLE ABOVE CLEANUP STANDARD FOR CPAHs (RI DATA)
SURFACE SOIL SAMPLE BELOW CLEANUP STANDARD FOR CPAHs, OR NONDETECT (RI DATA)
SUBSURFACE SOIL SAMPLE ABOVE CLEANUP STANDARD FOR CPAHs (RI DATA)
SUBSURFACE SOIL SAMPLE BELOW CLEANUP STANDARD FOR CPAHs, OR NONDETECT (RI DATA)
ACCURACIES NOT GUARANTEED IN OBSCURED AREAS SHOWN BY DASHED CONTOURS AND UNDERLINED ELEVATIONS
N
SOURCE:
ABRAMS
AERIAL SURVEY CORPORATION
124 NORTH LARCH LANSING, MI 48912
PO Box 15008 LANSING, MI 48901-5008
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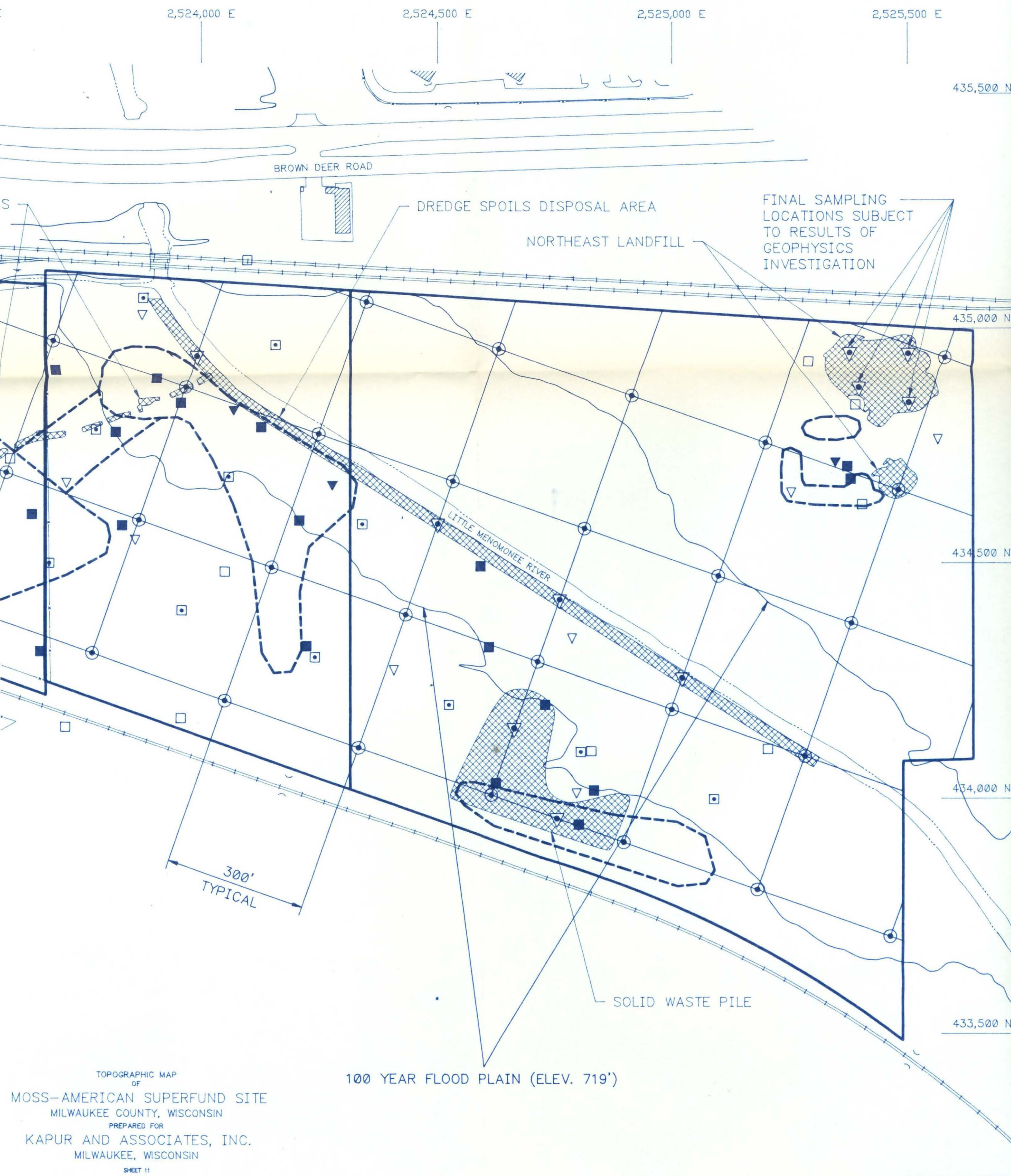


FIGURE 4-5

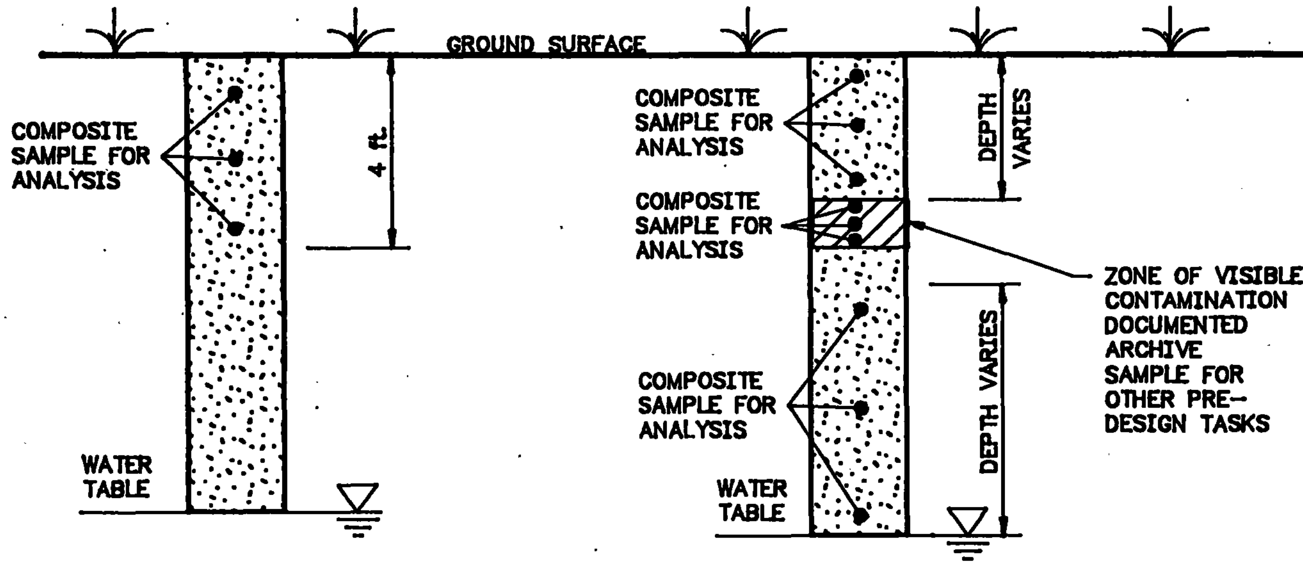
23692 B

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

PROPOSED SAMPLING LOCATIONS FOR FACILITY SOILS

MOSS - AMERICAN SITE
Milwaukee, Wisconsin



EXAMPLE A

SAMPLING APPROACH WHEN NO VISIBLE CONTAMINATION IS PRESENT

EXAMPLE B

SAMPLING APPROACH WHEN DISTINCT VISIBLY CONTAMINATED STRATUM IS PRESENT

FIGURE 4-6

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

EXAMPLE SOIL CORE SAMPLING APPROACH

MOSS-AMERICAN SITE
Milwaukee, Wisconsin

14892 C

zone, it will be assumed for the purposes of this extent-of-contamination study that the material overlying the zone of contamination will require remediation. This assumption will be further confirmed at a later stage of the predesign or RD/RA phase.

When soil borings are made through the asphalt-paved western end of the facility, samples will not be collected from the upper 1 foot of surficial material beneath the asphalt. This will minimize CPAH analytical results being influenced by CPAHs that have been introduced to the facility as a result of the paving process.

If a soil core, at any location, exhibits free product perched above the water table, the borehole will not be advanced further. This procedure will ensure that there are no pathways created for downward migration of the free product.

<u>Off-Set Grid Sampling</u>

If visible evidence of contamination is obtained at a sampling location on the initial 300-foot by 300-foot grid, additional soil borings will be installed to further define the horizontal and vertical limits of the visible contamination. Any sampling location on the initial grid that includes evidence of visible contamination will be surrounded by four additional sampling locations positioned at the centers of the surrounding squares of the original grid system (Figure 4-5), as long as the additional sampling location is on the facility. The same soil boring, sampling, and analysis procedures used for the initial grid locations will be followed at each off-set grid sampling location.

This off-set grid sampling approach will, therefore, provide a grid spacing of approximately 200 feet by 200 feet on those areas of the site determined to be visibly contaminated. This grid interval, combined with the 300-foot overall site grid, will provide adequate information for further defining the volume and extent of site soils above the cleanup standard. This information will provide the basis for designing excavation plans and materials handling/process systems during later predesign and RD phases.

<u>Additional Process and Disposal Area Sampling</u>

As specified in the SOW, the following former process and disposal areas will be subject to additional sampling and analysis:

- Pit and Ditch Area - Three additional, soil borings are proposed, as indicated in Figure 4-5. The same soil boring, sampling, and analysis procedures used for the systematic grid locations will be followed at each of these additional sample locations.

- Northeast Landfill Area - A minimum of four soil borings will be placed within the boundaries of the northeast landfill. This area of the site has the greatest depth to the water table and the lowest cleanup standard. For these reasons, samples will be composited to be uniformly representative of 4-foot intervals and will be analyzed for CPAHs, starting with the deepest samples and stopping when the cleanup standard (0.061 mg/kg or background) is first exceeded at each sample location. Coordination with the laboratory will be maintained so that sample holding times will not be exceeded. For purposes of this predesign task, it is assumed that overlying soil strata present above the first cleanup criteria exceedence will also be above the cleanup standard.

- Solid Waste Pile - Two additional soil borings will be placed, as indicated in Figure 4-5. The same soil boring, sampling, and analysis procedures used for the systematic grid locations will be followed at each of these sample locations.

- Dredge Spoils Disposal Area - Four additional locations will be sampled, as indicated in Figure 4-5. A composite sample will be collected at each of these locations to be uniformly representative of the above-grade materials. All other sampling and analysis procedures used for the systematic grid locations will be followed at each of these sample locations.

<u>Analytical Methods</u>

Samples collected from within the 100-year floodplain or within the northeast landfill will be analyzed for CPAHs by Method 8310 or the low detection limit Method 8270 SIMS (if the results of the background sampling program indicate the need for a low detection limit method). Samples collected outside the 100-year floodplain will be analyzed for CPAHs by either standard Method 8310 or 8270. Regardless of site location, samples collected from visibly contaminated strata will be analyzed for CPAHs by either standard Method 8310 or 8270.

<u>Archive Sampling and Analysis</u>

A second set of soil samples will also be collected from obvious zones of visible contamination. These samples will be documented, transferred, and stored at the analytical laboratory to provide a source of site materials for other predesign tasks, such as evaluation of rapid-turnaround analytical methods (Predesign Task 1A) or treatability studies (Predesign Task 16).

4.4.4 Deliverables

The results of the field activities and subsequent data analysis associated with this task will be summarized and presented to U.S. EPA as a TM. The TM for this task will consist of maps delineating extent-of-contamination, cross-section drawings, calculations, field logs, and raw data, as well as a narrative description of all activities and findings.

Field observations and analytical data will be combined to present a three-dimensional representation of on-site soil contamination. It is anticipated that the mapped information will include:

- Extent of visible contamination.
- CPAH content of visibly contaminated soils.
- Extent-of-contamination above cleanup standards, based on analytical data.
- Boundaries of past process and disposal areas of the site.
- Areas not requiring remediation.

An important result of this predesign task will be to provide data to estimate the volume of on-site soil requiring remediation. Field observations and analytical data, in conjunction with various soil cleanup standards, will be used to calculate the volume of on-site soil. In addition, the volume of floodplain soil requiring removal will be estimated. Additional sampling may be required at a later stage of remediation in areas of the site that are below the established cleanup standards.

The TM for this task will also provide associated raw data including:

- Laboratory analytical data.
- Soil boring logs.
- Geophysics report.

A Draft TM will be submitted to the Agency for comment prior to the submission of the Final TM for this task.

4.4.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 5. The Draft TM covering this task will be delivered to the Agency within 60 days of the receipt of the analytical data. The Final Predesign TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

4.5 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

4.5.1 Objective

As stated in the SOW:

> *"Settling Defendant shall determine if there is a hydraulic connection between the shallow, perched aquifer on the former wood preserving plant and the shallow groundwater east of the Little Menomonee River; if contaminated groundwater on the west side of the Little Menomonee River has impacted groundwater east of the Little Menomonee River; and if shallow groundwater east of the river has been impacted by the Northeast Landfill or any other sources not identified previously.... In order to understand the relationship between groundwater on the east and west sides of the River, Settling Defendant shall evaluate both the surface and groundwater components. This predesign task may include monitoring of existing gauging stations, groundwater elevation studies and installation of new gauging stations and monitoring wells. Previous surface and groundwater level investigations will be thoroughly reviewed, continued if appropriate, and augmented with new installations as necessary...."*

These objectives will be accomplished through the implementation of subtasks.

4.5.2 Subtask Rationale

In order to meet the objectives specified for this task in Subsection 4.4.1, the following data is required:

- Seasonal groundwater elevation data at monitoring points adjacent to the river on both the east and west sides.

- Seasonal surface water elevation data at a monitoring point (staff gauge) adjacent to the former wood preserving facility.

- Continuous surface water elevation data from Little Menomonee River watershed or adjacent watershed.

- Groundwater analytical data from monitoring locations east of the river.

The data requirements for surface water elevation monitoring also relate to Predesign Task 10 - River Hydraulics Study. The data requirements for the determination of groundwater contamination east of the river also relate to the data requirements for Predesign Task 19 - Identify and Test Groundwater Collection and Extraction Technologies. This will be considered when implementing each of these predesign tasks.

4.5.3 Subtasks

The following subtasks will be conducted as part of this predesign task:

- Monthly water level monitoring at surface water and groundwater monitoring stations for one to one-and-one-half years.

- New monitoring well installations east of the river.

- Groundwater sampling of new monitoring wells and selected existing monitoring wells.

- Installation and sampling of additional wells, if necessary.

Each of these subtasks are discussed individually in Subsections 4.5.3.1 through 4.5.3.3.

4.5.3.1 Water Level Monitoring

Water level monitoring was initiated during the fourth quarter of 1991 as part of the Interim Predesign Work Plan. However, at the time of this writing, only one-quarter of water level measurements has been performed, due to the inability to gain site access. Each round of quarterly monitoring consists of measurement of the river elevation at a staff gage installed adjacent to the existing monitoring well cluster 8-I/ 8-S, and measurement of groundwater elevations at 12 existing site monitoring wells adjacent to the river. The new monitoring wells to be installed east of the river will be added to the water elevation monitoring network in subsequent quarterly measurements. The timing of the quarterly measurements will be adjusted as necessary to account for unusually dry or wet periods during which water level elevation data would be especially useful.

As part of Predesign Task 10, river stage/discharge plots will be constructed from continuous water level and velocity measurements recorded at the Brown Deer Road crossing at the upstream edge of the site. This data will also be used for Predesign Task 6 for comparison to the manual river elevations measure adjacent to monitoring wells 8-I/8-S.

4.5.3.2 Monitoring Well Installation

Four new monitoring wells will be installed east of the Little Menomonee River to investigate groundwater quality in that area (Figure 4-2). These four new well locations are designed to detect contaminants migrating along any of the potential shallow groundwater flowpaths from the Northeast landfill. Additional wells may be required if contaminants are detected in these wells.

The four wells will consist of one intermediate depth well and three shallow wells. The intermediate depth well will be installed adjacent to the existing shallow well MW-20S to create a two-well cluster. The depth of the intermediate well is anticipated to be approximately 45 feet, based on the depth of the existing intermediate well MW-8I directly across the river. Establishment of a two-well cluster adjacent to the river will allow determination of the vertical gradient within the surficial layer adjacent to and east of the river. Measurement of an upward vertical gradient would indicate upward discharge of groundwater from the surficial layer to the river.

The three shallow wells will be installed to monitor the water table at the locations shown in Figure 4-2. The shallow wells will be located as close as possible to the estimated waste boundaries of the Northern Landfill. The anticipated depth of the new shallow wells is approximately 25-30 feet, based on the depths of the closest existing wells, MW-14S and MW-15S.

The new monitoring wells will be constructed of 2-inch diameter, Schedule 40, #304 stainless steel screen and casing. The screen length will be 10 feet in the shallow wells and 5 feet in the intermediate well. The shallow well screens will straddle the water table. Screen slot size will be 0.007 inches. The well boreholes will be drilled with 4.25-inch hollow-stem augers, and the wells will be constructed as the augers are withdrawn. The well installation will be as follows:

Shallow wells (assuming a water table depth of approximately 5 feet below surface):

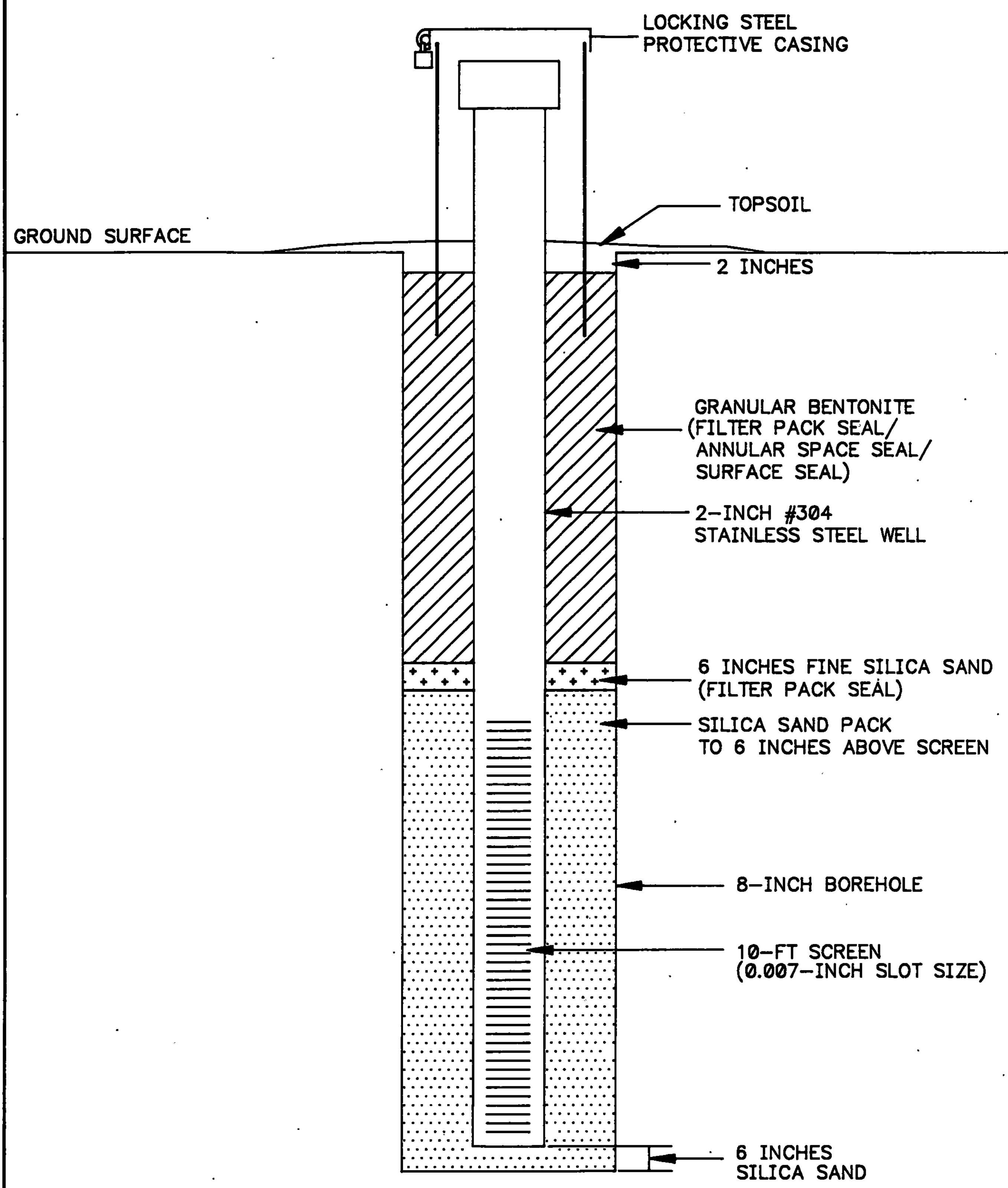
- Silt-free, coarse silica sandpack from 6 inches below to 6 inches above the well screen.
- Granular bentonite from sandpack to 2 inches below ground surface.
- Topsoil on top of bentonite seal.
- Leachable protective cover with an approximate 2.5-foot stick up and penetrating into but not through the bentonite seal.

