IMPORTANT MESSAGE

John Stra

ay 5/11 Time 9:40 [✓ A.M.] P.M.

M David Rigg - Confirmed! 5/30 for

Of BBL in Syracuse

Phone Area Code 315-446-9120 Number Extension

FAX MOBILE Area Code 9 am Number Extension

Telephoned	☒	Returned your call	☐	RUSH	☐
Came to see you	☐	Please call	☒	Special attention	☐
Wants to see you	☐	Will call again June 7	☐	Caller on hold	☐

Message Re: Annual Biota sampling monitoring in line sediment trap. for the PAS site in Oswego, N.Y. sediment 2nd yr.

Signed Sara

Universal office products 48023

LITHO IN U.S.A.

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via Facsimile/U.S. Mail

May 23, 2000

Ms. Patricia Simmons
Project Manager
Central New York Remediation Section
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

738001

Re: Pollution Abatement Services Superfund Site
Fourth Operable Unit
Oswego, New York
Project #: 0364.36444 #2

Dear Ms. Simmons:

As discussed during our May 10, 2000 telephone conversation, Blasland, Bouck & Lee, Inc. (BBL) anticipates performing the second round of PCB sampling and analysis activities for the fourth operable unit (OU4) of the above-referenced site on June 7 and 8, 2000. Those activities are required under the United States Environmental Protection Agency (USEPA)-approved *PCB Long-Term Monitoring Plan* (BBL, August 1999).

Pursuant to your request, BBL contacted Mr. John Strang of the New York State Department of Environmental Conservation (NYSDEC) on May 11, 2000 regarding the proposed sampling dates for the second sampling event. Mr. Strang indicated that the proposed dates were acceptable and that he would likely be on-site on June 7, 2000 to provide oversight. BBL and the NYSDEC agreed to confirm schedule details during the week of May 29, 2000 (i.e., the week prior to the sampling activities). Upon confirmation of the sampling dates, I will notify you.

As also discussed during our May 10, 2000 telephone conversation, the Settling Defendants (Niagara Mohawk Power Corporation and General Motors Corporation) had proposed in the second annual progress report for this project (dated December 20, 1999) that sediment core samples (i.e., sediment samples from the 3- to 6-inch and 6- to 12-inch depth intervals) are no longer necessary for future rounds of sampling to meet the requirements of the OU4 Record of Decision and Consent Decree. Under that proposal, all other samples, including surface sediment samples (0- to 3-inch depth interval), sediment trap samples, and biota samples, would still be collected and analyzed as detailed in the *PCB Long-Term Monitoring Plan*. Based on our telephone conversation today, we understand that the USEPA has reviewed that proposal and the collection of core sediment samples, as identified in the *PCB Long-Term Monitoring Plan,* is required at least for this second round of PCB sampling. Accordingly, the PCB sampling and analysis activities will be conducted by BBL in accordance with the requirements set-forth in the *PCB Long-Term Monitoring Plan*.

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Fax (315) 449-0017 • www.bbl-inc.com • offices nationwide

Finally, in accordance with the USEPA's November 23, 1999 letter to Niagara Mohawk Power Corporation, BBL will notify you when the sediment traps are pulled from their location and the written annual progress report will be submitted no later than 90 days from the date on which the traps are pulled.

If you have any questions or require additional information, please do not hesitate to call me at (315) 446-2570, extension 290.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

M Cathy Geraci

M. Cathy Geraci
Associate

MCG/mbl
P:\MBL\2000\39800842.WPD

cc: Mr. John Strang, New York State Department of Environmental Conservation
William C. Weiss, Esq., Niagara Mohawk Power Corporation
R. William Stephens, Esq., Raichle, Banning, Weiss & Stephens
Mr. David J. Ulm, Blasland, Bouck & Lee, Inc.
Mr. David K. Rigg, Blasland, Bouck & Lee, Inc.

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

RECEIVED
AUG - 9 1999
BUREAU OF CENTRAL REMEDIAL ACTION

Transmitted Via Federal Express

August 4, 1999

Chief, Central New York Remediation Section
New York Remediation Branch
Emergency and Remedial Response Division
United States Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, NY 10007-1866

Re: Pollution Abatement Services Superfund Site
Fourth Operable Unit
Oswego, New York
Revised PCB Long-Term Monitoring Plan
Project #: 0364.36444 #2

Attention -- Pollution Abatement Services Superfund Site Remedial Project Manager:

On behalf of Niagara Mohawk Power Corporation and General Motors Corporation (the Settling Defendants), please find enclosed seven copies of the revised *PCB Long-Term Monitoring Plan (the Plan)*. The *Plan* was prepared and previously submitted in connection with the fourth operable unit (OU4) of the Pollution Abatement Services (PAS) Superfund Site located in Oswego, New York.

The *Plan* was submitted to the USEPA and the State on April 20, 1999, in accordance with the requirements specified in the OU4 Consent Decree between the USEPA and the Settling Defendants. The USEPA subsequently provided comments regarding the *Plan* in a June 11, 1999 letter to the Settling Defendants. The Settling Defendants addressed the USEPA's comments in a June 30, 1999 response letter to the USEPA from Blasland, Bouck & Lee, Inc. (BBL). That response letter was verbally approved by the USEPA on July 8, 1999. Pursuant to a request from Ms. Patricia Simmons of the USEPA, draft revised pages of the *Plan* incorporating the approved responses were subsequently provided to the USEPA and the New York State Department of Environmental Conservation (NYSDEC) for review on July 20, 1999. BBL received a July 22, 1999 letter from the USEPA acknowledging receipt and granting approval of the draft revised pages.

In addition, the *Plan* has been revised to incorporate a modification to the sediment sampling procedure which was discussed and agreed-upon during a conversation between Ms. Patricia Simmons of the USEPA and Ms. Cathy Geraci of BBL on July 27, 1999. This modification was a result of a specific request from Mr. John Strang of the NYSDEC, who provided oversight during the sediment sampling activities conducted on July 23, 1999. Specifically, Mr. Strang requested the collection of surface sediment samples at each sediment sampling location from a depth interval of 0 to 3 inches and the collection of a sediment core sample at each sediment sampling location from a depth interval of 3 to 6 inches. Initially, the *Plan* detailed the collection of surface sediment samples from a depth interval of 0 to 6 inches and sediment core samples from a depth interval of 6 to 12 inches. Accordingly, as discussed and agreed-upon during the July 27, 1999 telephone conversation between BBL and the USEPA, sediment samples have been/will be collected at each specified sediment sampling location from the following depth intervals: 0 to 3 inches, 3 to 6 inches, and 6 to 12 inches (if possible due to the typically limited extent of sediment present in White

117440

and Wine Creeks at depths below 6 inches). The above modification has been appropriately incorporated into the revised *Plan* that is enclosed.

For your convenience, the Settling Defendants are providing a complete version of the revised *Plan* to replace the previously submitted version. In accordance with the USEPA's July 22, 1999 letter, the enclosed revised *Plan* is considered the final version.

Please feel free to call me at (315) 446-2570 (ext. 290) or William C. Weiss, Esq. of Niagara Mohawk Power Corporation at (315) 428-6944 if you have any questions regarding the enclosed.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

M. Cathy Geraci

M. Cathy Geraci
Associate

MAM/cmd
X:\COMMON\CMD\88091750.WPD

cc: Chief, New York/Caribbean Superfund Branch, Office of Regional Counsel, United States Environmental Protection Agency, Region II -- Attention: PAS Superfund Site Attorney (w/out encl.)
Chief, Environmental Enforcement Section, Environmental and Natural Resources Division, United States Department of Justice, Re: DOJ #90-11-2-2A (w/out encl.)
Director, Division of Hazardous Waste Remediation, New York State Department of Environmental Conservation -- Attention: PAS Site Project Manager (six copies)
Mr. Daniel Geraghty, New York State Department of Health, Bureau of Exposure Assessment (one copy)
William C. Weiss, Esq., Niagara Mohawk Power Corporation (one copy)
R. William Stephens, Esq., Raichle, Banning, Weiss & Stephens (one copy)
Mr. James F. Morgan, Niagara Mohawk Power Corporation (one copy)
Mr. David J. Ulm, Blasland, Bouck & Lee, Inc. (one copy)

PCB Long-Term Monitoring Plan

Pollution Abatement Services Superfund Site
Operable Unit 4
Oswego, New York

Settling Defendants

April 1999
Revised August 1999

Updated
8/19/99.

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Table of Contents

1. Introduction

1.1 General

This PCB Long-Term Monitoring Plan (Plan) for the Pollution Abatement Services (PAS) Superfund Site (Site) located in the City of Oswego, New York provides a detailed description of the requirements, methods, and procedures for implementing a long-term polychlorinated biphenyl (PCB) monitoring program for the Site. This Plan has been developed by Blasland, Bouck & Lee, Inc. (BBL) on behalf of Niagara Mohawk Power Corporation and General Motors Corporation (the Settling Defendants), and in accordance with the Consent Decree between the Settling Defendants and the United States Environmental Protection Agency (USEPA). That Consent Decree was lodged by the Court on December 15, 1998 and requires long-term monitoring of PCBs in sediments and biota (fish) adjacent to the Site, specifically in White and Wine Creeks and the adjacent wetlands.

The required monitoring is associated with the September 30, 1997 Record of Decision (ROD) issued for the Site by the USEPA. That ROD presents the remedial action selected by the USEPA to address the PCBs detected in the sediments of White and Wine Creeks, and the adjacent wetlands. The 1997 ROD is the "fourth operable unit" (OU4) ROD for the site. The USEPA-selected remedy presented in the OU4 ROD is long-term monitoring of sediments and biota, which is the subject of this Plan.

As documented in the OU4 ROD, the results of previous studies concluded that, although the PAS Site was a source of PCBs before the construction of a containment facility in 1986, the Site is not a present source of PCBs for sediments in White and Wine Creeks and the adjacent wetlands, and that other potential upstream sources of PCBs exist (USEPA, 1998). Additionally, previous PCB sediment monitoring data, collected between 1991 and 1996, indicate that the associated risk levels are relatively low and that there has been an overall decline in PCB concentrations in the creeks (USEPA, 1998). To further assess this decline and meet the requirements set forth in the Consent Decree and the OU4 ROD, this Plan has been developed to describe the activities necessary to monitor PCB concentrations in fish and sediment.

The sections and purpose of each section of this Plan are as follows:

Section	Purpose
1. Introduction	Provides a site description and history, and overview of current operations.
2. Project Organization	Presents the protocols for selecting and approving contractors and subcontractors, and lists the contractor and subcontractors identified for this project.
3. Methodology for Implementing the PCB Long-Term Monitoring Plan	Presents the requirements, frequency, methods, and procedures for performing annual fish and sediment monitoring.
4. Quality Assurance, Sampling, and Data Analysis	Discusses the quality assurance/quality control (QA/QC) procedures for implementation of this Plan.
5. Project Scheduling and Reporting	Outlines the project schedule, and identifies potential problems and alternative procedures.
6. References	Presents a list of the references cited in this Plan.

Figures and appendices are provided in support of the narrative section of this Plan. The appendices present the plans and technical information necessary for performing the long-term PCB monitoring activities, as listed below.

- ***Appendix A - Standard Operating Procedures*** - presents detailed descriptions of the procedures to be followed for collecting and handling samples and decontaminating equipment.

- ***Appendix B - Quality Assurance Project Plan (QAPP)*** - addresses sample collection, analytical methods, and QA/QC procedures to be followed during implementation of this Plan.

- ***Appendix C - Health and Safety Contingency Plan (HSCP)*** - presents plans and procedures to be followed during implementation of this Plan to protect the health and safety of BBL field personnel. BBL is the USEPA-approved Supervising Contractor identified in the OU4 Consent Decree and, accordingly, will be the principal contractor supervising and directing the implementation of this work (additional information regarding the contractor and subcontractors for this project is provided in Section 2).

Components of this Plan, including the appendices, are based, to the extent possible, on procedures and methods previously approved by the USEPA for conducting site-related monitoring activities. The USEPA-approved document consulted in preparation of this Plan was the *Operation and Maintenance Long-Term Monitoring Plan* (BBL Environmental Services, Inc., May 1998), including the associated QAPP and HSCP which were provided as Appendix K and Appendix L, respectively of that approved Plan.

1.2 Site Description

The PAS Site, located on 15 acres near the eastern edge of the City of Oswego, New York, is bounded on the south by East Seneca Street, and on the east, north, and west by wetlands formed along the stream channels of White and Wine Creeks (Figures 1 and 2). Just to the north (downstream) of the Site is the confluence of White and Wine Creeks. Wine Creek flows approximately 1,800 feet beyond the confluence (northward) to a channel and into Lake Ontario. Just east of this channel, Wine Creek connects with a wetland adjacent to the residential area known as Smith's Beach. Prior to passing through the PAS Site, White and Wine Creeks are proximate to the East Seneca Street Dump (also referred to and operated as the Oswego County Landfill), and White Creek is proximate to the Niagara Mohawk Fire Training School (Figure 2). The Oswego Castings site is situated upstream of the wetland adjacent to Smith's Beach.

The area between the PAS Site and Lake Ontario (to the north) is mostly undeveloped and currently includes three land uses. These uses (from west to east) include a cemetery, a wetland, and a residential area. The residential area, Smith's Beach, consists of approximately 25 dwellings, and is located on the shore of Lake Ontario, approximately 0.5 miles north of the Site.

1.3 Site History and Enforcement Activities

The PAS facility was a high-temperature, liquid-chemical waste incineration facility which operated from 1970 through 1977. Beginning in 1973, a series of incidents, including liquid waste spills and the overflow of liquid wastes from lagoons into White Creek, led to the involvement of the USEPA and New York State Department of Environmental Conservation (NYSDEC) at the Site. Response actions taken from 1973 to 1982 by the USEPA, NYSDEC, and Coast Guard resulted in an oil spill cleanup, the removal of the incineration facilities, drummed wastes, bulk liquid wastes, and contaminated soils, and the closure of two on-site lagoons. According to the 1993 ROD for the PAS Site, these removal actions constitute the first operable unit (OU1).

From 1982 to 1984, the NYSDEC performed a *Site Investigation and Remedial Alternatives Evaluation* of the Site, which was the initial Remedial Investigation/Feasibility Study (RI/FS) conducted at the Site. Based on the results of this study, the USEPA signed a ROD in 1984 (OU2), which specified the following remedial actions: 1) limited excavation and off-site disposal of contaminated materials; 2) installation of a perimeter slurry wall; 3) site grading and capping in accordance with Resource Conservation and Recovery Act (RCRA) requirements; 4) installation of a leachate collection and treatment system; and 5) ground-water monitoring. The NYSDEC implemented the remedial actions identified in the 1984 ROD, with the exception of the on-site treatment system. Rather than installing an on-site treatment system, the leachate was collected by the NYSDEC from 1986 through 1991 and transported off-site to an approved RCRA treatment, storage, and disposal (TSD) facility.

From 1984 to 1986, the NYSDEC performed an environmental assessment of the area in the vicinity of the Site that included White and Wine Creeks. Based on the results of the environmental assessment, the NYSDEC determined that no remediation of the creeks was required.

In 1989, the NYSDEC began a long-term monitoring program for ground water, surface water, and sediment in the vicinity of the Site. The results of soil gas and ground-water sampling, and down-hole camera investigations of the existing monitoring wells at the Site, conducted between 1987 and 1990, indicated the presence of volatile organic compounds (VOCs) in the ground water outside the slurry wall containment system.

In September 1990, an Administrative Order on Consent (AOC) was entered into between the USEPA and a group of potentially responsible parties (PRPs) to conduct a supplemental RI/FS to evaluate the integrity of the existing containment system at the Site, to determine the nature, extent, source, risk, and to identify and evaluate remedial alternatives for areas outside the containment system. The supplemental RI/FS concluded that chemicals detected in the ground water outside the containment system was attributable to insufficient leachate removal from within the containment system, resulting in a downward hydraulic gradient located at the center of the containment system.

In October 1991, the USEPA and a group of PRPs entered into a leachate-removal AOC. This AOC required interim ground-water removal (IGR) of leachate from within the containment system on a periodic basis. These IGR activities were extended by a second AOC entered into in 1994. The supplemental RI report, issued in 1993, concluded that the contamination that was detected in the bedrock ground-water outside the containment system was attributable to the downward migration of contaminants through the lodgement till beneath the containment system, particularly beneath the area of leachate collection well LCW-4 where the lodgement till is relatively thin. The supplemental RI Report noted that the highest level of contaminants occurred in the vicinity of leachate collection well LCW-4 where downward hydraulic gradients existed prior to implementation of the IGR program. The report concluded that IGR program effectively reversed these downward hydraulic gradients and mitigated releases from this source.

Based upon the results of the supplemental RI/FS, the USEPA signed a ROD on December 29, 1993 (OU3). The 1993 ROD incorporated all of the existing components of the 1984 ROD, as well as several additional components. The selected remedy under the 1993 ROD included: 1) enhancing the present source control system by optimizing the leachate extraction rate and other operating parameters in order to achieve, to the degree practicable, inward horizontal gradients in the overburden and upward vertical gradients from the bedrock toward the containment system; 2) connecting downgradient residents in the Smith's Beach area, who were using residential wells, to the public water supply; and 3) implementing institutional controls on ground-water usage through deed restrictions that covered the Site, as well as downgradient locations, including the Smith's Beach area.

The 1993 ROD also called for several investigations related to the enhancement of the source control system. In addition, as there was some uncertainty related to the source of the PCBs detected in the sediments in the adjacent wetlands and White and Wine Creek[1], the ROD called for a study to determine the sources of PCB and pesticide contamination.

In July 1994, an AOC was entered into by the USEPA and a group of PRPs to conduct a supplemental pre-remedial design study (SPRDS) (which was completed in 1996) related to the investigations specified in the 1993 ROD. In September 1994, an AOC was entered into between the USEPA and a group of PRPs to extend the routine leachate removal called for in the 1991 AOC, and, among other things, to connect downgradient residents in the Smith's Beach area, who were using residential wells, to the public water supply. The water-supply connections were completed in July 1995.

In September 1996, an Explanation of Significant Differences (ESD) was issued by the USEPA. The ESD explained the results of the additional investigations called for in the 1993 ROD and presented modifications as follows: 1) identified that bedrock pumping would adversely affect the containment system, streams, and wetlands; 2) modified the contingent remedy for the treatment of the leachate to provide for continued off-site treatment and disposal in lieu of discharge to the City of Oswego Waste Water Treatment Plant; and 3) identified that the Site was not the source of pesticides in surface water or a present source of PCBs in the creek or wetland sediments, and that other upstream sources of PCBs exist.

Based upon the results of the 1996 SPRDS, a Focused Feasibility Study (FFS) was completed in August 1997 to identify and evaluate remedial alternatives for the PCB-impacted sediments in the vicinity of the Site (Environ International Corporation, 1997). That FFS determined that PCB-impacted sediments do not pose a human health risk and that potential ecological risks to conservatively-selected receptor species (e.g., mink) are only marginal. In October 1997, the USEPA signed a ROD for the PCB-impacted sediments in the vicinity of the Site (OU4). The 1997 ROD identified no further action with long-term PCB monitoring as the selected remedy.

On September 26, 1997, the USEPA and the Performing Settling Defendants signed a Consent Decree for the performance of the operation, maintenance, and long-term monitoring components of the ground-water remedy described in the 1993 ROD, as clarified by the 1996 ESD. In September 1998, the USEPA and the Settling Defendants signed the OU4 Consent Decree, which was subsequently lodged by the Court on December 15, 1998. The OU4 Consent Decree, for which this Plan was developed, identified the scope of the remedy as long-term monitoring of PCBs in sediments and biota in White and Wine Creeks and the adjacent wetlands.

1.4 Objective of the PCB Long-Term Monitoring

Data generated from the PCB long-term monitoring will be used to monitor PCB concentrations in sediments and biota of White and Wine Creeks and the adjacent wetlands, and to confirm that PCB concentrations in the sediment and biota continue to be reduced over time (USEPA, 1997 and 1998). The long-term monitoring program components are listed below and described in detail in Section 3 of this Plan.

- Annual sampling of sediments and sediment cores in White and Wine Creeks and the adjacent wetland areas, during the late spring/early summer, at locations upstream, adjacent to, and downstream of the Site.

- Installing and sampling of sediment traps to be installed upstream of Reach 10, within Reach 10, and downstream of Reach 12 (see Figure 2).

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[1] PCBs were not detected in the surface water located adjacent to the Site and pesticides were not detected in the sediments located adjacent to the Site.

- Annual biota sampling of yearling fish, until the USEPA, in consultation with the State, makes a determination, as to whether or not the monitoring needs to continue, or if future action is necessary (Section 5 provides additional details regarding project reporting requirements).

Collectively, as presented in Appendix B of the OU4 Consent Decree [i.e., the Statement of Work (SOW)], these data will be used to periodically evaluate potential ecological risks. The PCB concentrations measured in fish tissue samples will be used to estimate potential ecological exposure of upper trophic level receptors. Estimates of PCB exposure will then be compared to toxicological benchmarks from the literature to evaluate the potential for ecological effects.

2. Project Organization

2.1 Contractors and Subcontractors

As specified in the OU4 Consent Decree, the PCB long-term monitoring will be conducted under the direction and supervision of a qualified, New York State-licensed, professional engineer. The USEPA has approved the Settling Defendant's selection of BBL as their Supervising Contractor for the purposes of the OU4 Consent Decree. That Consent Decree also requires written notification to the USEPA and State identifying the names of all contractors and subcontractors proposed to be used in the development and implementation of the PCB long-term monitoring. The required contractor/subcontractor information is provided below, and is followed by information regarding the contractor/subcontractor selection process.

The tasks to be performed as part of the PCB long-term monitoring (as described herein) involve sampling personnel and analytical laboratories. The analytical laboratories identified below have been selected because they have demonstrated the ability to perform Contract Laboratory Program (CLP) PCB analyses and have consistently proven their ability to successfully perform the required work. The analytical laboratories will be subcontractors to BBL. The contractor and subcontractors currently selected for implementation of the PCB long-term monitoring activities are presented below.

Activity	Contractor/Subcontractor
Sample Collection	BBL
Laboratory Analyses (sediments)	Galson Laboratories
Laboratory Analyses (fish)	EnChem, Inc.
Record Retention/Reporting	BBL

Details regarding the responsibilities of BBL (the Supervising Contractor) and the identified subcontractors to BBL are presented below.

Supervising Contractor - BBL, Syracuse, New York

BBL serves as the Supervising Contractor for the PCB long-term monitoring. As specified in Paragraph 9 of the OU4 Consent Decree, all aspects of the work to be performed by the Settling Defendants pursuant to Sections VI (Performance of the Work by the Settling Defendants), VII (Remedy Review), VIII (Quality Assurance, Sampling and Data Analysis) and XV (Emergency Response) of the OU4 Consent Decree will be conducted under the direction and supervision of BBL. In general, BBL's responsibilities include collecting biota and sediment samples, preparing and submitting the samples for laboratory analyses, subcontracting/coordinating with the laboratories, validating the PCB analytical data, and preparing documentation reports. The address and telephone information for BBL are as follows:

Blasland, Bouck & Lee, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse, New York 13214-0066
(315) 446-9120
Contact: David J. Ulm (Project Officer)
M. Cathy Geraci (Project Manager)

Analytical Laboratory (Sediments) - Galson Laboratories, East Syracuse, New York

As a subcontractor to BBL, Galson Laboratories serves as the primary analytical laboratory for the analysis of sediment samples collected as part of the long-term monitoring activities at the Site. Galson Laboratories is a New York State Analytical Services Protocol/CLP-certified laboratory for PCB analyses. The address and telephone information for Galson Laboratories are as follows:

Galson Laboratories
6601 Kirkville Road
East Syracuse, New York 13057
(315) 432-5227
Contact: Pam Weaver

Analytical Laboratory (Biota) - EnChem, Inc., Madison, Wisconsin

As a subcontractor to BBL, EnChem serves as the analytical laboratory for the analysis of biota collected as part of the long-term monitoring activities at the Site. EnChem is New York State-certified for biota analysis, and capable of performing CLP-equivalent work for PCBs. The address and telephone information for EnChem are as follows:

EnChem, Inc.
525 Science Drive
Madison, Wisconsin 53711
(608) 232-3303
Contact: Todd Noltemeyer

2.2 Approved Contractor and Subcontractor Selection Process

As set forth in the OU4 Consent Decree SOW, work carried out as part of the PCB long-term monitoring is required to be performed by USEPA-approved contractors and subcontractors. If contractors and/or subcontractors other than those listed above are to perform work under the requirements of the OU4 Consent Decree or ROD, the name, title, and qualifications of the proposed contractor or subcontractor will be submitted to the USEPA for approval. Based on a review of the submitted information, the USEPA will issue a notice of disapproval or an authorization to proceed. The proposed contractor or subcontractor will not perform, direct, or supervise any work under the requirements of the OU4 Consent Decree until the notice to proceed has been issued by the USEPA.

3. Methodology for Implementing the PCB Long-Term Monitoring Plan

3.1 General

The OU4 Consent Decree requires long-term monitoring of PCB levels in sediments and fish in White and Wine Creeks and the adjacent wetlands. As part of the PCB long-term monitoring program, CLP or CLP-equivalent data packages for PCB aroclors will be generated. These data will be used to periodically evaluate potential ecological risks. The sediment portion of the monitoring, as specified in the OU4 Consent Decree, will include the collection and analysis of surficial sediment samples and sediment core samples, and the collection of sediment captured within traps to be installed and used as part of the PCB long-term monitoring. Biota sampling will include the collection and analysis of whole-body composite samples of yearling fish.

3.2 Sample Locations

Sediment and biota samples will be collected from five locations (Figure 2) that have been selected based on the following considerations:

- Requirements specified in the OU4 Consent Decree (i.e., within White and Wine Creeks and the adjacent wetlands, at locations upstream, adjacent to and downstream of the site);
- Locations that generally coincide with the historical sediment sample locations that were used in the evaluation of PCB concentration trends in sediments, as presented in the OU4 FFS (Environ International Corporation, 1997);
- Sufficient water depth for placement of the sediment traps; and
- Maximum available habitat for fish.

The five proposed sampling locations are shown on Figure 2 and described below.

Location 1:	Upstream (east) of the Site, in White Creek, near historic sample location SS-1.
Location 2:	Adjacent to and northeast of the Site, in White Creek, in the vicinity of SPRDS Phase II sample location White 11A.
Location 3:	Adjacent to and north of the Site, in White Creek, approximately 50 feet downstream of historic sample location SS-3.
Location 4:	North of the Site in White Creek, in the vicinity of SPRDS Phase II sample location White 12B.
Location 5:	Downstream (northwest) of the Site, and downstream of the confluence of White and Wine Creeks, in the vicinity of historic sample location SS-4A.

The locations shown on Figure 2 and identified above are approximate. The actual locations will be proximate to those shown on Figure 2 and will be determined in the field based on the considerations identified above, the requirements of the OU4 ROD and Consent Decree, and the results of field reconnaissance and manual probing to identify prime depositional areas (e.g., thick, fine-grained sediment deposits). The actual locations sampled during each sampling event will be recorded in the field notebook using measured distances from existing physical features. The sampling locations will be identified in the field using permanent markers, and will subsequently be plotted on a base map that will be provided with the appropriate annual progress report and the Remedial Action Completion Report (Section 5 provides additional details regarding reporting requirements).

3.3 Monitoring Requirements and Frequency

Sediment and biota samples will be collected once annually in the late spring/early summer (i.e., May through July), as specified in the OU4 Consent Decree. The approximate date of the sampling will remain consistent from year to year. The sampling will be conducted on an annual basis until, EPA, in consultation with the State, makes a determination as to whether or not the monitoring needs to be continued, or if further action is necessary.

3.4 Sediment Monitoring

The sediment monitoring will include surficial sediment sampling, sediment cores, and sediment traps, as specified in the OU4 Consent Decree. Sediment monitoring will be conducted annually, in the late spring/early summer, at the five locations within White and Wine Creeks described previously in Section 3.2. In accordance with the OU4 Consent Decree SOW, the sediment samples will be analyzed for PCBs. In addition, the sediment samples will be analyzed for total organic carbon (TOC). Sediment PCB concentrations are frequently normalized for TOC content as a means of determining the bioavailability of sediment-bound PCBs. Therefore, the sediment samples will be analyzed for TOC as well as PCBs.

For QA/QC purposes, field duplicates, matrix spikes, matrix spike duplicates, and lab duplicates will also be submitted for laboratory analysis (see the QAPP provided as Appendix B for additional details). Detailed descriptions of each of the three sediment monitoring methods are presented below.

<u>Surficial and Sediment Core Samples</u>

Surficial (0 - 3 inch) sediment and sediment core (3 - 6 inch and 6 - 12 inch) samples will be collected from each of the five sample locations using the methodology presented in Appendix A-1. A calibrated rod will be employed to measure sediment depth prior to finalizing sample locations. At each of the five locations the cores will be advanced to 12 inches below the surface or until refusal, whichever is encountered first. Surficial and sediment core samples will be analyzed for aroclor-specific PCBs (USEPA SW-846 Method 8082) and TOC (USEPA Region 2 Lloyd Kahn Method). Sample handling, packaging, and shipment requirements are described in Appendix A-4.

The surficial sediment data will be used to monitor PCB levels in surficial sediments. Specifically, comparison of the surficial sediment data between years (possibly including the historical sediment data), and comparison of the surficial data to sediment core data, will provide information on PCB concentrations in recently-deposited sediment. The data may also be used to determine the potential for natural attenuation in the system. In addition, as required by the USEPA (1998), the sediment data will also be used to periodically assess the potential risks from PCBs.

The sediment core data will be used, to the extent possible, to relate PCB concentrations in recent depositional sediments (i.e., surficial sediment data and data from the sediment traps) to historical sediment deposits. Based on existing information presented in site-related documents (Environ International Corporation 1997; Roux Associates, Inc. 1995; and USEPA 1998) previous PCB sediment data was generally limited to the upper 6 inches of sediment. Reportedly, the depth of sediment in the White and Wine Creeks is generally limited and gravel is typically present below the surficial sediment layer (personal telephone conversation between BBL and de maximis, inc., April 14, 1999). Accordingly, sediment core samples may not be possible to collect. As specified in Appendix A-1 (Sediment Core Sampling Procedures), if the core sample from any of the specified locations is not suitably intact or can not be obtained, then the coring procedure will be repeated (attempted) once at a location approximately 5 feet from the first sampling location.

If sediment core samples can be collected, a limited evaluation may be conducted to meet the objective of the PCB long-term monitoring stated in the USEPA's ROD for OU4: "Long-term monitoring will be conducted to ensure that contaminant concentrations in the sediments and biota continue to be reduced over time and that further contamination of the area from upstream sources is not occurring." (USEPA, 1997).

Following collection of the first year's sediment cores from the 6-12 inch depth interval (if possible), the data will be evaluated to determine if additional cores from this depth interval need to be collected in subsequent years to achieve the requirements set-forth in the OU4 ROD and Consent Decree. Any conclusions/recommendations regarding revisions to the PCB long-term monitoring program will be presented to the USEPA and the State, in accordance the requirements presented in Section XXXI (Modification) of the OU4 Consent Decree.

Sediment Trap Samples

Sediment traps will be placed at each of the five sample locations. The traps will consist of an array of pre-cleaned sample jars placed on a stainless steel tray. The traps will be deployed prior to field activities which may cause an increase in disturbance of stream sediment and subsequently bias the sediments collected from the trap. The sediment traps will be deployed in the late spring/early summer, during the collection of the surficial and core sediment samples. Sediment samples will be collected from the traps following a three week period, although the traps may be left in place for additional weeks, if necessary, until enough sediment has accumulated to allow for the required PCB analyses. Upon recovery, the amount of sediment recovered in each trap will be recorded. One sediment sample from each trap will be processed accordingly, and analyzed for aroclor-specific PCBs (USEPA SW-846 Method 8082) and (if sufficient sample is available) TOC (USEPA Region 2 Lloyd Kahn Method). The methodology for setting and retrieving the sediment traps is presented in Appendix A-2. Sample handling, packaging, and shipment requirements are described in Appendix A-4.

The sediment trap data are intended to characterize the new layer of sediments at the surface-water/sediment bed interface. These data will be used to evaluate the movement and re-depositing of sediments. To aid in interpreting the results of the sediment trap samples, flow data for the monitoring period will be obtained from the United States Geological Survey (USGS) gages on White and/or Wine Creek, and meteorological data will be obtained from the City of Oswego.

3.5 Biota Monitoring

3.5.1 General

The biota monitoring program detailed below has been developed to meet the requirements of the OU4 Consent Decree and is generally consistent with the following USEPA documents:

- USEPA. 1995. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Sampling and Analysis*; and
- USEPA. 1993. *Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters.*

3.5.2 Biota Sampling and Analysis Activities

As required by the USEPA (1998), the biota monitoring will include the collection and analysis of yearling fish. White and Wine Creeks are relatively small and offer only limited habitat for fish, and the specific fish species to be sampled will depend on the availability of sufficient numbers of fish. The proposed target species for the long-term PCB monitoring are minnows (e.g., creek chub, fathead minnow, bluntnose minnow), or sticklebacks. Regardless of the species, attempts will be made to use the same species for every sample. In the event that sufficient numbers of fish are not available for every sample, substitutions may be made, as necessary, although individuals within each composite sample will be of the same species. In addition, a literature search will be conducted prior to sampling to established age/length relationships for the target species. This information will be used in the field to select appropriate-sized individuals (i.e., yearling fish).

Fish will be collected using a backpack electrofishing unit, using the procedures described in Appendix A-3. Three composite samples (approximately 5 to 10 fish per sample) will be collected from each of five areas shown on Figure 2. These areas will coincide with the five sediment sample locations described in Section 3.2 (Figure 2) and encompass larger areas to facilitate collecting sufficient numbers of fish. The OU4 Consent Decree SOW requires that the fish samples be composite samples of the same sex. However, sex determination for yearling fish is not straightforward, because yearlings do not have well-developed gonads, making sex determination difficult. In addition, sex determination involves dissecting the fish, which destroys the integrity of whole-body samples and increases the likelihood of cross-contamination. Therefore, determination of sex will not be attempted/performed on the fish submitted for analysis.

Each of the 15 composite yearling fish samples (three samples from each location) will be analyzed for aroclor-specific PCBs (USEPA SW-846 Method 8082) and percent lipids (standard gravimetric techniques). One factor affecting PCB levels in fish is the lipid content, and when evaluating PCB levels in fish, PCB concentrations are commonly lipid-normalized to account for potential effects of differences in lipid content. Therefore, the biota samples will be analyzed for percent lipids as well as PCBs, even though percent lipid analysis was not specified in the OU4 Consent Decree. A description of the lipid analytical method is provided as Attachment 1 to the QAPP.

The biota data will be used for long-term monitoring of PCB concentrations in yearling fish (USEPA, 1998). Once the actual target species have been identified during the initial year of sampling, efforts will focus on collecting the same species in subsequent years. As specified in the OU4 Consent Decree, the data will also be used to evaluate potential ecological risks. The PCB concentrations measured in fish tissue samples will be used to estimate potential ecological exposure of upper trophic level receptors. Estimates of PCB exposure will then be compared to toxicological benchmarks from the literature to evaluate the potential for ecological effects.

4. Quality Assurance, Sampling, and Data Analysis

4.1 General

Details regarding quality assurance protocols, sampling procedures, and data analysis associated with implementation of this Plan are detailed in the Standard Operating Procedures (Appendix A) , as well as the QAPP (Appendix B). Provided below is a summary of the laboratory analyses to be performed, information regarding split or duplicate samples, and data reporting requirements.

4.2 Laboratory Analysis

Consistent with the OU4 Consent Decree, laboratory analyses will be conducted according to accepted USEPA methods. These methods are identified in following table.

Analysis	Methodology
PCBs (all sediment samples)	USEPA SW-846 Method 8082
TOC (all sediment samples)	USEPA Region 2 Lloyd Kahn Method
PCBs (fish samples)	USEPA SW-846 Method 8082
Percent Lipids (fish samples)	Standard Gravimetric Techniques

4.3 Split or Duplicate Samples

Split or duplicate samples will be available to the USEPA, the NYSDEC or their representatives if requested, and if sufficient sample mass is available. To facilitate split sampling, the USEPA will be notified no less than 21 days prior to sampling, unless a shorter notice is agreed to by the USEPA.

4.4 Data Reporting

Upon receipt of the PCB analytical results from the laboratories, BBL will validate these data in accordance with the procedures described in the QAPP. As specified in the OU4 Consent Decree (Paragraph 21), two copies of the validated PCB analytical results, as well as TOC and percent lipids data, will be submitted to USEPA within ten days of the date when all of these results become available to the Settling Defendants.

5. Project Schedule and Reporting

5.1 General

The long-term monitoring described in this Plan will be conducted annually in the late spring/early summer (i.e., May through July) until the USEPA, in consultation with the State, provides written notification that the monitoring may cease. The alternative procedures that may be employed to permit the PCB long-term monitoring activities to be performed properly and in a timely manner in the event that conditions at the Site create potential sampling problems are identified below. The conclusion of this section provides a description of the annual progress reports and the Remedial Action Completion Report that will be provided as part of the PCB long-term monitoring.

5.2 Potential Problems and Alternative Procedures

Potential problems which may occur during the long-term monitoring plan include high water, lack of sufficient sediment in the sediment traps, and/or lack of sufficient numbers of biota. Alternative procedures for addressing these potential problems are discussed below.

High Water

Elevated water levels may create unsafe conditions for sampling. Therefore, sampling during a given year may be postponed until conditions permit a safe work environment. Postponement of the sampling (if necessary) is not anticipated to be a problem because the biota and sediment sampling activities can be completed in a relatively short time period (i.e., a few days) and the period during the which sampling must be conducted spans several months (i.e., May through July), thereby providing some flexibility for scheduling of the field activities. Efforts will be made, however, to consistently sample at the same time of year.

Insufficient Sedimentation in the Sediment Traps

Sediment traps will be placed in designated sampling locations during the collection of the surficial and core sediment samples. Initially, the sediment traps will remain in place for approximately three weeks. If, following the three-week period, sufficient sediment mass has not accumulated, the sediment traps will be left in place and monitored once a week until sufficient sediment mass has accumulated for the required PCB analyses.

Insufficient Numbers of Biota

Biota sampling will focus on the collection of three composite samples (5 to 10 individuals per composite) of the same species from each of the five sampling locations. If sufficient numbers of target species are not collected from one or more sampling locations, then the following actions may be taken, as deemed appropriate by the biota sampling crew leader.

- Increase the size of the original sampling area.
- Obtain composite samples of different species (e.g., one composite sample of two or more species per location). Regardless, each composite sample will consist of only individuals of the same species.
- If the alternate procedures described above still do not result in the collection of sufficient numbers of fish, then a follow-up sampling trip may be conducted.

5.3 Annual Progress Reports

As specified in the Consent Decree, written annual progress reports will be submitted to USEPA and the State. Consistent with the requirements of the OU4 Consent Decree (paragraph 28), these progress reports will:

- Describe the actions which have taken place during the previous year;
- Include a summary of all results and data generated during the previous year;
- Identify all work plans, plans, and other deliverables submitted during the previous year;
- Describe the activities proposed for the next sampling period;
- Include information regarding any unresolved delays that may affect the future schedule for implementation of the work, and a description of the efforts that have been or will be taken to mitigate those delays or anticipated delays;
- Include any proposed modifications to the work plans or schedules that have been proposed to or approved by the USEPA; and
- Describe the activities undertaken in support of Community Relations Plan during the previous year and those to be undertaken in the next year.

5.4 Remedial Action Completion Report

As set-forth in the OU4 Consent Decree (paragraph 47), the Settling Defendants will submit a Remedial Action Completion Report to the USEPA, with a copy to the State, within 90 days after the Settling Defendants conclude that the remedial action for OU4 has been fully performed. That report will present a summary and evaluation of the monitoring data generated pursuant to this Plan, and a request for the USEPA's approval pursuant to Section XI (EPA Approval of Plans and other Submissions) of the OU4 Consent Decree. The Remedial Action Completion Report will also contain the required statements regarding completion of the remedial action for OU4.

6. References

BBLES. 1998. *Operation Maintenance and Long-Term Monitoring Plan.* Pollution Abatement Services Site. Oswego, New York. May, 1998.

Environ International Corporation. 1997. *Focused Feasibility Study for PCB-Impacted Sediments in the Vicinity of the PAS Superfund Site.* Oswego, New York. August 20, 1997.

Roux Associates, Inc. 1995. *Supplemental Pre-Remedial Design Study Work Plan Addendum No. 2 Surface-Water/Sediment Quality Source Investigation.* Pollution Abatement Services Site. Oswego, New York. May, 1995.

United States Environmental Protection Agency (USEPA). 1989. *Preparing Perfect Project Plans.*

United States Environmental Protection Agency (USEPA). 1989. *Region II CERCLA Quality Assurance Manual.* EPA/902/9-89/501.

United States Environmental Protection Agency (USEPA). 1990. *Guidance on EPA Oversight of Remedial Designs and Remedial Actions performed by Potentially Responsible Parties.* Interim Final. EPA/540/G-90/001.

United States Environmental Protection Agency (USEPA). 1993. *Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters.* Office of Research and Development. EPA/600/R-92/111.

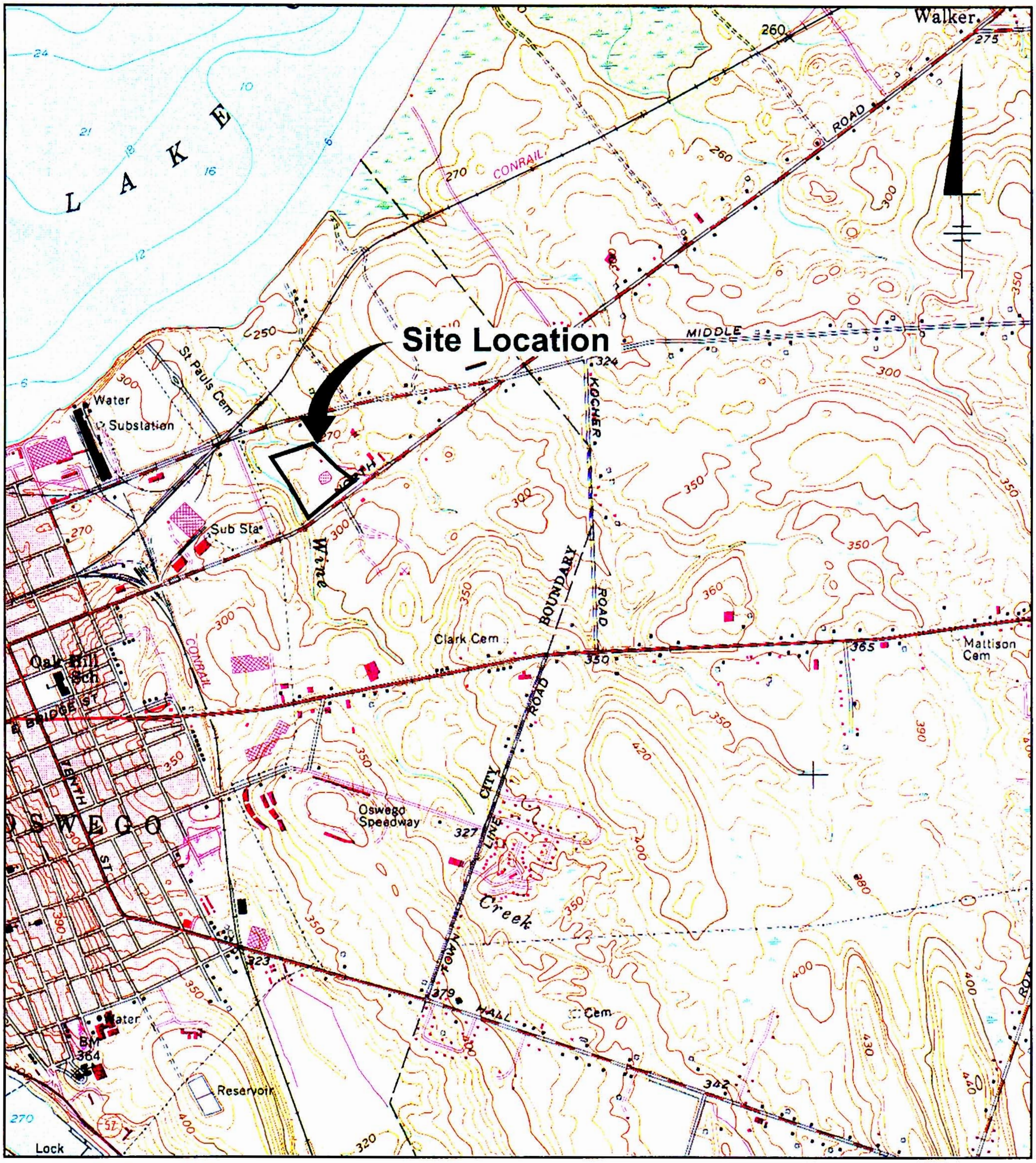
United States Environmental Protection Agency (USEPA). 1995. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Sampling and Analysis.* EPA/823/R-93/002.

United States Environmental Protection Agency (USEPA). 1997. *Record of Decision, Decision Summary.* Pollution Abatement Services. City of Oswego, Oswego County, New York. September, 1997. USEPA Region II. New York, NY.

United States Environmental Protection Agency (USEPA). 1998. PAS OU4 Consent Decree. September 29, 1998. USEPA Region II. New York, NY.

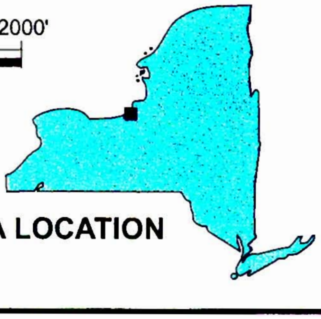
United States Environmental Protection Agency (USEPA). 1998a. The Guidance for Quality Assurance Project Plans. EPA QA/G-5, EPA/600/R-98/018, February 1998.

Figures



REFERENCE: BASE MAP USGS QUAD., OSWEGO EAST, NY, 1978.

Approximate Scale: 1" = 2000'



AREA LOCATION

04/99 SYR-D54-DJH LBR
36444001/36444n01.cdr

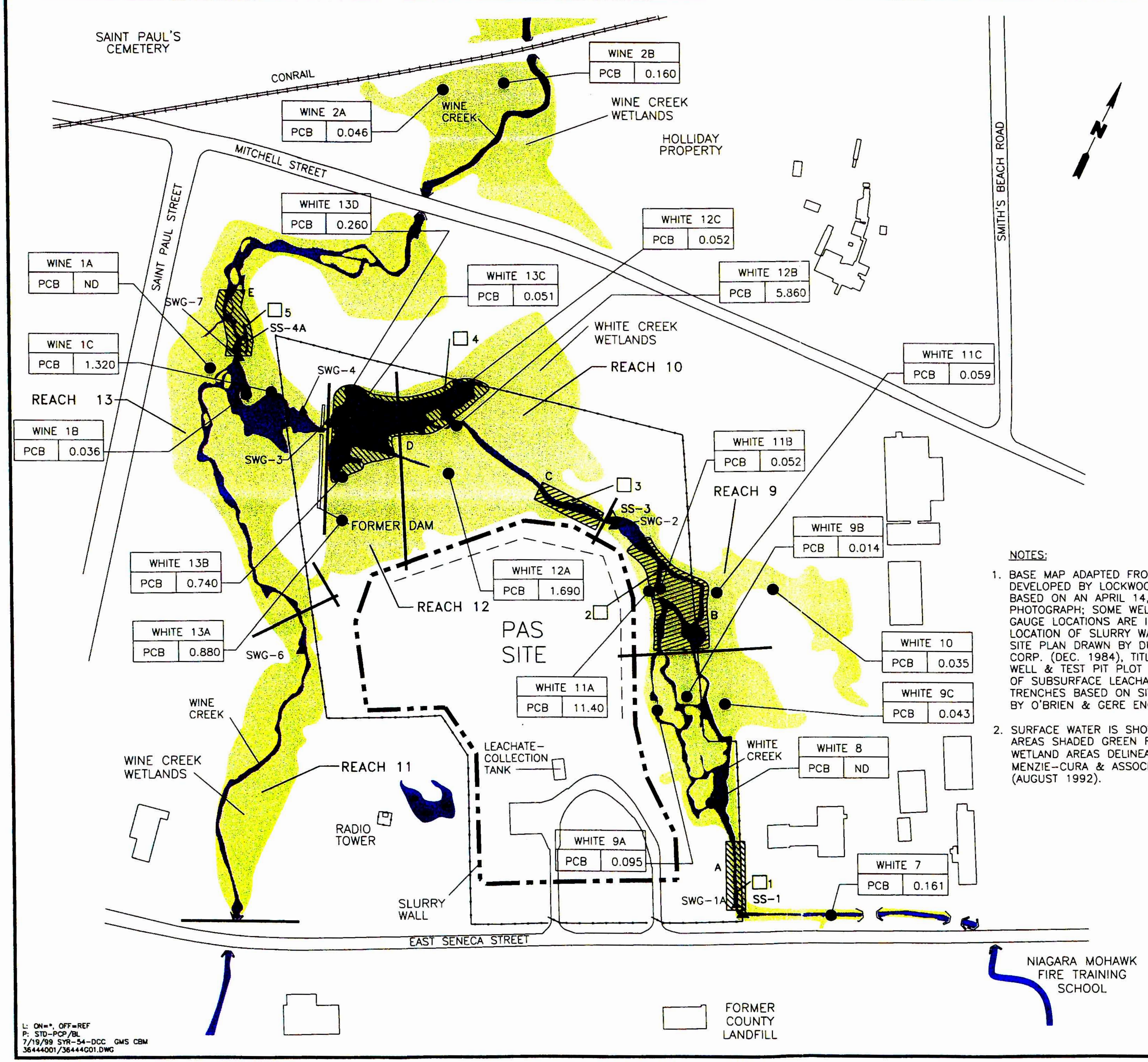
POLLUTION ABATEMENT SERVICES SITE
OSWEGO, NEW YORK

PCB LONG-TERM MONITORING PLAN

SITE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1



LEGEND:

A ▨	APPROXIMATE LONG-TERM MONITORING FISH SAMPLING LOCATION
1 ☐	APPROXIMATE LONG-TERM MONITORING SEDIMENT SAMPLING LOCATION
SS-1 △	APPROXIMATE PREVIOUS SEDIMENT SAMPLING LOCATION
SWG-1 ▲	APPROXIMATE STREAM GAUGE LOCATION
●	APPROXIMATE SPRDS PHASE II SEDIMENT SAMPLING LOCATION
—·—	FENCE (SITE BOUNDARY)
━ ■ ■ ━	SLURRY WALL
— — — —	APPROXIMATE LOCATION OF SUBSURFACE LEACHATE COLLECTION TRENCH
⁂	LAND AREAS SUBJECT TO FREQUENT, SHALLOW INUNDATION
🟨	WETLAND AREAS DELINEATED BY MENZIE-CURA & ASSOCIATES, INC. (AUGUST 1992)
━	REACH BOUNDARY
WHITE 12B	SAMPLE IDENTIFICATION
PCB 5.860	TOTAL PCB CONCENTRATION (mg/kg)

NOTES:

1. BASE MAP ADAPTED FROM TOPOGRAPHIC MAP DEVELOPED BY LOCKWOOD MAPPING, INC. BASED ON AN APRIL 14, 1993 AERIAL PHOTOGRAPH; SOME WELL AND STREAM-GAUGE LOCATIONS ARE INFERRED; LOCATION OF SLURRY WALL BASED ON SITE PLAN DRAWN BY DUNN GEOSCIENCE CORP. (DEC. 1984), TITLED "BORING, WELL & TEST PIT PLOT PLAN;" LOCATION OF SUBSURFACE LEACHATE-RECOVERY TRENCHES BASED ON SITE MAP PROVIDED BY O'BRIEN & GERE ENGINEERING INC.
2. SURFACE WATER IS SHOWN IN BLUE; AREAS SHADED GREEN REPRESENT WETLAND AREAS DELINEATED BY MENZIE-CURA & ASSOCIATES, INC. (AUGUST 1992).
3. BOUNDARIES FOR REACH 10 AND REACH 12, AS WELL AS SPRDS PHASE II SAMPLING LOCATIONS AND PCB RESULTS, WERE PRESENTED IN THE FINAL FOCUSED FEASIBILITY STUDY FOR PCB-IMPACTED SEDIMENTS IN THE VICINITY OF THE PAS SUPERFUND SITE, OSWEGO, NEW YORK (ENVIRON, AUGUST 20, 1997).
4. AS DETAILED IN THE PCB LONG-TERM MONITORING PLAN, SURFICIAL SEDIMENT, SEDIMENT CORE, AND SEDIMENT TRAP SAMPLES WILL BE COLLECTED FROM THE LONG-TERM SEDIMENT SAMPLING LOCATIONS SHOWN ON THIS FIGURE.
5. ND= PCBs WERE NOT DETECTED ABOVE THE ANALYTICAL DETECTION LIMIT.

0 200' 400'

GRAPHIC SCALE

POLLUTION ABATEMENT SERVICES SITE
OSWEGO, NEW YORK

PCB LONG-TERM MONITORING PLAN

SAMPLE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
2

L: ON=*, OFF=REF
P: STD-PCP/BL
7/19/99 SYR-54-DCC GMS CBM
36444001/36444G01.DWG

Appendix A-1 - Sediment Core Sampling Procedures

I. Introduction

The general procedures to be utilized in obtaining surficial sediment (0-3 inch) and sediment core (3-6 inch and 6-12 inch) samples from the identified sampling locations are outlined below. A stainless steel tube will be the primary method used to collect sediment cores. The core will be inserted with a straight, vertical entry into the sediments to secure a representative cross-section sample.

II. Materials

The following materials will be available, as required, during sediment core sampling activities:

- Personal protective equipment [as required by the Health and Safety Contingency Plan (HSCP)];
- Cleaning equipment (see Appendix A-5);
- Aluminum or stainless steel tray;
- 1 7/8" or 2"stainless steel tube with end caps;
- Brass push rod;
- Stainless steel core driver;
- Stainless steel spatula;
- Calibrated rod for sediment depth measurement;
- Vacuum pump;
- Field notebook;
- Appropriate transport containers and coolers with ice;
- Appropriate temperature blank, labeled and dated;
- Appropriate sample containers; and
- Appropriate forms, labels, and shipping materials.

III. Procedures for Stainless Steel Tube Sampling

1. Identify the proposed sample location in the field notebook along with other appropriate information collected during sediment sampling activities. Determine direction of water flow and position downstream.

2. Don personal protective equipment (as required by the HSCP).

3. At each sample location, lower a section of the tube until it just reaches the top of sediment. Measure the depth of water.

4. Push the tube into the sediment by hand to a depth of 12 inches below the surface or until refusal, whichever is encountered first. Measure the depth of sediment.

5. Drive the tube several more inches, using a stainless steel core driver, and measure the distance. This procedure is performed to obtain a "plug" at the bottom of the core and prevent the loose sediment from escaping upon retrieval of the sediment core.

6. Place a vacuum pump on the top end of the tube and create a vacuum to prevent the sediments/plug from escaping.

7. Slowly pull the tube from the sediment, twisting it slightly (if necessary) as it is removed.

8. Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged.

9. Sediment cores will be extruded from the stainless steel tube onto an aluminum or stainless steel tray using the brass push rod. Measure the length of sediment recovered and evaluate the integrity of the core. If the core is not suitably intact or could not be obtained, repeat coring procedure once approximately 5 feet from the first location attempted. All cores will be photographed for future reference.

10. Repeat the above procedures until all core samples are collected (for the sampling event or the sampling day).

11. Cores will be sectioned into the required depth-proportioned increments based on the ratio of the measured sediment depth to the recovered sediment depth to account for sample compression or expansion during collection. Each increment will be decanted, if necessary, and then homogenized prior to placement in sample containers and individually packaged. Description of each sample will be recorded in the field notebook.

12. The stainless steel tubes and spatulas used to collect the cores should be cleaned (as described in Appendix A-5) between each sampling location.

13. Label all sample containers and record all appropriate information in the field notebook. Place the sediment samples in a container with ice.

14. Handle, pack, and ship the samples in accordance with the procedures in Appendix A-4.

Appendix A-2 - Sediment Trap Sampling Procedures

I. Introduction

The procedures outlined below will be used to collect settleable particles in the water column for chemical and/or physical analysis.

II. Materials

The following materials will be available, as required, during sediment trap installation and retrieval:

- Personal protective equipment [as required by the Health and Safety Contingency Plan (HSCP)];
- Pre-cleaned glass sample jars;
- Stainless steel pans;
- Field notebook;
- Appropriate transport containers and coolers;
- Appropriate temperature blank, labeled and dated;
- Appropriate sample containers; and
- Appropriate forms, labels, and shipping materials.

III. Sediment Trap Construction

The sediment trap will consist of a series (16) of pre-cleaned sample jars contained within a stainless steel pan.

IV. Placement Procedures

1. Don health and safety equipment (as required by the HSCP).

2. Determine direction of water flow and position downstream.

3. Field crew will enter water from a location downstream of trap, and will minimize sediment resuspension as much as possible. Field crew will work downstream of the trap and will proceed downstream for trap placement.

4. Arrange sample jars in stainless steel pan and lower slowly into the water, allowing jars to fill with water before submerging.

5. Position sediment trap assembly on stream bottom.

V. Sample Retrieval

1. Don health and safety equipment.

2. Samplers locate sediment trap.

3. Determine direction of water flow and position downstream.

4. Samplers enter water from a location downstream of trap, and will minimize sediment resuspension as much as possible. Field crew will work downstream of the trap and will proceed upstream for trap retrieval.

5. Cap glass jars and retrieve by lifting the stainless steel pan carefully, to minimize sediment disturbance.

6. Allow glass jars to sit until sediment settles sufficiently. Measure the depth of solids in the jars. Decant the liquid fraction into jars prior to collection of the sediment fraction. Pour sediment into appropriate sample containers.

7. Place filled sample containers on ice in a cooler. Place temperature blank, labeled and dated, in each cooler. Record required information on the appropriate forms and field notebooks. Ship to laboratory for analysis, following the procedures detailed in Appendix A-4.

Appendix A-3 - Fish Sampling Procedures

I. Introduction

This protocol sets forth the field procedures for fish collection, species identification, length and weight measurements, and sample processing. All field operations will be conducted by trained Blasland, Bouck & Lee, Inc. field biologists. The following procedures apply to all target fish species retained for chemical analysis.

II. Materials

The following materials will be available for use, as necessary, during fish collection activities:

- Health and safety equipment (as required by the Health and Safety Contingency Plan);
- Backpack electrofishing unit;
- Dip net;
- Seines;
- Live well;
- Holding container with ice;
- Fish measuring board;
- Suspended-weight or top-loading spring balance;
- Top-loading electronic balance;
- Mesh bags, trays, or other containers suitable for holding fish to be weighed;
- Appropriate packaging materials and forms;
- Appropriate temperature blank, labeled and dated;
- Transport container (cooler) with ice; and
- Field notebook.

III. Procedures

The general procedures that will be followed during fish collection are provided below:

1. Identify sampling location.

2. Select collection method(s) based on the sampling location. In general, backpack electrofishing will be the preferred method at the site. Alternative methods (e.g., seining) will only be used in the event electrofishing methods are not successful or cannot be used.

3. Don health and safety equipment according to the collection procedure selected.

4. Using the appropriate collection method, collect the selected number of each target species specified for the sampling location, to the extent feasible.

5. When fish are collected, record the pertinent information in the field notebook.

6. Retain target fish species for chemical analysis. Release non-target fish species and record the types and relative abundance of these other species in the field notebook.

7. Place retained fish in a live well or in a holding container with ice.

8. Continue coverage of the area. If no additional fish are collected, move to a different area within the same sampling location.

9. Repeat steps 4 through 8 until selected quantities for each target fish species for the sampling location are obtained or the entire area of the sampling location has been covered. At the crew leader's discretion, use an alternate technique per those described above in Item 2 to obtain the selected quantities of target species.

10. After the specified number of all target species are collected for the sampling location or at the end of a sampling day (or sooner per the discretion of the field crew leader), identify the retained specimens to the species level (to the extent feasible). Identification of retained specimens will be conducted by examining each fish externally or with the aid of optical equipment (when necessary), for diagnostic characteristics as described in any of the following references:

    - Hubbs, C.L. & K.F. Lagler, 1958. Fishes of the Great Lakes Region. University of Michigan Press, Ann Arbor, MI. 213p.

    - Smith, C.L. 1985. The Inland Fishes of New York State. NYSDEC, Albany, NY. 522p.

    - Werner, R.G. 1980. Freshwater Fishes of New York State, Syracuse University Press, Syracuse, NY. 186p.

11. Record scientific names and common names (of standard and unambiguous usage) in the field notebook.

12. Place the fish on the measuring board and measure fish length relative to an imaginary straight line drawn along the middle of the side of the specimen (to be called the lateral reference line). Total length is defined as the distance along the lateral reference line between two points a and b, where point a is the perpendicular projection of the furthest anterior extent of the head of the specimen onto the lateral reference line; this point is determined with the mouth of the specimen in normal closed position. Point b is defined as the perpendicular projection of the furthest posterior extent of the tail of the specimen onto the lateral reference line. This point is assessed when the tail is held in closed position toward the lateral reference line (i.e., both caudal fin lobes are compressed dorso-ventrally).

13. Record length for each fish in a composite sample to the nearest centimeter in the field notebook.

14. Calibrate the balances prior to weighing fish from each sample location. (Balances will be calibrated following manufacturer specifications and procedures).

15. Based on established age/length relationship for the target species developed using literature search, select appropriate-sized individuals.

16. Zero the balance prior to weighing each fish.

17. Record calibration and zeroing events in the field notebook.

18. Weigh all fish in a composite sample together using one of the following methods:

    a. If using a top-loading balance weigh either directly or in a tared container;
    b. If using a suspended-weight balance weigh either directly or in a mesh bag or other suitable container.

19. Record, in the field notebook, the total fish weight to the nearest gram and the total number of individuals in each composite.

20. Examine each fish for the occurrence and nature of any external anomalies (i.e., general physical condition), including absence or erosion of fins; deformation of any structure; cuts, scars or areas of regenerated scales; presence of apparent lesions or diseases; and the occurrence of other abnormalities. Record observations in the field notebook.