Intermediate well:

- Silt-free, coarse silica sand filter pack from 6 inches below to 2 feet above the well screen.
- Clean, fine sand filter pack seal to 2 feet above coarse sand filter pack.
- Bentonite-sand slurry (filter pack seal) to 5 feet above fine sand filter pack seal.
- Bentonite granules or bentonite sand slurry annular space seal from the bentonite pellet seal to 5 feet below ground surface.
- Granular bentonite surface seal between protective casing and borehole wall from 5 feet below surface to 2 inches below ground surface.
- Topsoil above bentonite surface seal.
- Lockable protective cover with an approximate 2.5-foot stick up and penetrating to the annular space seal.

Figures 4-7 and 4-8 depict the design of the shallow and intermediate groundwater monitoring wells, respectively.

Well development will be performed until 10 well volumes of water is removed and is in accordance with NR141 regulations.



49692 C

NOTE: ASSUMING SHALLOW GROUNDWATER
(~ 5FT. BELOW GROUND SURFACE)

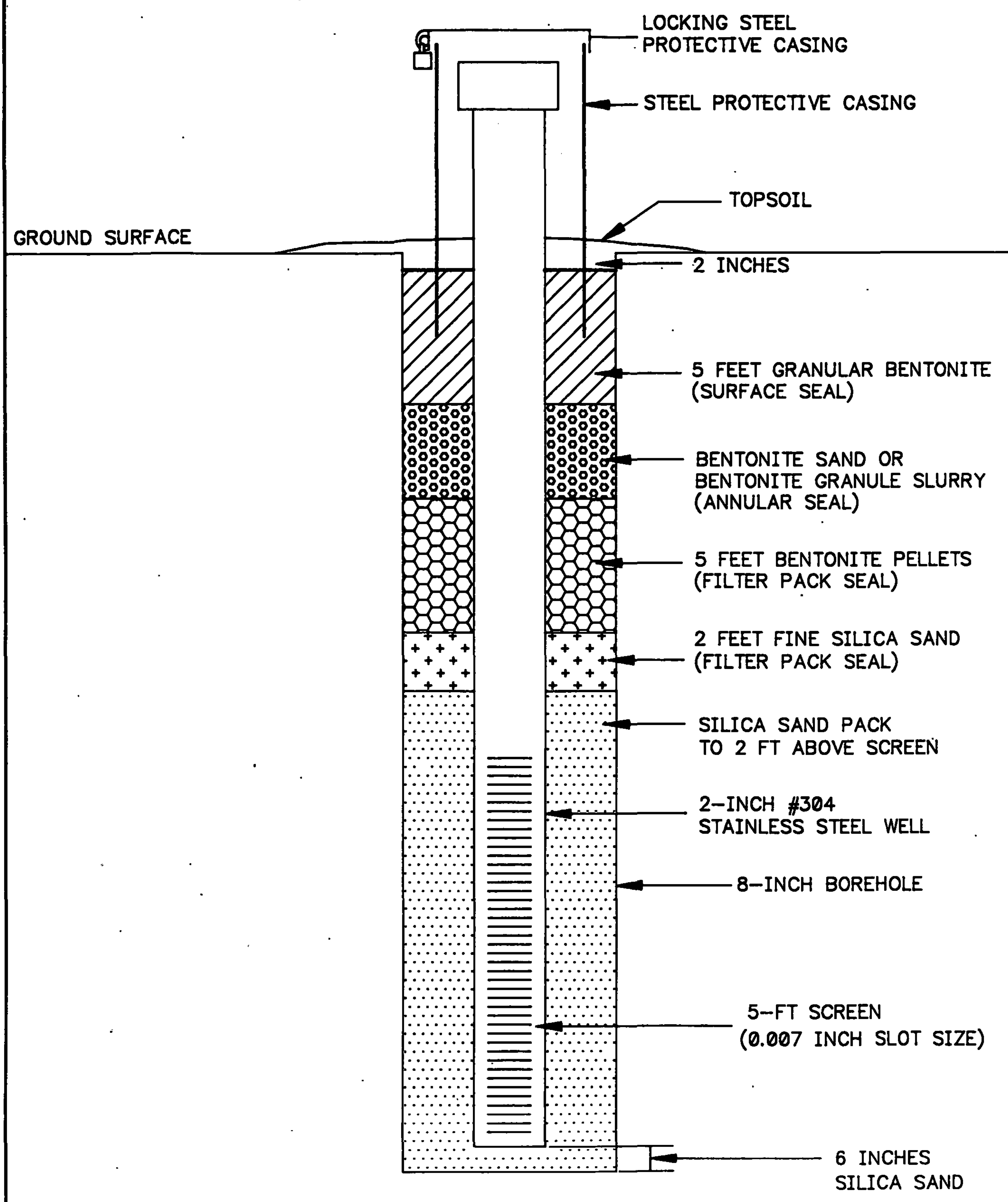
NOT TO SCALE

FIGURE 4-7

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

DESIGN FOR SHALLOW GROUNDWATER
MONITORING WELLS EAST OF LITTLE MENOMENEE RIVER
MOSS-AMERICAN
Milwaukee, Wisconsin



49692 C

NOT TO SCALE

FIGURE 4-8

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

DESIGN FOR INTERMEDIATE GROUNDWATER MONITORING WELL EAST OF LITTLE MENOMONEE RIVER

MOSS-AMERICAN
Milwaukee, Wisconsin

4.5.3.3 Groundwater Sampling and Analysis

Two rounds of groundwater samples will be collected from the four new monitoring wells and the existing wells MW-20S and MW-14S. These two rounds of sampling will be conducted at least 30 days apart. The samples will be analyzed for benzene, toluene, ethylbenzene, and xylene, according to SW846 Method 8021. Analytical results will be compared to the the NR140 groundwater quality standards to determine if groundwater east of the river has been impacted. If groundwater is determined to have been impacted, additional rounds of groundwater analysis will be used to confirm this and additional well(s) will be established as necessary and sampled to identify the source(s) and define the extent-of-contamination. Protocols for groundwater sampling and analysis will be outlined in the Quality Assurance Project Plan referenced in Section 2.

4.5.4 Deliverables

The results of Predesign Task 6 will be documented in a Technical Memorandum, and will include:

- Water elevation data for all quarterly measurements.
- Water elevation contour maps of shallow groundwater in the vicinity of the river.
- Boring/well construction logs for new monitoring wells.
- Summary table of groundwater analytical data, including comparison with Consent Decree groundwater cleanup levels.

4.5.5 Schedule

Figure 1-3 depicts the anticipated implementation schedule for Predesign Task 6. Quarterly water level monitoring will continue until six quarters of water elevation data will have been accumulated. This amount of data will be sufficient to meet the objectives of Predesign Task 6 relating to determining the hydraulic relationship between shallow groundwater and the Little Menomonee River. The installation and sampling of the new monitoring wells will be accomplished as outlined in Subsection 1.4, which presents the schedule for Predesign Work Plan activities. The draft TM for this task will be delivered to the agency within 60 days of the completion of the subtasks and the receipt of analytical data. The final TM will be delivered within 30 days after receipt of written comments from the agency on the draft TM.

4.6 PREDESIGN TASK 7 - DETERMINE THE EXTENT OF CPAH CONTAMINATION IN THE FLOODPLAIN ALONG THE NEW RIVER ALIGNMENT

4.6.1 Objective

As stated in the SOW:

> *"Settling Defendant shall examine the occurrence of CPAHs within the Little Menomonee River floodplain. Historic flood events may have deposited CPAHs in floodplain soils adjacent to the existing stream channel. The primary objective of this predesign task is to determine if high concentrations of CPAHs occur in the floodplain below the former wood preserving plant. The second objective is to evaluate the occurrence of CPAHs in the area of the new river alignment.*
>
> *The occurrence of CPAHs in the floodplain will be determined by examining areas prone to flooding as well as areas of historic deposition of stream sediments in the floodplain. The investigation will involve collection of surface and shallow subsurface soil samples using conventional sampling techniques. Specific locations for sample collection will be determined based upon such factors as stream morphometry, evidence of flooding, and topographic elevation and subject to U.S. EPA approval.*
>
> *The occurrence of CPAHs along the new river alignment will also be determined through conventional sampling techniques. Surface and shallow-subsurface soil samples will be collected along the proposed river alignment and in probable areas of remedial construction. Sampling along the new alignment will also focus on areas prone to flooding. The precise river alignment will depend on the results of other predesign tasks; therefore, this predesign task will probably not be undertaken until completion of river hydraulic studies and the wetlands assessment. Samples will be analyzed using either conventional laboratory-based CLP procedures or surrogate procedures established under Predesign Task 2 [1]."*

This objective will be accomplished through the implementation of subtasks.

4.6.2 Subtask Rationale

Samples from the downstream floodplain and dredge spoils area were collected at 17 locations during the RI. The samples were field-screened for extractable organic compounds and checked for visible evidence of contamination. None of the dredge spoils area samples were visibly contaminated; two of the floodplain samples appeared oily (SS-1007 and SS-1011). Only one sample (SS-1003) was analyzed for PAHs by GC/FID, and no PAHs were detected. CLP analysis of CPAHs was not performed on samples collected from the downstream floodplain or dredge spoils areas. On the basis of this limited RI information, further investigation of the floodplain soils will be performed during this predesign task.

The SOW requires an investigation of CPAH contamination in areas downstream of the former wood preserving plant within the 100-year floodplain that are "prone to flooding." Prone to flooding is defined as within the 2-year floodplain. The cleanup standard of the SOW requires removal of soils within flood-prone areas determined to contain CPAHs in excess of background or 6.1 mg/kg total CPAHs, whichever is greater. It is also a SOW requirement to remove visibly contaminated soils.

4.6.3 Subtasks

The subtasks for this predesign task include the following:

- Review findings/data from related Predesign Tasks 1, 4, 9, and 10.
- Identify areas prone to flooding and sediment deposition.
- Conduct sampling and analysis in flood-prone areas where sediment deposition has occurred.

Predesign Task 7 is dependent upon other predesign tasks for certain data and information. The relationship between Predesign Task 7 and other tasks is summarized below.

- Predesign Task 1 - Evaluation of rapid turnaround analytical methods may identify an analytical method suitable for this task.
- Predesign Task 4 - The determination of the extent-of-contamination in river sediment may be useful in predicting the potential occurrence of contamination in floodplain soils.

- Predesign Task 9 - The evaluation of alternative river alignments will define the new river alignment.

- Predesign Task 10 - River hydraulics studies will be used to identify areas prone to flooding.

4.6.3.1 Review Findings/Data from Related Predesign Tasks

Identification of flood-prone areas along the Little Menomonee River between Brown Deer Road and the confluence with the Menomonee River has previously been defined as an objective of Predesign Task 10. During Predesign Task 10, the 2-year flood event will be input to the HEC-2 model to calculate water surface profiles. The HEC-2 model will also provide river cross-sectional velocity distributions from which overbank areas of low velocity and potential sediment deposition can be identified.

The two-year flood elevations that are calculated by the model will be highlighted on a corresponding topographic map. This map will also identify areas of ponded or sluggish water movement that may be subject to sediment deposition.

Predesign Task 9 will define the study area for the determination of CPAHs in soils which exceed the removal criteria along the new river alignment.

4.6.3.2 Identify Areas Prone to Flooding and Sediment Deposition

Information developed during Predesign Task 10 will identify flood-prone areas and areas of sluggish water that may be subject to sediment deposition. Confirmation of these areas will be made through review of aerial photographs and field reconnaissance.

4.6.3.3 Sampling and Analysis in Flood-prone Areas of Sediment Deposition

Initially, in each of the five river reaches defined by major east-west road crossings, one target area as large as 10 acres will be selected to represent a likely location for historical sediment deposition of CPAHs. Selection of these target areas will be coordinated with the Agency following the determination and approval of a final river alignment and probable areas of remedial construction.

In each target area, soil samples will be collected from within the 2-year floodplain to a depth of 12 inches utilizing a coring device. A representative composite sample will be prepared from the soil core. Sample locations will be selected randomly within the target areas at an approximate density of one sample per acre. The soil cores will be examined in the field by the environmental sampler to note physical features and visible evidence of contamination. If contamination is visible, the thickness of the depositional layer will be determined. Samples will be analyzed for CPAHs by Method 8310 or 8270, or by a suitable rapid turnaround method identified through Predesign Task 1. Further sampling and evaluation will be performed for those river reaches where soils exceeding the CPAH removal criteria are identified.

4.6.4 Deliverables

The results of the field activities and subsequent data analysis associated with this task will be summarized and presented to the Agency as a TM. WESTON and KMCC anticipate that the TM for this task will describe the distribution of CPAHs found during this phase of sampling and analysis, and compare these results to the information collected during the RI. This information will be used to further define the location and volume of soil requiring remediation. A Draft TM will be submitted to the Agency for comment prior to the submission of the Final TM for this predesign task.

4.6.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 7. As noted by this schedule illustration, Predesign Task 7 is not proposed to be completed until after substantial completion of Predesign Tasks 1, 4, 9, and 10. This deferral is necessary because it is essential to obtain relevant data from these tasks prior to undertaking Predesign Task 7.

The draft TM for this task will be delivered to the agency within 60 days of the completion of the subtasks and the receipt of analytical data. The final TM will be delivered within 30 days after receipt of written comments from the agency on the draft TM.

4.7 PREDESIGN TASK 8 - SURVEY GROUNDWATER UTILIZATION

4.7.1 Objective

As stated in the SOW:

> *"The overall objective of this predesign task is to survey groundwater uses in the vicinity of the former creosoting facility. Specific objectives include:*

- *Determine the number and location of residential, commercial, and industrial water supply wells in the vicinity of the former creosoting facility.*

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

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

The objectives listed above will be accomplished using a two-phased approach. Phase I has been completed in accordance with the Final Interim Predesign Work Plan. This initial phase consisted of contacting various federal, state and city agencies, and collecting written records relating to water wells in the vicinity of the Moss-American site. The Phase I results are documented in a Technical Memorandum, Groundwater Utilization Survey -- Phase I, which was submitted to U.S. EPA on 4 February 1992. Phase II consists of contacting the owners of potential water wells identified during Phase I, to confirm that their water well is being used or has been abandoned. Phase II is currently being conducted. The Phase II results will be documented in an amended Predesign Task 8 Technical Memorandum documenting the final findings of the groundwater utilization survey.

SECTION 5

RIVER REMEDIATION

5.1 PREDESIGN TASK 9 - IDENTIFY AND EVALUATE ALTERNATIVE ALIGNMENTS FOR THE LITTLE MENOMONEE RIVER

5.1.1 Objective

As stated in the SOW:

> *"The objective of this predesign task is to determine the stream realignment which will best meet the environmental objectives while minimizing changes to the floodplain which could result in upstream or downstream flooding, and/or temporary or permanent environmental damage. This evaluation will draw upon information developed from Predesign Tasks 10, 11, 12, 13, 15, as well as the RI, FS, ROD, guidance provided by EPA, WDNR, COE, and other information that may be available from a literature search. Various stream realignments and longitudinal and cross-sectional configurations will be evaluated. Consideration will be given to the following factors: environmental objectives, including the ability to maintain instream riparian fish, aquatic life, wildlife habitat, ecological productivity and diversity; ability to establish and maintain aesthetic and recreational uses; ability to minimize impacts to wetlands; effectiveness and implementability.*
>
> *This predesign task must be conducted in conjunction with the Predesign Study of River and Floodplain Hydraulics (Predesign Task 10) and will result in selection of an alignment for the new river channel."*

5.1.2 Subtask Rationale

Under Predesign Task 9, the CD requires an evaluation of the environmental impacts associated with various alternative stream realignments. Environmental impacts must be compared between alignment alternatives to select the new stream alignment with the least adverse environmental impact. In order to compare potential alignments, it is first necessary to fully define the environmental resources associated with each alignment.

In order to select a stream realignment that will meet the objectives set forth in the SOW, Predesign Task 9 must:

- Confirm the regulatory requirements that apply to the stream realignment.
- Compile available information on the existing aquatic and terrestrial resources, as well as socioeconomic, land use and cultural resources data, to provide a basis for evaluating alternative realignments.
- Gather field information to supplement the existing information on the aquatic and terrestrial resources.
- Compare realignment alternatives with respect to environmental impacts.

This predesign task is dependent upon other predesign tasks for certain information activities, data, and information. The relationship between Predesign Task 9 and other tasks is summarized below.

- Predesign Task 10 - River hydraulics studies will provide basic hydraulic data that will be necessary in identifying alternative alignments.
- Predesign Task 11 - Pilot river diversion/dewatering will provide engineering information on the degree of floodplain disturbance as a result of diversion. This will, in turn, influence the alignments.
- Predesign Task 13 - Definition of the quantity and quality of river materials to be treated will indicate the degree to which access/haul roads will be required, which will affect potential river alignments.
- Predesign Task 15 - Conduct a Floodplain and Wetland Assessment, will be based upon data and information gathered during Predesign Task 9.

5.1.3 Subtasks

The following is a list of subtasks within Predesign Task 9.

1. Compile and confirm the regulations, requirements and guidelines of each ARAR that applies to this predesign task.

2. Compile and map information on aquatic and terrestrial environmental resources.

3. Define socioeconomic setting/land use and cultural resources in the project area.

4. Conduct field studies, as necessary to: a) verify the delineation of wetlands; b) collect data for the preparation of a report and final mapping for submission to agencies; and c) supplement the information gathered under Subtasks 2 and 3.

5. Identify areas which, for environmental or engineering reasons, must be avoided.

6. Establish three alternative alignments based on information gathered under Subtasks 2, 3, 4 and 5 and identify areas that would be disturbed by the new channel construction.

7. Revise the geometry data that defines the channel and overbank areas in the existing-conditions hydraulic model for each of the proposed alternative river realignments. The revised models will calculate the changes in depth, velocity and frequency of flooding in 500' by 500' cells covering the floodplain. This information will be stored within Geographical Information Systems (GIS) as attributes associated with the existing-condition floodplain characteristics.

8. Using an overlay technique, quantify each alternative's impact as measured by the area of excavation, disturbance and flooding characteristics (depth, velocity and frequency of flooding) on environmentally sensitive areas. This technique will involve a series of transparent maps that overlie one another. These maps will include each alternative's route, a wetlands value delineation, a vegetation value delineation, and sensitive terrestrial and aquatic communities. This technique will define the area affected by the excavation, construction disturbance, and changes in the flooding characteristics. The area will be multiplied by a numeric value assigned to the various environmentally sensitive areas. Table 5-1 presents a matrix illustrating this methodology.

Table 5-1

Alternatives Evaluation Matrix

Alternative	Excavated Area			Disturbed Area			Depth Area			Velocity Area			Frequency Area			Total Score
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1 - Area	5	10	15	5	10	15	5	10	15	5	10	15	5	10	15	
Weighted Area	5	20	45	5	20	45	5	20	45	5	20	45	5	20	45	350
2 - Area	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Weighted Area	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	300
3 - Area	15	10	5	15	10	5	15	10	5	15	10	5	15	10	5	
Weighted Area	15	20	15	15	20	15	15	20	15	15	20	15	15	20	15	250

5.1.3.1 Subtask 1 - Compile and Interpret ARARs

As specified by the CD, the river alignment alternatives analysis shall be consistent with the substantive requirements of the Clean Water Act and the pertaining regulations, including 40 CFR part 230. Also, as specified in the CD, the location, design and characteristics of the new river channel shall conform to ARARs and, to the extent practicable, other substantive requirements identified by WDNR under the authority of ch. 30 and ss. 62.231, and 144.26, Wis. Stats., and chs. NR 116, 117 and 347, Wis. Adm. Code, pertaining to navigable waterway, floodplain, channelization, dredging and wetland disturbance projects.