21. Prepare the samples for shipment to the laboratory. Wrap whole fish composite samples in aluminum foil and then freezer paper. The appropriate sample information will be placed on a label on the exterior of the sample.

22. Select the fish tissue sample preparation procedure (i.e., whole-body composite) and chemical analysis that the laboratory will follow. Record this information for each fish tissue sample in the field notebook and on the chain-of-custody form.

23. Prepare samples for shipment to the laboratory following the appropriate handling, packing, and shipping with chain-of-custody procedures presented in Appendix A-4.

Appendix A-4 - Field Sample Packaging, Handling, and Shipping Procedures

I. Introduction

The procedures that will be used for packaging, handling, and shipping the sediment and biota samples are described below.

II. Handling

1. Fill in sample label with:
    a. Sample type (sediment or biota);
    b. Project number and site name;
    c. Sample identification code and other sample identification information, if applicable;
    d. Analysis required;
    e. Date;
    f. Time sampled;
    g. Sample type (composite or discrete); and
    h. Preservative added, if applicable.

2. Cover the label with clear packing tape to secure the label onto the container.

3. Check the caps on the sample containers (if applicable) to ensure that they are tightly sealed.

4. Wrap the sample container cap with clear packing tape to prevent it from becoming loose.

5. Place a signed custody seal label over the cap such that the cap cannot be removed without breaking the custody seal.

6. Initiate chain-of-custody by designated sampling personnel responsible for sample custody (after sampling or prior to sample packing). Note: If the designated sampling person relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the chain-of-custody prior to this transfer. The appropriate personnel will sign and date the chain-of-custody form to document the sample custody transfer.

III. Packaging

1. Using duct tape, secure the outside and inside of the drain plug at the bottom of the cooler that is used for sample transport.

2. Place each sample container or package in individual polyethylene bags (Ziploc® type) and seal.

3. For sediment samples, place one to two inches of vermiculite at the bottom of the cooler as a cushioning material.

4. Place the sample containers upright in the cooler.

5. Repackage ice (if required) in small Ziploc® type plastic bags and place loosely in the cooler. Do not pack ice so tightly that it may prevent addition of sufficient cushioning material.

6. Place temperature blanks in the cooler. The temperature blank will consist of sample container filled with non-preserved water (potable or distilled). Label the container with "USEPA COOLER TEMPERATURE INDICATOR" and the sample collection date.

7. For sediment samples, fill the remaining space in the cooler with vermiculite.

8. Place the completed chain-of-custody forms in a large Ziploc® type bag and tape the forms to the inside of the cooler lid.

9. Close the lid of the cooler and fasten with duct tape.

10. Wrap strapping tape around both ends of the cooler at least twice.

11. Mark the cooler on the outside with the following information: shipping address, return address, "Fragile" labels on the top and on one side, and arrows indicating "This Side Up" on two adjacent sides.

12. Place custody seals over the front right and back left of the cooler lid and cover with clear plastic tape.

IV. Shipping

1. All samples will be hand delivered or delivered by an express carrier (e.g., Federal Express) within 48 hours or less from the date of sample collection.

2. The following chain-of-custody procedures will apply to sample shipping:

   a. Relinquish the sample containers to the laboratory via express carrier. The signed and dated chain-of-custody forms should be included in the cooler. The express carrier will not be required to sign the chain-of-custody forms. The sampler should retain the express carrier receipt or bill of lading.

   b. When the samples are received by the laboratory, the laboratory personnel shall complete the chain-of-custody forms by recording receipt of samples, and then check the sample identification numbers on the containers against the chain-of-custody forms.

   c. Record temperature of the temperature blank on the chain-of custody record immediately upon receipt at the laboratory, prior to inventory and refrigeration or freezing.

Appendix A-5 - Field Cleaning/Decontamination Procedures

I. Introduction

The following procedures describe the techniques that will be used clean and decontaminate field sampling equipment.

II. Materials

- Health and safety equipment (as required in the Health and Safety Plan);
- Distilled water;
- Non-phosphate soap (Alconox® or equivalent);
- Tap water;
- Appropriate cleaning solvent (i.e., pesticide grade or better methanol and hexane);
- Rinse collection plastic containers;
- Knife;
- Brushes;
- Aluminum foil;
- Garbage bags;
- Spray bottles;
- Ziploc®type bags; and
- Plastic sheeting.

III. Cleaning Procedures for Small Equipment and Sampling Devices

1. Follow health and safety procedures specified in the Health and Safety Plan.

2. Cleaning of reusable sampling equipment (e.g., scoops, mixing bowls, spatulas, etc.), will follow the decontamination procedures presented below:

   a. Non-phosphate detergent and distilled water wash;
   b. Distilled water rinse;
   c. Solvent (methanol and hexane) rinse;
   d. Distilled water rinse; and
   e. Allow to air dry and wrap in aluminum foil.

3. Cleaning/decontamination will be conducted in plastic containers. These containers will also be used to collect all decontamination rinsate, that will be subsequently disposed of in accordance with applicable rules and regulations.

IV. Cleaning Procedures for Large Equipment (if applicable)

1. Follow health and safety procedures specified in the HASP.

2. Cleaning of large sampling equipment will follow the decontamination procedures presented below:

   - Wash all large equipment with a high pressure water wash using a brush as deemed necessary, to remove any particles.

<u>OR</u>

   a. Scrub equipment with soapy (non-phosphate soap) tap water and brush;
   b. Rinse equipment with tap water;
   c. Rinse equipment with methanol, followed by hexane;

d. Rinse equipment with distilled/deionized water. The volume of distilled/deionized water shall be five times the volume of the solvent used in the previous step.
e. Allow the equipment to air dry; and
f. Wrap in aluminum foil (as appropriate).

Large sampling devices will be cleaned prior to mobilizing to the site, after mobilizing to the site, between each sampling location while on site, and prior to leaving the site.

V. Storage of Equipment

All decontaminated sampling equipment will be stored in a clean environment, and as appropriate, the equipment will be covered with aluminum foil.

Appendix B

Quality Assurance Project Plan

PCB Long-Term Monitoring Plan

Appendix B - Quality Assurance Project Plan

Pollution Abatement Services
Superfund Site
Operable Unit 4
Oswego, New York

Settling Defendants

April 1999
Revised August 1999

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

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Table of Contents

1. Project Description

1.1 Introduction

This Quality Assurance Project Plan (QAPP) represents Appendix B of the PCB Long-Term Monitoring Plan (Plan) for Operable Unit 4 (OU4) of the Pollution Abatement (PAS) Superfund Site (Site), located in the City of Oswego, New York.

This QAPP presents analytical methods and procedures that will be used during performance of long-term PCB monitoring activities at the Site. Field sampling requirements, frequency, methods, and procedures are presented in the Plan and will be referenced throughout this document.

This QAPP was prepared in a manner consistent with the following reference and guidance documents:

- United States Environmental Protection Agency's (USEPA's) "Test Methods for Evaluating Solid Waste, SW-846" (USEPA, 1996);
- The USEPA's guidance document entitled "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring" (USEPA, 1984);
- The National Enforcement Investigations Center (NEIC) Policies and Procedures Manual (NEIC, 1984); and
- The NEIC Manual for the Evidence Audit (NEIC, 1981).

Information contained in the QAPP has been organized into the following sections:

Section	Content
1	Project Description
2	Project Organization and Responsibilities
3	Quality Assurance Objectives for Measurement of Data
4	Sample Designation System and Sampling Procedures
5	Sample and Document Custody
6	Calibration Procedures and Frequency
7	Analytical Procedures
8	Data Reduction, Review, and Reporting
9	Field and Laboratory Quality Control Checks
10	Performance and System Audits
11	Preventive Maintenance
12	Data Assessment Procedures
13	Corrective Action
14	Quality Assurance Reports to Management

Details are provided in the subsequent sections. This document also contains pertinent information from the Work Plan related to the measurement and evaluation of the monitoring data.

1.1.1 Glossary of Terms

The list below presents abbreviations and the corresponding terms used in this QAPP (definitions of each term are provided with the body of the QAPP):

- BBL - Blasland, Bouck & Lee, Inc.;
- CLP - Contract Laboratory Procedures;
- DUP - Duplicate;
- DQOs - Data Quality Objectives;
- GC - Gas Chromatography;
- HSCP - Health and Safety Contingency Plan;
- MS - Matrix spike;
- MSD - Matrix spike duplicate;
- NEIC - National Enforcement Investigations Center;
- PARCC - Precision, Accuracy, Representativeness, Completeness, and Comparability;
- PCB - Polychlorinated biphenyl;
- QAM - Quality Assurance Manager;
- QAPP - Quality Assurance Project Plan;
- QA/QC - Quality Assurance/Quality Control;
- RPD - Relative percent difference;
- SDG - Sample delivery group;
- SOP - Standard operating procedures;
- TOC - Total Organic Carbon; and
- USEPA - United States Environmental Protection Agency.

1.2 Plan Objectives

The overall objective of the Plan is to provide a detailed description of the requirements, methods, and procedures for conducting long-term PCB monitoring, as set forth in the OU4 Consent Decree and Record of Decision (detailed site history and enforcement activity information is presented in the Plan). As required by the OU4 Consent Decree, the results of the monitoring activities will be used to monitor PCB levels in sediment and biota of White and Wine Creeks and the adjacent wetlands at locations upstream, adjacent to, and downstream of the site; and assess the threat on a periodic basis.

1.3 Data Quality Objectives

1.3.1 General

Sediment and biota samples will be collected and analyzed to obtain information necessary to meet the objectives stated above.

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support decisions made during site-related activities and are based on the end uses of the data to be collected. Preliminary DQOs were identified to ensure that the data generated during monitoring activities will be of adequate quality and sufficient quantity to form a sound basis for decision making purposes relative to the above objectives. Data quality objectives have been specified for each data collection activity. The DQOs presented herein address monitoring efforts only and do not cover health and safety issues, which are addressed in detail in the Health and Safety Contingency Plan (HSCP) for this project (copy provided as Appendix C to the PCB Long-Term Monitoring Plan).

A DQO summary for the sampling investigation efforts is presented below. The summary consists of stated DQOs relative to the following items:

A. Data Uses;
B. Data Types;
C. Data Quality;
D. Data Quantity;
E. Sampling and Analytical Methods; and
F. Data Precision, Accuracy, Representativeness, Completeness, and Comparability Parameters (PARCC Parameters).

Three data categories have been defined to address various analytical data uses and the associated quality assurance/quality control (QA/QC) effort and methods required to achieve the desired levels of quality. These categories are:

Screening Data: Screening data afford a quick assessment of site characteristics or conditions. This objective for data quality is applicable to data collection activities that involve rapid, non-rigorous methods of analysis and quality assurance. This objective is generally applied to: physical and/or chemical properties of samples; degree of contamination relative to concentration differences; and preliminary health and safety assessment.

Screening Data with Definitive Confirmation: Screening data allow rapid identification and quantitation, although the quantitation can be relatively imprecise. This objective of data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10 percent or more). This objective can also be used to verify less rigorous laboratory-based methods.

Definitive Data: Definitive data are generated using analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files.

1.3.2 Sediment Monitoring DQOs

Data Types - The sediment monitoring activities will include the collection and analysis of samples from White and Wine Creeks. These sediment samples will be analyzed for PCBs and total organic carbon (TOC). The Plan provides the rationale for the chemical parameters selected for analysis.

Data Quality - Sample analyses for PCBs will be performed in accordance with USEPA SW-846 Method 8082, and TOC analyses will be conducted in accordance with the USEPA Lloyd Kahn Method.

Data Quantity - The number and type of samples to be collected are summarized in Table 1.

Sampling and Analytical Methods - The Plan contains a description of the sampling procedures to be employed during implementation of the long-term monitoring activities. The laboratory analytical methods to be utilized are listed in Table 2 of this QAPP.

PARCC Parameters - Precision and accuracy quality control (QC) limits for chemical constituents used during data review to assess analytical performance are included in Table 3.

Data Representativeness - Addressed by the sample quantities and locations identified in the Plan. Data comparability is intended to be achieved through the use of standard USEPA-approved methods, which are presented in Table 2. Data completeness will be assessed at the conclusion of the analytical activities.

1.3.3 Biota Monitoring DQOs

Data Types - The biota monitoring activities will include the collection and analysis of whole-body composite samples of fish. These samples will be analyzed for PCBs and percent lipids. The Plan provides the rationale for the parameters selected for analysis.

Data Quality - Sample analyses for PCBs will be performed in accordance with USEPA SW-846 Method 8082. Percent lipids will be determined using standard gravimetric techniques.

Data Quantity - The number and type of samples to be collected are summarized in Table 1.

Sampling and Analytical Methods - The Plan contains a description of the sampling procedures to be employed during implementation of the monitoring activities. The laboratory analytical methods to be utilized are listed in Table 2 of this QAPP.

PARCC Parameters - Precision and accuracy QC limits for chemical constituents used during analytical data review to assess analytical performance are included in Table 3.

Data Representativeness - Addressed by the sample quantities and locations identified in the Plan. Data comparability is intended to be achieved through the use of standard USEPA-approved methods, which are presented in Table 2. Data completeness will be assessed at the conclusion of the analytical activities.

2. Project Organization and Responsibilities

2.1 Project Organization

The long-term monitoring activities will require integration of personnel from the organizations identified below, collectively referred to as the project team. A detailed description of the responsibilities of each member of the project team is presented below.

2.1.1 Overall Project Management

Blasland, Bouck & Lee, Inc. (BBL) will serve as the Supervising Contractor for the operation and maintenance and long-term monitoring program at the site. Supervising Contractor personnel will perform the monitoring activities. Project oversight will be provided by Niagara Mohawk Power Corporation, who will be responsible for maintaining contact and coordinating site-related activities with the USEPA. A listing of key project management personnel is provided below.

Project Title	Company/Organization	Name	Phone Number
Project Coordinator	Niagara Mohawk Power Corporation	James F. Morgan	(315) 428-3101
Project Officer	Blasland, Bouck & Lee, Inc.	David J. Ulm	(315) 446-9120
Project Manager	Blasland, Bouck & Lee, Inc.	Cathy Geraci	(315) 446-9120

2.1.2 Analytical Laboratory Services

Galson Laboratories, Inc. (Galson) will serve as the primary analytical laboratory for sediment samples. EnChem, Inc. will serve as the analytical laboratory for biota samples. Laboratory management personnel are listed below.

Title	Company	Name	Phone Number
Laboratory Project Manager	Galson Laboratories	Pam Weaver	(315) 432-5227
Laboratory Project Manager	EnChem, Inc.	Tod Noltemeyer	(608) 232-3303

2.1.3 Quality Assurance Staff

The following personnel have been assigned to this project:

Title	Company/Organization	Name	Phone Number
Quality Assurance Manager	Blasland, Bouck and Lee, Inc.	Laurie Indick	(315) 446-9120
Quality Assurance Manager	Galson Laboratories	Lyndi Mott	(315) 432-5227
Quality Assurance Manager	EnChem, Inc.	Greg Craf	(608) 232-3303

2.2 Team Member Responsibilities

This section of the QAPP discusses the responsibilities and duties of the project team members.

2.2.1 Project Coordinator

Responsibilities and duties of the project coordinator include:

1. Overall direction of the operation and maintenance and long-term monitoring activities;
2. Direction of the Supervising Contractor and its subcontractors; and
3. Review of Supervising Contractor work products, including data, memoranda, letters, and reports and documents transmitted to the USEPA.

2.2.2 Supervising Contractor

General responsibilities of the Supervising Contractor include:

1. Coordinate and execute the operation and maintenance and long-term monitoring activities defined in the Plan;
2. Transmit the results of long-term monitoring activities to the project coordinator; and
3. Perform data validation of the long-term PCB monitoring results and transmit the validated results to the project coordinator.

Project Officer

Responsibilities and duties include:

1. Oversight of Supervising Contractor work products; and
2. Provide approval for major project deliverables.

Project Manager

Responsibilities and duties include:

1. Management and coordination of the project as defined in the Plan;
2. Review deliverables prepared by the Supervising Contractor; and
3. Assure corrective actions are taken for deficiencies cited during audits of site activities.

Field Personnel

Responsibilities and duties include:

1. Perform field procedures associated with the monitoring activities, as set forth in the Plan;
2. Collect QA samples;
3. Calibrate, operate, and maintain field equipment;
4. Reduce field data;
5. Maintain sample custody; and
6. Prepare field records and logs.

Quality Assurance Manager (QAM)

Responsibilities and duties include:

1. Review/validate laboratory data packages;

2. Oversee and interface with the analytical laboratory;
3. Coordinate field QA/QC activities, including audits of monitoring activities;
4. Review field reports and data;
5. Review audit reports; and
6. Prepare interim QA/QC compliance reports.

2.2.3 Analytical Laboratory

General responsibilities and duties of the analytical laboratory include:

1. Perform sample analyses and associated laboratory QA/QC procedures;
2. Supply sampling containers and shipping cartons;
3. Maintain laboratory custody of sample; and
4. Strictly adhere to protocols in the QAPP.

Project Manager

Responsibilities and duties include:

1. Serve as primary communication link between the Supervising Contractor and laboratory technical staff;
2. Monitor work loads and ensure availability of resources;
3. Oversee preparation of analytical reports; and
4. Supervise in-house chain-of-custody.

Quality Assurance Manager

Responsibilities and duties include:

1. Supervise the group that reviews and inspects project-related laboratory activities; and
2. Conduct audits of laboratory activities.

2.2.4 USEPA

Responsibilities and duties include:

1. Review and approval of the Plan, supporting documents, and future deliverables, including this QAPP;
2. Review of the QA/QC portion of any submitted report;
3. Ensure that project activities are performed in compliance with applicable federal and regional requirements; and
4. Field and laboratory audit responsibilities, if determined necessary.

3. Quality Assurance Objectives for Measurement of Data

3.1 Laboratory Parameters and Methods

As described in the Plan, sediment samples will be analyzed for PCBs and TOC. Biota samples will be analyzed for PCBs and percent lipids. The laboratory analyses that will be performed are set forth in Table 1. Table 2 presents the chemical constituents identified by matrix, along with the associated analytical methods and reporting limits.

3.2 Quality Assurance Objectives

The overall quality assurance objective for this QAPP is to develop and implement procedures for sampling, chain-of-custody, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action, such that valid data will be generated. These procedures are presented or referenced in the following sections of the QAPP. Specific QC checks are discussed in Section 9 of this QAPP.

Quality assurance objectives are generally defined in terms of five parameters:

1. Representativeness;
2. Comparability;
3. Completeness;
4. Precision; and
5. Accuracy.

Each parameter is defined below. Specific objectives for the site monitoring activities are set forth in other sections of this QAPP, as referenced below.

3.2.1 Representativeness

Representativeness is the degree to which monitoring data accurately and precisely represent site conditions, and is dependent on sampling, analytical, and measurement variability and the variability of environmental media at the site. The site monitoring program has been designed to assess the presence of the chemical constituents in sediment and biota at the time of sampling. The Plan presents the rationale for sample quantities and location, and field sampling and measurement methods. This QAPP presents laboratory analytical methodologies. The use of the prescribed laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data. Further discussion of QC checks is presented in Section 9 of this QAPP.

3.2.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between monitoring events will be maintained through consistent use of the sampling and analytical methodologies set forth in the Plan and this QAPP through the use of established QA/QC procedures, and the utilization of appropriately trained personnel.

3.2.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from a monitoring event compared to the total amount that was obtained. This will be determined upon final assessment of the analytical and field measurement results, as discussed in Section 12 of this QAPP.

3.2.4 Precision

Precision is a measure of the reproducibility of monitoring results. The goal is to maintain a level of analytical precision consistent with the objectives of the monitoring program. To maximize precision, sampling and analytical procedures will be followed. All work for the site monitoring program will adhere to established protocols presented in the QAPP. Checks for analytical precision will include the analysis of matrix spike, matrix spike duplicates, laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Sections 9 and 12 of this QAPP.

3.2.5 Accuracy

Accuracy is a measure of how close a measured result is to the true value. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, reference standards, matrix spikes, blank spikes, and surrogate standards will be used to assess the accuracy of the analytical data. Further discussion of these QC samples is provided in Sections 9 and 12 of this QAPP.

4. Sample Designation System and Sampling Procedures

4.1 General

Sediment and biota samples will be collected as described in the Plan. Detailed descriptions of the sample designation system, sample handling and documentation, and field quality assurance/quality control are presented below.

4.2 Sample Designation System

A multi-digit sample designation code and the sample date will provide each sample with a unique "name." This alphanumeric system will apply to all samples collected that are to be transmitted to the analytical laboratory. The sample designation code system includes an alphabetic prefix describing the type of sample collection location, and a numeric suffix indicating the precise sampling location. The alphabetic prefix will be designated from the following:

- SS = surficial sediment samples "SS"
- SC = core sediment samples "SC";
- ST = sediment trap samples "ST"; and
- BS = biota sample "BS".

The numeric sample location number will be based on the sampling location, as shown on Figure 2 in the Plan.

Quality control samples will be designated with a specific suffix, as follows

- Rinse blank - "R"; and
- Duplicate sample - will be submitted blind and will have a separate and unique identification number.

Additional sample volumes collected for matrix spike (MS) and matrix spike duplicate (MSD) analysis will be noted on the chain-of-custody forms, and the associated additional sample containers will be labeled with the appropriate suffix ("MS" or "MSD"), as described above.

4.3 Sample Handling and Documentation

4.3.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for monitoring program samples are shown in Table 4.

The analytical laboratory will supply appropriate sample containers in sealed cartons, as well as sample labels and preservatives. The field personnel will be responsible for properly labeling containers and preserving samples (as appropriate). Sample labeling procedures are described in Appendix A of the Plan.

4.3.2 Packing, Handling, and Shipping Requirements

Sample custody seals and packing materials for filled sample containers will also be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage. All samples will be stored at or around 4°C after collection and maintained at this temperature until arrival at the laboratory. A temperature blank will be included in all sediment and biota sample coolers, to verify that samples have been maintained at 4°C.

All samples will be packaged by the field personnel and transported as low-concentration environmental samples. The packaged samples will be either shipped via express overnight carrier (Federal Express or courier), or hand delivered by the Supervising Contractor's sampling personnel to the laboratory within 24 hours of sample collection. General procedures for packing, handling, and shipping environmental samples are included in Appendix A of the Plan.

4.3.3 Documentation

Field personnel will provide comprehensive documentation covering the field sampling, field analysis, and sample chain-of-custody. This documentation constitutes a record that allows reconstruction of the field events to aid in the data review and interpretation process. Documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the monitoring program include:

- Daily Production Documentation - A field notebook consisting of a waterproof, bound notebook that will contain a record of the monitoring activities performed at the site.

- Sampling Information - Detailed notes will be made as to the sampling location, notable physical observations, and weather conditions (as appropriate).

- Sample Chain-of-Custody - Chain-of-custody forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. Chain-of-custody forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by the Supervising Contractor's field personnel designated to be responsible for sample custody. In the event that the samples are relinquished by the designated sampling person to other sampling or field personnel, the chain-of-custody form will be signed and dated by the appropriate personnel to document the sample transfer. The original chain-of-custody form will accompany the samples to the laboratory and copies will be forwarded to the project files.

  Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

- Field Equipment, Calibration, and Maintenance Logs - To document the calibration and maintenance of field instrumentation, calibration and maintenance activities will be recorded as part of the Daily Production Documentation described above.

4.3.4 Management of Monitoring Material and Waste

Disposable equipment and debris, such as health and safety equipment, plastic sheeting, sampling equipment, and other equipment and/or sampling debris not reused for future monitoring activities will be collected in plastic bags during the monitoring activities and subsequently drummed to await proper disposal.

4.4 Field Quality Assurance/Quality Control

This section summarizes the QA/QC requirements for the field investigation activities associated with the site monitoring activities.

4.4.1 QA/QC Sample Collection

An estimate of QA/QC field samples to be collected is provided in Table 1. Guidance on the collection of the QA/QC samples is presented in the Plan and below.

Rinse Blanks

Rinse blanks (if necessary) will be prepared by pouring demonstrated, analyte-free water over decontaminated sediment sampling equipment as a check that the decontamination procedure has been adequately performed and that cross-contamination of samples will not occur due to the equipment. One rinse blank will be collected for each type of equipment used each day that a decontamination event is performed.

Rinse blanks will be prepared in the field. Laboratory-supplied, demonstrated, analyte-free water will be poured into or over the sampling equipment and then directly into the laboratory-supplied sample bottles. The intent is for the water making up the blank to follow the same path, and therefore, come in contact with the same equipment as the samples.

It should be noted that rinse blank samples will not be collected for the biota sampling equipment.

Field Duplicate Samples

Duplicate samples will be sent for laboratory analysis to evaluate the reproducibility of the sampling technique used. One duplicate sample will be collected for each round of sediment samples.

It should be noted that no duplicate biota samples will be collected.

Matrix Spike/Matrix Spike Duplicate

Triple sample volumes from designated sampling locations will be collected for each matrix to perform matrix spike/matrix spike duplicate analysis. One matrix spike/matrix spike duplicate sample will be collected for each round of sediment and biota samples. Table 1 specifies the frequency of collection for matrix spike/matrix spike duplicates.

5. Sample and Document Custody

5.1 Field Procedures

The objective of field sample custody is to assure that samples are not tampered with from the time of sample collection through time of transport to the analytical laboratory. Persons will have "custody of samples" when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel. A discussion of sample custody and directions for the field use of chain-of-custody forms are provided in Section 4.

5.2 Laboratory Procedures

5.2.1 General

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field chain-of-custody form will accompany all samples requiring laboratory analysis. The laboratory will use chain-of-custody guidelines described in the USEPA guidance documents. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

5.2.2 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the package seal, open the package, and compare the contents against the field chain-of-custody. If a sample container is received broken, the sample is in an inappropriate container, or has not been preserved by appropriate means, the Supervising Contractor will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory logbook. All relevant custody documentation will be placed in the project file.

5.2.3 Sample Analysis

Analysis of an acceptable sample will be initiated by worksheets that contain all pertinent information for analysis. The analyst will sign and date the laboratory chain-of-custody form when removing the samples from storage.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. A SDG may contain up to 20 field samples (field duplicates and rinse blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG shall be received by the laboratory over a maximum of fourteen calendar days, and must be processed through the laboratory (preparation, analysis, and reporting) as a group. Sediment and biota SDGs must include a minimum of one media-specific MS/MSD pair, which shall be received by the laboratory at the start of the SDG assignment.

Each SDG will be self-contained for all of the required quality control samples. All parameters within an SDG will be extracted and analyzed together in the laboratory. At no time will the laboratory be allowed to run any sample (including QC samples) at an earlier or later time than the rest of the SDG. These rules for analysis will ensure that the quality control samples for an SDG are applicable to the field samples of the same SDG, and that the best possible comparisons may be made.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated, and will also identify the analyst, the instrument used, and the instrument conditions.

5.2.4 Laboratory Project Files

The analytical laboratory will establish a file for all pertinent data. The file will include all correspondence, faxed information, phone logs, and chain-of-custody forms. The analytical laboratory will retain all project files and data packages for a period of five years.

5.2.5 Laboratory Documentation

Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts, are used to trace the history of samples through the analytical process, and document and relate important aspects of the work, including the associated quality controls. As such, all logbooks, bench sheets, instrument logs, and instrument printouts are part of the permanent record of the laboratory.

Each page or entry is dated and initialed by the analyst at the time of entry. Errors in entry are crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used are completed by lining out unused portions.

Laboratory notebooks are periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance to this QAPP. All entries and calculations are verified by the laboratory group leader. If all entries on the pages are correct, then the laboratory group leader initials and dates the pages. Corrective action is taken for incorrect entries before the laboratory group leader signs.

Computer Tape and Hard Copy Storage

All electronic files are maintained on magnetic tape or diskette for five years, hard copy data packages are maintained in files for five years.

Sample Storage Following Analysis

Samples are maintained by the laboratory for one month after the final report is delivered to the Supervising Contractor. After this period, the samples are disposed of in accordance with applicable rules and regulations.

5.3 Project File

Project documentation will be retained by the Supervising Contractor. This file will consist of the following components:

1. Agreements (filed chronologically);
2. Correspondence (filed chronologically);
3. Memos (filed chronologically); and
4. Notes and Data (filed by topic).

Reports (including QA reports) will be filed with correspondence. Analytical laboratory documentation (when received) and field data will be filed with notes and data. Filed materials may be removed and signed out by authorized personnel on a temporary basis only.

6. Calibration Procedures and Frequency

6.1 Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used.

7. Analytical Procedures

7.1 Laboratory Analytical Procedures

As part of the monitoring activities, sediment and biota samples will be analyzed using laboratory methods. Sediment samples will be analyzed for PCBs using USEPA SW-846 Method 8082 and for TOC using USEPA Region 2 Lloyd Kahn Method. Biota samples will be analyzed for PCBs using USEPA SW-846 Method 8082 and percent lipids using standard gravimetric techniques. A description of the lipid analytical method is provided as Attachment 1 to this QAPP.

8. Data Reduction, Review and Reporting

8.1 General

After field and laboratory data are obtained, the data will be subject to the following:

1. Reduction or manipulation mathematically or otherwise into meaningful and useful forms;
2. Review;
3. Organization, interpretation, and reporting; and
4. Data Validation.

8.2 Field Data Reduction, Review, and Reporting

8.2.1 Field Data Reduction

Information collected in the field through visual observation and manual measurement will be recorded in field notebooks. Such data will be reviewed for adherence to the Plan requirements and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and as necessary, incorporated into the data evaluation process.

8.2.2 Field Data Review

Field data observations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the QAM. Logs and documents will be checked for:

1. General completeness;
2. Readability;
3. Usage of appropriate procedures; and
4. Correct sampling or measurement locations.

8.2.3 Field Data Reporting

Where appropriate, copies of field logs will be processed and included in the quarterly progress report. The original field logs and associated documents will be retained by the Supervising Contractor.

8.3 Laboratory Data Reduction, Review, and Reporting

8.3.1 Laboratory Data Reduction

The calculations used for data reduction are specified in each of the analytical methods referenced previously. Whenever possible, analytical data is transferred directly from the instrument to a computerized data system. Raw data is entered into permanently-bound laboratory notebooks. The data entered are sufficient to document all factors used to arrive at the reported value.

Concentration calculations for chromatographic analyses (i.e., PCBs) are based on response factors. Quantitation is performed using either internal or external standards.

Non-aqueous values are reported on a dry-weight basis. Unless otherwise specified, all values are reported uncorrected for blank contamination.

8.3.2 Laboratory Data Review

All data are subject to multi-level review by the analytical laboratory. The group leader will review all data reports prior to release for final data report generation. The QAM will review a random sample of 5 percent of the final data reports, and the laboratory director will review a cross-section of the final data reports. All final data reports are reviewed by the analytical laboratory Department Manager prior to transmittal to Supervising Contractor.

If discrepancies or deficiencies exist in the analytical results, then corrective action is taken as discussed in Section 13. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the Supervising Contractor Project Manager.

8.3.3 Laboratory Data Reporting

The laboratory is responsible for preparing full "CLP-type" data packages and case narratives for all analyses.

All data reports for all parameters will include, at a minimum, the following items:

Narrative: Summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address;
- Date of sample receipt;
- Cross reference of laboratory identification number to Supervising Contractor sample identification;
- Analytical methods used;
- Deviations from specified protocol; and
- Corrective actions taken.