The specific requirements of these ARARs have not been concisely defined for this RD/RA. The specific requirements of each of these ARARs will be defined in this first Subtask of Predesign Task 9. This definition of requirements will assure that the selection of a stream realignment is conducted with due consideration of applicable requirements. Each ARAR set forth in the CD will be reviewed and the relevant requirements will be defined. The requirements of each ARAR will be presented in text, and to the degree possible summarized in tabular format.

5.1.3.2 Subtask 2 - Compile and Map Information on Aquatic and Terrestrial Environmental Resources

The first step in this Subtask will be to conduct a literature search to gather available information on the environmental resources of the Little Menomonee River and its floodplain. The literature search will utilize key-word library searches, contacts with Federal, state and local agencies and discussions with EPA and WDNR site representatives. The literature search will address information on both aquatic and terrestrial environmental resources. Data and information on the following topics will be gathered:

<u>Aquatic Environmental Resources</u>

- Mammal and bird species
- Water Quality
- Sediment quality.
- Phytoplankten, zooplankton, periphyton and macroinvertebrate assemblages.
- Reptile and amphibian populations.
- Fisheries resources.
- Historical development of the River.
- Rare, threatened and endangered species.

Terrestrial Environmental Resources

- Prime and unique farmland soils
- Wetland delineations.
- Wetland habitat quality.
- Wetland plant assemblages.
- Upland plant communities.
- Upland habitat quality.
- Historical development of the floodplain and upland areas.
- Birds and mammals.
- Recreational resources and use.
- Rare, threatened and endangered species.

Upon completion of the literature search, the information will be reviewed, evaluated and summarized in the form of an annotated bibliography. All data and information will, to the degree possible, be transferred to scaled base maps. A series of maps or overlays will be prepared to support the objectives of the overall predesign task. The results of this review and mapping exercise will be used to assign numeric values to various environmental features within each stream reach that will be used in evaluating stream realignment alternatives.

5.1.3.3 Subtask 3 - Investigate Socioeconomic Setting/Land Use and Cultural Resources

Socioeconomic Setting/Land Use

The subtask will involve an evaluation of river realignment alternatives based on impact to the area's socioeconomic setting and land use. The majority of the information necessary for this analysis has probably been developed by Milwaukee County, the City of Milwaukee, Milwaukee County Parks and the Southeastern Wisconsin Regional Planning Commission. Other agencies, interested groups, or sources with such information might include:

- Citizens for Menomonee River Restoration, Inc.

- Milwaukee Estuaries Remedial Action Plan.

- Great Lakes National Program.

- Milwaukee Metropolitan Sewerage District.

- Wisconsin Department of Natural Resources.
- U.S. Geological Survey (USGS) quadrangles.
- U.S. Department of Commerce, Bureau of the Census publications on population, housing, and economic characteristics.

A study of baseline socioeconomic and land use data will be conducted using available and published documents and information on the project vicinity. The study area will be defined as the land within approximately 0.5 mile on either side of the existing river alignment. The types of information that could be considered include:

- Land use.
- Population density.
- Economic condition.
- Community facilities.
- Infrastructure systems.
- Recreational resources.
- Public health and safety.

Available data will be processed and entered in a Geographic Information System (GIS) and produced in overlays to compare alternative river alignments. Information transferred to GIS overlays will support review of each alternative river alignment to determine the alternative with the smallest impact on the baseline land uses and the socioeconomic setting of the communities or neighborhoods within the study area.

__Cultural Resources__

Areas containing cultural resources within the project site or in the immediate vicinity will be considered during the selection of the river realignment. These areas will be avoided if possible; otherwise, appropriate mitigating measures will be taken to minimize impact to these resources. Available information will be reviewed on historic and archaeological resources along the Little Menomonee River starting from Brown Deer Road north of Moss-American site to the confluence with the Menomonee River near Hampton Avenue. The State of Wisconsin Historic Preservation Office will be the primary source for information on the National and State Registers of historic places. The state may also provide information on archaeological resources in the general area as it becomes available from various research teams and institutions. Cultural resources will then be located on the GIS overlays to develop the preferred route that avoids or minimizes possible impact on these resources. A federal mandate requires that all historic or archaeologic resources listed in the National Register be protected. The river alignment will avoid such listed sites and resources or resources that are known to be under consideration for listing.

5.1.3.4 Subtask 4 - Conduct Field Studies

The goals of this subtask are as follows:

- Verify the delineation of wetlands and assess wetland quality.

- Collect additional field data to fill data gaps, check aerial photographs or to verify conditions that were previously reported.

Wetlands have been delineated previously using an existing field investigation report (U.S. EPA, Region V Superfund Technical Support Unit, September 1990) and aerial photographs. Additional field investigations will be conducted to collect data on soils, vegetation and hydrology in order to verify and refine this delineation. The field investigations will focus on field checking the boundaries of wetlands and to assess the comparative quality of wetlands shown on the aerial photographs. Results of these field studies will be used to finalize GIS mapping and assignment of numerical values to wetland habitats.

Additional field work may be necessary after analyzing information gathered during Subtasks 1, 2, or 3. Such field work will be conducted to fill data voids and clarify information compiled under previous subtasks, and will not include detailed faunal or floral surveys. Moreover, these field activities will be restricted to gathering or confirming data that will support selecting a stream realignment. For example, a typical field activity under this subtask would be a site reconnaissance to evaluate the quality of a particular upland or wetland habitat along a particular alignment. This field work will be conducted on an "as-needed" basis to support the alignment selection process and will not need extensive prior planning or scoping; therefore, no Field Sampling Plan will be prepared. Methods employed will be maintained through field notes and will be presented in a Technical Memorandum (TM).

5.1.3.5 Subtask 5 - Identify Areas to Avoid in Stream Realignment

Environmental and engineering considerations will identify areas to be avoided using information obtained in Subtask 1 through 4. These areas will include, but will not be limited to, areas where rare, threatened, or endangered species have been identified, unique cultural or historical resources, drainage structures or utilities that would be rendered inoperable by realignment of the channel or unique aquatic or terrestrial resources.

Information obtained in this subtask will be transferred to GIS and used in subtasks 6 and 8.

5.1.3.6 Subtask 6 - Establish Three Alternative River Alignments

Three alternative river alignments will be defined which avoid or minimize adverse impacts on areas identified in Subtasks 2, 3, 4, and 5. Detailed 1 inch = 200 feet, 1-foot vertical contour maps, prepared under the Interim Predesign Work Plan, are available to support this subtask. Each alternative route will be mapped, with the following considerations:

- Avoid or minimize adverse impacts on the sensitive areas identified in Subtasks 2, 4, and 5.
- Avoid or minimize adverse impact on socioeconomic/land use or cultural resources.
- Maintain the hydraulic character of the existing river channel.
- Maintain the same or similar flood control characteristics of the existing river channel.
- Utilize the existing river crossings (i.e., bridges) and outfall structures.

Areas to be excavated for the channel and the area that will be disturbed during construction will be delineated for each of the three alternative river alignments. These areas will be entered into a GIS overlay to be placed on the environmentally sensitive area mapping to assess the relative impact of each alternative route.

The product of this subtask will be maps delineating the three alternative river alignments with respect to aquatic, terrestrial, socioeconomic and cultural resources.

5.1.3.7 Subtask 7 - Revise Existing Hydraulic Model for the Three Alternative Alignments

During the evaluation of the floodplain characteristics for the existing river channel (conducted under the Interim Predesign Work Plan), over 50 cross-sections were input to a Flood Insurance Studies (FIS) hydraulic model (Version 4.6.2, May 1991) obtained from

FEMA. This model predicts the depth, velocity and frequency of flood waters along the Little Menomonee River. Where applicable, these cross-sections will be modified to reflect the proposed channel and overbank areas for each alternative alignment. Figure 5-1 presents a typical cross-section and the modification to reflect the alternative alignment. The FIS hydraulic model will be recalculated to determine the new depth, velocity and frequency of flooding associated with each alternative alignment. These three flooding characteristics will be recorded as average values within 500' by 500' cells in a grid pattern covering the entire floodplain mapping. Ultimately, this information will be examined for a change (positive or negative) in each of the three parameters. This will be noted by assigning a "+" or a "-" to each cell. The entire area of the cell will then be evaluated as to whether it has a positive or negative impact on the environment based on the findings in subtasks 1 through 6.

5.1.3.8 Subtask 8 - Quantify Each Alternative's Impact

Using an overlay technique, each alternative's impact will be quantified by measurements of the area of excavation, disturbance, and flooding characteristics. Table 5-2 illustrates the coverages that will be entered into GIS during the previous subtasks. The coverages will be split into two groups: the impacts of the alternative river realignments, and the environmentally sensitive areas that will be impacted by the realignments.

Each of the impact coverages will be overlaid on the environmentally sensitive areas mapping produced in previous subtasks. Figure 5-2 presents a schematic of this overlay technique. The resulting union of the two coverages will yield the acres of impacted areas that affects the underlying environmentally sensitive area. A numeric value assigned to each of the environmentally sensitive areas will be weighted by the importance of disturbing the area. The alternative with lowest combined impact score (area disturbed times the value of the area impacted) will be the selected alternative.

Figure 5-2 presents an example of the alternative overlay technique.

In addition, a numerical table will be established to present the water surface elevations computed by the HEC-2 model under existing conditions and under the three alternative alignments. This numerical table will be compiled for the 100-year flood event.

5.1.4 <u>Deliverables</u>

The following materials will be presented in the Predesign Task 9 Technical Memorandum:

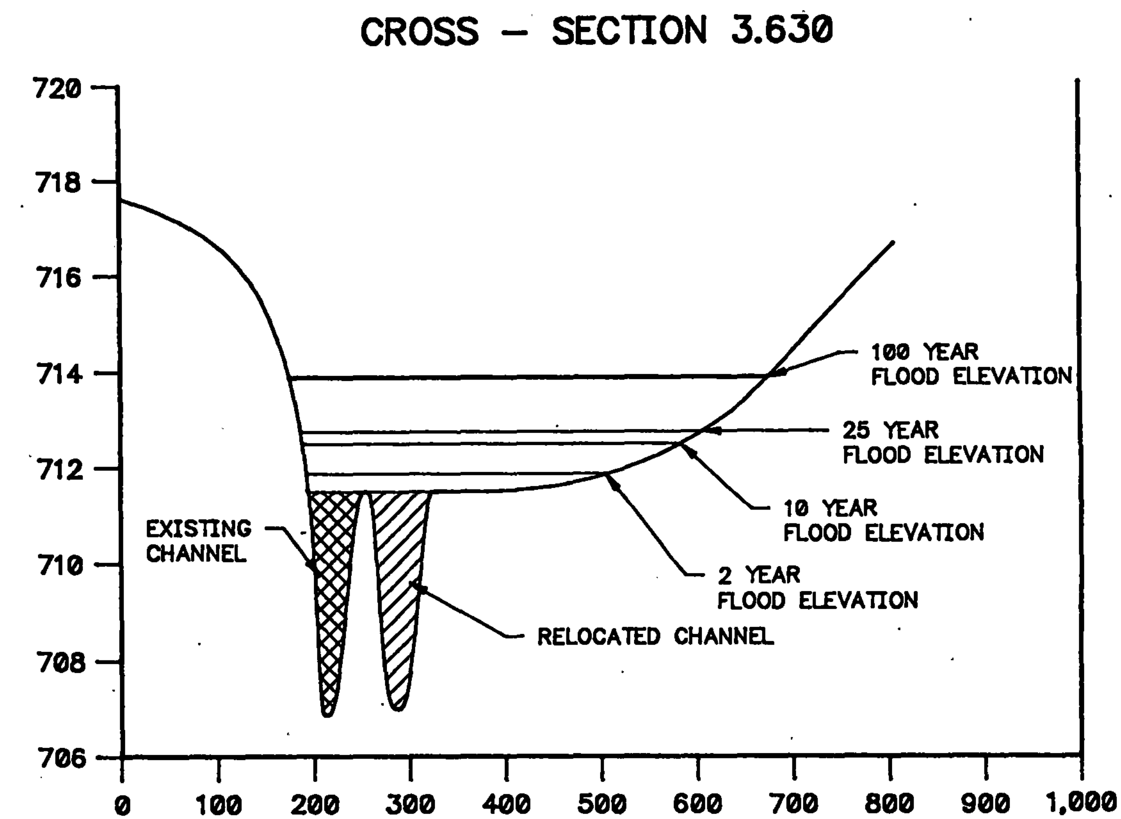


FIGURE 5–1

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

TYPICAL CROSS – SECTION ANALYSIS
OF LITTLE MENOMONEE RIVER
MOSS – AMERICAN SITE
Milwaukee, Wisconsin

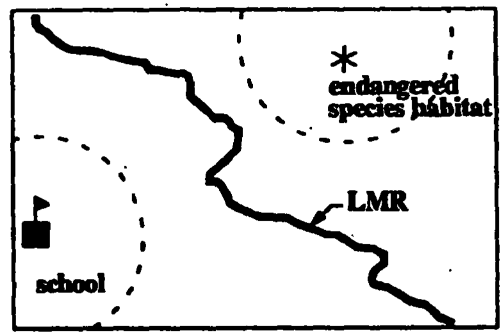
26392 A

Table 5-2

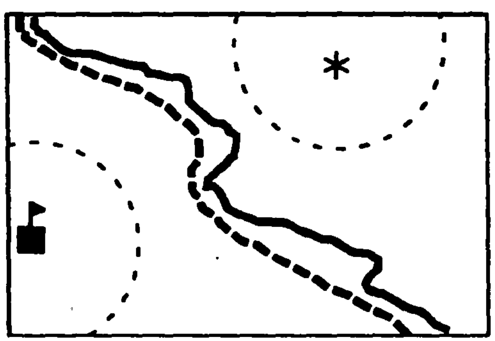
GIS Coverages

Impacts	Environmental Areas
Alt 1 - Areas of excavation and disturbance. • Depth of floods. • Velocity of floods. • Frequency of floods.	Wetlands and their functional value.
Alt 2 - Areas of excavation and disturbance. • Depth of floods. • Velocity of floods. • Frequency of floods.	Vegetative communities and their value.
Alt 3 - Areas of excavation and disturbance. • Depth of floods. • Velocity of floods. • Frequency of floods.	Terrestrial and aquatic habitat and its value.

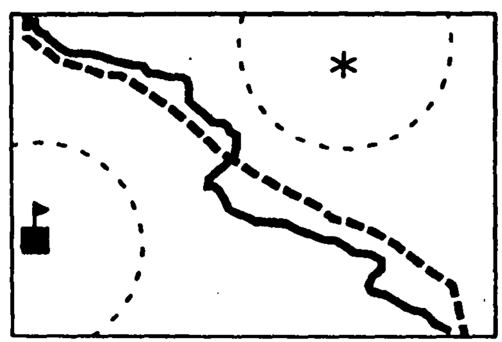
Step 1:
Identification of areas of avoidance



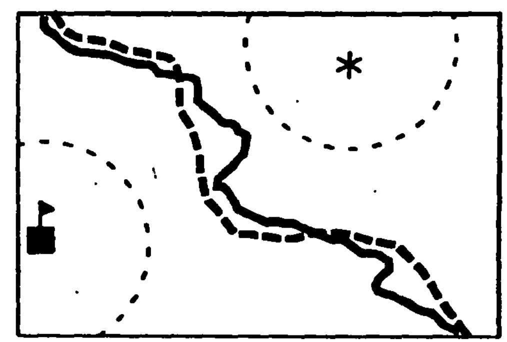
Step 2:
Creation of alternative river alignments



Alternative 1



Alternative 2



Alternative 3

FIGURE 5-2

WESTON
MANAGERS DESIGNERS/CONSULTANTS
Three Hawthorn Parkway
Vernon Hills, Illinois
60061

ALTERNATIVE RIVER ALIGNMENTS OVERLAY TECHNIQUE
MOSS-AMERICAN SITE
Milwaukee, Wisconsin

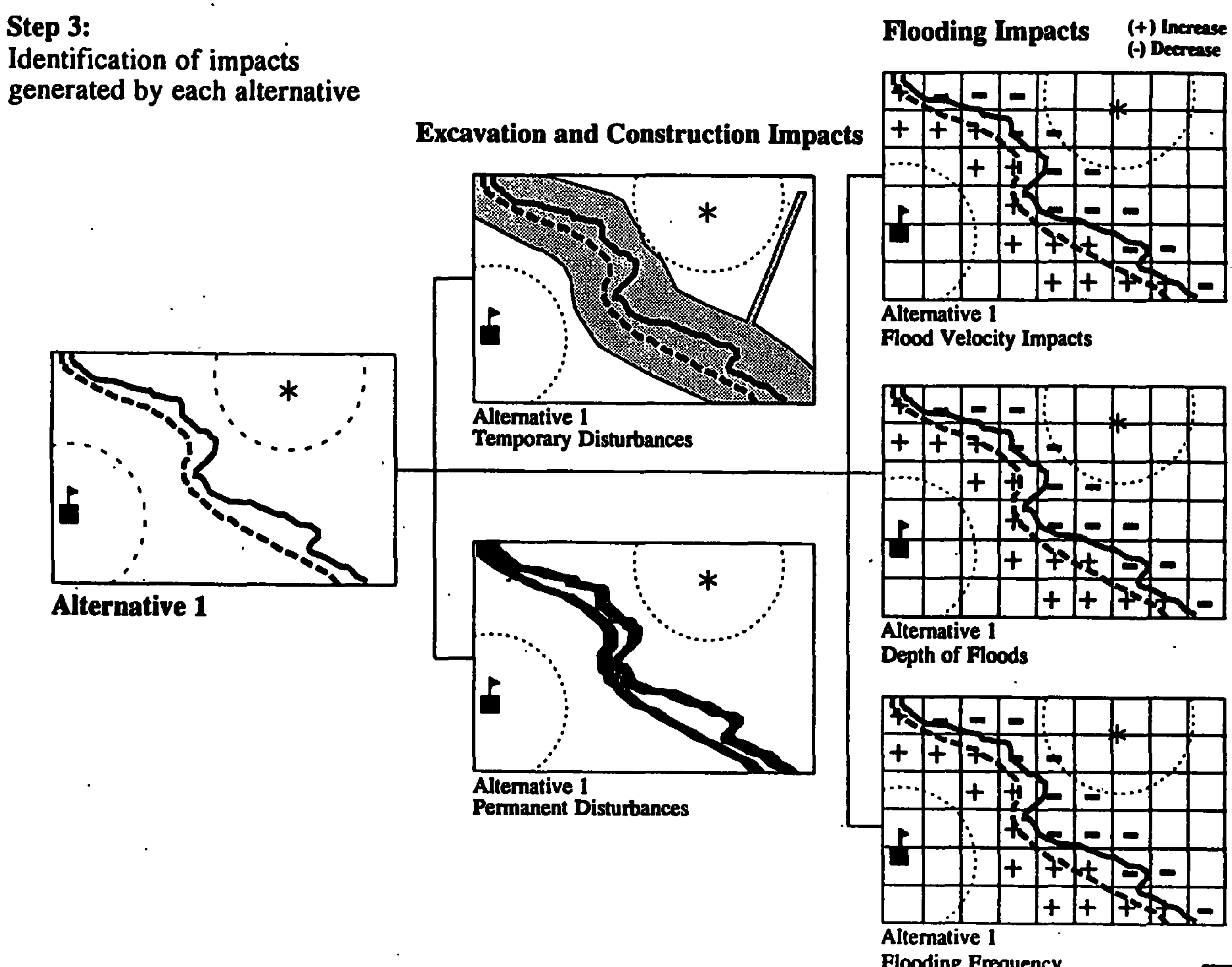


FIGURE 5-2 (cont.)

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

ALTERNATIVE RIVER ALIGNMENTS OVERLAY TECHNIQUE

MOSS-AMERICAN SITE
Milwaukee, Wisconsin

Step 4:
Conduct habitat value assessment

Step 5:
Overlay each impact with each alignment alternative and each habitat assessed.

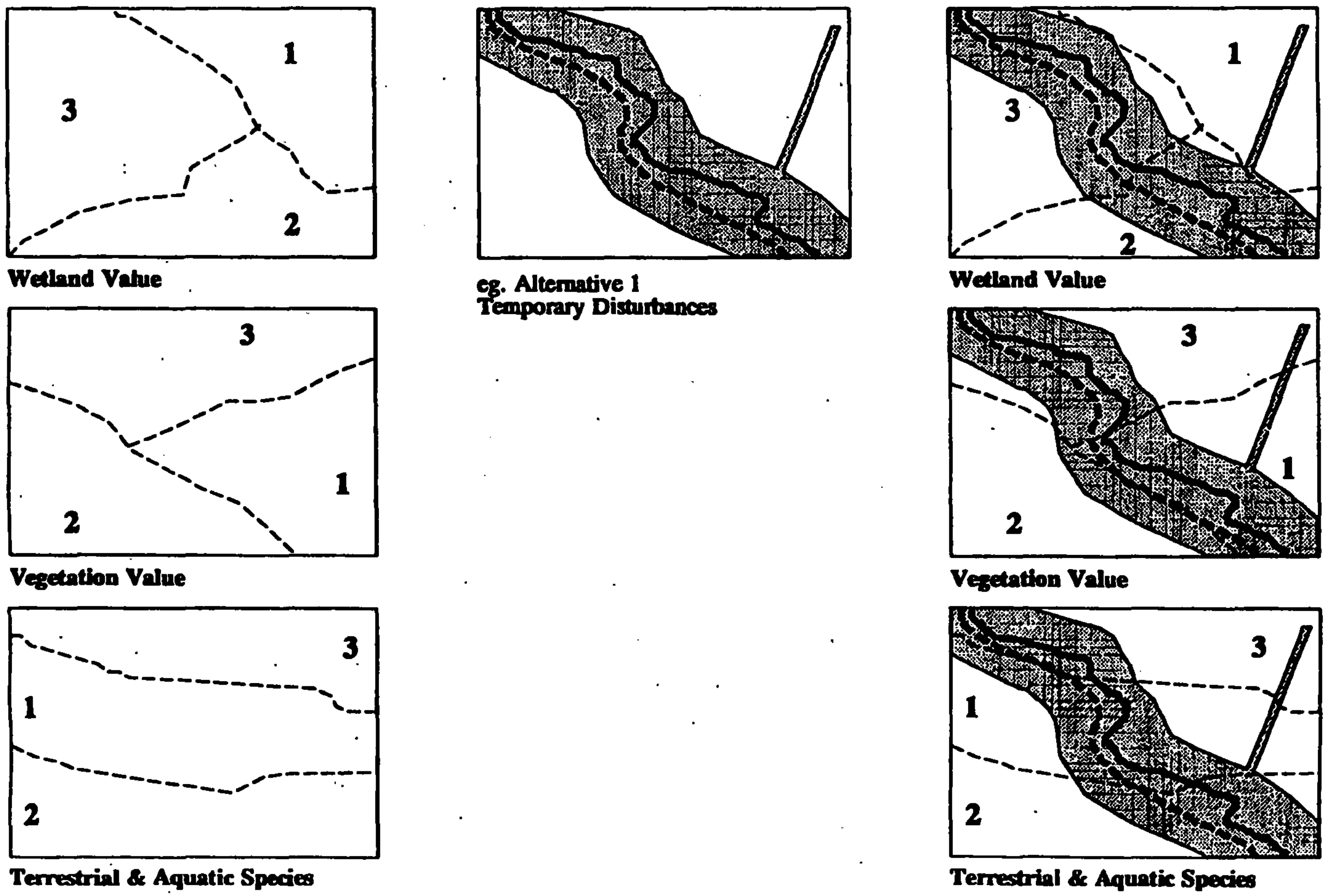


FIGURE 5-2 (cont.)

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

ALTERNATIVE RIVER ALIGNMENTS OVERLAY TECHNIQUE

MOSS-AMERICAN SITE
Milwaukee, Wisconsin

- A map showing areas to be avoided, such as areas containing valuable habitats, threatened and endangered species, sites of cultural or historical significance, baseline land uses, and public utilities.
- Wetlands delineation maps.
- A map showing the three alternative river alignments.
- A map of the produced floodplain associated with each of the alternative river alignments.
- An evaluation matrix illustrating the relative score that each alignment received.
- A summary of the procedure used to evaluate the various river alignments, the assumptions made, and the conclusion drawn from the analysis.

5.1.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 9. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

5.2 PREDESIGN TASK 10 - STUDY RIVER AND FLOODPLAIN HYDRAULICS

5.2.1 Objective

As stated in the SOW:

> *"The objective of this predesign task is to determine the existing river and floodplain hydraulic characteristics.... The results of the predesign study will be used to determine the extent to which it will be possible to construct a re-aligned stream which duplicates the existing stream hydraulic characteristics, meets or exceeds existing flood capacity, minimizes impact on existing wetlands, and preserves the characteristics of the historic original channel as much as possible."*

The subtask rationale and the associated subtasks that will be conducted within Predesign Task 10 have been presented in detail in the Interim Predesign Work Plan referenced in

Subsection 2.1. Predesign Task 10 has been initiated in accordance with the approved Interim Predesign Work Plan.

5.3 PREDESIGN TASK 11 - IDENTIFY AND PILOT TEST STREAM DIVERSION AND DEWATERING OPTIONS

5.3.1 Objective

"The objective of the predesign task is to determine the most effective option for diverting and dewatering the existing stream channel in order to determine the extent-of-contamination and examine options for removal of contaminated sediment.

Various stream diversion and dewatering options will be evaluated.

The results of the stream diversion/dewatering evaluation and pilot testing will be used to design the most appropriate means of diverting and dewatering the stream as well as to determine the extent to which it will be possible to remove contaminated sediment while minimizing impacts on existing wetlands."

5.3.2 Subtask Rationale

To accomplish the objectives of Predesign Task 11, the following goals will be addressed in the subtasks outlined in Subsection 5.3.3:

- Identify practical diversion methods and evaluate these methods with respect to the objectives of Predesign Task 11 and the overall project.
- Pilot test the preferred diversion method at one or more locations of the Little Menomonee River within the boundary of the Facility. This pilot diversion project should be of a one- to two-week duration.
- The pilot diversion project will be coordinated with other predesign tasks within this Work Plan and will include a planned overlap of both schedule and resources in order to maximize the efficiency of this activity.
- A cost-effective approach to the pilot river diversion effort will be maintained, while achieving the information objectives of the predesign task.

- The pilot diversion will be conducted during a timeframe of average low-flow conditions (i.e., during summer or fall).

Federal, state, and local agencies should review the approach to the pilot river diversion project outlined herein, and identify (consistent with the Consent Decree) any further requirements.

The discussions of subtasks presented in Subsection 5.3.4 detail the work scope that addresses these goals.

5.3.3 Subtasks

5.3.3.1 Identify Practical Diversion Methods

A preliminary engineering analysis of available diversion methods was conducted during the preparation of this work plan. This preliminary analysis considered various diversion structures placed within the riverbed (earthen cofferdam, sheet piling, and portable supported geomembrane structures), as well as alternate methods of conveying river flow around the diversion and back to its original downstream course.

Although several of these methods were determined to be infeasible for the scope of the pilot-scale diversion, further evaluations will be made during this predesign task to determine applicability to full-scale RA construction. Also, consideration will be given to evaluating methods that may be appropriate to only certain locations of the river (i.e., bridge underpasses, wide-bank, shallow flow areas, areas of multiple tributary inflows, and areas of significantly limited access).

The following section outlines alternative diversion methods that will be considered in Predesign Task 11.

Earthen Cofferdam

In accordance with the SOW, further analysis of the temporary river diversion option presented in the FS will be conducted to determine construction feasibility, environmental impact, and cost associated with this option. A preliminary analysis of this method showed an increased potential for sediment disturbance and sediment transport in and around the cofferdam construction location. This option would also require extensive clearing operations at many river locations to make the work site accessible to the heavy machinery necessary for construction of the diversion structure. This approach was eliminated for the pilot-scale diversion project; however, this alternative will be further evaluated for full-scale operations and at certain river locations.

Sheet Pile Cofferdam with Geomembrane Seal

A sheet pile alternative will be evaluated because of the potential disadvantages of using soil as a construction material for the cofferdam. This alternative consists of driving sheet pile sections with a pile driver into the riverbed and sealing the sheet pile sections with geomembrane liners held in place by sandbags or clean gravel fill. This alternative does not introduce additional soil into the riverbed, but has the potential to cause significant, localized riverbed disturbance. This approach will be further evaluated for feasibility, environmental impact, and cost as a full-scale RA implementation method. However, this method does not appear feasible for the temporary pilot-scale diversion, due the requirement for heavy equipment access, and the cost of construction.

Portable Cofferdam

The feasibility of portable cofferdam structures will also be evaluated. The typical cross-sectional dimensions and flow rates of the Little Menomonee River site are amenable to a portable cofferdam structure. This alternative consists of a tubular steel and geomembrane structure that may be constructed in the riverbed to varying widths. The structure consists of 7- to 10-foot high frames spaced approximately 15 inches apart, which would span the riverbed from bank to bank. A vinyl-coated nylon geomembrane is secured to the top of the structure and extends 15 to 20 feet out from the toe of the cofferdam. The structure is relatively lightweight and readily assembled/disassembled with small equipment and hand labor. Because of its size and flexibility of installation, it appears to be adaptable and reusable at various sections of the river. The manner in which the portable cofferdam is installed does not introduce additional soil to the riverbed and minimizes disturbance and transport of the sediment.

The portable cofferdam option was chosen on the basis of a preliminary alternatives analysis, as being most effective for the temporary pilot diversion project. The detailed engineering and construction approach to the pilot test is presented in the next subsection. Results of the pilot diversion project will determine this method's feasibility for full-scale operations.

Flow Conveyance

Alternative methods for conveyance of diverted river flows will be evaluated. These alternatives will include, but will not be limited to:

- Pumping and closed pipe transfer.
- Gravity flow via closed pipe.
- Pumping to adjacent open channel.
- Gravity flow to adjacent open channel.
- In-channel conveyance via closed piping or restricted channel sectioning.

In evaluating the feasibility of these methods, consideration will be given to a number of environmental, engineering, construction, and cost factors. Design considerations will be identified for those alternatives that are determined to be feasible and that merit further consideration during RD/RA. The selected approach to flow conveyance during the pilot diversion project will be pumping and closed pipe conveyance.

5.3.3.2 Pilot Test the Preferred Diversion Method

This section outlines the specifications and guidelines for activities associated with implementing the pilot-scale river diversion task. Figure 5-3 depicts the proposed river section to be diverted by the project. Figures 5-4 and 5-5 should be referenced to review the anticipated layout and details of the pilot diversion project site.

River Site Selection

As depicted in Figure 5-3, a section of the river between approximately 2,200 feet downstream of the former wood preserving property and approximately 1,600 feet north of West Bradley Road is proposed as a suitable location for the pilot river diversion. This location was chosen in part because the RI report indicated a "high" oily response when sediments were disturbed in this area. In addition, this location has cross-sectional river characteristics suitable for construction of the proposed portable cofferdam diversion approach. Tributary inputs to this river section are minimal and can be reasonably managed during the diversion.

A number of documentation items will be completed along the river test site location prior to the start of the river diversion and dewatering pilot test. This documentation will be prepared to provide key information during subsequent evaluation of this and other related predesign tasks. The following documentation will be obtained:

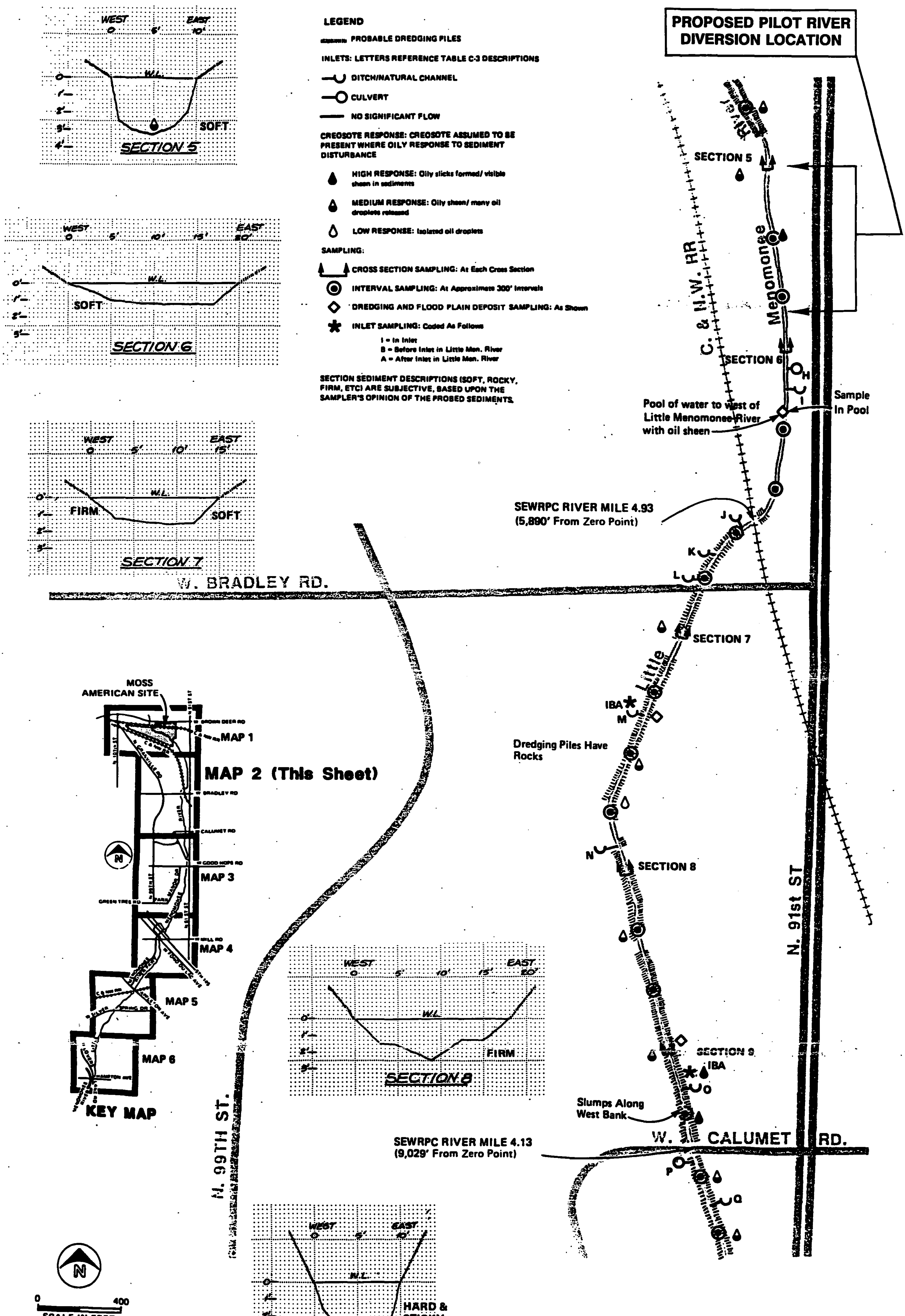


FIGURE 5-3
PREDESIGN TASK 11 - PROPOSED SITE LOCATION PILOT RIVER DIVERSION

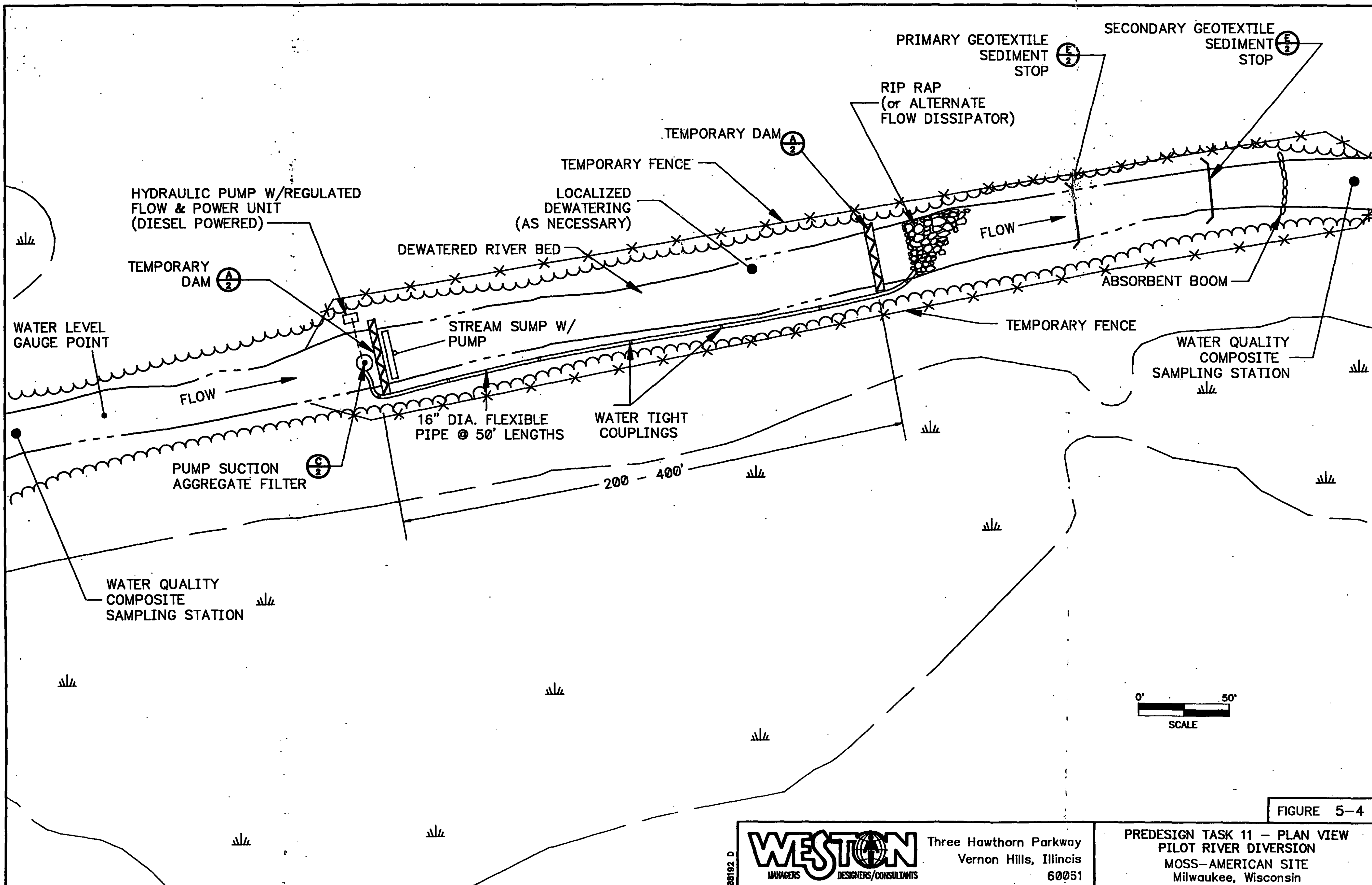
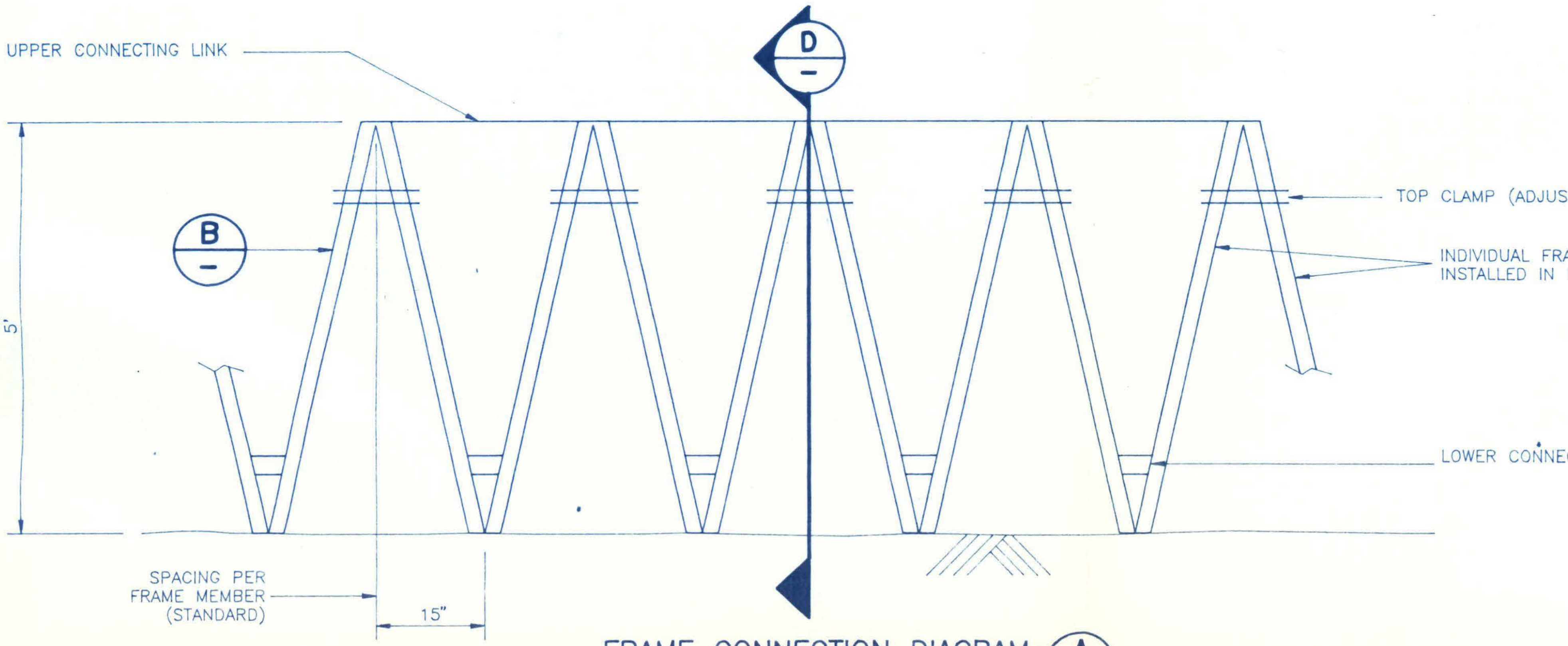
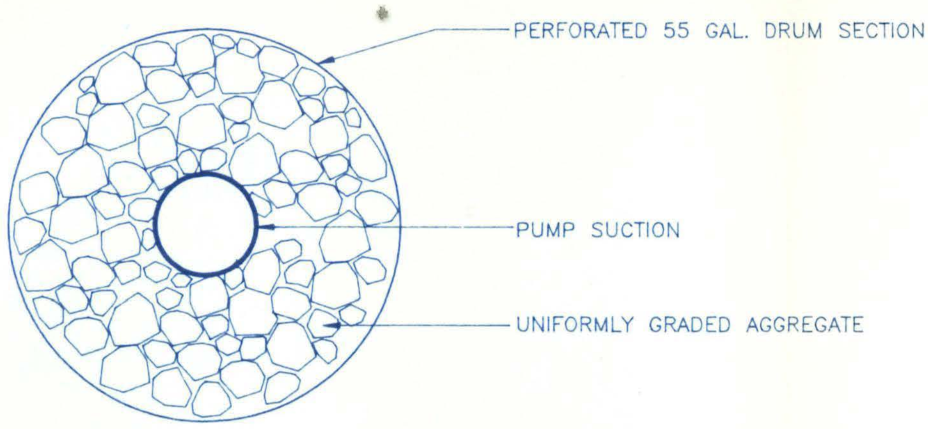