Included with the narrative are any sample handling documents including field and internal Chain of Custody forms, air bills, and shipping tags.

Analytical Results: Reported according to analysis type, and including the following information, as acceptable:

- Sample ID;
- Laboratory ID;
- Date of collection;
- Date of receipt;
- Date of extraction;
- Date of analysis; and
- Detection limits.

Sample results on the report forms will be collected for dilutions. Sediment sample results are reported on a dry weight basis. Unless otherwise specified, results will be reported uncorrected for blank contamination.

The data for all sediment and biota analyses will be expanded to the include all supporting documentation necessary to the provide a "CLP-equivalent" package. This additional documentation includes, but is not limited to, all raw data required to the recalculate any result including printouts, chromatograms, and quantitation reports. The report also will include: standards used in calibration and calculation of analytical results; sample extraction, digestion and other preparation logs; standard preparation logs; instrument run logs; and moisture and lipid content calculations.

8.4 Data Validation

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results are correctly transcribed from the instrument read outs, and which, if any, environmental samples are related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

The data validator will validate the sediment and biota PCB analytical data with "EPA Region II Contract Lab Program Organics Data Review and Preliminary Review (SOP #HW-6, Revision 11)", dated June 1996, or USEPA-approved equivalent procedures. Data validation will consist of data screening, checking, reviewing, editing, and interpretation to document analytical data quality and to determine if the quality is sufficient to meet the data quality objectives. Data validation will include a review of completeness and compliance including, but not limited to, the elements provided in Table 5.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements apart from that specified in this QAPP will be detailed on chain-of-custody forms.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate completeness of data package;

- Verify that field chain-of-custody forms were completed and that samples were handled properly;

- Verify that holding times were met for each parameter. Holding times exceedences, should they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis;

- Verify that parameters were analyzed according to the methods specified;

- Review QA/QC data (i.e., make sure duplicates, blanks, and spikes were analyzed on the required number of samples, as specified in the method, verify that duplicate and matrix spike recoveries are acceptable);

- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the project manager and/or laboratory manager, as appropriate; and

- If data appears suspect, the specific data of concern will be investigated. Calculations will be traced back to raw data; if calculations do not agree, the cause will be determined and corrected.

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics as applicable to each method:

1. Assessment of the data package;

2. Description of any protocol deviations;

3. Failures to reconcile reported and/or raw data;

4. Assessment of any compromised data;

5. Laboratory case narrative;

6. Overall appraisal of the analytical data; and

7. Table of site name, sample quantities, matrix, and fractions analyzed.

It should be noted that the existence of qualified results does not automatically invalidate data. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the analytical laboratory and the data validator. Suggestions for reanalysis may be made to the Supervising Contractor QAM at this point.

Data validation reports will be included, as appropriate, in the annual progress reports to the USEPA and the State, and retained by the Supervising Contractor (BBL).

9. Field and Laboratory Quality Control Checks

9.1 General

Both field and laboratory quality control checks are proposed for the monitoring program. In the event that there are any deviations from these checks, the Supervising Contractor QAM will be notified. The proposed field and laboratory control checks are discussed below.

9.2 Field Quality Control Checks

9.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for field measurements. A duplicate measurement will involve obtaining measurements a second time at the same sampling location.

9.2.2 Sample Containers

Certified-clean sample containers (I-Chem 300 Series or equivalent) will be supplied by the analytical laboratory. Sample containers will be chosen, cleaned, and quality controlled according to protocols in the OSWER Directive #9240.0-05A, *"Specifications and Guidance for Contaminant Free Sample Containers,"* December 1992. Certificates of analysis will be filed in the project file.

9.2.3 Field Duplicates

Sediment field duplicates will be collected to verify the reproducibility of the sampling methods. Field duplicates will be prepared as discussed in the Section 4.0. One field duplicate will be collected per sediment sampling event. Table 1 provides information associated with field duplicate sample collection.

9.2.4 Rinse Blanks

Rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. The equipment that is most likely to contact sediment or biota samples will be new disposable equipment, therefore, it will not be necessary to collect rinse blanks. However, if during sampling equipment must be re-used, then the equipment will first be cleaned in accordance with the procedures in Appendix A-5 of the Plan. In addition, one rinse blank sample will be prepared and submitted for PCB analysis for each type of sediment sampling equipment used each day that a decontamination event is carried out. Rinse blanks will be prepared by filling sample containers with demonstrated analyte-free water (supplied by the laboratory) that has been routed through a cleaned sampling device. Table 1 provides information associated with rinse blank sample collection.

9.3 Analytical Laboratory Quality Control Checks

9.3.1 General

Internal laboratory quality control checks will be used to monitor data integrity. These checks will include method blanks, matrix spikes (and matrix spike duplicates), spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Project QC limits for duplicates and matrix spikes are identified in Table 3. Unless otherwise specified below, acceptance limits will be as specified in the analytical methods.

9.3.2 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, need to be identified, isolated, and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources which could affect sample analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples. Acceptable method blanks will contain no analytes above the reporting limit.

9.3.3 Matrix Spikes/Matrix Spike Duplicates

Matrix spikes and matrix spike duplicates will be used to measure the accuracy of organic analyte recovery from the sample matrices. All matrix spikes and matrix spike duplicates will be site-specific. One matrix spike/matrix spike duplicate pair will be analyzed for each round of sediment and biota samples. Table 1 presents the number and frequency of matrix spike/matrix spike duplicate analysis. Table 3 presents the recommended quality control limits for accuracy and precision for matrix spikes and matrix spikes duplicates. The actual limits will be established based on laboratory performance (as specified in SW-846).

9.3.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions that have properties similar to the analyses of interest. This type of control is primarily used for organic samples analyzed by gas chromatography (GC) methods and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions which may not be attributable to sample matrix.

If surrogate spike recoveries exceed specified QC limits, then the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures (i.e., internal standard and matrix spikes), the integrity of the data may not be verifiable and reanalysis of the sample with additional controls may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods summarized in Table 2. The control limits for surrogate recovery will be based on laboratory performance (as specified in SW-846) and are expected to be between 60-140 percent or better.

9.3.5 Laboratory Duplicates

Laboratory duplicates are analyzed to assess laboratory precision. Laboratory duplicates are defined as duplicate aliquots of an individual sample that are analyzed as separate samples. Table 1 presents the frequency requirements for laboratory duplicates. Laboratory control limits will be based on laboratory performance, but are expected to be 30 percent relative difference or better.

9.3.6 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instruments' stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours, or more frequently as specified in the applicable analytical method. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be reanalyzed.

Laboratory instrument calibration standards will be selected utilizing the guidance provided in the analytical methods summarized in Table 2. Acceptance limits will be specified in the method.

9.3.7 Reference/Control Standards

Reference standards are standards of known concentration, and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods summary in Table 2. Control samples recoveries are expected to be between 80 to 120 percent.

10. Performance and Systems Audits

10.1 General

Performance and systems audits will be completed in the field and the laboratory during the monitoring program, as described below.

10.2 Field Audits

The following field performance and systems audits will be completed during this project.

Field audit summaries will contain an evaluation of field procedures to verify that samples are taken according to established protocols. The Supervising Contractor QAM will review field reports and communicate concerns to the Supervising Contractor Project Manager. In addition, the Supervising Contractor QAM will review the rinse blank data to identify potential deficiencies in field sampling and cleaning procedures. In addition, an evaluation comparing scheduled QA/QC activities from this document with actual QA/QC activities completed will be performed. The QAM will periodically confirm that work is being performed consistent with this QAPP, the Plan, and HSCP.

10.3 Laboratory Audits

The following laboratory performance and systems audits will be completed during this project.

The analytical laboratory's QA manager conducts a laboratory audit semi-annually and the analytical laboratory's corporate QA director also conducts a separate laboratory audit semi-annually. Between the QA Manager and the QA director, audits of the laboratory are conducted on a quarterly basis. As part of the audits, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the analytical laboratory's quality assurance manual and standard operating procedures (SOPs). The results of the audits are summarized and issued to each department supervisor, the laboratory manager, the laboratory director, the corporate QA director, and the director of operations.

In addition to the laboratory's internal audits, a participant in state and federal certification programs, the laboratory sections at the analytical laboratory are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

The Supervising Contractor reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

11. Preventative Maintenance

11.1 General

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

11.2 Field Equipment

Prior to field activities, field equipment will be inspected to assure it is operational. If the equipment is not operational, it must be serviced prior to use. Meters that require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the field personnel to follow the maintenance schedule and arrange for prompt service.

Field equipment returned from a site will be inspected to confirm it is in working order. This inspection will be recorded in the logbook or field notebooks as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook.

Non-operational field equipment will be either repaired or replaced. Appropriate spare parts will be available to minimize down-time due to repairs.

11.3 Laboratory Instruments and Equipment

11.3.1 General

Laboratory instrument and equipment documentation procedures are provided in the analytical laboratory's quality assurance/quality control policy and program. Documentation includes details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer. Specific procedures used by the analytical laboratory are discussed below.

11.3.2 Instrument Maintenance

Maintenance schedules for the analytical laboratory's equipment adhere to the manufacturer's recommendations. Records reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures are performed through service contracts with manufacturer or qualified contractors. All paperwork associated with service calls and preventative maintenance calls are kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the particular laboratory. Any routine preventative maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used, and/or the judgment of the Laboratory Systems Manager.

All major instruments are backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

12. Data Assessment Procedures

12.1 General

The analytical data generated during the monitoring program will be evaluated with respect to precision, accuracy, and completeness and compared to the DQOs set forth in Sections 1 and 3 of this QAPP.

The procedures utilized when assessing data precision, accuracy, and completeness are presented below.

12.2 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of matrix spike/matrix spike duplicate sample analyses. For other parameters, laboratory data precision will be monitored through the use of field duplicates and/or laboratory duplicates as identified in Table 1.

The precision of data will be measured by calculation of the relative percent difference (RPD) by the following equation:

$$\text{RPD} = \frac{(A-B)}{(A+B)/2} \times 100$$

Where:

A = Analytical result from one of two duplicate measurements
B = Analytical result from the second measurement.

Precision objectives for duplicate analyses are identified in Table 3.

12.3 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of matrix spikes, surrogate spikes and reference standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

$$\%\ \text{Recovery} = \frac{A-X}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard
X = Value measured in original sample
B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy between the original and spiked measurements. Accuracy objectives for matrix spike recoveries are identified in Tables 3 and 4.

12.4 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

$$\text{Completeness} = \frac{\text{Number Valid Results}}{\text{Total number of results generated x 100}}$$

As a general guideline, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgement to determine data useability for intended purposes.

13. Corrective Action

13.1 General

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP or the Plan. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the monitoring program are described below.

13.2 Field Procedures

When conducting the monitoring activity field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented will be documented on a Corrective Action Form and reported to the Supervising Contractor QAM and Project Manager.

Examples of situations that would require corrective actions are provided below:

1. Protocols as defined by the QAPP and the PCB Long-Term Monitoring Plan have not been followed;
2. Equipment is not in proper working order or properly calibrated;
3. QC requirements have not been met; and
4. Issues resulting from performance or systems audits.

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

13.3 Laboratory Procedures

13.3.1 General

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented, and reported to the appropriate project manager and QAM.

Corrective action may be initiated, at a minimum, under the following conditions:

1. Protocols as defined by this QAPP have not been followed;
2. Predetermined data acceptance standards are not obtained;
3. Equipment is not in proper working order or calibrated;
4. Sample and test results are not completely traceable;
5. QC requirements have not been met; and
6. Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Additional details of corrective action procedures used by the analytical laboratory are provided below.

13.3.2 Analytical Laboratory Procedures

For all instrument systems in use at the analytical laboratory, corrective action is initiated at a point were the problem has been identified. At whatever level this occurs (analyst, supervisor, data review, or quality control), it is brought to the attention of the QA Manager and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director.

Any corrective action deemed necessary based on system or performance audits, the analytical results of split samples or the results of data review will be implemented. The corrective action may include sample re-extraction, re-preparation, re-analysis, cleanup, dilutions, matrix modifications, or other activities.

14. Quality Assurance Reports to Management

The Remedial Action Completion Report will contain a QA section that summarizes data quality information collected during the project. Quality control reports will be submitted as documentation of compliance with QA/QC objectives. In addition, this information, as appropriate and required, will be presented in the annual progress reports required under paragraph 28 of the OU4 Consent Decree. These annual reports will serve to update the status of the project and to indicate any changes or deviations from the initial Plan.

Tables

Table 1

Blasland, Bouck & Lee, Inc.
PAS Site - Operable Unit 4
Oswego, New York

PCB Long-Term Monitoring Plan
Quality Assurance Project Plan
Environmental and Quality Control Analyses

Environmental Sample Matrix	Environmental Sample Quantity	Field QC Analyses			Laboratory QC Analyses						Est. Overall Total
		Field Duplicate		Est. Matrix Total	MS		MSD		Lab Duplicate		
		Freq.	No.		Freq.	No.	Freq.	No.	Freq.	No.	
Sediment (Surface)[1]											
PCBs	5	1/20	1	6	1/20	1	1/20	1	---	---	8
TOC	5	1/20	1	6	1/20	1	---	---	1/20	1	8
Sediment (Cores)[1]											
PCBs	10	---	---	10	---	---	---	---	---	---	10
TOC	10	---	---	10	---	---	---	---	---	---	10
Sediment (Trap)											
PCBs	5	1/20	1	6	1/20	1	1/20	1	---	---	8
TOC	5	1/20	1	6	1/20	1	---	---	1/20	1	8
Biota (Fish)											
PCBs	15	---	---	15	1/20	1	1/20	1	---	---	17
Lipids	15	---	---	15	---	---	---	---	---	---	15

Notes:

1. Surface sediment and sediment core samples will be collected during the same sampling event. Accordingly, quality control (QC) samples will be collected and analyzed based on the combined total number of these sediment samples and at the frequencies identified for surface sediment samples.

2. If additional environmental samples are to be collected for analysis, field duplicate, rinse blank (if necessary), matrix spike, matrix spike duplicate, and laboratory duplicate sample will be collected at a frequency of 1/20, or 1 per sampling event if additional samples are collected at greater than a 14-day interval.

Freq. = Frequency
MS = Matrix Spike
MSD = Matrix Spike Duplicate
PCB = Polychlorinated Biphenyl
TOC = Total Organic Carbon

Table 2

Blasland, Bouck & Lee, Inc.
PAS Site - Operable Unit 4
Oswego, New York

PCB Long-Term Monitoring Plan
Quality Assurance Project Plan
Parameters, Methods and Reporting Limits

Constituent	Analysis	Reporting Limit (mg/Kg)[1]
Sediment		
PCBs	8082	0.05
TOC	Lloyd Kahn	100
Biota		
PCBs	8082	0.05
Lipids	gravimetric	---

Notes:

1. mg/Kg = milligrams per kilogram which equates to ppm.
2. PCBs = polychlorinated biphenyls; TOC = total organic carbon.
3. See Table 3 for matrix spike/matrix spike duplicate compound list.
4. The lipid analytical method is presented in Attachment 1 to this QAPP

Table 3

Blasland, Bouck & Lee, Inc.
PAS Site - Operable Unit 4
Oswego, New York

PCB Long-Term Monitoring Plan
Quality Assurance Project Plan
Analytical Quality Control Limits[1]

Volatile Organic Compounds	**Analysis**	**MS/MSD Accuracy, % Recovery**	**MS/MSD or Duplicate Precision, RPD**
Sediment			
PCBs	8082	70-130	30
TOC	Lloyd Kahn	70-130	30
Biota			
PCBs	8082	70-130	30
Lipids	gravimetric	NA	NA

Notes:

1. The listed QC limits are based on SW-846 guidance and are advisory. Single laboratory performance based control limits should be established for each matrix. Frequent failure to meet the QC limits warrants investigation of the laboratory.
2. MS/MSD = Matrix Spike/Matrix Spike Duplicate, RPD = Relative Percent Difference, NA = not applicable.

Table 4

Blasland, Bouck & Lee, Inc.
PAS Site - Operable Unit 4
Oswego, New York

PCB Long-Term Monitoring Plan
Quality Assurance Project Plan
Sample Containers, Preservation, and Holding Times

Parameter	Analysis	Sample Container	Preservation	Maximum Holding Time from Sample Collection
Sediment				
PCBs	8082	250 ml glass jar with Teflon-lined lid	Cool 4°C	7 days from collection to extraction, and 40 days to analysis.
TOC	Lloyd Kahn	125 ml glass jar with Teflon-lined lid	Cool 4°C	14 days
Biota				
PCBs	8082	Wrap in aluminum foil and freezer paper, and place in ziploc bag	Cool 4°C; laboratory freeze	14 days from collection to extraction if unfrozen; 6 months from collection and extraction if frozen; 40 days from extraction to analysis.
Lipids	gravimetric			

Notes:

1. PCBs = polychlorinated biphenyls; TOC = total organic carbon.

Table 5

Blasland, Bouck & Lee, Inc.
PAS Site - Operable Unit 4
Oswego, New York

PCB Long-Term Monitoring Plan
Quality Assurance Project Plan
Data Validation Checklist - Laboratory Analytical Data

REVIEW FOR COMPLETENESS

1. All chain-of-custody forms included.
2. Case narratives.
3. QA/QC summaries of analytical data including supporting documentation.
4. All relevant calibration data including supporting documentation.
5. Instrument and method performance data.
6. Documentation showing laboratory's ability to attain specified method detection limits.
7. Data report forms of examples for calculations of concentrations.
8. Raw data used in identification and quantification of the analysis required.

REVIEW OF COMPLIANCE

1. Data package completed as described above.
2. QAPP requirements for data production and reporting have been met.
3. QA/QC criteria have been met.
4. Instrument type and calibration procedures have been met.
5. Initial and continuing calibration have been met.
6. Data reporting forms are completed.
7. Problems and corrective actions documented.

Attachments

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

ATTACHMENT 1

LIPID ANALYTICAL METHOD

En Chem, Inc.

Quality Assurance Document

SET No: 1

En Chem SOP
SVO-59
Rev. No. 0
DATE: April 1999
PAGE: 1 OF 3

STANDARD OPERATING PROCEDURE

TITLE: The Determination of Lipids in Tissues, Fats and Plants.

DEPARTMENT: Semivolatile Organics

APPLICATION: This method is applicable to the determination of lipid in any matrix.

REFERENCES:

1. Randall, R.C., Lee, H., Ozretich, R.J., Lake, J.L., and Pruell, Pruell, R.J. "Evaluation of Selected Lipid Methods for Normalizing Pollutant Bioaccumulation". Environmental Toxicology and Chemistry, Vol 10, p. 1431-1436, (1991)

2. "Standard Methods for the Examination of Water and Wastewater." ALPH, AWWA, WPCF 18th ed., method 5520, (1992)

PROCEDURE SUMMARY:

An aliquot of a sample extract is placed into a pre-weighed aluminum weighing pan and the solvent is allowed to evaporate. The lipids are determined gravimetrically.

REVIEWED BY: Daniel M Rude 4-19-99
Daniel Rude Date
Semivolatile Group Leader

REVIEWED BY: Gregory J Graf 4-19-99
Gregory J Graf Date
Quality Assurance Officer

APPROVED BY: Glen A. Coder 4-19-99
Glen Coder Date
Laboratory Manager

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SAFETY PRECAUTIONS:

Observe all standard laboratory safety procedures as outlined in the Safety Training Manual.

INTERFERENCES:

Do not allow foreign material to fall into the weighing pans while they are drying or the results will be biased low. It is recommended to cover the weighing pans with a loose piece of aluminum foil while they are drying.

QUALITY ASSURANCE:

Calibrate the analytical balance prior to each day's weighing.

APPARATUS:

- Aluminum weighing pans
- One milliliter pipet or syringe
- Balance - Analytical, capable of accurately weighing to the nearest 0.01 g

PROCEDURE:

1. Label an aluminum pan for each sample to be analyzed.
2. Weigh the aluminum pan to the nearest 0.01 grams. Record this "pan weight" in a log book or have it electronically downloaded into a calculation sheet.
3. An extract is typically obtained by a soxhlet extraction of a sample followed by a concentration to a measured volume (refer to En Chem SOP SVO-60). Place one milliliter of sample extract into the pan. If sufficient volume of extract is not available, a lesser amount may be used. Record the volume.
4. Place the sample and pan onto a drying rack at room temperature or into a fume-hood for a minimum of 12 hours. The sample pans may need to be lightly covered with aluminum foil to avoid particulate matter from getting into the pans.
5. After the solvent has evaprated from the pan weigh the sample and pan again to obtain gross dry weight. Record this in the log book or have it recorded electronically.

CALCULATIONS:

En Chem, Inc.

Quality Assurance Document

1. The pan weight is subtracted from the gross dry weight yielding net dry weight.
2. The following calculation is used to calculate the percent lipid:

$$\% \text{ Lipid} = \frac{NDW \times V}{W \times A} \times 100$$

Where:

NDW = Net Dry Weight (g)
V = Total volume of Extract (mL)
W = Weight of Sample Extracted (g)
A = Aliquot volume of sample used for % lipid (mL)

REPORTING:

The percent lipid is reported as a percentage with three significant figures or two decimal places:

e.g. 23.6%
e.g. 0.34%

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Appendix C

Health and Safety Contingency Plan

PCB Long-Term Monitoring Plan

Appendix C - Health and Safety Contingency Plan

Pollution Abatement Services
Superfund Site
Operable Unit 4
Oswego, New York

Settling Defendants

April 1999
Revised August 1999

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

6723 Towpath Road, P.O. Box 66
Syracuse, New York, 13214-0066
(315) 446-9120

Approvals and Acknowledgments

Approvals

I have read and approved this HSCP with respect to project hazards, regulatory requirements, and BBL procedures.

Project Name: PAS Operable Unit 4: PCB Long-Term Monitoring Activities Project Number: 364.44

Project Manager/Date

Corporate HS Associate/Date

Project/Site HS Staff/Date

Acknowledgments

The final approved version of this HCSP has been provided to the Site Supervisor. I acknowledge my responsibility to provide the Site Supervisor with the equipment, materials and qualified personnel to implement fully all safety requirements in this HCSP. I will formally review this plan with the HS Staff every six months until project completion.

Project Manager

Date

I acknowledge receipt of this HCSP from the Project Manager, and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the Project Manager and/or the Health and Safety Representative.

Site Supervisor

Date

Health and Safety Contingency Plan Acknowledgment

I have read this Site-Specific Health and Safety Contingency Plan, or its contents have been presented to me, and I understand the contents, and I agree to abide by its requirements.

Name (Print)	**Signature**	**Representing**	**Date**

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Tables

Attachments

1. Introduction

1.1 Objective

This Health and Safety Contingency Plan (HSCP) has been prepared for the performance of sediment and biota sampling and monitoring activities for Operable Unit 4 (OU4) of the Pollution Abatement Services (PAS) Superfund Site (Site) located in the City of Oswego, New York. A detailed description of the requirements, methods, and procedures for conducting the sediment and biota sampling at the Site is presented in the PCB Long-Term Monitoring Plan (the Plan). As described in the Plan, site activities that include (in general) the following components:

- Sediment Monitoring;
- Biota (Fish) Sampling via Electrofishing; and
- Sample Preparation.

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 Site and Location Description

The PCB Long-Term Monitoring Plan was prepared by Blasland, Bouck & Lee, Inc. (BBL) on behalf of Niagara Mohawk Power Corporation and General Motors Corporation (the Settling Defendants). BBL is the United States Environmental Protection Agency (USEPA)-approved Supervising Contractor for the long-term PCB monitoring to be conducted at the Site to meet the requirements of the OU4 Record of Decision and Consent Decree. A detailed description of the requirements, methods, and procedures for conducting long-term PCB monitoring activities is provided in the Plan.

1.3 Policy Statement

The policy of BBL is to provide a safe and healthful work environment for all employees. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety is that all accidents and injuries are preventable. BBL will take every reasonable step to eliminate or control hazards in order to minimize the possibility of injury, illness, or accident.

This HSCP prescribes the procedures that must be followed during site sediment and biota sampling activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Representative. This document will be periodically reviewed to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to the HSCP. Such changes will be completed in the form of an addendum to this plan or a revision of the plan.

The provisions of this plan are mandatory for all BBL personnel. All visitors to the work site must also abide by the requirements of this plan. It should be acknowledged that the employees of other consulting and/or contracted companies may work in accordance with their own independent HSCPs.

1.4 References

This HSCP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, USEPA regulations, and BBL Health and Safety policies and procedures. This plan follows the guidelines established in the following:

- *Standard Operating Safety Guides*, USEPA (Publication 9285.1-03, June 1992).
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86-116, October 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.120.
- Title 29 of the Code of Federal Regulations (CFR), Part 1926.
- *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (1994).
- *Threshold Limit Values*, ACGIH (1995).
- *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).
- *Health and Safety Policies and Procedures Manual*, BBL.

1.5 Definitions

The following definitions are applicable to this HSCP:

- ***Site*** - the area where the work is to be performed by BBL personnel. The site includes the EZ, CRZ, and SZ.
- ***Project*** - all on-site work performed under the scope of work for Environmental Monitoring Plans.
- ***Subcontractor*** - includes subcontractor personnel hired by BBL.
- ***On-Site Personnel*** - all client personnel, BBL, and subcontractor personnel involved with the project.
- ***Visitor*** - all other personnel, except the on-site personnel. All visitors must receive approval to enter the site.
- ***Exclusion Zone (EZ)*** - any portion of the site where hazardous substances are, or are reasonably suspected to be, present in the air, water, or soil.
- ***Contamination Reduction Zone (CRZ)*** - area between the Exclusion Zone and Support Zone that provides a transition between the exclusion zone and clean areas. Decontamination stations are located in this zone.
- ***Support Zone (SZ)*** - all areas of the site excluding the EZ and CRZ. The SZ surrounds the immediate area where project activities are underway. Support equipment is located in this zone.
- ***Buddy system*** - a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group at all times. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.
- ***Decontamination*** - the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.
- ***Hazardous substance*** - means any substance designated or listed under (A) through (D) of this definition, exposure to which results or may result in adverse effects on the health or safety of employees:

[A] Any substance defined under section 101(14) of CERCLA;

[B] Any biologic agent and other disease-causing agent which, after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring.

[C] Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 ; and

[D] Hazardous waste as herein defined.

- ***Hazardous waste*** -

  A) A waste or combination of wastes as defined in 40 CFR 261.3, or

  B) Those substances defined as hazardous wastes in 49 CFR 171.8.

- ***Health hazard*** - a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in 29 CFR 1910.1200.

- ***Immediately dangerous to life or health (IDLH)*** - an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere.

- ***Oxygen deficiency*** - a concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

- ***Permissible exposure limit (PEL)*** - the exposure, inhalation or dermal permissible exposure limit specified in 29 CFR 1910, Subparts G and Z. "Published exposure level" means the exposure limits published in "NIOSH recommendations for Occupational Health Standards" dated 1986 incorporated by reference, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1987 - 88" dated 1987 incorporated by reference.

- ***Qualified/Competent person*** - a person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control.

2. Roles and Responsibilities

2.1 All Personnel

All BBL personnel must adhere to these procedures during the performance of their field work associated with implementation of the PCB Long-Term Monitoring Plan. Each person is responsible for completing tasks safely, and reporting any unsafe acts or conditions to his or her immediate supervisor or to the Site Supervisor (SS). No person may work in a manner that conflicts with these procedures. After due warnings, the PM will dismiss from the site any person who violates safety procedures.

All on-site personnel will receive training in accordance with 29 CFR 1910.120, and be familiar with the requirements and procedures contained in this document prior to the beginning of project operations.

The roles of key BBL personnel are outlined in the following sections. Key personnel and contacts are summarized in Table 2-1.

2.2 Health and Safety Supervisor (HSS)

The BBL HSS is responsible for technical health and safety aspects of the project, including preparation, review, and approval of this HSCP. Inquiries regarding BBL procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. Any changes or addenda to this HSCP must be approved by the HSS, who is also responsible for coordinating on-site health and safety issues. The HSS will advise the PM on health and safety issues, and will establish and oversee the project air monitoring program (if necessary to implement). The HSS is the primary site contact on occupational health and safety matters.

It is the responsibility of the HSS or designated alternate to:

- Provide on-site technical assistance, if necessary;
- Conduct site and personal air monitoring (as necessary), including equipment maintenance and calibration. Where necessary, submit samples to an American Industrial Hygiene Association (AIHA) accredited laboratory;
- Prepare material for site safety orientation training and daily safety meetings;
- Verify that on-site personnel have received the required physical examinations and medical certifications;
- Review site activities with respect to compliance with the HSCP;
- Maintain required health and safety documents and records; and
- Assist, if necessary, the Site Supervisor (SS) in the instruction of field personnel on the hazards, and equipment procedures required.

2.3 Project Manager

The PM is ultimately responsible for verifying that all project activities are completed in accordance with the requirements and procedures in this plan. The PM is responsible to provide the SS with the equipment, materials, and qualified personnel to implement fully all safety requirements in this HSCP.

It is the responsibility of the PM to:

- Review safety inspection reports;
- Thoroughly investigate all accidents and incidents on the project;
- Approve, in writing, addenda or modifications of this HSCP; and
- Suspend work if health- and/or safety-related concerns arise.

2.4 Site Supervisor

The SS is responsible for implementation of the HSCP, including communication of site requirements to all on-site project personnel (including subcontractors). The SS will be responsible for informing the PM of any changes in the work plan or procedures so that those changes may be addressed in the HSCP. Other responsibilities include:

- Consultation with the HSS on site safety and health issues;
- Conducting a daily safety inspection of the site, and completing a weekly inspection form (Attachment H-1);
- Stopping work, as required, to ensure personal safety and protection of property, or in cases of life- or property-threatening safety non-compliance;
- Obtaining a site map and determining and posting routes to medical facilities and emergency telephone numbers, and arranging emergency transportation to medical facilities;
- Notifying local public emergency officers of the nature of the site operations, and posting of their telephone numbers in an appropriate location;
- Observing on-site project personnel for signs of chemical or physical trauma;
- Verifying that all site personnel have the proper medical clearance, have met applicable training requirements, and have training documentation available in the office;
- Verifying that all on-site personnel are made aware of the provisions of the HSCP and have been informed of the nature of any physical, chemical, and biological hazards associated with the site activities;
- Verifying that on-site personnel and visitors have received the required training, including instructions for safety equipment and personal protective equipment (PPE) use;
- Suspending work if health- and/or safety-related concerns arise; and
- Issuing/obtaining required work permits.

2.5 On-Site Personnel and Visitors

All personnel must read and acknowledge their understanding of this HSCP, abide by the requirements of the plan, and cooperate with site supervision in ensuring a safe work site. Site personnel will immediately report any of the following to the SS or HSS:

- Accidents and injuries, no matter how minor;
- Unexpected or uncontrolled release of chemical substances;
- Symptoms of chemical exposure;
- Unsafe or malfunctioning equipment;
- Changes in site conditions that may affect the health and safety of project personnel;
- Damage to equipment or property; and
- Situations or activities for which they are not properly trained.