FIGURE 5-4

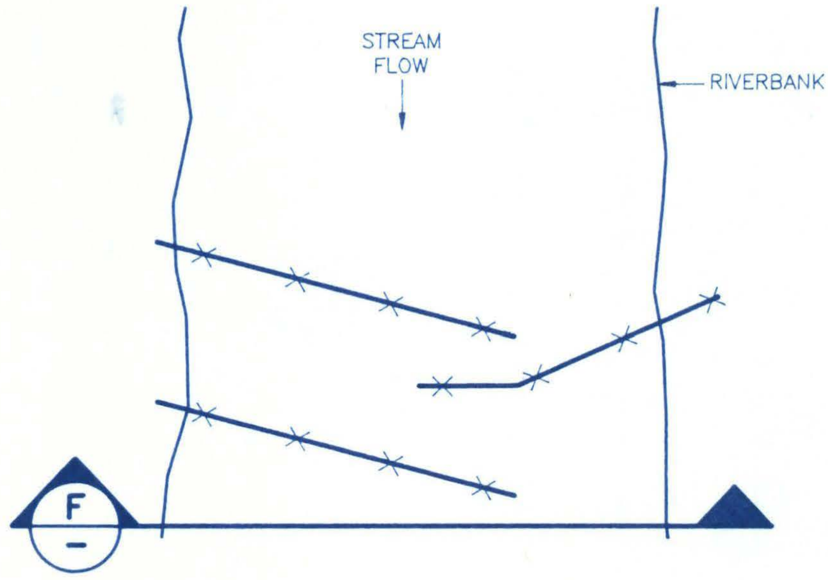
PREDESIGN TASK 11 – PLAN VIEW
PILOT RIVER DIVERSION
MOSS–AMERICAN SITE
Milwaukee, Wisconsin



FRAME CONNECTION DIAGRAM (A/1)
NTS
ADAPTED FROM PORTADAM, INC.



AGGREGATE PUMP SUCTION FILTER (C/1)
NTS

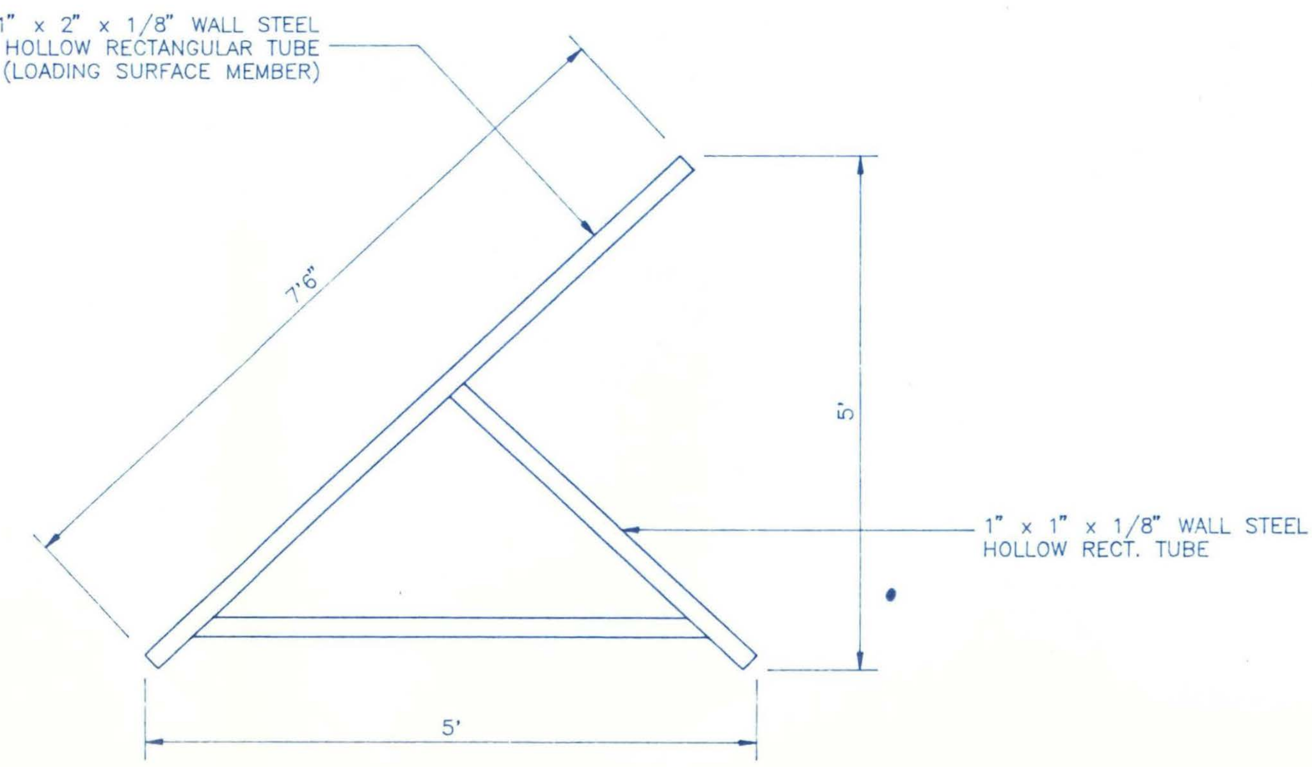


TYPICAL SEDIMENT STOP DETAIL (E/1)
NTS

P (ADJUSTABLE)

IDUAL FRAME MEMBERS
LLED IN PAIRS

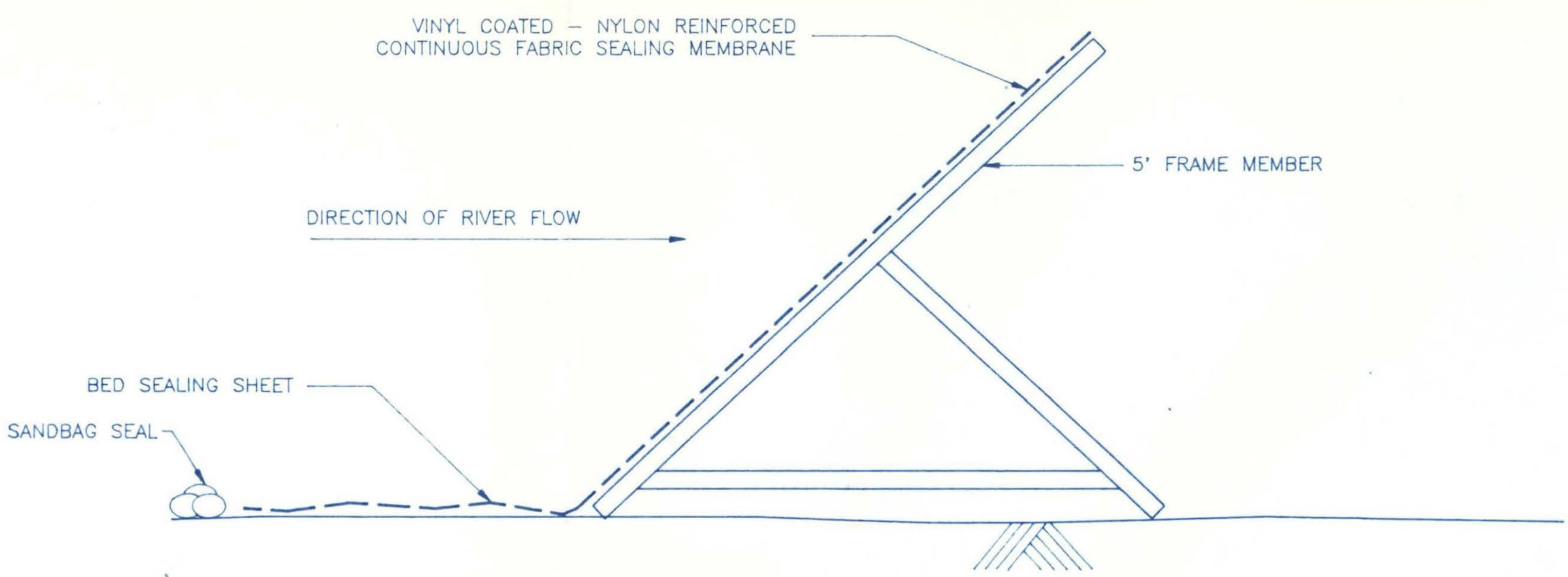
R CONNECTING LINK



5' HIGH FRAME DETAIL (B/–)

NTS

ADAPTED FROM PORTADAM, INC.

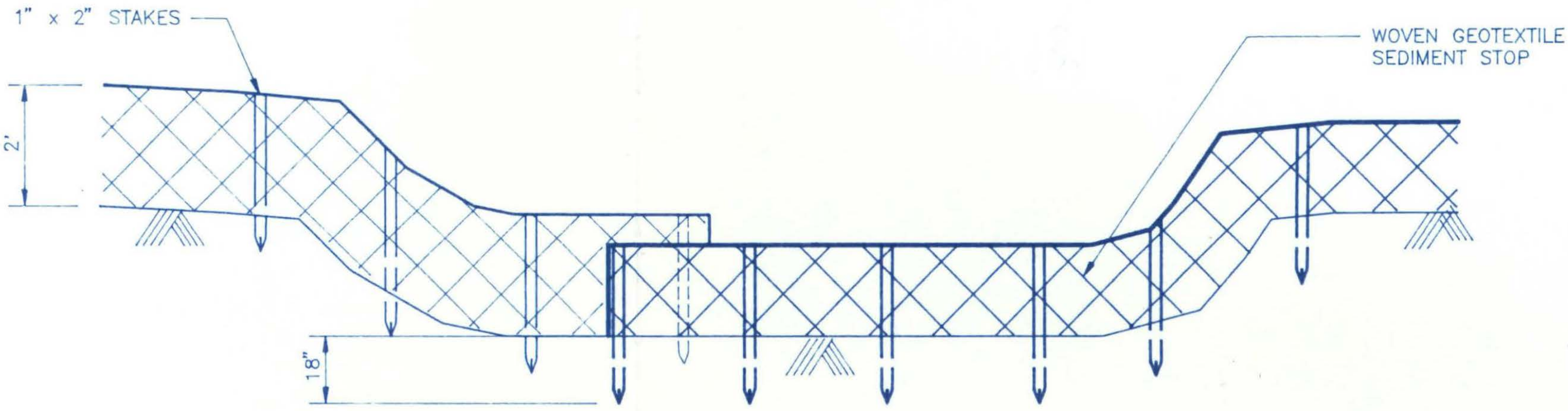


SEALING MEMBRANE DETAIL CROSS-SECTION (D/–)

NTS

ADAPTED FROM PORTADAM, INC.

NOTES: 1. ANCHOR BOLTS MAY BE REQUIRED ON HARD ROCK, FLAT OR CONCRETE SURFACES.



TYPICAL SEDIMENT STOP CROSS-SECTION (F/–)

NTS

FIGURE 5-5

15092 C

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

PREDESIGN TASK 11-STANDARD DETAILS
PILOT RIVER DIVERSION

MOSS AMERICAN SITE
Milwaukee, Wisconsin

- A base map of the diverted/dewatered river section will be prepared. This base map will be prepared from the site topographic map and will be supplemented with localized field survey information.

- Flow velocities will be measured within the river section prior to any diversion.

- The depth of river flow will be measured at 50-foot station intervals within the river section, and river bank cross-sections will be plotted at these station intervals.

- Sediment will be qualitatively mapped in an undisturbed condition prior to any river disturbance.

- The river site location will be photographed and videotaped prior to the start of any work.

<u>Environmental Controls</u>

Several environmental controls will be constructed and monitored prior to undertaking any activities within the riverbed. These environmental controls will allow monitoring of changes in river hydraulics, and will provide a means to localize any adverse effects from activities within the river section. A primary and secondary sediment stop will be constructed approximately 100 feet downstream of the pilot diversion area to control downstream transport of disturbed sediment. A woven geotextile turbidity screen will be placed within the riverbed. This dual turbidity screen will effectively limit migration of potentially contaminated sediment downstream.

An absorbent boom will be placed across the river section approximately 400 feet downstream of the pilot diversion, and downstream of the dual turbidity screen. This will minimize the potential for downstream transport and/or migration of any oily supernatant that may occur from sediment disturbance. A temporary river depth gauge will be installed approximately 200 feet upstream of the pilot diversion area to monitor backwater effects. This information will be used to monitor and regulate the flow diversion pumping rates, and will prevent any increase in backwater depth adjacent to the Little Menomonee River site (i.e., the Facility, as defined by the Consent Decree).

A final environmental control system will include upstream and downstream river water composite sampling stations. The upstream sampling station will be positioned approximately 500 feet upstream of the pilot diversion. The downstream sampling station will be positioned approximately 400 feet downstream of the absorbent boom, but upstream of any significant downstream tributary. Each sampling station will consist of an automatic liquid composite sampler. The sampler will collect a 24-hour (time-based) composite sample that will then be laboratory-analyzed for total suspended solids, and total PAHs. A daily random grab sample at one location upstream and one location downstream of the diversion will be collected and analyzed for BETX. The results will be recorded and reported to the field on a 24-hour turnaround time basis. Downstream water quality data will be compared to upstream water quality data. Any significant changes in water quality will be immediately evaluated and adjustments to the diversion project's environmental controls will be made.

Visual inspection and monitoring will be used in the field to ensure the effectiveness of environmental controls on maintaining downstream water quality. Visual observations of increased turbidity and oil sheen movement beyond the sediment stop and absorbent boom system will provide an early warning system to prompt corrective measures.

Construction and Operation of Pilot River Diversion

The construction of the river diversion components will proceed following installation of the environmental control systems. Site preparations may include minor grading adjacent to the river bank; localized weed, brush, and tree-trimming; and mobilization of the pumping unit and diversion structure components.

The flow diversion pump system will then be installed. The pump units (one primary unit and a secondary backup unit) will have the ability to convey 5,500 GPM, which is 120 percent of the typical flow within this section of the Little Menomonee River. An aggregate filtration device will be installed around the upstream pump suction inlet to minimize any potential of the pump unit to transfer sediment, mud, and debris. The pump unit will be placed in the riverbed and the power lines and associated transfer pipes will be connected. Flexible, reinforced vinyl transfer pipes will be installed and anchored above grade along the river bank, taking precaution to avoid any abrupt changes in grade. A flow dissipating device, such as a rip rap apron or channel lining, will be constructed at the downstream discharge of the transfer pipe. The purpose of this device will be to dissipate flow energy, which will decrease the potential for erosion, disturbance, and transport of sediments downstream.

Next, the portable diversion structures will be erected and installed. The tubular sections of the portable dam units will be assembled on shore to the manufacturer's specifications.

The portable dam frames will then be placed within the riverbed locations, taking precautions to minimize disturbance of the bottom sediment. No foundation preparation or excavation is necessary for this structure. Once the upstream and downstream frames are in place, the dewatering sump pump will be installed directly behind the top of the downstream dam. All connections will be made at this time in preparation for dewatering of the riverbed.

The final step of the installation consists of placing the geomembrane and dewatering the test area. The geomembrane will be attached to the top of each dam frame and placed on the riverbed. The geomembrane will extend 15 to 20 feet upstream from the structure. At the same time the membrane is being placed, the flow diversion pump will be activated. The river depth gauge will be monitored to determine appropriate regulations of pump speed in order to maintain river flow rate. The dewatering sump pumps will then be activated to begin the dewatering and drying of the riverbed. Portable sump pumps at each dam location will manage any river seepage under the dam structure.

Pilot test activities will take place during summer months (i.e., seasonal low-flow conditions). Information in the FS suggests that during summer months, very little, if any, groundwater enters the river. For the purposes of this pilot diversion, this assumption will be maintained. However, results of this and other predesign tasks will provide data to confirm the potential need for groundwater infiltration management systems during full-scale, RA river diversions. WESTON also anticipates that sufficient data and findings from a low-flow pilot-scale diversion will be obtained to scale up (if necessary) during the RD/RA phases of the project to accommodate a higher flow diversion.

Following localized dewatering of the river section, a system of portable scaffolding and/or planking will be placed across the river from bank to bank. This will allow remote access to riverbed sediments by field personnel during the proposed various study and sampling events to be coordinated with Predesign Task 11 (specifically Predesign Tasks 4 and 12).

The diversion components will be manned on a full-time, 24-hour basis during the period of pilot river diversion (estimated at one to two weeks). Staff assigned to this position will have a complete working knowledge of the system components, environmental controls, and contingent events/actions outlined in this work plan.

<u>Contingencies</u>

Construction access to the selected river site is not anticipated to be a problem, due to the type of diversion structure chosen. The structure and supporting pumps, pipes and power units can be brought to the pilot test location by pick-up truck or bobcat-type excavator. Minimal, if any, clearing will be required to make the test site accessible. Any construction access improvements will be completed during site preparations.

The Little Menomonee River is expected to be at seasonal low flow conditions during the planned pilot diversion project. Preliminary information gathered from Predesign Task 10 (River and Floodplain Hydraulics Studies) suggest that storm events can drastically change flow characteristics of the watershed and river basin over a short period of time. Under such conditions, flows are very high in comparison to seasonal levels but these conditions occur infrequently and for a short duration. The contingency plan to address this type of event during the pilot river diversion will be as follows:

- Allow flows to return to the original riverbed test area.
- Temporarily suspend diversion activities.
- Following the storm event, allow the river to return to stabilized flow conditions.