TABLE 2-1
KEY PERSONNEL

Niagara Mohawk Power Corporation Key Personnel		
Title/Role	**Name**	**Address/Telephone No.**
Project Manager	James F. Morgan	300 Erie Boulevard West Syracuse, NY 13202 Phone: (315) 428-3101
BBL Key Personnel		
Role	**Name**	**Address/Telephone**
BBL Site Health and Safety Supervisor/ BBL Site Supervisor	David Rigg	6723 Towpath Rd. Box 66 Syracuse, NY 13214 (315) 446-9120
Project Manager	Cathy Geraci	6723 Towpath Rd. Box 66 Syracuse, NY 13214 (315) 446-9120
Project Officer	David J. Ulm	6723 Towpath Rd. Box 66 Syracuse, NY 13214 (315) 446-9120
Corporate Health and Safety Associate	Jay D. Keough, CIH	8 South River Road Cranbury, NJ 08512 (609) 860-0590
Regional Health and Safety Coordinator	Herrick L. Teeter Jr., CIH	6723 Towpath Rd. Box 66 Syracuse, NY 13214 (315) 446-9120

3. Project Hazards and Control Measures

3.1 Scope of Activities

The scope of activities covered by this HSCP includes the following:

- Mobilization;
- Sediment Sampling;
- Biota Sampling;
- Sample Preparation;
- Equipment Cleaning/Decontamination; and
- Demobilization.

3.1.1 Job Hazard Assessment

The following job hazard assessment identifies potential safety, health, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the work site to identify hazards that may affect site personnel, the community, or the environment. The SS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The SS will keep BBL personnel informed of the changing conditions, and the PM will write or approve addenda or revisions to this HSCP as necessary.

3.2 Field Activities, Hazards, Control Procedures

The following sections contain summaries of hazards and control measures for site activities. Some activities are grouped due to similar hazards associated with the activities.

3.2.1 Mobilization

Site mobilization may include setting up equipment, establishing temporary site facilities or work areas, and establishing temporary site facilities. During this initial phase, project personnel will walk the site to confirm the existence of anticipated hazards, and identify safety and health issues that may have arisen since the writing of this plan.

The hazards of this phase of activity are associated with equipment movement, manual materials handling, installation of temporary on-site facilities, and manual site preparation. Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil.

Installation of temporary field support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to manual lifting and moving of materials.

Environmental hazards may include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitos, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, heat- and cold-related illnesses; and pathogens, such as rabies, lyme disease, and blood-borne pathogens. Control procedures for these hazards are discussed in Section 4.

3.2.2 Sediment Sampling

Field sampling operations consist of the collection of sediment samples for subsequent analyses. The physical hazards of this operation are primarily associated with the sample collection methods and procedures utilized.

Inhalation and absorption of constituents (skin contact) are the primary routes of entry associated with sediment sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. To control dermal exposure during sediment sampling activities, a minimum of Modified Level D protection will be worn. Air monitoring may be conducted during sediment sampling if necessary to assess the potential for exposure to airborne constituents. Refer to Section 8 for information regarding the air monitoring requirements. A description of each level of protection is included in Section 5.

During the course of this project, several different sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. The primary hazards associated with the specific sampling collection procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards of the sampling procedures are generally limited to strains/sprains and potential eye hazards resulting from sampling activities.

In addition to the safety hazards specific to sample collection, hazards associated with working over or near water will be a concern. The following section provides safety procedures for working near water.

3.2.3 Biota Sampling

Field biota sampling operations consist of the collection of fish samples for subsequent laboratory analyses. The physical hazards of this operation are primarily associated with the sample collection methods and procedures utilized.

The fish sampling methods may include electrofishing or seining. The primary hazards associated with the specific sampling collection procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards of the sampling procedures are generally limited to strains/sprains and potential eye hazards resulting from sampling activities. Potential chemical hazards will include contact with media containing site constituents and potential contact with chemicals used for equipment cleaning/decontamination. Electrofishing presents serious electrical hazards and will only be conducted by specially trained and authorized personnel.

In addition to the safety hazards specific to sample collection, hazards associated with working over or near water will be a concern. The following sections provide general safety procedures for sampling and working near water.

3.2.3.1 Wading/Water Hazards

BBL personnel working over, adjacent, or near water, where the danger of drowning exists, must wear an U.S. Coast Guard-approved life jacket or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers must be inspected for defects which would alter their strength or buoyancy. Defective units must be removed from service.

Wading operations will not be conducted during high flow conditions, during rain events, or in or near extreme flow areas (i.e., strong rapids, upstream near waterfalls, etc.). All wading operations conducted in bodies of water where currents or flow may sweep personnel downstream or away from shore will be conducted with a safety harness and lifeline on the wading personnel. Each lifeline will be tended by a support person situated on the shore and in constant visual contact with the wader. All personnel involved in wading operations will wear an U.S. Coast Guard approved personal floating devices (PFD).

3.2.3.2 Electrofishing Hazards and Safety Precautions

Working around or near water presents the obvious hazard of drowning, but several other hazards exist. Weather, currents, and electricity from electrofishing may also pose significant hazards to the crew.

In land-based field operations, proper training and equipment are essential to completing a project efficiently and safely. This also holds true for operations conducted on or adjacent to bodies of water. BBL is strongly committed to ensuring all employees operating conducting electrofishing work are familiar with the hazards of electrofishing operations and the proper protective measures that must be taken to prevent injury.

As a minimum, each employee working on the electrofishing crew is required to participate in an electrofishing safety training session conducted during the daily safety meeting. The training session shall provide instruction on the following topics: proper electrofishing and safety equipment inspections; content and frequency of equipment safety inspections; proper use of safety equipment, including insulating gloves, waders, etc.; proper procedures on the appropriate electrofishing "rules-of-the-road"; emergency procedures in the event of system malfunction; PFD and their proper inspection and use.

Prior to each day or shift of operations, an inspection must be conducted by the electrofishing system operator and site supervisor. This inspection shall be conducted in accordance with manufacturers' recommendations and any applicable safety inspection procedures for the electrofishing unit. The inspection must verify that necessary safety devices (kill switches, etc.) are functioning properly, and all members of the crew are aware of proper procedures that are to be followed during use of the electrofishing unit. In addition, this information shall be reviewed during the daily tailgate safety meeting to ensure the procedures have been followed and all crew members are satisfied as to completion of the inspection.

It will be the responsibility of the site supervisor to ensure daily equipment inspections are completed and documented and daily tailgate safety meetings are conducted. The following safety procedures shall be observed at all times:

- Unauthorized personnel shall not be allowed in the work area while electrofishing equipment is in use;
- Only properly trained and authorized personnel will operate the electrofishing unit;
- PFD shall be worn at all times when working on or adjacent to the water; and
- All personnel working with the electrofishing unit shall be equipped with appropriate electrical insulating personal protective equipment (boots, gloves, etc.) as required for the unit.

3.2.4 Demobilization

Demobilization will involve the removal of all tools, equipment, supplies, and vehicles brought to the site. The physical hazards of this phase of activity are associated with equipment operation and manual materials handling. Equipment operation presents noise and vibration hazards and hot surfaces. Manual materials handling and manually working with soils may cause blisters, sore muscles, joint and skeletal injuries. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing weather hazards include frozen, slick and irregular walking surfaces. Wet weather may cause wet, muddy, slick walking surfaces.

Exposure to sediments and water containing site constituents is possible. In accordance with Section 5, decisions regarding personal protective equipment (PPE) for the chemical hazards will be based on measurements made prior to and during work activities. Environmental hazards include aggressive fauna, such as ticks, fleas, mosquitos, wasps, and spiders; weather, such as sunburn, lightning, rain, and heat-related illnesses. Control procedures for these hazards are discussed in Section 4.0.

3.3 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin contact with sediment and water containing site constituents of concern (COCs). Site COCs include: PCBs, benzene, trichloroethylene, methylene chloride, as well as other volatile organic compounds. In general symptoms of exposure to site COCs include but are not limited to the following: skin irritation, eye irritation, respiratory tract irritation, dizziness, and nausea. Table 3-1 lists the chemical, physical, and toxicological properties of site COCs. Material Safety Data Sheets (MSDSs) for COCs and materials used on site by BBL personnel are included in Attachment H-2.

The results of recent sediment sampling activities conducted at the PAS Site, indicate that volatile organic compounds have not been detected. Based on these data, as well as the type of sampling to be conducted under this HSCP (biota and sediment), airborne concentrations of COCs are not anticipated to be an issue. Accordingly, air monitoring will not be required for the field activities identified herein unless field observations indicate the potential presence of volatile organic compounds (e.g., visible sheens or noticeable odors). In the event that field conditions indicate the need for air monitoring, the applicable air monitoring protocols and requirements set-forth in the USEPA-approved document for this Site entitled "Operation and Maintenance Long-Term Monitoring Plan" (BBL Environmental Services, Inc., May 1998) will be followed. These air monitoring requirements are detailed in Section 8 of the HSCP which is provided as Appendix L of that approved Plan. The potential for dermal contact with sediments or water containing site COCs during sampling operations is moderate.

TABLE 3-1
CHEMICAL HAZARD INFORMATION

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Benzene [71-43-2]	9.24	34–119	Inh Abs Ing Con	Irritates eyes, nose, respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone-marrow depression. Carcinogenic.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (10 ppm) NIC–0.1 skin 0.1 ppm	5 ppm C1 ppm (Ca)	PEL TLV REL	Ca [1,000 ppm]* *OSHA
Methylene chloride (dichloromethane) [75-09-2]	11.32	UN	Inh Ing Con	Fatigue, weakness, sleepiness, lightheadedness; numbness and tingling in limbs; nausea; irritated eyes and skin.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	500 ppm 50 ppm	C1,000 ppm; C2,000 mg/m^3 (5 min in 2 hrs)	PEL TLV REL	Ca (5,000 ppm)
Trichloroethylene (TCE, trichloroethene) [79-01-6]	9.45	21.4	Inh Ing Con	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting; irritated eyes; dermatitis; cardiac arrhythmia, paresthesia. Carcinogenic.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	50 ppm 50 ppm 25 ppm	200 ppm 200 ppm Ca	PEL TLV REL	Ca [1,000 ppm]
Chlorodiphenyl (42% chlorine) [53469-21-9]	UN	UN	Inh Abs Ing Con	Irritated eyes; chloracne; liver damage. Carcinogenic.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 (skin) 1 mg/m^3 (skin) 0.001 mg/m^3 Ca		PEL TLV REL	Ca [10 mg/m^3]
Chlorodiphenyl (54% chlorine), [11097-69-1]	UN	UN	Inh Abs Ing Con	Irritated eyes and skin; acne-form dermatitis; carcinogenic; in animals: causes liver damage.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.5 mg/m^3 (skin) 0.5 mg/m^3 (skin) 0.001 mg/m^3 Ca		PEL TLV REL	Ca [5 mg/m^3]

TABLE 3-1 (Cont'd)
CHEMICAL HAZARD INFORMATION

[a] IP = Ionization potential (electron volts).
[b] Route = Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; Con, Skin and/or eye contact.
[c] TWA = Time-weighted average. The TWA concentration for a normal work day (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[d] STEL = Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.
[e] PEL = Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
TLV = American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value—TWA.
REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[f] IDLH (NIOSH)—Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE = No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 1990).
C = Ceiling limit value which should not be exceeded at any time.
Ca = Carcinogen.
NA = Not applicable.
UN = Unknown.
LEL = Lower explosive limits.
LC_{50} = Lethal concentration for 50 percent of population tested.
LD_{50} = Lethal dose for 50 percent of population tested.
NIC = Notice of intended change (ACGIH).

References:

American Conference of Governmental Industrial Hygienists Guide to Occupational Exposure Values, 1991, compiled by the American Conference of Governmental Industrial Hygienists.
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Documentation of TLVs and BEIs, American Conference of Governmental Industrial Hygienists, 5th ed., 1986.
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Micromedex Tomes Plus (R) System, 1992, Micromedex, Inc.
National Institute for Occupational Safety and Health Pocket Guide to Chemicals, Pub. 1990, No. 90-117, National Institute for Occupational Safety and Health.
Odor Threshold for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
Respirator Selection Guide, 3M Occupational Health and Safety Division, 1993.
Verschuseren, K., Handbook of Environmental Data on Organic Chemicals, Van Nostrand and Reinhold, 1977.
Warning Properties of Industrial Chemicals—Occupational Health Resource Center, Oregon Lung Association.
Workplace Environmental Exposure Levels, American Industrial Hygiene Association, 1992.

4. General Safety Practices

4.1 General Practices

General safety procedures for site activities include, but are not limited to the following:

- At least one copy of this plan must be at the project site, in a location readily available to all personnel, and reviewed by all project personnel prior to starting work.

- Food, beverages, or tobacco products must not be present or consumed in the exclusion and contamination reduction zones. Cosmetics must not be applied within these zones.

- Impacted waste, debris, and used protective clothing must be properly contained, and labeled.

- Removing impacted materials from protective clothing or equipment with compressed air, shaking, or any other means that disperses constituents into the air is prohibited.

- Visitors to the site must abide by the following:

    - All visitors must be instructed to remain within the support zone during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces which contain site constituents or are suspected of containing site constituents.

4.1.1 Buddy System

All on-site personnel must use the buddy system. Visual contact must be maintained between crew members at all times, and crew members must observe each other for signs of chemical exposure, heat or cold stress. Indications of adverse effects include, but are not limited to:

- changes in complexion and skin coloration;
- changes in coordination;
- changes in demeanor;
- excessive salivation and pupillary response; and
- changes in speech pattern.

- Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

- Employees must inform their fellow team members of non-visible effects of exposure to toxic materials. The symptoms of such exposure may include:

    - headaches;
    - dizziness;
    - nausea;
    - blurred vision;

- cramps; and/or
- irritation of eyes, skin, or respiratory tract.

- If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.1.2 Emergency Equipment

Adequate emergency equipment for the activities conducted on-site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926. Personnel will be provided with access to emergency equipment including but limited to the following:

- Emergency eyewash and shower meeting ANSI Z358.1-1990.
- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 29 CFR 1926.
- Industrial First Aid Kit of adequate size for number of personnel on-site.

4.2 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are the one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, any employee suspected of being ill from heat stroke should not be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in Table 4-1.

TABLE 4-1
WORK/REST SCHEDULE

Adjusted Temperature[b]	*Work-Rest Regimen Normal Work Ensemble*[c]	*Work-Rest Regimen Impermeable Ensemble*
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (30.8°-32.2°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour (Light-Moderate Type of Work)

[b] Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

[d] The information presented above was generated using the information provided in the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities; 1985.

In order to determine if the work rest cycles are adequate for the personnel and specific site conditions additional monitoring of individuals heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period

Additional one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding of 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek-type garments.
- All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.3 Cold Stress Hazards

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in Table 4-2.

TABLE 4-2
CHILL TEMPERATURE CHART

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	**LITTLE DANGER** **Maximum danger of false sense of security.**				**INCREASING DANGER** **Danger from freezing of exposed flesh within one minute.**			**GREAT DANGER** **Flesh may freeze within 30 seconds.**				
	Trench foot and immersion foot may occur at any point on this chart.											

[This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents)].

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- ***Frost Nip or Incipient Frostbite*** - characterized by suddenly blanching or whitening of skin.
- ***Superficial Frostbite*** - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- ***Deep Frostbite*** - tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death. Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

4.3.1 Safety Precautions for Cold Stress Prevention

- For air temperature of 0°F or less, the hands should be protected by mittens. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must ensure that their clothing is not wet as a consequence of sweating. If wet, field personnel must change into dry clothes prior to entering the cold area.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.
- Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

4.3.2 Safe Work Practices

- Direct contact between bare skin and cold surfaces (≤ 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.
- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.
- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.
- Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.4 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, and other pests.

4.4.1 Tick-Borne Diseases

Lyme disease, erlichiosis, and Rocky Mountain Spotted Fever (RMSF) are diseases transmitted by ticks and occur throughout the United States during spring, summer, and fall.

Lyme Disease - The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota and Wisconsin. Few cases have been identified in other states.

Erlichiosis - The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota and Wisconsin. Few cases have been identified in other states.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever - This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control - Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pants legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.4.2 Poisonous Plants

Poison ivy may be present in the work area. Personnel should be alerted to its presence, and instructed on methods to prevent exposure.

Control - The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water, and observed for signs of reddening.

4.4.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snake bites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control - To minimize the threat of snake bites and insect hazards, all personnel walking through vegetated areas must aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snake bite occurs, an attempt should be made to kill the snake for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band, and washing the area around the wound to remove any unabsorbed venom.

4.5 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control - All personnel must wear hearing protection - with a Noise Reduction Rating (NRR) of at least 20 - when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in Section 8.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

4.6 Sanitation

Site sanitation will be maintained according to OSHA and Department of Health requirements.

4.6.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in the area other than the SZ.

4.7 Electrical Hazards

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, it must be performed by a qualified electrician.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by UL, Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.

- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations.

- Portable and semi portable tools and equipment must be grounded by a multiconductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.

- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.

- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.

- All circuits must be protected from overload.

- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.

- Plugs and receptacles must be kept out of water unless of an approved submersible construction.

- All extension outlets must be equipped with ground fault circuit interrupters (GFCI).

- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.

- Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.

- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.8 Lifting Hazards

Back strain or injury may be prevented by using proper lifting techniques. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.

- The hands and the object should be free of dirt or grease that could prevent a firm grip.

- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.

- Fingers must be kept away from points which could crush or pinch them, especially when putting an object down.

- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

5. Personal Protective Equipment

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the level of constituents and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level.

5.1 Levels of Protection

Protection levels are determined based on constituents present in the work area. A summary of the levels is presented in this section.

5.1.1 Level D Protection

The minimum level of protection that will be required of BBL personnel at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather;
- Safety toe work boots, meeting ANSI Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Hard hat, meeting ANSI Z89 when falling object hazards are present; and
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a US EPA NRR of at least 20 dBA must be used).

Additional Level D PPE items which may be added for selected tasks may include:

- Nitrile sample gloves;
- US Coast Guard-approved personal flotation device (over or near water);
- Hip or chest waders; and
- Rubber over boots.

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne constituents are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Polyethylene coated Tyvek® coveralls when potential skin/body contact with sediments is anticipated (Disposable raingear coveralls or raingear and waders may be utilized when potential water contact exists;
- US Coast Guard-approved personal flotation device (over or near water);
- Safety toe work boots;
- Vinyl or latex booties, or PVC overboots when contact with impacted media is anticipated;

- Safety glasses or goggles;
- Hard hat;
- Face shield in addition to safety glasses or goggles when projectiles pose a hazard;
- Nitrile gloves over nitrile inner gloves; and
- Hearing protection (if necessary).

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of site constituents reaches ½ the OSHA PEL or ACGIH TLV. The following equipment will be used for Level C protection:

- MSA UltraTwin full-face, air purifying respirator with GMC-H cartridges, or equivalent.
- Polyethylene coated Tyvek® suit, ankles and cuffs taped to boots and gloves;
- US Coast Guard-approved personal flotation device (over or near water);
- Nitrile gloves over nitrile sample gloves;
- Safety toe work boots, ANSI approved;
- Chemical resistant Neoprene boots with steel toes; or latex/PVC booties over safety toe shoes;
- Hard hat, ANSI approved; and
- Hearing protection (if necessary).

5.1.4 Selection of PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and HS professionals. The PPE used will be chosen to be effective against the compound(s) present on the site.

5.2 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the site due to the potential for airborne constituents.

The site respiratory protection program will consist of the following:

- All site personnel who may use respiratory protection will have an assigned respirator.
- All site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air purifying respirator within the past 12 months.

- All site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSS, prior to commencement of site work.

- Only cleaned, maintained, NIOSH/MSHA-approved respirators are to be used on this site.

- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.

- Contact lenses are not to be worn on-site.

- All site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected, and a negative pressure test performed prior to each use.

- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.3 Using PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory when Modified Level D, Level C, or B PPE is used.

All people entering the EZ must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of impacted materials.

5.3.1 Donning Procedures

These procedures are mandatory when Modified Level D or higher PPE is used on the project:

- Remove bulky outerwear. Remove street clothes and store in clean location;

- Put on work clothes or coveralls;

- Put on the required chemical protective coveralls or rain gear;

- Put on the required chemical protective boots or boot covers;

- Tape the legs of the coveralls to the boots with duct tape;

- Put on the required chemical protective gloves;

- Tape the wrists of the protective coveralls to the gloves;

- Don the required respirator (Level C or higher) and perform appropriate fit check;

- Put hood or head covering over head and respirator straps (Level C or higher) and tape hood to facepiece; and

- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

5.3.2 Doffing Procedures

The following procedures are mandatory when Modified Level D or higher PPE is required for this project. Whenever a person leaves a Modified Level D or higher work site, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse materials from the boots or remove boot covers;
- Clean reusable protective equipment;
- Remove protective garments, equipment, and respirator (Level C or higher). All disposable clothing should be placed in plastic bags, which are labeled with appropriate waste labels;
- Wash hands, face and neck or shower (if necessary);
- Proceed to clean area and dress in clean clothing; and
- Clean and disinfect respirator (Level C or higher) for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags, labeled for disposal. See Section 7 for detailed information on decontamination stations.

5.4 Selection Matrix

The level of personal protection selected will be based upon real-time air monitoring (if necessary to conduct) of the work environment and an assessment by the HSS of the potential for skin contact with impacted materials. The PPE selection matrix is given in Table 5-1. This matrix is based on information available at the time this plan was written.

TABLE 5-1
PPE SELECTION MATRIX

Task	Anticipated Level of Protection for Task Initiation
Mobilization/Demobilization	Level D Support Zones Modified Level D (Site Exclusion Zone)
Support Zone Activities	Level D
Sediment/Sampling	Modified Level D
Biota Sampling	Modified Level D with Raingear
Sample Preparation	Level D
Equipment Cleaning/Decontamination	Modified Level D

6. Site Control

6.1 Authorization to Enter

All personnel who are potentially exposed to hazardous substances must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1910.120, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations in order to enter a site area designated as an EZ or CRZ. Personnel without such training or medical certification may enter the designated SZ only. The SS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed within the EZ or CRZ.

6.2 Site Orientation and Hazard Briefing

No person will be allowed in the general work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the HSS, and will consist of a review of this HSCP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. In addition to this meeting, Daily Safety Meetings will be held each day before work begins.

All people on the site, including visitors, must document their attendance to this briefing as well as the Daily Safety Meetings on the forms included with this plan.

6.3 Certification Documents

A training and medical file may be established for the project and kept on site during all site operations. The 24 or 40-hour training, update, and specialty training [first-aid/cardiopulmonary resuscitation (CPR)] certificates, as well as current medical clearance for all project field personnel, will be maintained within that file. All BBL and subcontractor personnel must provide their training and medical documentation to the HSS prior to the start of field work.

6.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the SS. Personnel must sign in and out on a log sheet as they enter and leave the CRZ, and the SS may document entry and exit in the field notebook.

6.5 Entry Requirements

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed on any BBL field site unless he or she is wearing the minimum SZ PPE as described in Section 5. Personnel entering the EZ or CRZ must wear the required PPE for those locations.

6.6 Emergency Entry and Exit

People who must enter the site on an emergency basis will be briefed of the hazards by the SS. All hazardous activities will cease in the event of an emergency and any sources of emissions will be controlled, if possible.

People exiting the site because of an emergency will gather in a safe area for a head count. The SS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

6.7 Site Control Zones

Site control zones are maintained to prevent the spread of constituents and to prevent unauthorized people from entering hazardous areas.

6.7.1 Exclusion Zone

The EZ consists of the specific work area, or may be the entire area of suspected impacts. All employees entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. The location of each exclusion zone will be identified by cones, caution tape, or other appropriate means.

6.7.2 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

6.7.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

6.7.4 Posting

The EZ, CRZ, and SZ will be prominently marked and delineated using cones, caution tape, or other suitable means.

6.8 Site Inspections

The site supervisor will conduct a daily inspection of site activities, equipment, and zone set up to verify that the required elements are in place. The inspection form in Attachment H-1 may be used as a guide for daily inspections. The form must be completed weekly, and forwarded to the HSS and PM for review.

7. Decontamination

7.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the exclusion zone must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations.

Station 1: Personnel leaving the exclusion zone will remove the gross contamination from their outer clothing and boots.

Station 2: Personnel will remove their outer garment and gloves and deposit them in the lined waste receptacles. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.

Station 3: Personnel will thoroughly wash their hands and face before leaving the decontamination zone. Respirators will be sanitized and then placed in a clean plastic ziplock bag.

Figure 1 provides additional information of decontamination layout.

7.2 Equipment Decontamination

All vehicles and equipment that have been used in the exclusion zone or contacted sediments will be decontaminated at the decontamination pad prior to leaving the site. If the level of vehicle and equipment impact is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly impacted, steam cleaning or pressure washing of vehicles and equipment may be required.

7.3 Personal Protective Equipment Decontamination

Where and whenever possible, single use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers.

Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves and covers must be thoroughly cleaned at the end of each work shift, and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water, or by using a spray disinfectant.

8. Site Monitoring

As discussed in Section 3.3, airborne concentrations of COCs are not anticipated to be an issue. Accordingly, air monitoring will not be required for the field activities identified herein unless field observations indicate the potential presence of volatile organic compounds (e.g., visible sheens or noticeable odors). In the event that field conditions indicate the need for air monitoring, the applicable air monitoring protocols and requirements set-forth in the USEPA-approved document for this Site entitled "Operation and Maintenance Long-Term Monitoring Plan" (BBL Environmental Services, Inc., May 1998) will be followed. These air monitoring requirements are detailed in Section 8 of the HSCP which is provided as Appendix L of that approved Plan.

9. Employee Training

9.1 General

All on-site project personnel who work in areas where they may be exposed to site constituents must be trained as required by OSHA Regulation 29 CFR 1910.120. Such field employees also receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The BBL SS must have completed an additional 8 hours of training for supervisors, and must have a current first-aid/CPR certificate.

9.2 Initial 40-Hour Course

The following is a list of the topics typically covered in a 40-hour training course:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site HS;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application and limitations of PPE;
- Work practices by which employees can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs which might indicate overexposure to hazards;
- Worker right-to-know (Hazard Communication OSHA 1910.1200);
- Routes of exposure to constituents;
- Engineering controls and safe work practices;
- Components of a site HS program and HSCP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

9.3 Supervisor Course

Management and supervisors receive an additional eight hours of training which typically includes:

- General site safety and health procedures;

- PPE programs; and

- Air monitoring techniques.

9.4 Site-Specific Training

Site-specific training will be accomplished by each site worker reading this HSCP, or through a site briefing by the PM, SS, or HSS on the contents of this HSCP before work begins. The review must include a discussion of the chemical, physical, and biological hazards, the protective equipment and safety procedures, and emergency procedures.

9.5 Daily Safety Meetings

Daily Safety Meetings will be held to cover the work to be accomplished, the hazards anticipated, the protective clothing and procedures required to minimize site hazards, and emergency procedures. These meetings should be presented by the SS or HSS prior to beginning the day's field work. No work will be performed in an EZ before the Daily Safety Meeting has been held. The Daily Safety Meeting must also be held prior to new tasks, and repeated if new hazards are encountered. The Daily Safety Meeting Log is included in Attachment H-3.

9.6 First Aid and CPR

At least two employees current in first aid/CPR will be assigned to the work crew and will be on the site during operations. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

10. Medical Surveillance

10.1 Medical Examination

All personnel who are potentially exposed to site constituents must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

10.1.1 Preplacement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable OSHA Regulations. The preplacement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire;
- Physical examination;
- Complete blood count, with differential;
- Liver enzyme profile;
- Chest X-ray, at a frequency determined by the physician;
- Pulmonary function test;
- Audiogram;
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- Drug and alcohol screening, as required by job assignment;
- Visual acuity; and
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

10.1.2 Other Medical Examination

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials;
- At the discretion of the client, HS professional, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials; and

- At the discretion of the occupational physician.

10.1.3 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 18 months.

10.2 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the HSS. The terms of the restriction will be discussed with the employee and the supervisor.

11. Emergency Procedures

11.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, constituent release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the SS/HSS immediately.

The SS/HSS will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area.

11.2 Emergency Response

If an incident occurs, the following steps will be taken:

- The SS/HSS will evaluate the incident and assess the need for assistance and/or evacuation;
- The SS/HSS will call for outside assistance as needed;
- The SS/HSS will ensure the PM is notified promptly of the incident; and
- The SS/HSS will take appropriate measures to stabilize the incident scene.

11.2.1 Fire

In the case of a fire on the site, the SS/HSS will assess the situation and direct fire-fighting activities. The SS/HSS will ensure that the client site representative (as appropriate) is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish, the local fire department will be summoned.

11.2.2 Constituent Release

In the event of a constituent release, the following steps will be taken:

- Notify SS/HSS immediately;
- Evacuate immediate area of release;
- Conduct air monitoring to determine needed level of PPE; and
- Don required level of PPE and prepare to implement control procedures.

The SS/HSS has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-site areas.

11.3 Medical Emergency

All employee injuries must be promptly reported to the HSS/SS, who will:

- Ensure that the injured employee receives prompt first aid and medical attention;

- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room); and
- The CSA or the RHSC is to be notified by site personnel as soon as possible after the worker has left the site.

11.3.1 First Aid - General

All persons must report any near-miss incident, accident, injury, or illness to their immediate supervisor or the SS. First aid will be provided by trained personnel. Injuries and illnesses requiring medical treatment must be documented. The SS must conduct an accident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been ensured. These two reports must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

- ***Survey the scene.*** Determine if it is safe to proceed. Try to determine if the conditions which caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- ***Do a primary survey of the victim.*** Check for **airway** obstruction, **breathing**, and **pulse**. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- ***Phone Emergency Medical Services (EMS).*** Give the location, telephone number used, caller's name, what happened, number of victims, victims' condition, and help being given.
- ***Maintain airway and perform rescue breathing*** as necessary.
- ***Perform cardiopulmonary resuscitation (CPR)*** as necessary.
- ***Do a secondary survey of the victim.*** Check **vital signs** and do a **head-to-toe exam**.
- ***Treat other conditions as necessary.*** If the victim can be moved, take him to a location away from the work area where EMS can gain access.

11.3.2 First Aid - Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Section 3 will be removed from the work area and transported to the designated medical facility for examination and treatment.

11.3.3 First Aid - Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information, if recommended. If unconscious, keep the victim on his side and clear the airway if vomiting occurs.

11.3.4 First Aid - Skin Contact

Project personnel who have had skin contact with constituents will, unless the contact is severe, proceed through the decontamination zone, to the wash-up area. Personnel will remove any impacted clothing, and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he shows any sign of skin reddening, irritation, or if he requests a medical examination.

11.3.5 First Aid - Eye Contact

Project personnel who have had constituents splashed in their eyes or who have experienced eye irritation while in the exclusion zone, must immediately proceed to the eyewash station, set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

11.4 Reporting Injuries and Illnesses

All injuries and illnesses, however minor, will be reported to the SS immediately. The SS will complete an injury report and submit it to the PM within 24 hours.

11.5 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the Daily Safety Meeting. These agencies are identified in Table 11-1. A map showing the route from the site to Oswego Hospital is presented as Attachment H-5.

TABLE 11-1

Health and Safety Contingency Plan
Emergency Response Contact List

Agency	Contact/Function	Phone Number
Oswego Town Fire	Report Fire	(315) 343-0220
	If busy or no answer	(315) 343-8571
Oswego County Ambulance	Ambulance	(315) 343-1313
Oswego Hospital West Bridge Street Oswego, NY	Hospital	(315) 349-5511
Contingency Plan Contact List		
Oswego County Sheriffs Dept.	Report Incidents	(315) 343-5490
State Police	Report Incidents	(315) 593-1223
National Emergency Contact List		
USEPA Emergency Response Team, Region 2		(212) 340-6656
Chemtrec - Chemical Emergencies (Washington, D.C.)		(800) 424-9300
National Foam Center - Emergency Response (Pennsylvania)		(215) 363-1400
Utility Telephone Contact List		
Niagara Mohawk Power Corporation		(315) 474-1511
Oswego Town Supervisor		(315) 343-2424
New York Telephone Company		(607) 272-1834
	Emergency	(800) 722-2300
Underground Utility (UFPO) 3650 James Street Syracuse, New York		(800) 962-7962
New York State Department of Environmental Conservation Contact List		
Oil Spill or Hazardous Material Spill		(800) 457-7362

Note: See Table 2-1 of this HSCP for telephone numbers of key client and BBL personnel associated with this project.

ATTACHMENT H-1
SAFETY INSPECTION FORM

TABLE 1
BLASLAND, BOUCK & LEE, INC.
PAS SITE
OSWEGO, NEW YORK

HEALTH and SAFETY CONTINGENCY PLAN
DAILY HEALTH and SAFETY CHECKLIST

DAILY HEALTH AND SAFETY CHECKLIST

Site Name: ______________________ Date: ________ Project #: ____________

HSS or Designated Alternate: ______________________________

FORWARD A COPY,OF COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER

	Yes	No	N/A	Comments (Use back of form if more space is needed)
1. Safety meeting held today?				
2. Emergency procedures discussed during safety meeting?				
3. Vehicle available on-site for transporation to the hospital?				
4. At least one person trained in CPR and first-aid on-site?				
5. Proper PPE being worn as specified in the HASP?				
Level of PPE being worn: ____________				
6. PPE adequate for work conditions?				
If not, give reason: ____________				
Upgrade/downgrade to PPE level: ____________				
7. If Level B, back-up/emergency person suited up (except for air)?				
8. Monitoring equipment calibrated?				
9. Monitoring equipment in good condition?				
10. Monitoring equipment used properly?				
11. Other monitoring equipment needed?				
List: ____________				
12. Monitoring equipment covered with plastic to minimize contamination?				
13. Decon line set up properly?				
14. Proper cleaning fluid used for known or suspected contaminants?				
15. Proper decon procedures used?				
16. Decon personnel wearing proper PPE?				
17. Equipment decontaminated?				
18. Sample containers decontaminated?				
19. Disposable items changed twice a day or more often if needed?				
20. Proper collection and disposal of potentially contaminated PPE?				
21. Proper collection and disposal of decon fluid?				
22. Buddy system used?				
23. Equipment kept off drums and ground?				
24. Kneeling or sitting on drums or ground prohibited?				
25. Personnel avoid standing or walking through puddles or stained soil?				
26. Work zones established?				
27. If night work is conducted, is adequate illumination provided?				
28. Smoking, eating, or drinking in the Exclusion Zone or CRZ prohibited?				
29. To the extent feasible, contaminated materials handled remotely?				
30. Entry into excavations prohibited unless properly shored or sloped?				
31. All unusual situations on-site listed in HASP?				
If not, what? ____________				
Action taken? ____________				
HASP revised? ____________				
32. All confined spaces identified?				
If not, list: ____________				
33. Confined Space Checklists used?				
34. Confined Space Checklists completely and correctly filled out?				

ATTACHMENT H-2
MATERIAL SAFETY DATA SHEETS

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 366
Chlorobenzene

Issued: 11/82 Revision: B, 11/90

Section 1. Material Identification

33

Chlorobenzene (C_6H_5Cl) Description: Produced by chlorinating benzene in the presence of a catalyst. Used in dry cleaning; as a solvent in manufacturing paints, adhesives, polishes, waxes, diisocyanates, natural rubber, and pharmaceuticals; a chemical intermediate for phenol, *o*-, and *p*-chloronitrobenzene, DDT, and aniline; and an intermediate in manufacturing dyestuffs.

Other Designations: CAS No. 0108-90-7, benzene chloride; chlorobenzol; MCB; monochlorobenzene; phenyl chloride.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

Cautions: Chlorobenzene is a skin and mucous membrane irritant, a fairly strong narcotic, and a central nervous system (CNS) depressant. Chronic inhalation may cause *lung, liver, and kidney damage.* This material is a dangerous fire hazard when exposed to heat or flame.

R	1
I	3
S	2
K	3

NFPA

HMIS

H	2
F	3
R	0
PPG*	

* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Chlorobenzene, ca 100%

1989 OSHA PEL
8-hr TWA: 75 ppm, 350 mg/m^3

1990-91 ACGIH TLV*
TWA: 75 ppm, 345 mg/m^3

1988 NIOSH REL
None established

1985-86 Toxicity Data†
Rat, oral, LD_{50}: 2910 mg/kg; toxic effects not yet reviewed
Rat, inhalation, TC_{Lo}: 210 ppm administered for 6 hr to a 6- to 15-day pregnant female produces specific developmental abnormalities

1987 IDLH Level
2400 ppm

* In its "Notice of Intended Changes (for 1990-91)," the ACGIH lists a proposed lower level TWA for chlorobenzene: 10 ppm, 46 mg/m^3.(150)
†See NIOSH, *RTECS* (CZ0175000), for additional mutative, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 270 °F (132 °C) at 760 mm Hg
Melting Point: -50.1 °F (-45.6 °C)
Vapor Pressure: 11.8 mm Hg at 77 °F (25 °C)
Vapor Density (Air = 1): 3.88
Viscosity: 0.790 centipoise at 70 °F (21 °C)
Molecular Weight: 112.56
Specific Gravity (20 °C/4 °C): 1.1058
Water Solubility: Insoluble

Appearance and Odor: A clear, colorless, volatile liquid with a faint, almond-like odor. Threshold odor concentration: 100% recognition, 0.21 ppm.

Section 4. Fire and Explosion Data

Flash Point: 85 °F (29.5 °C), CC	**Autoignition Temperature:** 1180 °F (638 °C)	**LEL:** 1.8% v/v	**UEL:** 9.6% v/v

Extinguishing Media: Use carbon dioxide, dry chemical, halon, water spray, or standard foam to extinguish fires involving chlorobenzene. Use water in flooding quantities as fog since solid streams of water may spread fire. Apply water spray from as far as possible to cool fire-exposed containers.

Unusual Fire or Explosion Hazards: Chlorobenzene is dangerous when exposed to heat or flame. Vapor may travel to an ignition source and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Do not extinguish fire unless flow can be stopped. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Chlorobenzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Chlorobenzene is incompatible with strong oxidizers; contact may cause fires and explosions. It reacts violently with dimethyl sulfoxide. Silver perchlorate forms a solvated, shock-sensitive salt with chlorobenzene (explosion). Chlorobenzene is potentially explosive with powdered sodium or phosphorus trichloride + sodium.

Conditions to Avoid: Avoid all heat and ignition sources and incompatible materials.

Hazardous Products of Decomposition: Thermal oxidative decomposition products of chlorobenzene can include soot, hydrogen chloride, phosgene, and carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The NTP, IARC, and OSHA do not list chlorobenzene as a carcinogen.
Summary of Risks: Chlorobenzene is a fairly strong narcotic and can cause central nervous system (CNS) depression. Overexposure is irritating to the eyes, nasal passages, and upper respiratory tract. It is moderately toxic by inhalation or ingestion and can be absorbed slowly through the skin. Short exposures to liquid may cause skin irritation and defatting, while prolonged or repeated skin contact may result in dermatitis or skin burns. Following absorption of toxic doses, liver and kidney degeneration are also observed. Chlorobenzene may also cause hemolysis.
Medical Conditions Aggravated by Long-Term Exposure: Individuals with skin, liver, kidney, or chronic respiratory disease may be at increased risk from exposure.
Target Organs: Respiratory system, eyes, skin, central nervous system, and liver.
Primary Entry Routes: Inhalation, ingestion, eye and skin contact.
Acute Effects: Symptoms to be expected from acute exposure are headache, eye and upper respiratory tract irritation, dizziness, drowsiness, cyanosis, spastic contractions of extremities, and loss of consciousness, depending on the exposure's concentration and duration. Symptoms of ingestion include pallor, cyanosis, and coma, followed by complete recovery.
Chronic Effects: Frequently repeated contact with chlorobenzene may result in skin burns, eye and upper respiratory tract irritation, headaches, dizziness, somnolence, and dyspeptic disorders (indigestion). Chronic inhalation may result in lung, liver, and kidney damage.

FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious* person drink 1 to 2 glasses of water. Consult a physician immediately. If vomiting occurs, administer more water.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: In a *conscious* patient, attempt to induce vomiting with Syrup of Ipecac. Consider activated charcoal cathartic. Administer charcoal slurry with saline, water, or sorbitol. In an *unconscious* patient, do gastric lavage with suction.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a chlorobenzene spill control and counter measure plan (SCCP).* Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and contact with liquid. Take up spilled material with a noncombustible absorbent material and place into containers for disposal. For large spills, dike far ahead of spill to contain. Do not release runoff to sewers or waterways since chlorobenzene is harmful to aquatic life in very low concentrations. Aquatic toxicity: A 20-ppm concentration of chlorobenzene administered to bluegill in fresh water during a 96-hr test period is the median tolerance limit (TLm) at which 50% of the aquatic organisms survive. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U037
CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 100 lb (45.4 kg) [* per Clean Water Act, Sec. 311(b)(4), Sec. 307(a), and per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Use an organic vapor-acid gas respirator where appropriate. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets (polyvinyl alcohol is recommended) to prevent prolonged or repeated skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL and ACGIH TLV (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a well-ventilated, fire-resistant area away from heat and ignition sources and oxidizing agents. Outside or detached storage is preferred. Storage and handling must be suitable for an OSHA Class IC flammable liquid. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Protect containers from physical damage.
Engineering Controls: Avoid vapor inhalation and contact with liquid. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures.
Other Precautions: Provide a preplacement questionnaire that emphasizes detecting a history of skin, liver, kidney, or chronic respiratory disease.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Chlorobenzene	**IMO Shipping Name:** Chlorobenzene
DOT Hazard Class: Flammable liquid	**IMO Hazard Class:** 3.3
ID No.: UN1134	**ID No.:** UN1134
DOT Label: Flammable liquid	**IMO Label:** Flammable liquid
DOT Packaging Exceptions: 173.118	**IMDG Packaging Group:** II
DOT Packaging Requirements: 173.119	

MSDS Collection References: 38, 73, 84, 85, 89, 100, 101, 103, 124, 126, 131, 132, 133, 136, 138, 139, 140, 143, 146, 148
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD; **Edited by:** JR Stuart, MS

One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Sheet No. 385
Ethylbenzene

Issued: 8/78 Revision: B, 9/92

Section 1. Material Identification

39

Ethylbenzene ($C_6H_5C_2H_5$) Description: Derived by heating benzene and ethylene in presence of aluminum chloride with subsequent distillation, by fractionation directly from the mixed xylene stream in petroleum refining, or dehydrogenation of naphthenes. Used as a solvent, an antiknock agent in gasoline; and as an intermediate in production of synthetic rubber, styrene, cellulose acetate, diethylbenzene, acetophenone, ethyl anthraquinone, propyl oxide, and α-methylbenzol alcohol.
Other Designations: CAS No. 100-41-4, ethylbenzol, EB, phenylethane, NCI-C56393.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Ethylbenzene is a skin and mucous membrane irritant considered the most irritating of the benzene series. Inhalation causes acute and chronic central nervous system (CNS) effects. It is highly flammable and forms explosive mixtures with air.

R 1
I 3
S 2*
K 4
* Skin absorption

NFPA

HMIS
H 2†
F 3
R 0
PPE - Sec. 8
† Chronic effects

Section 2. Ingredients and Occupational Exposure Limits

Ethylbenzene, ca >99.0%. Impurities include ~ 0.1% *meta* & *para* xylene, ~ 0.1% cumene, and ~ 0.1% toluene.

1991 OSHA PELs
8-hr TWA: 100 ppm (435 mg/m^3)
15-min STEL: 125 ppm (545 mg/m^3)
Action Level: 50 ppm (217 mg/m^3)

1990 IDLH Level
2000 ppm

1990 NIOSH REL
TWA: 100 ppm (435 mg/m^3)
STEL: 125 ppm (545 mg/m^3)

1992-93 ACGIH TLVs
TWA: 100 ppm (434 mg/m^3)
STEL: 125 ppm (545 mg/m^3)

1990 DFG (Germany) MAK
TWA: 100 ppm (440 mg/m^3)
Category 1: local irritants
Peak Exposure Limit: 200 ppm, 5 min momentary value, max of 8/shift
Danger of cutaneous absorption

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 100 ppm/8 hr caused eye effects, sleep, and respiratory changes.
Human, lymphocyte: 1 mmol/L induced sister chromatid exchange.
Rat, oral, LD_{50}: 3500 mg/kg; toxic effects not yet reviewed
Rat (female), inhalation, TC_{Lo}: 1000 ppm/7 hr/day, 5 days/wk, for 3 wk prior to mating and daily for 19 days of gestation produced pups with high incidence of extra ribs.(179)

* See NIOSH, *RTECS* (DA0700000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 277 F (136 C)
Melting Point: -139 F (-95 C)
Surface Tension: 31.5 dyne/cm
Ionization Potential: 8.76 eV
Viscosity: 0.64 cP at 77 F (25 C)
Refraction Index: 1.4959 at 68 F (20 C)
Relative Evaporation Rate (ether = 1): 0.0106
Bulk Density: 7.21 lb/Gal at 77 F (25 C)
Critical Temperature: 651 F (343.9 C)
Critical Pressure: 35.6 atm
Molecular Weight: 106.16
Density: 0.863 at 77 F (25 C)
Water Solubility: Slightly, 14 mg/100 mL at 59 F (15 C)
Other Solubilities: Miscible in alcohol, ether; soluble in carbon tetrachloride, benzene, sulfur dioxide, and many organic solvents; insoluble in ammonia
Odor Threshold: 2.3 ppm
Vapor Pressure: 7.1 mm Hg at 68 F (20 C); 10 mmHg at 78.62 F (25.9 C); 100 mm Hg 165.38 F (74.1 C)
Saturated Vapor Density (Air = 0.075 lb/ft^3 or 1.2 kg/m^3): 0.0768 lb/ft^3 or 1.2298 kg/m^3

Appearance and Odor: Colorless, flammable liquid with a pungent odor.

Section 4. Fire and Explosion Data

Flash Point: 64 F (18 C) CC	**Autoignition Temperature:** 810 F (432 C)	**LEL:** 1.0% v/v	**UEL:** 6.7% v/v

Extinguishing Media: Class 1B Flammable liquid. For small fires, use dry chemical, carbon dioxide, or 'alcohol-resistant' foam. For large fires, use fog or 'alcohol-resistant' foam. Use water only if other agents are unavailable; EB floats on water and may travel to an ignition source and spread fire. **Unusual Fire or Explosion Hazards:** Burning rate = 5.8 mm/min. Vapors may travel to an ignition source and flash back. Container may explode in heat of fire. EB poses a vapor explosion hazard indoors, outdoors, and in sewers. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Cool container sides with water until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Withdraw immediately if you hear rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Ethylbenzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Reacts vigorously with oxidizers.
Conditions to Avoid: Exposure to heat and oxidizers.
Hazardous Products of Decomposition: Thermal oxidative decomposition of EB can produce acrid smoke and irritating fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list EB as a carcinogen. **Summary of Risks:** Occupational exposure to EB alone is rare since it is usually present together with other solvents. EB is irritating to the eyes, skin, and respiratory tract. Vapor inhalation produces varying degrees of CNS effects depending on concentration. The liquid is absorbed through the skin but vapors are not. 56 to 64% of inhaled ethylbenzene is retained and metabolized. Urinary metabolites following exposure to 23 to 85 ppm for 8 hr are mandelic acid (64%), phenylglyoxylic acid (25%), and methylphenylcarbinol/1-phenyl ethanol (5%). Concurrent exposure to xylene and ethylbenzene causes slower excretion of EB metabolites. Based on the rat LD_{50}, one manufacturer gives 3 to 4 oz. as the lethal dose for a 100 lb person.

Continue on next page

Section 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Skin and CNS diseases and impaired pulmonary function (especially obstructive airway disease). **Target Organs:** Eyes, respiratory system, skin, CNS, blood. **Primary Entry Routes:** Inhalation, skin and eye contact. **Acute ffects:** Vapor inhalation of 200 ppm caused transient eye irritation; 1000 ppm caused eye irritation with profuse watering (tolerance developed apidly); 2000 ppm caused severe and immediate eye irritation and watering, nasal irritation, chest constriction, and vertigo; 5000 ppm was intolerable and caused eye and nose irritation. Inhalation of high concentrations may cause narcosis, cramps, and death due to respiratory paralysis. Skin exposed to pure ethylbenzene for 10 to 15 min absorbed 22 to 33 $mg/cm^2/hr$. Immersion of hand in solutions of 112 & 156 mg/L for 1 hr absorbed 118 & 215.7 $\mu g/cm^2/hr$, respectively. **Chronic Effects:** Repeated skin contact may cause dryness, scaling, and fissuring. Workers chronically exposed to > 100 ppm complained of fatigue, sleepiness, headache, and mild irritation of the eyes and respiratory tract. Repeated vapor inhalation may result in blood disorders, particularly leukopenia (abnormally low level of white blood cells) and lymphocytosis.

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting! Aspiration of even a small amount of EB in vomitus can cause severe damage since its low viscosity and surface tension will cause it to spread over a large area of the lung tissue.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: BEI = mandelic acid in urine (1.5 g/g of creatinine), sample at end of shift at workweeks end. Since this test is not specific, test for EB in expired air for confirmation.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate and ventilate area, deny entry and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable container. Dike far ahead of large spill for later reclamation or disposal. Report any release >1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** If released to soil, EB partially evaporates into the atmosphere, with a half-life of hrs to wks, and some leaches into groundwater, especially in soil with low organic carbon content. Biodegradation occurs with a half-life of 2 days. Some EB may absorb to sediment or bioconcentrate in fish. Evidence points to slow biodegradation in groundwater. In air, it reacts with photochemically produced hydroxyl radicals with a half-life of hrs to 2 days. Additional amounts may be removed by rain. **Ecotoxicity Values:** Shrimp (*Mysidopsis bahia*), LC_{50} = 87.6 mg/L/96 hr; sheepshead minnow (*Cyprinodon variegatus*) LC_{50} = 275 mg/L/96 hr; fathead minnow (*Pimephales promelas*) LC_{50} = 42.3 mg/L/96 hr in hard water & 48.5 mg/L/96 hr in softwater. **Disposal:** A candidate for rotary kiln incineration at 1508 to 2912°F (820 to 1600°C), liquid injection incineration at 1202 to 2912°F (650 to 1600°C), and fluidized bed incineration at 842 to 1796°F (450 to 980°C). Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.21): No. D001

Listed as a SARA Toxic Chemical (40 CFR 372.65)

SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311 (b)(4) & CWA, Sec. 307 (a)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use a powered air-purifying respirator with an appropriate organic vapor cartridge, a supplied-air respirator (SAR), SCBA, or chemical cartridge respirator with appropriate organic vapor cartridge. For < 2000 ppm, use a SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made of Viton or polyvinylchloride to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103) **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, well-ventilated area away from ignition sources and oxidizers. Outside or detatched storage is preferred. If inside, store in a standard flammable liquids cabinet. Containers should have flame-arrester or pressure-vacuum venting. To prevent static sparks, electrically ground and bond all equipment used with ethylbenzene. Install Class 1, Group D electrical equipment. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain levels as low as possible. Purge and ventilate reaction vessels before workers are allowed to enter for maintenance or cleanup. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, skin, blood, and respiratory system.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Ethylbenzene
DOT Hazard Class: 3
ID No.: UN1175
DOT Packing Group: II
DOT Label: Flammable liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60 L
Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: —

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 153, 159, 162, 163, 164, 167, 168, 171, 176, 179

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** D Wilson, CIH; **Medical Review:** W Silverman, MD

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Material Safety Data Sheets Collection:

Sheet No. 830
1,1-Dichloroethane

Issued: 6/92

Section 1. Material Identification

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1,1-Dichloroethane (CH_3CHCl_2) Description: Derived by various methods; by direct chlorination of ethane, as a side product of chloral manufacture, by treating ethylene and chlorine with calcium chloride, by action of phosphorus chloride on acetaldehyde, and the reaction of hydrogen chloride and vinyl chloride at 20 to 55 °C in the presence of an aluminum, ferric, or zinc chloride catalyst. Found as an air contaminant in submarines and space craft. Its largest industrial use is in the production of 1,1,1-trichloroethane. Also used as a cleansing agent, degreaser, solvent for plastics, oils, and fats, grain fumigant, chemical intermediate; in insecticide sprays, rubber cementing, fabric spreading, paint and varnish removers, in ore flotation, vinyl chloride production, and as a coupling agent in anti-knock gasoline. Formerly used as an anesthetic.

Other Designations: CAS No. 75-34-3; assymetrical dichloroethane; chlorinated hydrochloric ether; ethylidene chloride; ethylidene dichloride.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: 1,1-Dichloroethane is volatile and highly flammable. It is irritating to the eyes and respiratory tract and inhalation of high concentrations causes an anesthetic effect.

R 1
I 3
S 2
K 4

NFPA
3
2 0
-

HMIS
H 2
F 3
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

1,1-Dichloroethane, reagent grade (99.7%). Impurities consist of ethyl chloride (0.02%), trichloroethylene (0.08%), butylene oxide (0.08%), ethylene dichloride (0.01%), and unknown (0.14%).

1991 OSHA PEL
8-hr TWA: 100 ppm (400 mg/m^3)

1990 IDLH Level
4000 ppm

1990 NIOSH REL
8-hr TWA: 100 ppm (400 mg/m^3)

1991-92 ACGIH TLVs*
TWA: 200 ppm (810 mg/m^3)
STEL: 250 ppm (1010 mg/m^3)

1990 DFG (Germany) MAK
100 ppm (400 mg/m^3)
Half-life: < 2hr
Peak Exposure Limit: 200 ppm/30 min. average value/maximum of 4 peaks per shift

1985-86 Toxicity Data†
Mouse, oral, TD_{Lo}: 185 g/kg administered intermittently for 78 wk produced uterine tumors.
Rat, oral, LD_{50}: 725 mg/kg; toxic effects not yet reviewed.‡
Rat, inhalation, TC_{Lo}: 6000 ppm/7 hr administered during 6 to 15 days of pregnancy caused developmental abnormalities of the musculoskeletal system.

* Notice of intended change to 100 ppm/405 mg/m^3.
†See NIOSH, *RTECS* (KI0175000), for additional reproductive, tumorigenic and toxicity data.
‡ Considered a possible error since subsequent studies at higher concentrations failed to produce comparative results.(133)

Section 3. Physical Data

Boiling Point: 135 °F (57.3 °C)
Melting Point: -143 °F (-96.98 °C)
Vapor Pressure: 230 mm Hg at 77 °F (25 °C)
Saturated Vapor Density (air = 1.2 kg/m^3 or 0.075 lbs/ft^3): 2.076 kg/m^3 or 0.129 lbs/ft^3
Refraction Index: 1.4166 at 68 °F (20 °C)
Surface Tension: 24.75 dyne/cm at 68 °F (20 °C)
Molecular Weight: 98.97
Specific Gravity: 1.174 at 68 °F (20/4 °C)
Water Solubility: Slightly, 0.5%
Other Solubilities: Very soluble in alcohol and ether, soluble in acetone, benzene, and fixed and volatile oils.
Relative Evaporation Rate (BuAc=1): 11.6
Odor Threshold: 49 to 1359 ppm; odor is not sufficient to warn against overexposure

Appearance and Odor: Colorless, mobile, oily liquid with a chloroform odor and a saccharin taste.

Section 4. Fire and Explosion Data

Flash Point: 17 °F (-8.33 °C) CC*	**Autoignition Temperature:** 856 °F (493 °C)	**LEL:** 5.6% v/v	**UEL:** 11.4% v/v

Extinguishing Media: A Class 1B Flammable Liquid. For small fires, use dry chemical, carbon dioxide (CO_2), or "alcohol-resistant" foam. For large fires, use fog or "alcohol-resistant" foam. Water may be ineffective unless used as a "blanket".

Unusual Fire or Explosion Hazards: Vapors may travel to an ignition source and flash back. Container may explode in heat of fire.

Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide only limited protection. If possible without risk, move container from fire area. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw from area and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers (explosion) or waterways.

* 22 °F (-5.5 °C), OC(148)

Section 5. Reactivity Data

Stability/Polymerization: 1,1-Dichloroethane is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Incompatible with strong oxidizers and forms acetaldehyde in contact with caustics. 1,1-Dichloroethane will attack some forms of plastics, rubber, and coatings.

Conditions to Avoid: Exposure to heat and ignition sources and contact with incompatibles.

Hazardous Products of Decomposition: Thermal oxidative decomposition of 1,1-dichloroethane can produce carbon dioxide (CO_2), irritating hydrogen chloride (HCl) and toxic phosgene ($COCl_2$) fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list 1,1-dichloroethane as a carcinogen. However, the National Cancer Institute has recommended caution due to analogy to other chloroethanes such as 1,2-dichlorothane which are shown to cause cancer in animals.

Summary of Risks: 1,1-Dichloroethane is irritating to the eyes and respiratory system. It causes varying degrees of central nervous system (CNS) disturbance depending on the concentration and duration of exposure. Liver and kidney toxicity is controversial.

Continue on next page

Section 6. Health Hazard Data, *continued*

Some sources report that severe, acute exposures can cause damage, some quote recent detailed chronic studies which indicate little capacity for damage; still others refute the possibility of acute damage even from very high exposures. In reviewing the data it appears likely that chronic exposure will not cause kidney or liver damage but acute exposures to high concentrations may. There is definite evidence that 1,1-dichloroethane produces liver damage in monkeys, dogs, and rats when exposed to 98 ppm/90 days. It is also unclear whether or not 1,1-dichloroethane is absorbed through the skin. There are reports of absorption (although not in toxic amounts) and others claiming there is no absorption. Given this controversial data it is best to take precautions as if skin absorption, and liver and kidney damage were proven to occur. **Medical Conditions Aggravated by Long-term Exposure:** Chronic respiratory and skin disease, neurological damage, and liver or kidney disorders. **Target Organs:** Skin, CNS, liver, kidney. **Primary Entry Routes:** Inhalation and skin contact. **Acute Effects:** Inhalation symptoms include eye, nose, and throat irritation, headache, dizziness, coughing, staggering, disturbed vision, irregular heartbeat (can result in sudden death), unconsciousness, narcosis, coma, and death due to cardiac or respiratory failure. There is the risk of pulmonary edema (fluid in lungs). Skin contact is irritating and causes defatting, redness and swelling. Vapor contact with the eyes causes irritation, watering eyes and lid inflammation. Splashes to the eyes produces a burning sensation, watering, and lid inflammation. **Chronic Effects:** Repeated skin contact can cause a rash and scaliness. Repeated inhalation may have neurological effects.

FIRST AID *Emergency personnel should protect against contamination.*

Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do *not* allow victim to rub or keep eyes tightly shut. Immediately consult an ophthamlologist. **Skin:** 1,1-Dichloroethane vaporizes easily and poses an inhalation hazard as well. *Quickly and carefully* remove contaminated clothing; *1,1-dichloroethane is flammable!* Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. After vomiting, give 2 tbsp activated charcoal in 8 oz water to drink.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Proper ventilation is the main treatment for acute exposure. Be prepared to support respiration if needed. Monitor liver function studies, urine analysis, and creatinine with acute and chronic exposure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against inhalation and skin contact. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and using nonsparking tools, place in a suitable container. For large spills, dike far ahead of liquid spill for disposal or reclamation. Do not allow 1,1-dichloroethane to enter confined areas such as a sewer because of potential explosion. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Degradation:** In soil, 1,1-dichloroethane volatilizes rapidly but may leach into groundwater. In water it will volatilize from a pond, lake, or river with a half-life of 6 to 9 days, 5 to 8 days, and 24 to 32 hr, respectively. In the atmosphere it will degrade by reaction with photochemically produced hydroxyl radicals with a 62 day half-life. It may also be carried back to soil via rain.

Ecotoxicity Values: *Artemia salina*, brine shrimp, TLm 320 mg/L/24 hr; *Lagodon rhomboides*, pinperch, TLm 160 mg/L/24 hr; *Poecilia reticulata*, guppies, LC_{50} 202 ppm/7 days.

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U076
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)
[* per RCRA, Sec. 3001 & CWA, Sec. 307(a)]

OSHA Designations Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH/MSHA-approved respirator. For < 1000 ppm, use any supplied-air respirator or SCBA. For < 2500 ppm, use any supplied-air respirator operated in a continuous flow mode. For < 4000 ppm, use any supplied-air respirator or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent repeated or prolonged skin contact. Polyvinyl alcohol is recommended as suitable material for PPG. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103) **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Thoroughly decontaminate personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incompatibles (Sec. 5). Label containers to indicate the contents' high flammability. Periodically inspect containers for cracks and leaks. To prevent static sparks, electrically ground and bond all equipment used in 1,1-dichloroethane manufacture, use, storage, transfer, and shipping.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers emphasizing the skin, CNS, liver, and kidney. Educate workers about the hazards of 1,1-dichloroethane and the necessary precautions to reduce or prevent exposure.

Transportation Data (49 CFR 172.102)

IMO Shipping Name: 1,1-Dichloroethane
IMO Hazard Class: 3.2
ID No.: UN2362
IMO Label: Flammable Liquid
IMDG Packaging Group: II

MSDS Collection **References:** 73, 89, 101, 103, 126, 127, 131, 132, 133, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

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Material Safety Data Sheet Collection

Methylene Chloride **MSDS No. 310**

Date of Preparation: 11/77 Revision: G, 6/94

Section 1 - Chemical Product and Company Identification

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Product/Chemical Name: Methylene Chloride
Chemical Formula: CH_2Cl_2
CAS No.: 75-09-2
Synonyms: DCM, dichloromethane, Freon 30, methylene bichloride, methylene dichloride, NCI-C50102, Solmethine
Derivation: Produced by chlorination of methane.
General Use: Used as a solvent for cellulose acetate, adhesives, food processing, and pharmaceuticals; in degreasing and cleaning fluids, paint and varnish removers, decaffeination of coffee, in propellant mixtures for aerosols; as a blowing agent in foams, dewaxing agent, component of fire extinguishing compound, chemical intermediate, low temperature heat-transfer medium, and as a fumigant. Formerly used as an anesthetic.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Methylene chloride, ca < 100 % vol
Trace Impurities: Stabilizers may be added such as: amines, 4-cresol, hydroquinone, methanol, 2-methyl-2-ene, 1-naphthol, nitromethane + 1,4-dioxane, phenol, resorcinol, and thymol.

OSHA PELs
8-hr TWA: 500 ppm*
Ceiling: 1000 ppm (2000 ppm 5 min. peak in any 2 hr period)

ACGIH TLV
TWA: 50 ppm (174 mg/m^3)

NIOSH REL
Carcinogen; lowest feasible concentration.