This contingency action could be quickly accomplished by removing the geomembrane from both diversion structures and allowing the diverted flow to pass. A "dry run" of this contingency action will be undertaken during the initial stage of the diversion. The pumping system would be relocated to high ground; however, flow dissipators and diversion structure framing would be left in place. Once river conditions return to typical seasonal levels, the geomembranes would be reinstalled, the pumping system repositioned, and the test area dewatered as outlined previously. This type of storm event, while being disruptive to the predesign task, is not anticipated to increase flooding potential or cause adverse environmental impacts to adjacent properties, due to the ability to readily dismantle the proposed diversion system.

<u>Pilot Test Closeout</u>

Upon completion of the pilot river diversion, the portable system components will be dismantled and removed. Sump pumps and test/sampling equipment will be removed from the riverbed and the upstream and downstream portable cofferdam will be carefully breached to allow water to flow slowly into the drained riverbed. Once riverbed levels have stabilized, the downstream liner and frame structure will be removed. The flow diversion pump will be disengaged once flow begins to pass through the test area. The diversion structure and pumps will be decontaminated and any residue (fluids/sediments) will be containerized and staged on the former wood preserving facility property with other RI and predesign wastes. Rip rap and aggregate flow dissipators will be graded and left along the banks of the river. Any accumulated sediment in front of sediment stops will be left within the river in a manner which does not restrict flow. Sediment stops and absorbent booms will be removed and appropriately staged on site with other RI and predesign phase investigative wastes. Areas along the river where vegetation was removed will be regraded, seeded, and mulched prior to leaving site. All documentation records and field logs associated with this activity will be transferred to the home office files.

5.3.3.3 Evaluate Pilot Test Effectiveness

The pilot test will be conducted following the protocols detailed above in order to provide an opportunity to evaluate the effectiveness or feasibility of the river diversion/dewatering approach. As stated in the SOW for this predesign task, some of the issues that will be addressed during evaluation of the pilot test are:

1. Construction phasing.
2. Construction space requirements.
3. Construction access.
4. Runoff diversion.
5. Impacts of rain, snow, or flood events on stream diversion and dewatering.
6. Impacts of diversion on stream tributaries and existing structures (bridges, culverts, utilities, etc.).
7. Potential temporary dam sites.
8. Groundwater control.
9. Pumping requirements.

10. Ability to determine extent of sediment contamination.

11. Ability to remove contaminated sediment.

12. Temporary seeding to promote dewatering through evapotranspiration.

13. Erosion control.

14. Temporary diversion of storm drains and tributaries.

15. Excavation characteristics of river bed sediments and river bank soils will be determined through test pit excavations.

5.3.4 Deliverables

A TM with detailed findings and a summary of pilot activities will be produced after the completion of Predesign Task 11. The report will include closeout documentation as well as a detailed analysis of procedures and materials used and their effectiveness in achieving the desired result. An analysis of alternative approaches and important design considerations generated from the pilot test work will also be included for reference during the RD/RA phases. A draft TM will be issued to U.S. EPA for review and comment. A final TM will incorporate Agency comments on the draft TM.

5.3.5 Schedule

The Predesign Task 11 Pilot River Diversion has been scheduled to be conducted during an the August to September timeframe, as is shown in the Figure 1-3 predesign schedule. Since Predesign Task 11 directly and indirectly affects the progress of several other predesign tasks, consideration was given to selecting the most beneficial time to complete this task, while recognizing the need for seasonal low-flow conditions of the Little Menomonee River. In the event that Agency approval is not received prior to this scheduled timeframe, this task (and other directly related predesign tasks) will be postponed until typical seasonal low-flow conditions return.

5.4 PREDESIGN TASK 12 - PILOT TEST IDENTIFICATION OF CREOSOTE RESIDUE IN SEDIMENTS USING VISUAL CRITERIA

5.4.1 Objective

As stated in the SOW:

> *"The objective of this predesign task is to test the effectiveness of using visual observation to determine the extent of creosote residue in the sediments of the Little Menomonee River. During field studies, it was shown that creosote residue in the river is not uniformly distributed. The test will indicate whether visual observation is a viable method for identifying the extent and location of creosote residue in the sediment.... The analytical results obtained in this predesign task will be used in determining whether visual observation is a viable method to locate the sediments containing the contaminants of concern in the Little Menomonee River. If it is not, an alternative method shall be developed. If used, visual identification will be combined with a confirmatory testing method, approved by U.S. EPA."*

5.4.2 Subtask Rationale

The Consent Decree (CD) requires the removal and treatment of contaminated sediments from the Little Menomonee River. As conceptualized in the FS, much of the removal of contaminated river sediments will occur after river water has been diverted to the new river channel. The CD, therefore, established cleanup standards for contaminated sediments in the old river channel, assuming the riverbed will be dewatered and the sediments will be available for visual inspection. The cleanup standard for sediments within the former river alignment requires the removal of visible contamination or sediments containing in excess of 388 mg/kg total CPAHs.

This predesign task was established to determine if creosote residue can be effectively identified in dewatered sediments by visual observations. This task is highly dependent of and interrelated to Predesign Task 4 and Predesign Task 11. Predesign Task 4 (Section 4.3.3.2) addresses the sampling and laboratory analysis of sediments to determine the extent-of-contamination. Predesign Task 12 (Section 5.3) is the pilot scale diversion and dewatering of the Little Menomonee River.

Predesign Task 12 can only be conducted during the pilot-scale dewatering of (a) segment(s) of the Little Menomonee River (Predesign Task 11). Once a segment of the river has been dewatered, the scope of work outlined in the following subsections will be conducted. Collection of samples for laboratory analysis will be as defined within Predesign Task 4 (see Subsection 4.3).

Predesign Task 12 is designed to meet three very focused goals:

- Determine if creosote residue is visible in the dewatered sediments of the Little Menomonee River.
- Conduct and record visual observations during sample collection activities (Predesign Task 4) and pilot river diversion (Predesign Task 11).
- Correlate recorded visual observations with CPAH concentrations determined by laboratory analyses.

5.4.3 Subtasks

The subtasks within Predesign Task 12 are 1) conduct field investigations and 2) correlate laboratory data with field observations. Both subtasks are described in the following paragraphs.

5.4.3.1 Conduct Field Investigations

A sampling team will visually inspect of the dewatered river segment by walking each side of the river and looking for oil sheens or staining on the sediment surface that could indicate the presence of creosote residues. Any area that exhibits a sheen or staining will be staked and flagged for subsequent sampling. Each location that exhibits a sheen or staining will be recorded on a scaled drawing and photographed.

Additionally, at approximate 10-foot intervals, a stainless steel rod, shovel, or other suitable tool will be used to probe into the sediment to the depth of hardpan. The tool will be inspected for the presence of a sheen or staining. The depth of the sediment will also be recorded at each probed area. Subsurface sediments will also be exposed by probing or digging to examine for the visible evidence of creosote residue. Suspected areas of visible subsurface creosote residue will be staked and flagged with a different color for subsequent sampling. Each location that exhibits evidence of a subsurface sheen or staining will be recorded and photographed.

A maximum of 5 samples will be collected from each category of sediments (surface and subsurface) exhibiting visible evidence of creosote. Sampling points will be randomly selected if more than 5 candidate sampling locations are identified for either category. In addition, 10 samples will be collected for analysis from areas with no visible evidence of creosote residue.

Sediment samples will be collected using appropriate methods and sampling devices. The method of collection will depend upon the degree of access to the streambed, the consistency of the sediments and the apparent depth of contamination. Access to the streambed will depend largely upon the degree of stream dewatering. If the streambed is dewatered sufficiently, it may be possible to walk on the streambed and collect sediments without special equipment. If, however, the streambed remains saturated or inundated, special equipment may be required for both access and collection of samples.

In dry conditions, sampling devices may include trowels or disposable spatulas. Wet conditions may require the use of a sediment sampler such as an Ekman dredge, Ponar grab or core sampler.

Samples will be collected in a direction proceeding from the downstream end of the dewatered segment(s) toward the upstream end. Sample collection devices will be decontaminated using an alconox solution followed by ethanol and distilled water rinses. Samples will be appropriately labeled, logged, preserved, and transferred to the laboratory under chain-of-custody for analysis using Method 8270 or 8310.

The field sampling team will record the following information in a field notebook concurrent with collection of each sample:

- A description of each sampling point before sediments are disturbed, including consistency, color, the presence of an oily sheen, texture (particle size), and root and debris content.

- A qualitative description of any evidence of creosote residue before and after the sediment is sampled.

- Notations as to potential natural or non-site-related sources of a sheen, staining, creosote or oily residue.

- Depth of sediment at flagged areas.

- Width and morphometry of the streambed.
- Results of real-time environmental air monitoring instrument readings taken near the sample collection point.
- Notations of unanticipated findings or site features.
- Location of sample points and methods used to collect samples for laboratory analysis.

Each sample collection point will be photographed before, during, and after sample collection. Photographs will be logged in the field notebook.

5.4.3.2 Correlate Laboratory Analytical Data to Visual Criteria

The environmental sampling team will compare visual documentation (field notes, logs, photographs, archive samples and other information gathered) with laboratory-determined CPAH concentrations. This activity will occur after completing the field investigation and receiving laboratory analytical results. Correlations between visual observations and laboratory-determined CPAH concentrations, especially at levels near the specified cleanup standard or 388 mg/Kg total CPAH, will be evaluated and summarized.

In the event that a correlation between visible observations and the 388 mg/kg removal standard cannot be made, then data from fixed laboratory analysis or approved field analytical procedures (to be determined under Predesign Task 1) will be utilized. However, on the basis of industry findings, 388 mg/kg CPAHs is approximately equivalent to 1% creosote, which is readily identifiable by color and odor.

The alternatives that will be evaluated, if necessary, will be determined during execution of this predesign task and presented in a Technical Memorandum.

5.4.4 <u>Deliverables</u>

The results of this predesign task will be presented in a TM. The TM will describe and document field investigation activities, laboratory analytical data, and present any correlations between visual observations and CPAH concentrations relative to cleanup standards. If a reliable correlation exists, the TM will include a protocol for using visual observations to identify sediments which require removal and treatment during the RA.

A draft TM will be submitted to the Agency for comment prior to the submission of the final TM.

5.4.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 12. The overall schedule for this predesign task will depend on the schedule for implementing Predesign Task 11. The draft TM will be delivered to the Agency 60 days after receipt of the corresponding analytical data. The final TM will be delivered 30 days after receipt of the Agency's written comments on the draft TM.

5.5 PREDESIGN TASK 13 - DEFINE THE QUANTITY AND PHYSICAL/CHEMICAL QUALITY OF RIVER MATERIALS (SOIL, SEDIMENT, WATER, OR DEBRIS) TO BE TREATED

5.5.1 Objective

As stated in the SOW:

> *"The objective of this predesign task is to obtain information and define the quantity, physical characteristics, and chemical quality of river materials to be treated in the biological treatment system.... The results of this predesign task will help to plan other predesign tasks such as:*
>
> - *Defining, handling, staging, and storage systems for untreated river materials.*
> - *Selection of dredging technologies."*

This objective will be accomplished through the implementation of subtasks.

5.5.2 Subtask Rationale

The following goals will be addressed by the scope of subtasks outlined in Subsection 5.5.3:

- Define the physical properties of river sediment and soils to be managed.

- Identify the various types of materials along the river corridor that require treatment and/or removal and determine their respective physical/chemical composition.

Relevant information will also be provided by other related predesign tasks:

- Extent-of-contamination data for the river and floodplain will be obtained by Predesign Tasks 4, 5, and 7.

- Predesign Task 9 will identify the preferred river realignment alternative.

- The extent of CPAH contamination in the floodplain along the proposed new river alignment will be derived from Predesign Task 7.

- The pilot-scale river diversion/dewatering activity will yield information on the quantity and potential special handling requirements posed by river sediments.

- The vegetative cover and topographic features of the river having contaminants above the cleanup criteria will be determined during Predesign Tasks 4 and 7.

5.5.3 Subtasks

The following subtasks will be conducted within Predesign Task 13:

- Conducting geotechnical testing of river materials.

- Reviewing relevant findings and data from other related predesign tasks.

- Conducting river material quantity takeoff calculations.

Subsections 5.5.3.1 through 5.5.3.3 further describe the scope of these subtasks.

5.5.3.1 Conduct Geotechnical Testing of River Materials

A limited and focused program of soil and sediment sampling for geotechnical index property testing will be conducted during this subtask. This sampling and analysis program will provide quantifiable data on grain size distribution, soil classifications, organic content, moisture content, and Atterberg limits for those river materials that may require management by RD/RA systems. Standard ASTM laboratory methods will be followed in conducting this testing. The following river materials are anticipated to be collected for this geotechnical analysis:

- River bank soils.
- Floodplain and wetland surface soils.
- River sediments in slow-velocity (sluggish) flow areas.
- River sediments in high-velocity flow areas.

Results of this laboratory geotechnical testing will establish the typical index properties for these soil types.

5.5.3.2 Review Findings/Data from Related Predesign Tasks

As outlined in Subsection 5.5.2, a number of other related predesign tasks must be implemented to provide the basic data parameters for conducting Predesign Task 13. Most importantly, extent-of-contamination Predesign Tasks 4, 5, and 7 will provide delineation of river materials with CPAHS above the cleanup standards.

The TM findings from the pilot-scale river diversion (Predesign Task 11) will provide important information regarding the expected physical consistency of river sediments and soils. In addition, field reconnaissance, aerial photograph reviews, and findings from the preliminary and final environmental assessments conducted during Predesign Tasks 9 and 15 will provide data regarding surface vegetation and soil types within the areas designated for contaminant removal. This data will assist in defining the physical characteristics of river materials required to be managed by the RD/RA systems.

5.5.3.3 Conduct River Material Quantity Takeoffs

This subtask will use the initial mapping of areas designated to require sediment and/or soil removal in order to conduct more detailed material quantity takeoffs. Cross-sections of the subject areas will be prepared and any need for additional field surveying will be identified. Computer-based earthwork estimating programs using the "average-end area" method of computation will be used for conducting quantity calculations. These calculations will be further proportioned to provide an estimate of vegetative matter, debris, and other component materials.

5.5.4 Deliverables

The findings from Predesign Task 13 will be summarized and presented to the Agency in a TM. This TM will include appropriately-scaled maps, cross-sections, survey data, and computations that depict the river material quantities required to be managed by the RD/RA systems. This TM will also present geotechnical analytical data that defines the soil index properties of the river materials. The chemical characteristics of river material, as determined by sampling and analysis during Predesign Tasks 4 and 7, will also be referenced in this TM.

A draft TM will be submitted to the Agency for comment prior to the submission of a final TM for this predesign task.

5.5.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 13. As noted by this schedule illustration, Predesign Task 13 is not proposed to be completed until after the substantial completion of Predesign Tasks 4, 5, 7, 9, and 11. This deferral is necessary because it is important to obtain relevant data from these tasks prior to undertaking Predesign Task 13.

5.6 PREDESIGN TASK 14 - IDENTIFY AND TEST ALTERNATIVE DREDGING TECHNOLOGIES FOR SEDIMENT REMOVAL FROM THE LITTLE MENOMONEE RIVER

5.6.1 Objective

As stated in the SOW:

> *"The objective of this predesign task is to identify dredging technologies and methods that can remove the river sediments effectively, select the optimal technology, and test the selected technology's effectiveness and implementability as defined under Task 9.*
>
> *Dredging technologies will be screened to determine which technology would be most effective in removing contaminated stream sediment and minimizing adverse environmental impact. The selected technology will be pilot tested to verify its effectiveness."*

The objective will be accomplished through the implementation of subtasks.

5.6.2 Subtask Rationale

the following goals will be addressed in the subtasks outlined in Subsection 5.6.3:

- Determine through other predesign tasks, which areas of the river will require sediment removal, and what volume of sediment is present in these areas.
- Determine specialized engineering, design, and/or construction requirements for sediment removal.
- Review the physical characteristics of river material resulting from the dredging technique(s).
- Identify material handling system requirements for the dredging technique(s).
- Evaluate the potential impact of dredging technique(s) to the river and surrounding environment, which, in turn, would identify necessary engineering and environmental controls that may be required during RA implementation.
- Develop a plan to pilot test the selected dredging technique, if necessary to meet the objective of this predesign task.

The discussion of subtasks in Subsection 5.6.3 details the work scope that addresses these goals.

5.6.3 Subtasks

The following subtasks will be conducted within Predesign Task 14:

- Identify and evaluate feasible sediment removal techniques.
- Determine the need for pilot-scale testing and (if necessary) developing a test plan.

5.6.3.1 Identify and Evaluate Feasible Sediment Removal Techniques

Predesign Tasks 4, 7, 11, 12, and 13 are expected to define the extent, location, quantity, and physical characteristics of those sediments requiring removal from the Little Menomonee River. Predesign Tasks 9, 10, and 15 are expected to define the realignment corridor for the Little Menomonee River. These predesign tasks will also define those portions of the river that will not be conducive to realignment.

After a review of the findings from the predesign tasks referenced in the previous paragraph, an engineering evaluation of sediment removal techniques will be conducted. This evaluation will consider:

- Recommendations from specialized contractors and vendors experienced in conducting sediment removal and transfer.
- Anticipated river site conditions during the RA phase.
- Environmental health and safety concerns and public impact.
- Method efficiency and cost.

The intended result of this evaluation will be to identify cost- and performance-effective techniques for removal and transfer of sediments to the remedial treatment system and/or final disposal area. Widely-used and standardized techniques will be chosen, if possible. Certain portions of the river (beneath bridges and within culverts) may require modifications to standard methods.

Engineering and environmental controls required for the sediment removal and transfer technique(s) will be identified. These controls can then be addressed by the RD/RA plan development. Finally, this subtask will make recommendations as to whether further evaluation of the sediment removal technique(s) is necessary via a pilot-scale demonstration.

5.6.3.2 Determine the Need for Pilot-Scale Testing and (If Necessary) Develop Test Plan

Findings from the sediment removal technique evaluation subtask (5.6.3.1) will determine the need for pilot-scale testing of river sediment removal and transfer techniques. In the event that widely-used and standard construction methods are determined to be feasible for achieving sediment removal, a pilot-scale test may not be necessary during predesign.

If, however, nonstandard techniques are required or unusual river site conditions or sediment characteristics prevail, a pilot-scale demonstration may be necessary to further evaluate the sediment removal technique during predesign. Prior to conducting a sediment removal pilot-scale demonstration in the Little Menomonee River, a detailed testing plan will be prepared and submitted to U.S. EPA for review and approval.

5.6.4 Deliverables

A TM will be prepared presenting the results of the sediment removal techniques evaluation and providing an assessment of the need for conducting further pilot-scale evaluation. If a pilot-scale demonstration is to be performed on the Little Menomonee River, a pilot-scale test plan will be prepared to accompany the TM submittal. These deliverables will be submitted to U.S. EPA and WDNR for review and comment. If a pilot test is implemented, a follow-up TM will be prepared to document this activity and its findings.

5.6.5 Schedule

Figure 1-3 presents the anticipated schedule for conducting Predesign Task 14. It should be noted that Predesign Task 14 cannot be effectively initiated until findings from Predesign Tasks 4, 7, 11, 12, and 13 are available.

5.7 PREDESIGN TASK 15 - CONDUCT A FLOODPLAIN AND WETLANDS ASSESSMENT CONSISTENT WITH THE REQUIREMENTS OF SECTION 10.2.2 OF THE ROD AND SECTION II.B.10 OF THE SOW

5.7.1 Objective

As stated in the SOW:

> *"A preliminary floodplain and wetland assessment of the Site has been completed. This task envisions a more in-depth analysis, continuing in the general vein as the preliminary assessment, that will serve a three-fold purpose: it will provide continuing information as needed (each segment and/or portion of segment will pose its own unique problems); it will provide a framework for assessing and reviewing potential impacts of construction options in accordance with applicable regulations, guidance and policy including ROD Section 10.2.2; and it will provide a means of comparing environmental conditions at the facility prior to cleanup and after cleanup is complete..."*

5.7.2 Subtask Rationale

To meet the objectives of this predesign task, subtasks must fulfill two goals:

- Establish a baseline (pre-remediation) definition of the terrestrial and aquatic resources along the Little Menomonee River.
- Prepare floodplain and wetland assessments.

The baseline conditions will be used to compare conditions at the facility prior to cleanup and after cleanup is complete. Terrestrial and aquatic environmental resources will be defined based upon historic data, reports, and field investigations. Definition of the existing conditions will focus on upland, floodplain, and river habitats potentially affected by the remedial action. Baseline conditions may be useful in developing mitigation and restoration plans during design. In addition, the baseline terrestrial and aquatic resources will need to be defined in order to develop the floodplain and wetland assessments.