IDLH Level
Ca [5000 ppm]

DFG (Germany) MAK
TWA: 100 ppm (360 mg/m^3)
Category II: Substances with systemic effects
Onset of Effect: < 2 hr
Half-life: 2 hr to shift length

Peak Exposure Limit:
500 ppm, 30 min. average value, 2/shift

*Proposed change to: 25 ppm (TWA); 125 ppm (STEL)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Methylene chloride is a colorless, volatile liquid with a sweet odor. It is irritating to the eyes, skin, and respiratory tract. At high concentrations it can cause narcosis (unconsciousness). Methylene chloride is metabolized to carbon monoxide in the body which contributes to much of its toxicity. It can form flammable mixtures with air (forming toxic phosgene when burned) and becomes explosive when mixed with oxygen.

Wilson Risk Scale

R	1
I	3
S	2*
K	1

*Skin absorption

HMIS

H	2*
F	1
R	0

*Chronic Effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, skin and eye contact.
Target Organs: Eyes, skin, central nervous system (CNS), cardiovascular system (CVS), blood.
Acute Effects

Inhalation: Symptoms include headache, giddiness, irritability, nausea, stupor, numbness and tingling of limbs, fatigue, anemia and polymorphonuclear leukocytosis, digestive disturbances, and neurasthenic disorders (emotional and psychic disorders characterized by easy fatigue, lack of motivation, feelings of inadequacy, and psychosomatic symptoms). Many symptoms are attributed to the metabolism of methylene chloride to carbon monoxide in the body. The carbon monoxide forms carboxyhemoglobin in the blood, which unlike hemoglobin, does not have the ability to carry oxygen. This lack of oxygen leads to CNS and CVS problems. However, CNS effects *have* been seen in persons without a significantly elevated blood carbon monoxide level.

Eye: Exposure to vapors produces irritation, tearing, and conjunctivitis. Direct contact with the liquid causes severe pain, but permanent damage does not occur.

Skin: Contact is irritating and can be painful (burns) if confined to skin (i.e. trapped under gloves or clothing). Methylene chloride can be absorbed through the skin to cause systemic effects.

Ingestion: Expected to cause gastrointestinal irritation, nausea, vomiting, and systemic effects (see inhalation).

Carcinogenicity: IARC (Class 2B, possibly carcinogenic to humans with limited human and sufficient animal evidence), NTP (Class 2, reasonably anticipated to be a carcinogen with limited human and sufficient animal evidence), ACGIH (TLV-A2, suspected human carcinogen as agent is carcinogenic in animals at dose levels considered relevant to worker exposure but insufficient epidemiological studies are available to confirm an increased cancer risk), NIOSH (Class X, carcinogen defined without further categorization), EPA (Class B2, sufficient evidence from animal studies and inadequate or no data from epidemiologic studies), and DFG (MAK B, justifiably suspected of having carcinogenic potential).

Medical Conditions Aggravated by Long-Term Exposure: Skin and cardiovascular disorders.

Chronic Effects: Repeated skin contact can cause dermatitis. Liver disease has been reported. *Case Reports*: 1 yr exposure caused toxic encephalopathy (toxicity of the brain) with audio and visual delusions and hallucinations; 3 yr exposure to 300 to 1000 ppm caused memory loss, intellectual impairment, and balance disturbances.

Other: Methylene chloride will cross the placenta. The estimated lethal dose is 0.5 to 5 mL/kg. Although methylene chloride has a distinct sweetish odor, it is not recognized at levels low enough to protect from overexposure.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air, administer 100% humidified, supplemental oxygen and support breathing.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult an ophthalmologist if pain or irritation persist.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting with Ipecac syrup. If vomiting does not occur, the decision to perform gastric lavage should be made.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Lethal blood level = 280 mg/L. Biological monitoring: carbon monoxide in expired air (nonsmokers only). Recently, methylene chloride concentrations in urine have been found to correlate well to concentrations in air.

Section 5 - Fire-Fighting Measures

Flash Point: Methylene chloride does not have a flash point by standard tests. However, it does form flammable mixtures with air.

Autoignition Temperature: 1033 °F (556 °C)

LFL: 12% v/v

UFL: 19% v/v

LEL: 15.5% (in oxygen)

UEL: 66.4% (in oxygen)

Extinguishing Media: For small fires, use dry chemical or carbon dioxide. For large fires, use water spray, fog, or regular foam.

Unusual Fire or Explosion Hazards: Creates an explosion hazard if allowed to enter a confined space. Container may explode in heat of fire.

Hazardous Combustion Products: Hydrogen chloride, carbon monoxide and phosgene.

Fire-Fighting Instructions: Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel need to protect against inhalation and skin/eye contact.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material.

Large Spills

Containment: Dike far ahead of spill for later reclamation or disposal. Do not release into sewers or waterways.

Cleanup: Damp mop any residue.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not use near ignition sources. Wear appropriate PPE. Do not use plastic or rubber hose for unloading trucks or tank cars unless the materials have been tested and approved for methylene chloride service.

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. Indoor storage tanks should have vents piped outdoors to prevent vapors from escaping into work areas. Prevent moisture from entering tanks.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Do not use closed circuit rebreathing systems employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. To prevent static sparks, electrically ground and bond all equipment used with and around methylene chloride.

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on skin, liver, CNS, CVS, and blood. A complete blood count should be performed and carboxyhemoglobin levels should be determined periodically. Any level above 5% should prompt investigation of employee and workplace to determine the cause (smokers will already have an increased level of carboxyhemoglobin and are at increased risk). Use less hazardous solvents where possible.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use any SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyvinyl alcohol and Viton laminated with Neoprene are suitable materials for PPE. Natural rubber, synthetic rubbers, and polyvinyl chloride *do not* provide protection against methylene chloride. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove methylene chloride from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using methylene chloride, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance and Odor: Colorless; volatile with a sweet odor.

Odor Threshold: 205 to 307 ppm

Vapor Pressure: 350 mm Hg at 68 °F (20 °C); 440 mm Hg at 77 °F (25 °C)

Saturated Vapor Density (Air = 1.2 kg/m^3, 0.075 lb/ft^3): 2.256 kg/m^3 or 0.141 lb/ft^3

Formula Weight: 84.9

Specific Gravity (H_2O=1, at 4 °C): 1.33 at 15 °C

Water Solubility: 2%

Octanol/Water Partition Coefficient: log Kow = 1.25

Other Solubilities: Soluble in alcohol, acetone, chloroform, carbon tetrachloride, ether, and dimethylformamide.

Boiling Point: 104 °F (40 °C)

Freezing Point: -142 °F (-97 °C)

Viscosity: 0.430 cP at 68 °F (20 °C)

Refractive Index: 1.4244 at 68 °F (20 °C/D)

Surface Tension: 0.5 to 2.3 g/L (*in oxygen*)

Bulk Density: 11.07 lb/gal at 68 °F (20 °C)

Ionization Potential: 11.32 eV

Critical Temperature: 473 °F (245 °C)

Critical Pressure: 60.9 atm

Section 10 - Stability and Reactivity

Stability: Methylene chloride is stable at room temperature in closed containers under normal storage and handling conditions. Tends to carbonize when vapor contacts steel or metal chlorides at high temperatures 572 to 842 °F (300 to 450 °C).

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Include aluminum, lithium, sodium, aluminum bromide, azides, dimethyl sulfoxide + perchloric acid, N-methyl-N-nitrosourea + potassium hydroxide, sodium-potassium alloy, potassium *t*-butoxide, dinitrogen pentoxide, dinitrogen tetraoxide, nitric acid, and oxidizers. Methylene chloride will attack some forms of plastic, rubber, and coatings. Corrodes iron, some stainless steel, copper, and nickel.

Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.

Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide and phosgene.

Section 11 - Toxicological Information

Toxicity Data:*

Eye Effects:

Rabbit, eye: 162 mg caused moderate irritation.

Skin Effects:

Rabbit, skin: 810 mg/24 hr caused severe irritation.

Carcinogenicity:

Rat, inhalation: 3500 ppm/2 yr (intermittently) caused endocrine tumors.

Mutagenicity:

Rat, oral: 1275 mg/kg caused DNA damage.

Human, fibroblast: 5000 ppm/1 hr (continuously) caused DNA inhibition.

Acute Inhalation Effects:

Human, inhalation, TC_{Lo}: 500 ppm/1 yr (intermittently) caused altered sleep time, somnolence, and change in heart rate.

Human, inhalation, TC_{Lo}: 500 ppm/8 hr caused euphoria.

Acute Oral Effects:

Human, oral, LD_{Lo}: 357 mg/kg caused somnolence, paresthesia, and convulsions or effect on seizure threshold.

Rat, oral, LD_{50}: 1600 mg/kg

Multiple Dose Toxicity Data:

Rat, inhalation: 8400 ppm/6 hr/13 weeks (intermittently) caused changes in liver weight.

* See NIOSH, *RTECS* (PA8050000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: *Pimephales promelas* (fathead minnow), LC_{50} = 193 mg/L/96 hr; *Lepomis macrochirus* (bluegill), LC_{50} = 230 mg/L/24 hr; *Poecilia reticulata* (guppies), LC_{50} = 294 ppm/14 days. Cytotoxic to plants.

Environmental Degradation: In air, methylene chloride degrades by reaction with photochemically-produced hydroxyl radicals (half-life = a few months) but does not undergo *direct* photolysis. Degradation products include carbon monoxide, carbon dioxide, and phosgene. In water, it is removed primarily by evaporation (est. half-life = 3 to 5.6 hr under moderate mixing conditions). Some may biodegrade but it is not expected to adsorb to sediment or bioconcentrate. If released to soil most methylene chloride will rapidly evaporate. Some may leach through soil. Methylene chloride will adsorb to peat moss but not to sand.

Section 13 - Disposal Considerations

Disposal: Pour on sand or earth at a safe distance/location from occupied areas and allow to evaporate (most is transformed to carbon monoxide). A good candidate for liquid injection, rotary kiln, or fluidized bed incineration. Investigate biodegradation: methylene chloride is reported to completely biodegrade under aerobic conditions with sewage seed or activated sludge between 6 hrs. and 7 days. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Dichloromethane
Shipping Symbols: –
Hazard Class: 6.1
ID No.: UN1593
Packing Group: III
Label: Keep away from food
Special Provisions (172.102): N36, T13

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.203
c) Bulk Packaging: 173.241

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 60 L
b) Cargo Aircraft Only: 220 L

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: –

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste Number (40 CFR 261.33): U080
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001 and CWA, Sec. 307(a)
CERCLA Reportable Quantity (RQ), 1000 lb (454 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 1, 8, 73, 103, 124, 132, 136, 148, 149, 153, 159, 187, 190, 192, 194, 195

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Industrial Hygiene Review .... S Gilson, CIH
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Material Safety Data Sheets Collection:

Sheet No. 312
Trichloroethylene

Issued: 7/79 **Revision: F, 9/92**

Section 1. Material Identification

Trichloroethylene (C_2HCl_3) Description: Derived by treating tetrachloroethane with lime or other alkali in the presence of water, or by thermal decomposition of tetrachloroethane followed by steam distillation. Stabilizers such as epichlorohydrin, isobutanol, carbon tetrachloride, chloroform, benzene, or pentanol-2-triethanolamine are then added. Used as a degreasing solvent in electronics and dry cleaning, a chemical intermediate, a refrigerant and heat-exchange liquid, and a diluent in paint and adhesives; in oil, fat, and wax extraction and in aerospace operations (flushing liquid oxygen). Formerly used as a fumigant (food) and anesthetic (replaced due to its hazardous decomposition in closed-circuit apparatus).

Other Designations: CAS No. 79-01-6; acetylene trichloride; Algylen; Anamenth; Benzinol; Cecolene; Chlorylen; Dow-Tri; ethylene trichloride; Germalgene; Narcogen; Triasol; trichloroethene; TCE; 1,1,3-trichloroethylene.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

R 1
I 2
S 2*
K 3
* Skin absorption

NFPA

HMIS
H 2†
F 2
R 0
PPE‡
† Chronic Effects
‡ Sec. 8

Cautions: TCE is irritating and toxic to the central nervous system (CNS). Inhalation of high concentrations have lead to death due to ventricular fibrillation. Chronic exposure may lead to heart, liver, and kidney damage. The liquid is absorbed through the skin. Although it has a relatively low flash point, TCE burns with difficulty.

Section 2. Ingredients and Occupational Exposure Limits

Trichloroethylene, < 100% [contains stabilizers (Sec. 1)].

1991 OSHA PELs
8-hr TWA: 50 ppm (270 mg/m^3)
15-min STEL: 200 ppm (1080 mg/m^3)

1990 IDLH Level
1000 ppm

1990 NIOSH REL
10-hr TWA: 25 ppm (~135 mg/m^3)

1992-93 ACGIH TLVs
TWA: 50 ppm (269 mg/m^3)
STEL: 200 ppm (1070 mg/m^3)

1990 DFG (Germany) MAK
Ceiling: 50 ppm (270 mg/m^3)
Category II: Substances with systemic effects
Half-life: 2 hr to shift length
Peak Exposure Limit: 250 ppm, 30 min average value; 2 peaks/shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 160 ppm/83 min caused hallucinations and distorted perceptions.
Human, lymphocyte: 5 mL/L caused DNA inhibition.
Rabbit, skin: 500 mg/24 hr caused severe irritation.
Rabbit, eye: 20 mg/24 hr caused moderate irritation.
Mouse, oral, TD_{Lo}: 455 mg/kg administered intermittently for 78 weeks produced liver tumors.

* See NIOSH, *RTECS* (KX4550000), for additional irritation, mutation, reproductive, tumorigenic and toxicity data.

Section 3. Physical Data

Boiling Point: 189 °F (87 °C)
Freezing Point: -121 °F (-85 °C)
Viscosity: 0.0055 Poise at 77 °F (25 °C)
Molecular Weight: 131.38
Density: 1.4649 at 20/4 °C
Refraction Index: 1.477 at 68 °F (20 °C/D)
Odor Threshold: 82 to 108 ppm *(not an effective warning)*
Vapor Pressure: 58 mm Hg at 68 °F (20 °C); 100 mm Hg at 32 °F (0 °C)
Saturated Vapor Density (Air = 0.075 lbs/ft^3; 1.2 kg/m^3): 0.0956 lbs/ft^3; 1.53 kg/m^3
Water Solubility: Very slightly soluble; 0.1% at 77 °F (25 °C)
Other Solubilities: Highly soluble in organic solvents (alcohol, acetone, ether, carbon tetrachloride, & chloroform) and lipids.
Surface Tension: 29.3 dyne/cm

Appearance and Odor: Clear, colorless (sometimes dyed blue), mobile liquid with a sweet chloroform odor.

Section 4. Fire and Explosion Data

Flash Point: 90 °F (32 °C) CC	Autoignition Temperature: 788 °F (420 °C)	LEL: 8% (25 °C); 12.5% (100 °C)	UEL: 10% (25 °C); 90% (100 °C)

Extinguishing Media: A Class 1C Flammable Liquid. Although it has a flash point of 90 °F, TCE burns with difficulty. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** Vapor/air mixtures may explode when ignited. Container may explode in heat of fire. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection against TCE. Apply cooling water to sides of container until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: TCE slowly decomposes in the presence of light and moisture to form corrosive hydrochloric acid. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Include alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium, sodium, potassium, and titanium), epoxides, and oxidants (nitrogen tetraoxide, perchloric acid). Contact with 1-chloro-2,3-epoxy propane or the mono and di 2,3-epoxypropyl ethers of 1,4-butanediol + 2,2-bis-4(2',3'-epoxypropoxy)-phenylpropane can, in the presence of catalytic quantities of halide ions, cause dehydrochlorination of TCE to explosive dichloroacetylene. **Conditions to Avoid:** Exposure to light, moisture, ignition sources, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of TCE (above 300 °C) or exposure to ultraviolet light can produce carbon dioxide (CO_2) and toxic dichloro acetylene (explosive), chlorine, hydrogen chloride, and phosgene gas.

Section 6. Health Hazard Data

Carcinogenicity: The following agencies have rated TCE's carcinogenicity: IARC (Class 3, limited animal evidence & insufficient human data), Germany MAK (Class B, justifiably suspected of having carcinogenic potential), & NIOSH (Class X, carcinogen defined with no further categorization). **Summary of Risks:** TCE vapor is irritating to the eyes, nose, and respiratory tract and inhalation of high concentrations can lead to severe CNS effects such as unconsciousness, ventricular arrythmias, and death due to cardiac arrest. Mild liver dysfunction was also seen at levels high enough to produce CNS effects. Contact with the liquid is irritating to the skin and can lead to dermatitis by defatting the skin. Chronic toxicity is observed in the victims increasing intolerance to alcohol characterized by 'degreasers flush', a transient redness of the face, trunk, and arms. The euphoric effect of TCE has led to craving, and habitual sniffing of its vapors.

Continue on next page

Section 6. Health Hazard Data, *Continued*

TCE crosses the placental barrier and thus exposes the fetus (any effects are yet unknown). There are increased reports of menstrual disorders in women workers and decreased libido in males at exposures high enough to cause CNS effects. TCE is eliminated unchanged in expired air and as metabolites (trichloroacetic acid & trichloroethanol) in blood and urine. **Medical Conditions Aggravated by Long-Term Exposure:** Disorders of nervous system, skin, heart, liver, and kidney. **Target Organs:** Respiratory, central & peripheral nervous, and cardiovascular (heart) systems, liver, kidney, and skin. **Primary Entry Routes:** Inhalation, skin and eye contact, and ingestion (rarely). **Acute Effects:** Vapor inhalation can cause eye, nose, and throat irritation, nausea, blurred vision, overexcitement, headache, drunkenness, memory loss, irregular heartbeat (resulting in sudden death), unconsciousness, and death due to cardiac failure. Skin contact with the liquid can cause dryness and cracking and prolonged exposure (generally if the victim is unconscious) can cause blistering. Eye contact can cause irritation and watering, with corneal epithelium injury in some cases. Ingestion of the liquid can cause lip, mouth, and gastrointestinal irritation, irregular heartbeat, nausea and vomiting, diarrhea (possibly blood-stained), drowsiness, and risk of pulmonary edema (fluid in lungs). **Chronic Effects:** Effects may persist for several weeks or months after repeated exposure. Symptoms include giddiness, irritability, headache, digestive disturbances, mental confusion, intolerance to alcohol (degreasers flush), altered color perception, loss or impairment of sense of smell, double vision, and peripheral nervous system function impairment including persistent neuritis, temporary loss of sense of touch, and paralysis of the fingers from direct contact with TCE liquid.

FIRST AID **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. Do not give milk, as its fat content (TCE is lipid soluble) may inhance gastrointestinal absorption of TCE. **Note to Physicians:** TCE elimination seems to be triphasic with half lives at 20 min, 3 hr, and 30 hr. Some success is seen in treating patients with propranolol, atropine, and disulfiram. Monitor urine and blood (lethal level = 3 to 110 µg/mL) metabolites. BEI = 100 mg/g creatinine (trichloroacetic acid) in urine, *sample at end of workweek.* BEI = 4 mg/L (trichloroethanol) in blood, *sample at end of shift at end of the workweek.* These tests are not 100% accurate indicators of exposure; monitor TCE in expired air as a confirmatory test.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable container for later disposal. For large spills, flush to containment area where density stratification will form a bottom TCE layer which can be pumped and containerized. Report any release in excess of 1000 lbs. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Bluegill sunfish, LC_{50} = 44,700 µg/L/96 hr; fathead minnow (*Pimephales promelas*), LC_{50} = 40.7 mg/L/96 hr. **Environmental Degradation:** In air, TCE is photooxidized with a half-life of 5 days and reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water it evaporates rapidly in minutes to hours. TCE rapidly evaporates and may leach since it does not absorb to sediment. **Soil Absorption/Mobility:** TCE has a Log K_{oc} of 2, indicating high soil mobility. **Disposal:** Waste TCE can be poured on dry sand and allowed to vaporize in isolated location, purified by distillation, or returned to supplier. A potential candidate for rotary kiln incineration at 1508 to 2912 °F (820 to 1600 °C) with an acid scrubber to remove halo acids. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a RCRA Hazardous Waste (40 CFR 261.33 & 261.31): No. U228 & F002 (*spent solvent*)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001, CWA Sec. 311 (b)(4), & CWA Sec. 307 (a)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear chemical safety goggles (cup-type or rubber framed, equipped with impact-resistant glass), per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. At any detectable concentration, wear a SCBA with a full facepiece operated in pressure demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made from Viton or Neoprene to prevent skin contact. *Do not* use natural rubber or polyvinyl chloride (PVC). **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in steel drums, in a cool, dry, well-ventilated area away from sunlight, heat, ignition sources, and incompatibles (Sec. 5). Store large quantities in galvanized iron, black iron, or steel containers; small amounts in dark (amber) colored glass bottles. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Design processes so that the operator is not directly exposed to the solvent or its vapor. Do not use open electric heaters, high-temperature processes, arc-welding or open flames in TCE atmospheres. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on skin, respiratory, cardiac, central and peripheral nervous systems, and liver and kidney function. Employ air and biological monitoring (BEIs). Instruct employees on safe handling of TCE.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Trichloroethylene
DOT Hazard Class: 6.1
No.: UN1710
DOT Packing Group: III
DOT Label: Keep Away From Food
DOT Special Provisions (172.102): N36, T1

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.203
c) Bulk Packaging: 173.241

Quantity Limitations
a) Passenger Aircraft or Railcar: 60L
b) Cargo Aircraft Only: 220L

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: 40

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 175, 176, 180.

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** D Wilson, CIH; **Medical Review:** AC Darlington, MD

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Material Safety Data Sheets Collection:

Sheet No. 317
Toluene

Issued: 8/79 Revision: E, 9/92 Errata: 2/94

Section 1. Material Identification

Toluene ($C_6H_5CH_3$) Description: Derived from petroleum i.e., dehydrogenation of cycloparaffin fractions followed by the aromatization of saturated aromatic hydrocarbons or by fractional distillation of coal-tar light oil and purified by rectification. Used widely as a solvent (replacing benzene in many cases) for oils, resins, adhesives, natural rubber, coal tar, asphalt, pitch, acetyl celluloses, cellulose paints and varnishes; a diluent for photogravure inks, raw material for organic synthesis (benzoyl & benzilidene chlorides, saccharine, TNT, toluene diisocyanate, and many dyestuffs), in aviation and high octane automobile gasoline, as a nonclinical thermometer liquid and suspension solution for navigational instruments.

Other Designations: CAS No. 108-88-3, Methacide, methylbenzene, methylbenzol, phenylmethane, toluol, Tolu-sol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Toluene is an eye, skin, and respiratory tract irritant becoming narcotic at high centrations. Liver and kidney damage has occurred. Pregnant women chronically exposed to toluene have shown teratogenic effects. Toluene is highly flammable.

R 1
I 3
S 2*
K 3
* Skin absorption

NFPA

HMIS
H 2- Chronic effects
F 3
R 0
PPE-Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Toluene, < 100%; may contain a small amount of benzene (~ 1%), xylene, and nonaromatic hydrocarbons.

1991 OSHA PELs
8-hr TWA: 100 ppm (375 mg/m³)
15-min STEL: 150 ppm (560 mg/m³)

1990 IDLH Level
2000 ppm

1990 NIOSH RELs
TWA: 100 ppm (375 mg/m³)
STEL: 150 ppm (560 mg/m³)

1992-93 ACGIH TLV (Skin)
TWA: 50 ppm (188 mg/m³)

1990 DFG (Germany) MAK*
TWA: 100 ppm (380 mg/m³)
Half-life: 2 hr to end of shift
Category II: Substances with systemic effects
Peak Exposure Limit: 500 ppm, 30 min average value, 2/shift

1985-86 Toxicity Data†
Man, inhalation, TC_{Lo}: 100 ppm caused hallucinations, and changes in motor activity and changes in psychophysiological tests.
Human, oral, LD_{Lo}: 50 mg/kg; toxic effects not yet reviewed
Human, eye: 300 ppm caused irritation.
Rat, oral, LD_{50}: 5000 mg/kg
Rat, liver: 30 µmol/L caused DNA damage.

* Available information suggests damage to the developing fetus is probable.
†See NIOSH, *RTECS* (XS5250000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 232 °F (110.6 °C)
Melting Point: -139 °F (-95 °C)
Molecular Weight: 92.15
Density: 0.866 at 68 °F (20/4 °C)
Surface Tension: 29 dyne/cm at 68 °F (20 °C)
Viscosity: 0.59 cP at 68 °F (20 °C)
Refraction Index: 1.4967 at 20 °C/D
Water Solubility: Very slightly soluble, 0.6 mg/L at 68 °F (20 °C)
Other Solubilities: Soluble in acetone, alcohol, ether, benzene, chloroform, glacial acetic acid, petroleum ether, and carbon disulfide.
Vapor Pressure: 22 mm Hg at 68 °F (20 °C); 36.7 mm Hg at 86 °F (30 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.0797 lb/ft³ or 1.2755 kg/m³
Odor Threshold (range of all referenced values): 0.021 to 69 ppm

Appearance and Odor: Colorless liquid with a sickly sweet odor.

Section 4. Fire and Explosion Data

Flash Point: 40 °F (4.4 °C) CC	**Autoignition Temperature:** 896 °F (480 °C)	**LEL:** 1.27% v/v	**UEL:** 7.0% v/v

Extinguishing Media: Toluene is a Class 1B flammable liquid. To fight fire, use dry chemical carbon dioxide, or 'alcohol-resistant' foam. Water spray may be ineffective as toluene floats on water and may actually spread fire. **Unusual Fire or Explosion Hazards:** Concentrated vapors are heavier than air and may travel to an ignition source and flash back. Container may explode in heat of fire. Toluenes' burning rate = 5.7 mm/min and its flame speed = 37 cm/sec. Vapor poses an explosion hazard indoors, outdoors, and in sewers. May accumulate static electricity. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection. Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire because a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Toluene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can't occur. **Chemical Incompatibilities:** Strong oxidizers, concentrated nitric acid, nitric acid + sulfuric acid, dinitrogen tetroxide, silver perchlorate, bromine trifluoride, tetranitromethane, and 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione. **Conditions to Avoid:** Contact with heat, ignition sources, or incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of toluene can produce carbon dioxide, and acrid, irritating smoke.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list toluene as a carcinogen. **Summary of Risks:** Toluene is irritating to the eyes, nose, and respiratory tract. Inhalation of high concentrations produces a narcotic effect sometimes leading to coma as well as liver and kidney damage. 93% of inhaled toluene is retained in the body of which 80% is metabolized to benzoic acid, then to hippuric acid and excreted in urine. The remainder is metabolized to *o*-cresol and excreted or exhaled unchanged. Toluene metabolism is inhibited by alcohol ingestion and is synergistic with benzene, asphalt fumes, or chlorinated hydrocarbons (i.e. perchloroethylene). Toluene is readily absorbed through the skin at 14 to 23 mg/cm²/hr. Toluene is absorbed quicker during exercise than at rest and appears to be retained longer in obese versus thin victims; presumably due to its lipid solubility. There is inconsistent data on toluene's ability to damage bone marrow; chronic poisoning has resulted in anemia and leucopenia with biopsy showing bone marrow hypo-plasia. These reports are few and some authorities argue that the effects may have been due to benzene contaminants. Chronic inhalation during pregnancy has been associated with teratogenic effects on the fetus including microcephaly, CNS dysfunction, attentional deficits, developmental delay + language impairment, growth retardation, and physical defects including a small midface, short palpebral fissures, with deep-set eyes, low-set ears, flat nasal bridge with a small nose, micrognathia, and blunt fingertips. There is some evidence that toluene causes an autoimmune illness in which the body produces antibodies that cause inflammation of its own kidney.

Continue on next page

ection 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Alcoholism and CNS, kidney, skin, or liver disease. **Target Organs:** CNS, liver, kidney, skin. **Primary Entry Routes:** Inhalation, skin contact/absorption. **Acute Effects:** Vapor inhalation causes respiratory tract irritation, fatigue, eakness, confusion, dizziness, headache, dilated pupils, watering eyes, nervousness, insomnia, parasthesis, and vertigo progressing to narcotic coma. eath may result from cardiac arrest due to ventricular fibrillation with catecholamines loss. Liquid splashed in the eye causes conjunctival irritation, nsient corneal damage and possible burns. Prolonged skin contact leads to drying and fissured dermatitis. Ingestion causes GI tract irritation and s toms associated with inhalation. **Chronic Effects:** Symptoms include mucous membrane irritation, headache, vertigo, nausea, appetite loss and a ol intolerance. Repeated heavy exposure may result in encephalopathies (cerebellar ataxia and cognitive dysfunction), liver enlargement, and iney dystrophy (wasting away). Symptoms usually appear at workdays end, worsen at weeks end and decrease or disappear over the weekend.

RST AID **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult an ophthalmologist immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to sh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control nter and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting because of danger of aspiration into the lungs. Gastric lavage may be indicated if large amounts are swallowed; potential toxicity needs to be weighed against aspiration risk when deciding for or against gastric lavage. **Note to Physicians:** Monitor cardiac function. If indicated, use epinephrine and other techolamines carefully, because of the possibility of a lowered myocardial threshold to the arrhythmogenic effects of such substances. Obtain CBC, ctrolytes, and urinalysis. Monitor arterial blood gases. If toluene has > 0.02% (200 ppm) benzene, evaluate for potential benzene toxicity. BEI: ppuric acid in urine, sample at shift end (2.5 g/g creatinine); Toluene in venous blood, sample at shift end (1.0 mg/L).

Section 7. Spill, Leak, and Disposal Procedures

ill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel protect against inhalation and skin/eye ntact. Use water spray to cool and disperse vapors but it may not prevent ignition in closed spaces. Cellosolve, hycar absorbent materials, and fluorocarbon water can also be used for vapor suppression/containment. Take up small spill with earth, sand, vermiculite, or other absorbent, noncombustible material. Dike far ahead of large spills for later reclamation or disposal. For water spills, (10 ppm or greater) apply activated carbon at X the spilled amount and remove trapped material with suction hoses or use mechanical dredges/lifts to remove immobilized masses of pollutants d precipitates. Toluene can undergo fluidized bed incineration at 842 to 1796 °F (450 to 980 °C), rotary kiln incineration at 1508 to 2912 °F (820 to 00 °C), or liquid injection incineration at 1202 to 2912 °F (650 to 1600 °C). Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Blue gill, LC_{50} = 17 mg/L/24 hr; shrimp (*Crangonfracis coron*), LC_{50} = 4.3 ppm/96 hr; fathead minnow (*Pimephales promelas*), LC_{50} = 36.2 /L/96 hr. **Environmental Degradation:** If released to land, toluene evaporates and undergoes microbial degradation. In water, toluene volatilizes d biodegrades with a half-life of days to several weeks. In air, toluene degrades by reaction with photochemically produced hydroxyl radicals. **sposal:** Treat contaminated water by gravity separation of solids, followed by skimming of surface. Pass through dual media filtration and carbon absorption units (carbon ratio 1 kg to 10 kg soluble material). Return waste water from backwash to gravity separator. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

A Designations

sted as a RCRA Hazardous Waste (40 CFR 261.33): No. U220
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)
* per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); CWA, Sec. 307 (a)]
d as a SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses with shatter-resistant glass and side-shields or chemical safety goggles, per OSHA eye- and face-protection gulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional vice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any chemical cartridge respirator with appropriate organic vapor cartridges, any supplied-air respirator (SAR), or SCBA. For < 2000 ppm, use any SAR operated in continuous-flow mode, any SAR or SCBA with a full facepiece, or any air-purifying pirator with a full facepiece having a chin-style, front or back mounted organic vapor canister. For emergency or nonroutine operations (cleaning ills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective ves, boots, aprons, and gauntlets to prevent skin contact. Polyvinyl alcohol with a breakthrough time of > 8 hr, Teflon and Viton are recom-ended as suitable materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103) **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove toluene from your shoes and an PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, nking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

rage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incom-ibles. Outside or detached storage is preferred. If stored inside, use a standard flammable liquids warehouse, room, or cabinet. To prevent static sparks, electrically ground and bond all equipment used with toluene. Do not use open lights in toluene areas. Install Class 1, Group D electrical equipment. Check that toluene is free of or contains < 1% benzene before use. **Engineering Controls:** To reduce potential health hazards, use ficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Adminis-tive Controls:** Adopt controls for confined spaces (29 CFR 1910.146) if entering areas of unknown toluene levels (holes, wells, storage tanks). Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, liver, kidney, and skin. Include hemocytometric and thrombocyte count in cases where benzene is a contaminant of toluene. Monitor air at regular intervals to ensure effective ventilation.