Preparation of Floodplain and Wetland Assessments are required under Executive Orders 11988 and 11990, respectively. Both the Floodplain and Wetland Assessments are required under the CD, SOW, and ROD. Policy for the implementation of Floodplain and Wetland Assessments was defined within OSWER Directive 9280.0-02, 6 August 1985.

OSWER Directive 9280.0-02 states:

> "...floodplain/wetland assessments shall consist of a description of the proposed action, a discussion of its effect on the floodplain/wetlands, a description of the alternatives considered and their effects on the floodplains and wetlands, and measures to minimize potential harm to the floodplain/wetland if there is no practicable alternative to locating in or affecting floodplain/wetlands."

According to the OSWER Directive, the decision to propose an action within or affecting a floodplain/wetland shall be documented by a Statement of Findings, and:

> "This statement will not exceed three pages and will include: (i) the reasons why the proposed action must be located in or affect the floodplain or wetland; (ii) a description of significant facts considered in making the decision to locate or affect the floodplain or wetlands including alternative sites and actions; (iii) a statement indicating whether the proposed action

conforms to applicable state or local floodplain/wetland protection standards; (iv) a description of the steps taken to design or modify the proposed act to minimize potential harm to or within the floodplain or wetlands; and (v) a statement indicating how the proposed action affects the natural or beneficial values of the floodplain or wetlands."

This predesign task will draw upon information derived from Predesign Tasks 4, 7, 9, 10, 11, 14, and 17 in order to meet the two goals stated above. The following tabulation describes the interrelationship between the objectives of Predesign Task 15 and other predesign tasks:

- Predesign Task 4 will define the extent of contaminated sediment to be managed. The amount of sediment to be managed will affect the degree of disturbance to the floodplain during construction.

- Predesign Task 7 will determine the extent of floodplain contamination. The amount of soil in the floodplain requiring remediation will affect the degree of disturbance to the floodplain during construction.

- Predesign Task 9 will identify and evaluate alternative river alignments and select a preferred alignment that minimizes adverse environmental impact. The selected alignment will affect the degree of impact upon the floodplain and wetland. This predesign task will provide extensive baseline information on the terrestrial and aquatic resources along the selected alignment for the Little Menomonee River.

- Predesign Task 10 will provide detailed information on river and floodplain hydraulics under existing and post-remediation conditions. Alterations of river and floodplain hydraulics will affect the aquatic and terrestrial resources along the Little Menomonee River.

- Predesign Task 11 will test the stream diversion and dewatering options. Data from this predesign task will determine the degree of disturbance to the floodplain during construction.

- Predesign Task 14 will identify and test alternative dredging technologies. This information will determine the degree of disturbance to the river and floodplain during construction.

- Predesign Task 17 will define handling, staging, and storage systems for soils and sediments. Information derived from this task will indicate the degree of disturbance to the floodplain and wetlands along the Little Menomonee River.

5.7.3 Subtasks

5.7.3.1 Define and Document Baseline Environmental Resources Along the Little Menomonee River and its Floodplain

Baseline information on the aquatic and terrestrial resources along the Little Menomonee River will be based primarily on the results of Predesign Task 9. The scope of Predesign Task 9 (Subsection 5.1) is very broad and addresses all of the major aquatic and terrestrial biotic habitats, communities, and assemblages. Predesign Task 9 includes literature searches, data review, and field confirmation studies.

The primary objective of Predesign Task 9 is the selection of a river realignment that minimizes adverse environmental impact on environmental resources.

This Predesign Task 15 will refine information gathered under Predesign Task 9, with a focus on defining existing conditions prior to the remedial action. This task will emphasize gathering additional information and documentation for comparison of pre- and post-remedial action conditions.

Activities that will be undertaken in this subtask will depend on the final alignment and remedial design. Once the alignment is defined and construction techniques identified, the potential environmental impacts may be predicted. Depending on the specific resources that may be affected, additional baseline data may be required. Collection of additional baseline data could focus on any of the following:

- Water Quality
- Sediment quality.
- Phytoplankten, zooplankton, periphyton and macroinvertebrate assemblages.
- Reptile and amphibian populations.
- Fisheries resources.
- Historical development of the River.
- Rare, threatened and endangered species.
- Wetland delineations.

- Wetland habitat quality.
- Wetland plant assemblages.
- Upland plant communities.
- Upland habitat quality.
- Historical development of the floodplain and upland areas.
- Birds and mammals.
- Recreational resources and use.
- Rare, threatened and endangered species.

If it is determined that existing data are insufficient to define the baseline conditions adequately, additional field data will be collected. The scope of additional data collection activities will then be defined in an interim Technical Memorandum.

This predesign subtask will also include:

- Preparation of detailed maps of the terrestrial and aquatic resources along the selected alignment of the Little Menomonee River.
- Photographic and videographic records of baseline environmental conditions.

5.7.3.2 Prepare Floodplain/Wetland Assessment

Floodplain and wetland assessments will be prepared in accordance with OSWER directive 9280.0-02.

5.7.4 Deliverables

Two deliverables will be prepared upon completion of this Predesign Task. The first deliverable will be a baseline environmental assessment. This document will draw upon information gathered in related predesign tasks listed in Section 5.7.2, and information obtained in this predesign task. The baseline environmental assessment will provide a general description of the environmental resources in and along the Little Menomonee River and a detailed definition of baseline conditions in areas likely to be affected during construction. The detailed baseline data will focus on the assemblages and communities that have the greatest potential for adverse impact due to remedial construction. Back-up documentation of existing conditions will include photographs and video tape, if appropriate.

The second deliverable will be the result of the floodplain and wetland assessment. This deliverable will conform to the requirements of OSWER directive 9280.0-02 for presentation of a Statement of Findings.

5.7.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 15. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

SECTION 6

FORMER WOOD PRESERVING PLANT REMEDIATION

6.1 PREDESIGN TASK 16 - CONDUCT LABORATORY AND FIELD TESTS OF THE BIOLOGICAL TREATMENT SYSTEM

6.1.1 Objective

As stated in the SOW:

> *"... The objective of this predesign task is to assess the feasibility of the soil washing and bioslurry system, and to determine design parameters and anticipated operational performance of the system. A two-phased approach is planned. Phase One will consist of bench scale tests of soil washing and the bioslurry processes: first in isolation, and then in combination. Phase Two will consist of pilot-scale tests of the successful bench-tested soil washing and bioslurry process.... Phase Two will occur at the pilot scale. Phase Two testing will not proceed if Phase One bioslurry testing demonstrates that it is not technically feasible from an engineering perspective to achieve the cleanup standards.... The results of bench-scale testing will help to determine the treatability characteristics of the soil and the efficiency of the soil washing and bioslurry systems.... If the bench or pilot-scale tests demonstrate that it is not technically feasible from an engineering perspective to achieve the cleanup standards using the biological treatment system or a component thereof, the Settling Defendant shall propose ... alternative systems and/or components that can achieve the cleanup standards.... Factors to be considered in demonstrating technical infeasibility, for the purpose of evaluating the biological treatment system, include but are not limited to:*
>
> - *Retention time - should not delay or impede other aspects of the remedial action to such a degree as to offset the benefits of treatment.*
> - *Unacceptable risks to human health or the environment.*
> - *Requirement by excessive stockpiling and management of materials awaiting treatment.*

- *Failure to tolerate variations in process control parameters such as fluctuations in Ph, shock loading of PAHs, or winter temperatures..."*

The objective will be accomplished by the implementation of subtasks.

6.1.2 Subtask Rationale

The objective of Predesign Task 16 will be accomplished using a two-phased approach. Phase I will be a laboratory bench scale process evaluation. Phase II will be a laboratory and field scale pilot scale engineering evaluation. The goals of each phase are described below:

Phase I - Bench Scale Process Evaluation

Phase I testing will individually evaluate the performance of the soil washing and bioslurry treatment processes in terms of the removal efficiency for PAHs which can be achieved under practical operating conditions. This testing will include two components. Phase Ia will consist of batch (flask) testing of the bioslurry process and bench scale evaluation of soil washing. Phase Ib will consist of bench scale continuous flow testing of the bioslurry process. The following activities will take place during Phase I testing:

- Prequalify, solicit proposals from, and select specialized subcontractors for conducting bioslurry and soil washing treatability studies.
- Develop a specific scope of work for each Phase Ia bench scale treatability test program in order to fulfill the goals outlined in Subsection 6.1.1.
- Prepare a Bench Scale Treatability Test Plan for submittal to U.S. EPA.
- Collect and characterize representative portions of facility soils and provide this test matrix to selected subcontractors for bench scale treatability testing.
- Conduct bench scale treatability testing and analyses programs in accordance with the Bench Scale Testing Plan.
- Develop conclusions regarding the feasibility of each treatment process and provide recommendations for Phase II testing based upon results from the bench scale treatability testing.

- Prepare Phase I Treatability Test Technical Memoranda that documents methods, results, conclusions and recommendations.

Phase II - Pilot Scale Engineering Evaluation

Phase II pilot testing will be conducted if Phase I testing for the bioslurry process proves successful. Pilot tests will be conducted at the laboratory and field scale to evaluate the performance of the combined treatment process train as defined in Phase I. Phase IIa will test the combined process at the laboratory scale to refine design and operating parameters for Phase IIb field scale testing. Phase IIb will be conducted at the site to confirm the feasibility and performance of the system under field conditions. Specific goals will be developed based upon Phase I test results; however, the following general requirements are anticipated:

- Prequalify, solicit proposals from, and select subcontractors for laboratory scale and field scale pilot test implementation.
- Based upon Phase I results, develop a specific scope of work for the pilot test program to fulfill the goals outlined in Subsection 6.1.1.
- Prepare Pilot Scale Test Plans.
- Design, procure and/or fabricate pilot treatment system components.
- Mobilize these components to the testing facility for Phase IIa.
- Conduct the laboratory pilot scale demonstration and engineering evaluation program to refine design and operating requirements.
- Design, procure, and/or fabricate the field scale pilot treatment system.
- Mobilize these components to the site and construct the field scale pilot treatment system.
- Conduct the field scale pilot test to confirm feasibility and performance under field conditions.

- Develop conclusions regarding the feasibility of pilot and full scale treatment operations. Prepare recommendations and criteria for design and operation of a full scale system during RD.

- Prepare a Technical Memorandum (TM) to document the findings and conclusions from each phase (a & b) of the Phase II pilot evaluation.

The subtasks presented in the following Subsection 6.1.3 and those subtasks presented in the Interim Predesign Work Plan have been developed to accomplish the goals of these predesign task phases.

6.1.3 <u>Subtasks</u>

The subtasks of Predesign Task 16 will consist of remedial treatment process evaluation, preparation of bench scale testing plans, conducting Phase I a & b bench scale treatability testing, and, if necessary, conducting Phase II pilot scale testing and engineering evaluation.

6.1.3.1 Remedial Treatment Process Evaluation

The Final Interim Predesign Work Plan presents the steps that will be taken in evaluating applicable bioslurry and soil washing remedial treatment processes. In summary, this subtask is comprised of:

- Conducting a review of existing treatability data for similar processes and similar contaminant matrices.

- Determining soil treatment process options.

- Evaluating treatability test conditions to be considered.

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

The information from this subtask will also be used to prequalify potential subcontractors for conducting Phase I bench scale and Phase II pilot scale testing. Test conditions will be evaluated based on the projected remedial design and operating conditions of Phase I and Phase II testing and subcontractors will be evaluated and qualified accordingly. The test condition evaluation will be incorporated into subsequent Phase I bench scale and/or Phase

II pilot scale test protocols, as appropriate. If Phase I process evaluation testing is successful, Phase II pilot scale testing will be conducted. Such testing will be conducted under conditions that are expected to occur during the RA, in order to develop an effective and reliable remedial treatment system.

In conducting this subtask, the following activities will be coordinated with other predesign tasks:

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

- Developing a laboratory analytical method for additional pre-, interim, and post-treatment soil and sediment characterizations.

- Evaluating data from bioslurry and soil washing treatability studies, including the characteristics of treated soils and sediments requiring final disposal, and the characteristics of sidestreams or process residuals that may require treatment/management during the RA.

6.1.3.2 Prepare Bench Scale Testing Plans

The testing methods for the Phase I bioslurry and soil washing treatability studies will be presented in bench scale test plans. These plans will be submitted to U.S. EPA for review and comment prior to initiating the test phase.

The bench scale test plans for soil washing and bioslurry treatability studies will contain the following components:

- Project description.
- Remedial technology description.
- Test objectives.
- Experimental design and procedures.
- Equipment and materials.
- Sampling and analysis plan.
- Data management.
- Data analysis and interpretation.
- Health and safety.
- Residuals management.
- Reports.

- Schedule.

These test plan components are consistent with U.S. EPA's Guide for Conducting Treatability Studies under CERCLA (EPA/540/2-89/058).

6.1.3.3 Conduct Phase I Bench Scale Treatability Testing

Phase I Bench Scale treatability testing of soil washing and bioslurry treatment options will focus on determining the feasibility of the proposed processes to meet the established cleanup criterion for CPAHs of 6.1 mg/kg. This testing will be conducted using composited representative samples of CPAH-contaminated soils from the site.

Phase Ia testing will consist of batch (flask) testing of the bioslurry process and bench scale soil washing tests. Phase Ib will consist of bench scale continuous flow bioslurry testing.

Sample selection and location will be based upon existing RI/FS site characterization data and data from other predesign activities as the data become available. Sample locations and the compositing approach will be outlined within the Bench Scale Test Plan described in Subsection 6.1.3.2.

Test Matrix Characterization

Prior to conducting treatability testing, soil samples will be characterized in order to evaluate properties or conditions that may affect or determine the results of the treatability test. Properties or conditions that will be considered include the following:

- Contaminant distribution and variability, which could affect treatability performance and the statistical interpretation of treatability test results.
- Physical/chemical properties, such as particle size distribution, organic carbon content and the presence of other contaminants, that may interfere with the treatment processes.
- Variables that may affect biological activity, such as macro- and micronutrient levels and Ph.

Indigenous microbial activity levels in the soil samples/composites will be characterized to determine the potential need for microbial acclimation or stimulation. This effort will include an estimation of microbial population/viability and determination of PAH/CPAH degradation capabilities, which would be accomplished by using aerobic plate counts or most probable number (MPN) methods.

Soil Washing Treatability Testing

Phase Ia soil washing studies will evaluate the Bergmann soil washing technology. Bench scale studies will be conducted by Bergmann USA, Inc. of Stafford Springs, Connecticut. Treatability test procedures will be specified in a Bench Scale Treatability Test Plan, as outlined in Subsection 6.1.3.2.

Phase Ia soil washing experiments will be conducted with site soil sample composites. These soil sample composites will consist of a test batch exhibiting "average" total CPAH levels (300 to 600 mg/kg) and another test batch exhibiting "high" total CPAH levels (1,000 to 1,500 mg/kg). Parameters that may affect soil washing testing include the following:

- Soil wash process equipment and operating conditions (e.g., physical/mechanical manipulation steps).

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

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

Bioslurry Treatability Testing

Phase Ia bench scale bioslurry treatability testing will be conducted by IT Corporation's Biotechnology Applications Center. Treatability test protocols will be specified in a Bench Scale Treatability Test Plan, as described in Subsection 6.1.4. The "average" and "high" CPAH soil portions previously described will be composited into one soil sample in order to evaluate potential contaminant removal efficiencies and operational parameters. Therefore, Phase Ia bioslurry treatability testing will entail batch screening studies and Phase Ib will consist of continuous flow bioslurry reactor studies.

Batch screening studies will address contaminant removal efficiencies, including a study of inhibited controls to assess abiotic contaminant reduction and an evaluation of biological removal of contaminants. Bioslurry reactor studies will provide a preliminary assessment of potential operational parameters, focusing on those parameters that are most critical to demonstrating process performance. Operational parameters that will be used as variables in this Phase I testing include slurry proportions (percent soil by volume/weight) and reactor operating parameters (mean cell residence time).

The performance of bioslurry treatment will be evaluated in relation to the variables that are tested, and the bioslurry treatment process will be determined feasible or infeasible. If the treatment process is feasible, evaluation criteria for subsequent Phase II testing will be developed to reflect the findings of the batch screening and bioslurry reactor studies. The Treatability Test Plan for pilot scale phases will be modified as appropriate.

6.1.3.4 Phase II - Pilot Scale Testing and Engineering Evaluation

Phase II pilot scale evaluation of the combined remedial treatment system will be conducted if Phase I bench scale testing determines that the system is feasible and will employ the process or combination of processes determined to be feasible by the bench scale testing. Pending the results of Phase I testing, Phase IIa may consist of a laboratory pilot scale test of the combined treatment process. If both processes prove feasible, this will consist of a continuous flow bioslurry test using contaminated residuals from the soil washing process as feed. Phase IIb will consist of a field scale test of the combined treatment system. As such, definition of Phase II activities at the subtask level will take place after the Phase I treatability test results are available and, therefore, have not been included within this work plan.

6.1.4 Deliverables

Phase I - Bench Scale Process Evaluation

For each of the Phase I (bioslurry and soil washing) treatability tests, the following deliverables will be prepared:

- A Bench Scale Treatability Test Plan detailing test procedures, sampling and analysis, test data, and data evaluation and interpretation.
- A TM documenting the approach, assumptions, methods and procedures, results, and conclusions from the bench scale treatability studies. The TM will address the requirements of, and follow the format in, EPA's Guide for Conducting Treatability Studies Under CERCLA. The TM will document the process feasibility determination and will make recommendations regarding Phase II testing.

Phase II - Pilot Scale Testing and Engineering Evaluation

Phase II deliverables will be defined based upon the results of Phase I testing. If Phase II testing is conducted, the following deliverables are anticipated:

- A Pilot Scale Test Plan/Sampling and Analysis Plan.
- A Pilot Scale Predesign Technical Memorandum.

6.1.5 Schedule

Figure 1-3 depicts the anticipated implementation schedule for Predesign Task 16. A draft TM for Phase I treatability testing will be delivered to the Agency within 60 days of the completion of the treatability evaluations. The final TM will be delivered within 30 days after receipt of written comments from the Agency on the draft TM.

6.2 PREDESIGN TASK 17 - DEFINE HANDLING, STAGING, AND STORAGE SYSTEMS FOR SOILS AND SEDIMENTS

6.2.1 Objective

As stated in the SOW:

> *"... The objective of this predesign task is to identify and define the handling, staging, and storage systems for soils and sediments. The handling portion of materials includes excavation and removal, and transport of soils and sediments... The staging and storage methods may include open piles and/or covered piles and enclosed areas....*

This objective will be accomplished by the implementation of subtasks.

6.2.2 Subtask Rationale

The following goals have been identified and will be addressed by the subtasks outlined in Subsection 6.2.3:

- Determine ARARs that may influence the selection of material handling, staging, and storage alternatives.

- Identify feasible handling, staging, and storage techniques for sediments and soil.

- Identify parameters that may restrict the handling, staging, and storage techniques deemed feasible.

- Identify additional design and construction considerations that must be addressed during RD/RA.

In addition, the following goals will be addressed through the implementation and/or completion of related predesign tasks:

- Review data and findings that define the quantity, location, physical characteristics, and site conditions for soil and sediment removal activities (Predesign Tasks 4, 5, 6, 7, 9, 11, 12, 13, 14, and 15).

- Review data and findings that define the processing and treatment throughput rates and/or final disposal location(s) for soils and sediments (Predesign Tasks 16 and 18).

6.2.3 Subtasks

As indicated in Subsection 6.2.2, a number of other predesign tasks must be completed in order to fully define the subtasks and scope of Predesign Task 17. Therefore, this section outlines, in general, the following anticipated subtasks:

- Review findings/data from related predesign tasks and determine ARARs.
- Develop preliminary soil and sediment removal sequencing plan.
- Evaluate soil and sediment handling, staging, and storage alternatives.

6.2.3.1 Review Findings/Data from Related Predesign Tasks and Determine ARARs

This subtask will include a review of findings from other relevant predesign tasks in order to provide the basic parameters for conducting Predesign Task 17. Following this review, several important factors will be determined:

- Quantity and location of soils and sediments requiring removal.

- Physical and chemical characteristics of sediments and soils.

- Environmental setting and site construction restrictions that may be imposed during RA.
- Anticipated process component layout and operating parameters affecting untreated material handling.

In addition, ARARs (including Federal, state, and local requirements) that may influence the determination of material handling, staging, and storage requirements will be identified and reviewed.

6.2.3.2 Develop Preliminary Soil and Sediment Removal and Sequencing Plan

Depending on findings from the various extent-of-contamination studies, it is estimated (by the ROD) that approximately 200,000 cubic yards of soil and sediment will require removal. Depending on CPAH concentration, some of this material will require treatment by the remedial system; however, some will only require direct disposal in an on-site containment cell. The soil and sediment transfer will take place from various and differing site locations, including wetlands, river bed, river bank, floodplains, beneath bridges and culverts, and among the debris on the former wood preserving plant property. The soil and sediment will vary in moisture content, soil type, density, vegetative matter, and root content.

Materials requiring treatment could undergo a series of mechanical/ physical, chemical, and biological processes. Depending on the treatment, a production capacity will be established. Materials that do not require treatment may require certain staging and/or physical/ mechanical processing prior to final disposal.

This subtask will consider the important factors identified above in order to develop a preliminary sequence and rate of soil and sediment removal. Excavation mass balances will be prepared to assist in defining the corresponding rates of removal, treatment, and final disposal. This information will serve as a basis for evaluating excavation, transport, staging, storage, and placement alternatives.

6.2.3.3 Evaluate Soil and Sediment Handling, Staging, and Storage Alternatives

Following the development of preliminary rate and sequence of removal plans, this subtask will evaluate available alternatives for soil and sediment handling, staging, and storage. This engineering evaluation will consider:

- The use of conventional and, where necessary, specialized earthmoving equipment and techniques.
- Site conditions, including space requirements, environmental impacts, health and safety considerations, and local land use impacts.
- Other factors determined by related predesign tasks.

6.2.4 Deliverables

A TM will be prepared at the completion of Predesign Task 17 that presents the results of the soil and sediment handling, staging, and storage systems evaluation. This TM will also provide recommendations for further consideration during the RD phase. A draft TM will be issued to U.S. EPA for review and comment. A final TM will incorporate Agency comments on the draft TM.

6.2.5 Schedule

As discussed in Subsection 6.2.2, a number of other predesign tasks must be completed prior to initiating work on Predesign Task 17. Figure 1-3 presents the anticipated schedule for implementing Predesign Task 17. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

6.3 PREDESIGN TASK 18 - DEFINE HANDLING, STAGING, STORAGE, AND PLACEMENT SYSTEMS FOR TREATED SOILS AND SEDIMENTS

6.3.1 Objective

As stated in the SOW:

> *"... The objective of this predesign task is to identify and define the management of treated soils and sediments using the criteria defined in Predesign Task 17. As with untreated materials, large volumes of treated soils and sediment will require management... The management of treated materials will include handling, staging, and storing treated soil and sediment as well as wastewater generated by the soil washing and bioslurry systems... The analysis will identify the best methods of managing treated materials based on the evaluation criteria and identify significant negative impacts...."*

This objective will be accomplished using the information to be obtained in Predesign Task 17 and through the implementation of subtasks.

6.3.2 Subtask Rationale

A number of other extent-of-contamination and river remediation predesign tasks will serve to define the quantity and characteristics of soils and sediments requiring remediation at the site. Predesign Task 17 (Subsection 6.2) will define the handling, staging, and storage requirements for these materials prior to treatment and/or disposal. The bench- and pilot-scale testing of Predesign Task 16 (Subsection 6.1) will define the processing and treatment systems, and will estimate the resultant material quantities and physical/chemical characteristics of treated soils and sediments.

Predesign Task 18 will use the data and information generated by the above-referenced tasks to define the requirements for management of treated materials, treatment residuals, and related process streams. In addition, the soils/sediments that require removal and disposal but do not require treatment will be determined. Findings from Predesign Task 18 will then serve as the basis for more detailed material handling systems design during the RD phase.

The following goals have been identified and will be addressed by the subtasks within Subsection 6.3.3:

- Determine ARARs that may influence the selection and design of material handling, staging, storage and placement alternatives.
- Identify feasible handling, staging, storage and placement techniques for sediments, soils, process streams, and residuals.
- Identify parameters (material characteristics, site conditions, process rates, quantities) that may restrict the handling, staging and storage techniques.
- Identify additional design and construction considerations that must be addressed during RD/RA.

6.3.3 Subtasks

As indicated in Subsection 6.3.2, Predesign Tasks 16 and 17 must be substantially completed in order to define the subtasks of this predesign task. Therefore, this section presents a general scope of the following anticipated subtasks:

- Review findings/data from related predesign tasks and determine ARARs.
- Develop preliminary treated material and process stream management and placement alternatives.

6.3.3.1 Subtask 1 - Review Findings/Data from Related Predesign Tasks and Determine ARARs

This subtask will include a review of findings from other relevant predesign tasks in order to provide the basic parameters for conducting Predesign Task 18. The following factors will be determined:

- The process throughput rates of treated materials.
- Physical and chemical characteristics of treated materials.
- The quantity, rate, and physical characteristics of untreated soils, sediments, and debris that will require direct placement without treatment.
- The environmental setting, anticipated process layout, and site construction restrictions that may be expected during the RA and that will influence material handling systems.

In addition, ARARs (including federal, state, and local requirements) that may influence the determination of treated material handling, staging, storage, and placement requirements will be identified and reviewed. These ARARs will define such requirements as set-back or buffer distances, surface water and groundwater protection, cover system performance standards, and other related factors.

6.3.3.2 Subtask 2 - Develop Preliminary Treated Material and Process Stream Management and Placement Alternatives

This subtask will evaluate the soil and sediment removal and sequencing plan designed during Predesign Task 17, and the expected throughputs of the soil washing/bioslurry treatment system. This will serve to determine management requirements for treated materials and process streams. Physical characteristics and volume of these treated materials and process streams will also define the management system requirements. The necessity of further treated material processing (i.e. dewatering, stabilization/solidification) prior to final placement and disposal will also be evaluated during this subtask.

The development and sequence of treated materials staging, storage and placement in an on-site containment cell will be evaluated. This will serve to define additional engineering factors (foundation design, grating design, closure/post-closure) to be considered during the RD phase.

Soil sediment and oversized debris requiring management (staging, stockpiling, placement) will also be quantified and incorporated into this engineering evaluation.

6.3.4 Deliverables

At the completion of Predesign Task 18, a TM will be prepared that presents an evaluation of treated soil, sediment, and process stream management systems. A draft TM will be issued to U.S. EPA and WDNR for final review and comment. A final TM will incorporate Agency comments on the draft TM.

6.3.5 Schedule

As discussed in Subsection 6.3.2, Predesign Tasks 16 and 17 must be substantially completed prior to completing Predesign Task 18 work. Figure 1-3 presents the anticipated schedule for implementing Predesign Task 18. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

6.4 PREDESIGN TASK 19 - IDENTIFY AND TEST GROUNDWATER COLLECTION AND EXTRACTION TECHNOLOGIES

6.4.1 Objective

As stated in the SOW:

> *"... The objective of this predesign task is to develop information necessary to design a collection/extraction system capable of collecting and extracting contaminants, including free-product creosote residues, from the groundwater.... The results of the groundwater extraction tests and demonstrations will provide information to allow design of full-scale groundwater extraction systems to effectively meet short-term and long-term objectives..."*

This objective will be accomplished through the implementation of subtasks.

6.4.2 Subtask Rationale

The following goals have been identified and will be addressed by the subtasks outlined in Subsection 6.4.3:

- Confirm the size and extent of the groundwater plume within the site, including quantifying the extent of recoverable free product and/or dissolved and suspended contaminant constituents.

- Determine the hydraulic characteristics of the surficial unit and dense till (Oak Creek Formation) subsurface soils on the site.

- Identify and review applicable groundwater extraction technologies.

- Pilot test a preliminary groundwater extraction design.

This predesign task will also be coordinated with other predesign tasks that involve extent-of-contamination and groundwater studies (Predesign Tasks 3, 4, 5, and 6) to ensure the determination of the following information:

- Extent of groundwater contamination.
- Extent of recoverable free product.
- Groundwater flow rates and direction.

- Mobility of free product.
- Subsurface (geotechnical) characteristics of the site.

6.4.3 Subtasks

The subtasks within Predesign Task 19 will consist of installing additional monitoring wells, conducting groundwater sampling and analysis, identifying and evaluating available groundwater extraction technologies, and pilot testing a preliminary groundwater extraction design.

6.4.3.1 Install Additional Monitoring Wells

The scope of Predesign Task 3, includes the installation of additional monitoring wells within previous process areas of the site to evaluate the presence of free-product creosote residue. Predesign Task 6 will include installation of additional monitoring wells east of the Little Menomonee River. These wells will be designed to evaluate flow direction and groundwater quality. During Predesign Task 19, additional wells will be installed west of the Little Menomonee River on the former wood preserving facility property. These wells will be required to confirm groundwater quality and to determine hydraulic characteristics of the aquifer.

During the RI, contaminants were not detected in the intermediate or deep wells, and were limited to the shallow wells. Therefore, unless data from the completion of other predesign tasks provides conflicting information, only shallow (10 to 15 ft. below land surface) monitoring wells will be installed and evaluated during Predesign Task 19. The procedures for monitoring well installation are outlined within Predesign Task 6 and will generally be followed in Predesign Task 19. However, the well design for Predesign Task 19 may be somewhat modified to more closely represent an extraction well. The location and number of monitoring wells required for Predesign Task 19 has not been specified because they will be dependent on data collected in preceding predesign tasks.

6.4.3.2 Conduct Groundwater Sampling and Analysis

Groundwater samples will be collected from existing, shallow monitoring wells installed during the RI and from those additional wells to be installed during this predesign task and Predesign Task 6. At least two rounds of groundwater samples will be conducted at least 30 days apart. Sampling and analysis will be conducted to further define the size and extent of the groundwater plume and to confirm the source of groundwater contamination at the pit and ditch areas.

Groundwater sampling and analytical protocols will be specified in the forthcoming predesign phase QAPP submittal.

Samples will be analyzed for BTEX parameters. Results of this analysis will be used to assist in determining the extent of the groundwater plume and to evaluate appropriate groundwater extraction technology designs. Predesign Task 20 (Subsection 6.5) specifies additional laboratory analysis of groundwater samples for purposes of obtaining predesign information for the groundwater treatment system evaluation.

6.4.3.3 Identify/Review Available Groundwater Extraction Technologies

Under this subtask, groundwater extraction technologies, including extraction wells and interception trenches, will be evaluated with respect to the ROD-specified remedy for groundwater and site conditions. Following this engineering and alternatives evaluation, a groundwater extraction technology that is feasible and effective for groundwater removal will be pilot tested at the site.

6.4.3.4 Pilot Testing a Preliminary Groundwater Extraction Design

A preliminary groundwater extraction design which has been determined feasible by the review of available technologies and site conditions, will be pilot tested to determine further design requirements and to evaluate performance effectiveness. The following tests will be performed during the pilot testing of the preliminary extraction design:

- Aquifer pumping test.
- Hydraulic conductivity tests (slug tests).
- Pilot testing an interception trench.

<u>Aquifer Pumping Test</u>

An aquifer pumping test will be designed and performed to determine the following aquifer properties:

- Transmissivity, storativity, specific capacity, and hydraulic conductivity.

- Radius of influence.

- Groundwater extraction rate.

Aquifer pumping test results will help to determine the feasibility of using extraction wells and will be utilized to design and predict the performance of the groundwater extraction system.

Hydraulic Conductivity Test

Hydraulic conductivity testing or slug tests will be performed on shallow wells installed during this predesign task and on selected existing RI monitoring wells. Slug tests will provide an estimate of horizontal permeability within the surficial unit soils. Depending on the volume of water present in the site wells, either a rising or falling head slug test will be conducted. In conducting this test, a "slug" of water of known volume (determined in the field) will be displaced or removed from the well and the recovery of the water level with time will be monitored to determine the shallow aquifer's flow characteristics. Data curves generated as a result of the slug test will be used with the method described by Bower and Rice (1986) to estimate aquifer permeability in the vicinity of each tested well.

Laboratory permeability testing on undisturbed Shelby tube samples collected during well installation will provide a measure of vertical permeability of surficial unit soils. ASTM procedures for soil sampling and geotechnical testing will be followed.

Pilot Testing an Interception Trench

A pilot test interception trench will be constructed, perpendicular to the groundwater flow, to determine its feasibility and effectiveness in capturing and removing groundwater. The following information will be obtained during construction and operation of the pilot interception trench:

- Zone of influence.
- Pumping rates for groundwater removal.
- Pumping rates for lowering groundwater.
- Amount of construction water to be managed during installation of trenches.
- Quantity of groundwater to be managed.
- Potential effectiveness in removal/recovery of free product.

6.4.4 Deliverables

A TM will be prepared at the completion of Predesign Task 19 that presents task findings, definition of methodologies, tabulation of results, and interpretation and analysis. A draft

TM will be issued to U.S. EPA for review and comment. A final TM will incorporate Agency comments on the draft TM.

6.4.5 Schedule

Figure 1-3 presents the anticipated schedule for implementing Predesign Task 19. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.

6.5 PREDESIGN TASK - 20 IDENTIFY AND TEST GROUNDWATER TREATMENT TECHNOLOGIES

6.5.1 Objective

As stated in the SOW:

> *"... The objective of predesign studies of groundwater treatment technologies is to allow design of a facility that is capable of handling variable flows and variable contaminant concentrations and will meet pretreatment standards for discharge to the Milwaukee Metropolitan Sanitary District or the Little Menomonee River.... A secondary objective of the groundwater treatment system predesign studies is to determine whether the groundwater treatment system can be made sufficiently flexible to cost-effectively accommodate wastewater from the soil and sediment washing, and the bioslurry systems during the remedial action.... The results of the predesign work will provide the information necessary to design a full-scale groundwater treatment facility capable of removing site-related contaminants specified in the CD and attaining Milwaukee's pretreatment standards. The system will ideally be able to accommodate wastewater from the soil washing and bioslurry system, but if not, the need for ancillary water treatment will be identified...."*

This objective will be accomplished through the implementation of subtasks.

6.5.2 Subtask Rationale

The following goals have been identified and will be addressed in the subtasks outlined in Subsection 6.5.3.

- Estimate the rate of groundwater flow to be managed by the groundwater treatment system.

- Determine the contaminant characteristics of groundwater requiring treatment.

- Identify Milwaukee Metropolitan Sanitary District (MMSD) pretreatment standards and determine MMSD's capacity to accept the flow and quality of pretreated groundwater.

- In the event that effluent discharge rates will be different than those specified in the FS, determine effluent standards for direct discharge to the Little Menomonee River or its tributary.

- Identify and review the groundwater treatment technologies/process systems that will meet the discharge requirements to either the Jones Island POTW or the Little Menomonee River.

6.5.3 Subtasks

The subtasks within Predesign Task 20 will consist of the following activities:

- Determine the quantity of contaminated groundwater and process waters to be managed by the treatment system.

- Define the characteristics of the water to be managed by the groundwater treatment system.

- Determine effluent discharge requirements.

- Review and identify applicable technology.

- Develop, design, construct, install, operate, and evaluate a pilot treatment system for water generated during predesign pilot scale testing.

6.5.3.1 Determine the Quantity of Contaminated Groundwater to be Managed by the Treatment System

In order to determine the quantity of groundwater to be managed by the groundwater treatment system, information will be obtained from the following related predesign tasks:

- A definition of the expected flows and chemical characteristics of groundwater from the site extraction system (Predesign Task 19) and the free product recovery systems (Predesign Task 3) will be determined.
- A definition of the flow, characteristics, and variability of various process streams from the soil washing/bioslurry pilot testing that will require treatment by the groundwater treatment system will be determined during Predesign Task 16.
- The potential need for treatment of surface runoff or leachate from the storage systems for untreated soil, sediments, and debris will be determined during Predesign Tasks 17 and 18.

This information will provide the basis for determining hydraulic loading to the groundwater treatment system. An estimate of flow resulting from the following RA activities will also be evaluated:

- Decontamination waters.
- Construction waters, including temporary groundwater and surface water flows.

The treatment system will be sized to accommodate the anticipated flow from groundwater and other RA activities.

6.5.3.2 Define the Characteristics of Waters to be Managed by the Groundwater Treatment System

The characteristics of the various sources that will be managed by the groundwater treatment system will be based on the groundwater quality, effluent characteristics from soil washing/bioslurry treatment system, and other wastewaters identified in Subsection 6.5.3.1. In determining these characteristics, the analytical data to be obtained from the following predesign tasks will be used:

- Wastewater analysis from the laboratory bench scale soil washing/bioslurry systems testing (Predesign Task 16).
- Groundwater analysis from on-site monitoring wells and/or pilot groundwater extraction system operations (Predesign Task 19).
- Groundwater analysis from free product recovery operations (Predesign Task 3).

Anticipated variations in wastewater characteristics will be identified to include short-term, seasonal, and process-related loading factors.

Both non-site specific and site-specific contaminant analysis (conducted concurrently with Predesign Task 19) will define wastewater characteristics that will be necessary for discharge to the POTW or the river. This analysis will include pH, BOD_5, COD, TOC, oil and grease, nitrogen, phosphorous, total suspended solids, and PAHs.

6.5.3.3 Determination of Effluent Discharge Requirements

The degree of treatment required will be defined by the wastewater characteristics and the applicable discharge requirements. The POTW discharge standards and its capacity to accept the flow and quality of treated groundwater will be identified in this subtask. The CD specifies that discharge to the metropolitan sewer shall not exceed a total volatile organic compound (VOC) concentration of 5 mg/l.

Alternatively, the CD has identified compound-specific effluent requirements for direct discharge to the Little Menomonee River and its tributaries. These effluent requirements are specific to groundwater discharges. Additional sources to be managed by the treatment system identified in Subsection 6.5.3.1 and 6.5.3.2 will be evaluated for meeting this discharge standard. The CD also indicates that if flow rates change from those in the FS, new discharge standards will be determined pursuant to NR 102, 104, 106, and 207 of Wisconsin Administrative Code.

The subtask will determine effluent requirement for both, sewer (POTW) and river discharge.

6.5.3.4 Review and Identify Applicable Treatment Technologies

The groundwater treatment technologies to be reviewed for applicability are as follows:

- Gravity oil-water separation.
- Metal precipitation (hydroxide and sulfide)
- Biological treatment.
- Air stripping (for BETX only).
- Filtration (gravity, pressure, or continuous backwash).
- Ultraviolet/ozone/peroxide oxidation.
- Liquid phase activated carbon adsorption.
- Membrane filtration (reverse osmosis or ultrafiltration).
- Dissolved air flotation.

The need for combinations of these processes will be evaluated with respect to the anticipated characteristics of contaminated waters to be processed by the treatment system. The most practical treatment system may involve a combination of the above technologies. Many of the technologies are standard processes and the ability to meet the discharge requirements can be readily evaluated from literature searches, vendor inquires, and previously conducted treatability evaluations. The need to conduct additional pilot-scale testing for confirmatory purposes and to obtain adequate design information will be determined during this subtask. Therefore, the pretreatment of the process streams will be evaluated based on the physical/chemical/biological characterizations conducted during Predesign Task 16.

6.5.3.5 Pilot Scale Testing of Treatment System

A pilot-scale testing of the groundwater treatment system, if determined to be necessary, will be conducted concurrently with the groundwater extraction pilot test (Predesign Task 19). Flows from these pilot tests and the aquifer pumping test will be treated by the pilot-scale groundwater treatment system.

The pilot-scale treatment system design, operation, and field evaluation, in addition to literature reviews of conventional designs will provide the design parameters required for the full-scale groundwater system design.

6.5.4 Deliverables

Upon completion of Predesign Task 20, a TM will be prepared and will be submitted to the U.S. EPA. This TM will present the findings of each of the subtasks presented above, and will provide the basis for design of a full-scale groundwater treatment system during the RD phase.

6.5.5 Schedule

Figure 1-3 presents the anticipated schedule for conducting Predesign Task 20. As previously stated, the implementation schedule for Predesign Task 20 will be closely coordinated with the completion of Predesign Task 16 (bench-scale phase) and Predesign Task 19. The Draft TM for this task will be delivered to the Agency 60 days after completion of the subtasks outlined herein. The Final TM will be delivered 30 days after receipt of written comments from the Agency on the Draft TM.