Transportation Data (49 CFR 172.101)

T Shipping Name: Toluene
DOT Hazard Class: 3
ID No.: UN1294
Packing Group: II
T Label: Flammable Liquid
ecial Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 150
b) Non-bulk Packaging: 202
c) Bulk Packaging: 242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
Vessel Stowage: B
Other: --

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 140, 148, 153, 159, 163, 164, 167, 169, 171, 174, 175, 176, 180.
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, CIH, MPH; **Medical Review:** AC Darlington, MD, MPH

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Sheet No. 318
Xylene ***(Mixed Isomers)***

Issued: 11/80 Revision: E, 9/92 Errata: 12/94

Section 1. Material Identification

45

Xylene (Mixed Isomers) (C_8H_{10}) Description: The commercial product is a blend of the three isomers [*ortho*-(*o*-), *meta*-(*m*-), *para*-(*p*-)] with the largest proportion being *m*- xylene. Xylene is obtained from coal tar, toluene by transalkylation, and pseudocumene. Used in the manufacture of dyes, resins, paints, varnishes, and other organics; as a general solvent for adhesives, a cleaning agent in microscope technique; as a solvent for Canada balsam microscopy; as a fuel component; in aviation gasoline, protective coatings, sterilizing catgut, hydrogen peroxide, perfumes, insect repellants, pharmaceuticals, and the leather industry; in the production of phthalic anhydride, isophthalic, and terephthalic acids and their dimethyl esters which are used in the manufacture of polyester fibers; and as an indirect food additive as a component of adhesives. Around the home, xylene is found as vehicles in paints, paint removers, degreasing cleaners, lacquers, glues and cements and as solvent/vehicles for pesticides.

Other Designations: CAS No. 1330-20-7 [95-47-6; 108-38-3; 106-42-3 (*o*-, *m*-, *p*-isomers)], dimethylbenzene, methyltoluene, NCI-C55232, Violet 3, xylol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Xylene is an eye, skin, and mucous membrane irritant and may be narcotic in high concentrations. It is a dangerous fire hazard.

R 1
I 2
S 2
K 3

NFPA
3
2 0
–

HMIS
H 2
F
R 0
PPE ‡
† Chronic Effects
‡ Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Xylene (mixed isomers): the commercial product generally contains ~ 40% *m*-xylene; 20% each of *o*-xylene, *p*-xylene, and ethylbenzene; and small quantities of toluene. Unpurified xylene may contain pseudocumene.

1991 OSHA PELs
8-hr TWA: 100 ppm (435 mg/m^3)
15-min STEL: 150 ppm (655 mg/m^3)

1990 IDLH Level
1000 ppm

1990 NIOSH RELs
TWA: 100 ppm (435 mg/m^3)
STEL: 150 ppm (655 mg/m^3)

1992-93 ACGIH TLVs
TWA: 100 ppm (434 mg/m^3)
STEL: 150 ppm (651 mg/m^3)
BEI (Biological Exposure Index): Methylhippuric acids in urine at end of shift: 1.5 g/g creatinine

1990 DFG (Germany) MAK
TWA: 100 ppm (440 mg/m^3)
Category II: Substances with systemic effects
Half-life: < 2 hr
Peak Exposure: 200 ppm, 30 min, average value, 4 peaks per shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 200 ppm produced olfaction effects, conjunctiva irritation, and other changes involving the lungs, thorax, or respiration.
Man, inhalation, LC_{Lo}: 10000 ppm/6 hr; toxic effects not yet reviewed.
Human, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted.
Rat, oral, LD_{50}: 4300 mg/kg; toxic effect not yet reviewed.
Rat, inhalation, LC_{50}: 5000 ppm/4 hr; toxic effects not yet reviewed.

* See NIOSH, *RTECS* (XE2100000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 279 to 284 F (137 to 140 C)*
Boiling Point: *ortho:* 291 F (144 C); *meta:* 281.8 F (138.8 C); *para:* 281.3 F (138.5 C)
Freezing Point/Melting Point: *ortho:* -13 F (-25 C); *meta:* -53.3 F (- 47.4 C); *para:* 55 to 57 F (13 to 14 C)
Vapor Pressure: 6.72 mm Hg at 70 F (21 C)
Saturated Vapor Density (Air = 1.2 kg/m^3): 1.23 kg/m^3, 0.077 lbs/ft^3

Appearance and Odor: Clear, sweet-smelling liquid.

* Materials with wider and narrower boiling ranges are commercially available.

Molecular Weight: 106.16
Specific Gravity: 0.864 at 20 C/4 C
Water Solubility: Practically insoluble
Other Solubilities: Miscible with absolute alcohol, ether, and many other organic liquids.
Octanol/Water Partition Coefficient: logKow = 3.12-3.20
Odor Threshold: 1 ppm
Viscosity: <32.6 SUS

Section 4. Fire and Explosion Data

Flash Point: 63 to 77 F (17 to 25 C) CC	**Autoignition Temperature:** 982 F (527 C) (*m*-)	**LEL:** 1.1 (*m*-, *p*-); 0.9 (*o*-)	**UEL:** 7.0 (*m*-, *p*-); 6.7 (*o*-)

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray or regular foam. For large fires, use water spray, fog or regular foam. Water may be ineffective. Use water spray to cool fire-exposed containers. **Unusual Fire or Explosion Hazards:** Xylene vapors or liquid (which floats on water) may travel to an ignition source and flash back. The heat of fire may cause containers to explode and/or produce irritating or poisonous decomposition products. Xylene may present a vapor explosion hazard indoors, outdoors, or in sewers. Accumulated static electricity may occur from vapor or liquid flow sufficient to cause ignition. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection. If feasible and without risk, move containers from fire area. Otherwise, cool fire-exposed containers until well after fire is extinguished. Stay clear of tank ends. Use unmanned hose holder or monitor nozzles for massive cargo fires. If impossible, withdraw from area and let fire burn. Withdraw immediately in case of any tank discoloration or rising sound from venting safety device. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Xylene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Xylene is easily chlorinated, sulfonated, or nitrated. **Chemical Incompatibilities:** Incompatibilities include strong acids and oxidizers and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin). Xylene attacks some forms of plastics, rubber, and coatings. **Conditions to Avoid:** Avoid heat and ignition sources and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of xylene can produce carbon dioxide, carbon monoxide, and various hydrocarbon products.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list xylene as a carcinogen. **Summary of Risks:** Xylene is an eye, mucous membrane, and respiratory tract irritant. Irritation starts at 200 ppm; severe breathing difficulties which may be delayed in onset can occur at high concentrations. It is a central nervous system (CNS) depressant and at high concentrations can cause coma. Kidney and liver damage can occur with xylene exposure. With prolonged or repeated cutaneous exposure, xylene produces a defatting dermatitis. Chronic toxicity is not well defined, but it is less toxic than benzene. Prior to the 1950s, benzene was often found as a contaminant of xylene and the effects attributed to xylene such as blood dyscrasias are questionable. Since the late 1950s, xylenes have been virtually benzene-free and blood dyscrasias have not been associated with xylenes. Chronic exposure to high concentrations of xylene in animal studies have demonstrated mild reversible decrease in red and white cell counts as well as increases in platelet counts.

Continue on next page

Section 6. Health Hazard Data, *continued*

Menstrual irregularity was reported in association with workplace exposure to xylene perhaps due to effects on liver metabolism. Xylene crosses the human placenta, but does not appear to be teratogenic under conditions tested to date. **Medical Conditions Aggravated by Long-Term Exposure:** CNS, respiratory, eye, skin, gastrointestinal (GI) , liver and kidney disorders. **Target Organs:** CNS, eyes, GI tract, liver, kidneys, and skin. **Primary Entry Routes:** Inhalation, skin absorption (slight), eye contact, ingestion. **Acute Effects:** Inhalation of high xylene concentrations may cause dizziness; nausea, vomiting, and abdominal pain; eye, nose, and throat irritation; respiratory tract irritation leading to pulmonary edema (fluid [illegible] lung); drowsiness; and unconsciousness. Direct eye contact can result in conjunctivitis and corneal burns. Ingestion may cause a burning sensation in the oropharynx and stomach and transient CNS depression. **Chronic Effects:** Repeated or prolonged skin contact may cause drying and defatting of the skin leading to dermatitis. Repeated eye exposure to high vapor concentrations may cause reversible eye damage, peripheral and central neuropathy, and liver damage. Other symptoms of chronic exposure include headache, fatigue, irritability, chronic bronchitis, and GI disturbances such as nausea, loss of appetite, and gas.

FIRST AID *Emergency personnel should protect against exposure.* **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing as it may pose a fire hazard. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. Monitor exposed person for respiratory distress. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, *do not induce vomiting!* If spontaneous vomiting should occur, keep exposed person's head below the hips to prevent aspiration (breathing liquid xylene into the lungs). *Aspiration of a few millimeters of xylene can cause chemical pneumonitis, pulmonary edema, and hemorrhage.* **Note to Physicians:** Hippuric acid or the ether glucuronide of *ortho*-toluic acid may be useful in diagnosis of *meta-*, *para-* and *ortho*-xylene exposure, respectively. Consider gastric lavage if a large quantity of xylene was ingested. Proceed gastric lavage with protection of the airway from aspiration; consider endotracheal intubation with inflated cuff.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate spill area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If feasible and without undue risk, stop leak. Use appropriate foam to blanket release and suppress vapors. Water spray may reduce vapor, but does not prevent ignition in closed spaces. For small spills, absorb on paper and evaporate in appropriate exhaust hood or absorb with sand or some non-combustible absorbent and place in containers for later disposal. For large spills dike far ahead of liquid to contain. Do not allow xylene to enter a confined space such as sewers or drains. On land, dike to contain or divert to impermeable holding area. Apply water spray to control flammable vapor and remove material with pumps or vacuum equipment. On water, contain material with natural barriers, booms, or weirs; apply universal gelling agent; and use suction hoses to remove spilled material. Report any release in excess of 1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** Little bioconcentration is expected. Biological oxygen demand 5 (after 5 days at 20 °C): 0.64 (no stated isomer). **Ecotoxicity values:** LD_{50}, Goldfish, 13 mg/L/24 hr, conditions of bioassay not specified, no specific isomer. **Environmental Degradation:** In the atmosphere, xylenes degrade by reacting with photochemically produced hydroxyl radicals with a half-life ranging from 1-1.7 hr. in the summer to 10-18 hr in winter or a typical loss of 67-86% per day. Xylenes are resistant to hydrolysis. **Soil Absorption/Mobility:** Xylenes have low to moderate adsorption to soil and when spilled on land, will volatilize and leach into groundwater. **Disposal:** As a hydrocarbon, xylene is a good candidate for controlled incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U239, F003 (spent solvent)

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per Clean Water Act, Sec. 311(b)(4); per RCRA, Sec. 3001]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations >1000 ppm, use any chemical cartridge respirator with organic vapor cartridges; any powered, air-purifying respirator with organic vapor cartridges; any supplied-air respirator; or any self-contained breathing apparatus. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. With breakthrough times > 8 hr, consider polyvinyl alcohol and fluorocarbon rubber (Viton) as materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in clearly labelled, tightly closed, containers in a cool, well-ventilated place, away from strong oxidizing materials and heat and ignition sources. During transferring operations, electrically ground and bond metal containers. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use hermetically sealed equipment, transfer xylene in enclosed systems, avoid processes associated with open evaporating surfaces, and provide sources of gas release with enclosures and local exhaust ventilation. Use Class I, Group D electrical equipment. **Administrative Controls:** Establish air and biological monitoring programs and evaluate regularly. Consider preplacement and periodic medical examinations including a complete blood count, a routine urinalysis, and liver function tests. Consider hematologic studies if there is any significant contamination of the solvent with benzene. If feasible, consider the replacement of xylene by less toxic solvents such as petrol (motor fuel) or white spirit. Before carrying out maintenance and repair work, steam and flush all equipment to remove any xylene residues.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Xylenes
DOT Hazard Class: 3
ID No.: UN1307
DOT Packing Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Nonbulk Packaging : 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: –

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 171, 174, 176, 180.
Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

ATTACHMENT H-3
BBL DAILY SAFETY MEETING LOG

BBL DAILY SAFETY MEETING LOG

PROJECT: ______________________________ **LOCATION:** ________________________

DATE/TIME: __________________________________ **ACTIVITY:** ___________________

1. Work Summary

2. Physical/Chemical Hazards

3. Protective Equipment/Procedures

4. Emergency Procedures

5. Signatures of Attendees

ATTACHMENT H-4
ACCIDENT INVESTIGATION REPORT

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

ACCIDENT INVESTIGATION REPORT

Date of Report ____________ Date of Accident ____________ Time of Accident ____________

Health & Safety Notified ☐ **Human Resources Notified** ☐

Employee's Name ____________ Title ____________

Address ____________ Employee # ____________

City ____________ State ____________ Zip Code ____________

Age ____________ Sex ____________ Marital Status ____________

Date of Hire ____________ Social Security # ____________ # of Dependents ____________

Description of Accident: ____________

Description of Injuries: ____________

Witnesses: ____________

Injuries Required:
☐ First Aid (At Scene) ☐ Emergency Room Treatment ☐ Hospitalization

Location & Address of Accident ____________

First Aid Provided By ____________

Medical Facility/Address ____________

Attending Physician ____________

Did Employee Return to Work?
☐ Yes ☐ No If Yes, Give Date ____________

Did Employee Lose Time at Work?
☐ Yes ☐ No If Yes, Give Amount ____________

Actions or Conditions Causing Accident: ____________

Corrective Actions: ____________

Further Comments: ____________

Employee Signature ____________ Date ____________

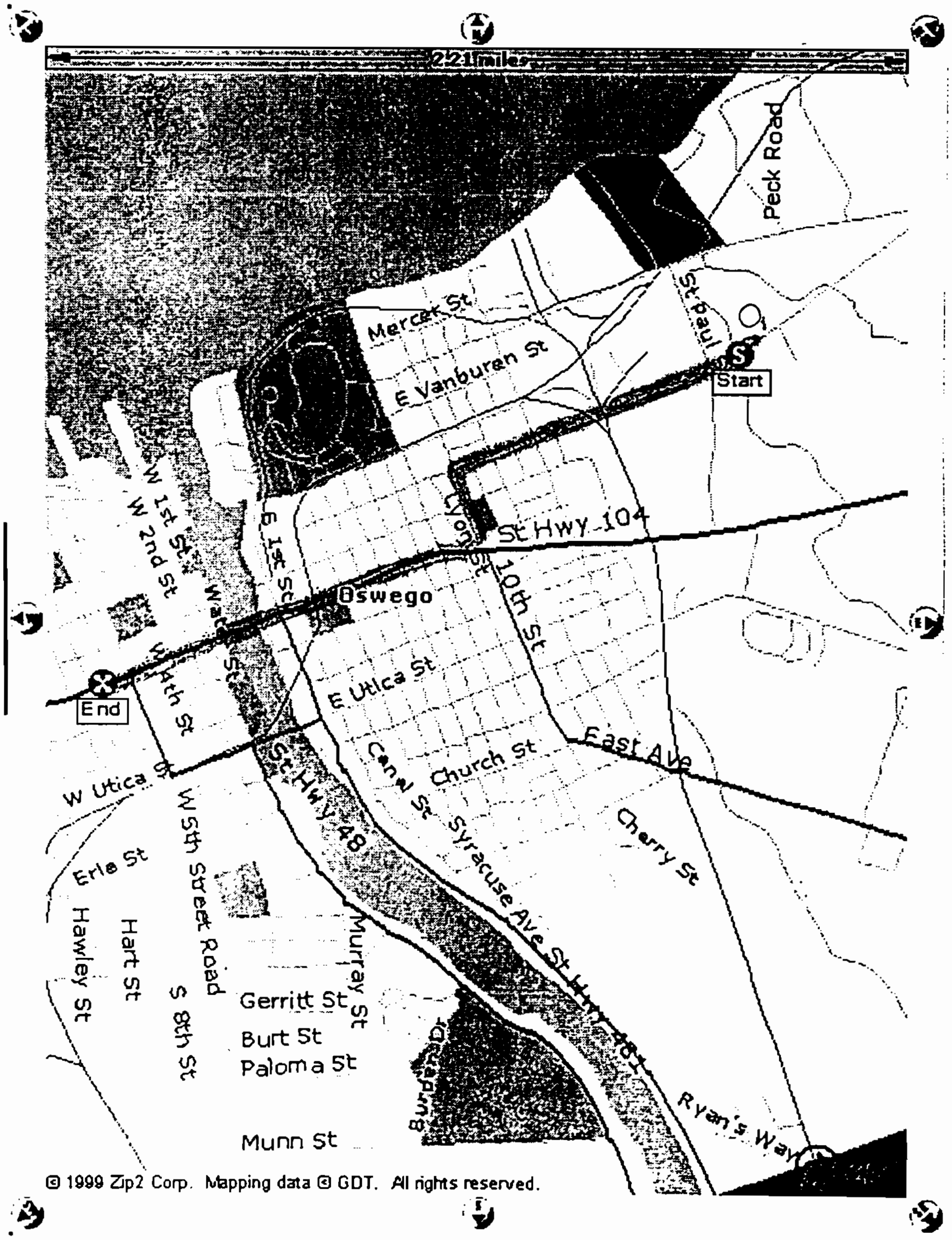
Health & Safety Review ____________ Date ____________

ATTACHMENT H-5

MAP FROM THE SITE TO OSWEGO HOSPITAL

Directions from the Site to Oswego Hospital

- Start out going West on Seneca Street
- Turn left on East 10th Street (East Seneca Street becomes East 10th Street)
- Turn right onto RT - 104 (Bridge Street)
- Turn left onto West 6th Street
- The Oswego Hospital is located at the corner of West 6th Street and Bridge Street
- Travel time: about 2.0 miles, 5 minutes



© 1999 Zip2 Corp. Mapping data © GDT. All rights reserved.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

Thomas C. Jorling
Commissioner

Copy - G. Rider.
Dave Foster
John St.
for Inf.
Frankert - Alb.
Does [illegible] have any experience to share relative to this activity - useful on our develop of a contract?

RECEIVED
MAY 13 1991

May 13, 1991

Ms. Laine Vignona
Senior Scientist
Geraghty & Miller, Inc.
125 East Bethpage Road
Plainview, New York 11803

RE: Pollution Abatement Services Site
Oswego, New York
Site Code: 7-38-001

Then file well decom

Dear Ms. Vignona:

Eleven groundwater monitoring wells were abandoned at the PAS site during the week of May 6, 1991. Tremie grouting from the bottom of the well screen to ground surface was completed on wells MW-1A, MW-1B, MW-3, MW-8, MW-9, MW-11A, MW-11B, OD-1, OS-2, OI-2, AND OD-2. In addition, bedrock wells OD-3 and OD-4 were grouted back to within 15 feet of the bottom of the seated casing to reduce the potential for shallow bedrock contamination from entering deeper bedrock zones; total depths are now approximately 42' and 32', respectively. Stainless steel well screens and risers will be installed in these two wells to facilitate sample collection.

I have enclosed a revised site map which shows all remaining wells with corresponding surface elevation data.

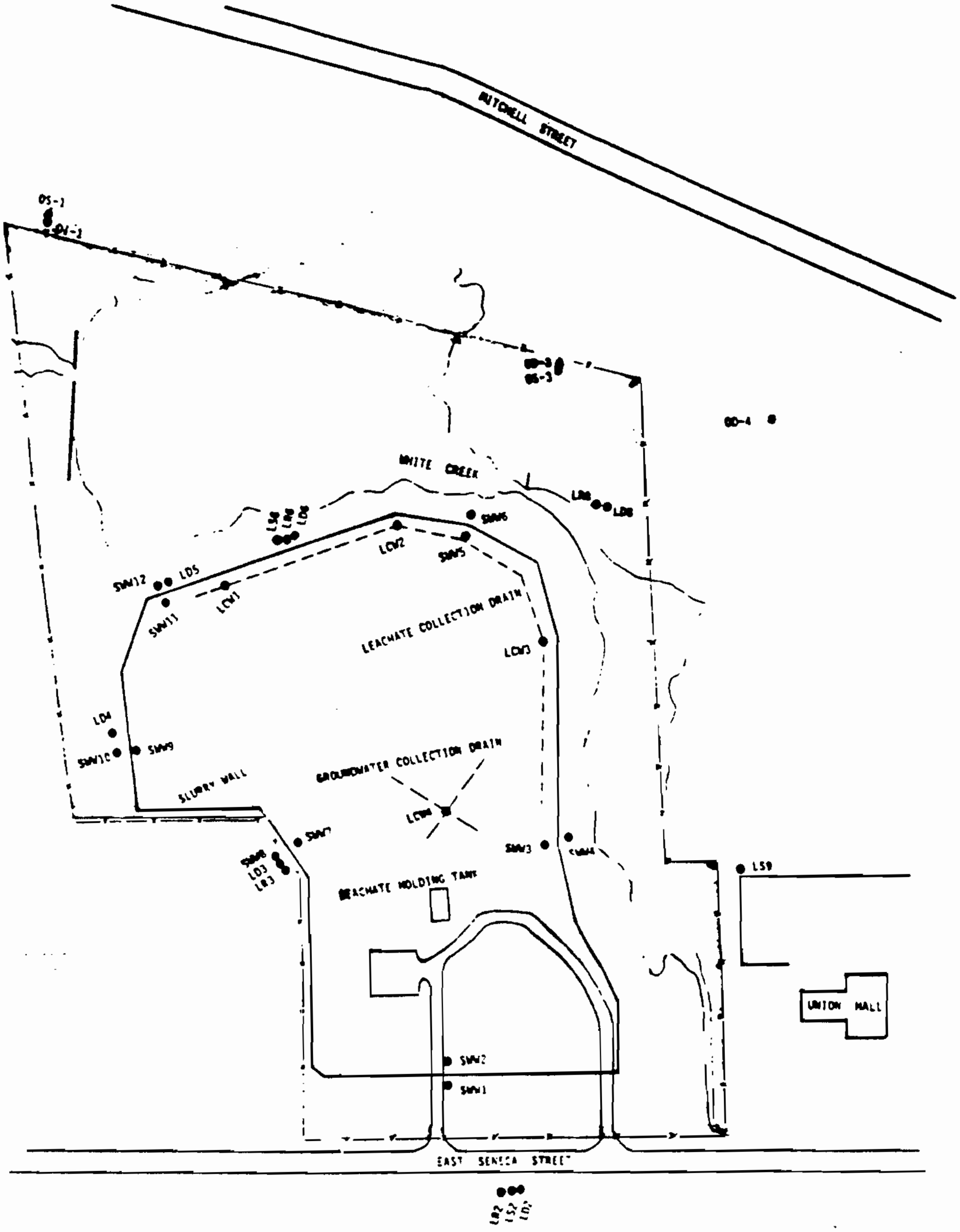
If you have any questions, please do not hesitate to call.

Sincerely,

Robert J. McNamee
Senior Engineering Geologist
Bureau of Central Remedial Action
Division of Hazardous Waste Remediation

Enclosure

cc: R. Brazell, w/enc.
M. Valentine, w/enc.
R. Ramon, w/enc.
A. K. Gupta, w/enc.



POLLUTION ABATEMENT SERVICES SITE

Oswego, New York

MONITORING WELL I.D.	GROUND SURFACE	TOP OF RISER
LS2	287.5	289.81
LD2	287.1	289.73
LR2	287.5	289.85
LD3	275.8	278.62
LR3	275.5	278.06
LD4	276.3	279.25
LD5	270.2	272.94
LS6	271.4	274.14
LD6	270.9	274.03
LR6	270.9	274.39
LD8	269.9	272.83
LR8	270.0	273.42
LS9	274.0	276.72
LCW1	271.4	272.21
LCW2	272.6	274.44
LCW3	283.3	284.36
LCW4	283.8	285.70
SWW1	286.2	289.33
SWW2	286.3	289.37
SWW3	286.0	286.50
SWW4	282.9	283.60
SWW5	275.9	277.02
SWW6	270.9	273.06
SWW7	275.3	277.93
SWW8	275.7	278.24
SWW9	283.3	285.55
SWW10	279.3	280.43
SWW11	271.0	273.50
SWW12	270.2	272.82
OS-1	269.63	272.19
OI-1	269.14	272.00
OS-3	274.63	277.89
OD-3	274.96	277.85
OD-4	271.02	274.85

Correspondence
Re: Comments on Draft
PCB Long-Term Monitoring Plan

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via Federal Express

July 20, 1999

7/20/99

Ms. Patricia Simmons
Project Manager
Central New York Remediation Section
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Re: PCB Long-Term Monitoring Plan
Pollution Abatement Services
Superfund Site, OU4
Oswego, NY
Project #: 0364.36444 #2

Dear Ms. Simmons:

Pursuant to our recent telephone conversations, please find attached for your review a draft copy of the revised pages from the PCB Long-Term Monitoring Plan for the above-referenced site. These pages have been revised as detailed in Blasland, Bouck & Lee, Inc.'s (BBL's) June 30, 1999 letter to you, which you verbally approved on July 8, 1999. To facilitate your review, the revisions have been identified on the attached pages using double underline, and some pages with no revisions have also been included. As discussed, a copy of the enclosed revised pages was provided to Mr. John Strang of the New York State Department of Environmental Conservation on July 19, 1999.

Upon receipt of your approval, BBL will distribute the revised pages for substitution into the original Plan in accordance with the requirements set forth in the OU4 Consent Decree. Also, as requested, please find attached the current New York State certifications for Galson Laboratories and EnChem (Attachment 1).

As previously discussed and detailed in the June 30, 1999 letter, BBL is hoping to complete the required sampling this month in order to meet the requirements of the Consent Decree. Specifically, BBL is hoping to complete the sediment sampling on Friday, July 23, 1999 and the biota sampling on Wednesday, July 28, 1999. The sediment traps would also be set on July 28, upon completion of the biota sampling.

Please feel free to call me at (315) 446-2570 (ext. 290) with any questions, or if you require any additional information. Thank you.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

M Cathy Geraci

M. Cathy Geraci
Associate

MCG/bew
Attachments

X:\COMMON\BEW\14591778.WPD

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Fax (315) 449-0017 • www.bbl-inc.com
Offices Nationwide

cc: Mr. John Strang, New York State Department of Environmental Conservation (w/o enclosure)
Mr. James F. Morgan, Niagara Mohawk Power Corporation
William C. Weiss, Esq., Niagara Mohawk Power Corporation
R. William Stephens, Esq., Raichle, Banning, Weiss & Stephens
Mr. David J. Ulm, Blasland, Bouck & Lee, Inc. (w/o enclosure)

From: John Strang
To: Internet:Simmons.Pat@epamail.epa.gov
Date: 7/16/99 4:40PM
Subject: PAS PCB Long-Term Monitoring

Patricia, I spoke with Kathy Geraci of Basland, Bouck and Lee (BBL) on Friday (7/16/99). BBL is sending the revised pages for the PCB Long-Term Monitoring Plan by fax early next week. I did not receive a copy of EPA's final comment letter to BBL. Please send me a copy.

BBL has tentatively scheduled PCB Sediment Sampling for Friday 7/23/99 and on 7/28/99 they plan to sample the fish and set sediment traps. I plan to be there on Friday 7/23/99. I'll be in contact soon. John Strang

CC: Carella, Paul; Rider, Jerry; Rossi, Christine

✓ J. Strang
7/2/99

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via U.S. Mail

June 30, 1999

Ms. Patricia Simmons
Project Manager
Central New York Remediation Section
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Re: PCB Long-Term Monitoring
Plan Comments
PAS Site OU-4, Oswego, NY 738001
Project #: 0364.36444 #2

Dear Ms. Simmons:

We have received your letter dated June 11, 1999, containing comments on the above-referenced document. A summary of these comments and our response is presented below.

Comment 1: Section 1.3 - Site History, Page 1-3, Paragraph 4: *Please replace the last sentence with the following text, "The supplemental RI report, issued in 1993, concluded that the contamination that was detected in the bedrock groundwater outside the containment system was attributable to the downward migration of contaminants through the lodgement till beneath the containment system, particularly beneath the area of leachate collection well LCW-4 where the lodgement till is relatively thin. The supplemental RI Report noted that the highest level of contaminants occurred in the vicinity of leachate collection well LCW-4 where downward hydraulic gradients existed prior to implementation of the IGR program. The report concluded that the IGR program effectively reversed these downward hydraulic gradients and mitigated releases from this source."*

Response: The text will be modified to include the suggested language.

✦ ✦ ✦

Comment 2: Section 1.4 Objective: *A schedule for implementation of the tasks described should be included in the Plan. The Plan should include a discussion of the methods that will be used to "periodically evaluate potential ecological risks". Specifically, more details should be provided on how risk will be determined from the data collected. The Plan should state that based on our 5-year reviews, EPA we will make a determination as to whether or not the monitoring needs to be continued, or if further action is necessary.*

Response: Information on scheduling is included in Section 3.3. Due to the current schedule for sampling in 1999, the first sentence in Section 3.3 will be modified as follows: "Sediment and biota samples will be collected once annually in late spring/early summer (i.e., May through July)." Due to the current schedule for sampling in 1999, the first sentence in Section 3.3 will be modified as follows: "Sediment and biota samples will be collected once annually in late spring/early summer (i.e. May-July)." The last sentence in Section 3.3 will be revised to state that "based on 5-year reviews, EPA will make a determination as to whether or not the monitoring needs to be continued, or if further action is necessary." With respect to risk evaluation, the PCB concentrations measured in fish tissue samples will be used to estimate potential ecological exposure of upper trophic level receptors. Estimates of PCB exposure will then be compared to toxicological benchmarks from the literature to evaluate the potential for ecological effects.

◆ ◆ ◆

Comment 3: Section 2.1 - Contractors and Subcontractors: *It is stated that Galson Laboratories is a New York State Analytical Services Protocol/CLP - certified laboratory for PCB analyses. Galson does not currently hold a contract with the Contract Laboratory Program (CLP); however, the lab is a participant of the New York State Department of Health Environmental Laboratory Approval Program. The text should be corrected. Galson Laboratories and EnChem must demonstrate their capability to perform the required analyses through Performance Evaluation (PE) samples or New York State certifications. The PE samples or state certifications must be specific to the analysis and media required for this project. In order to fulfill this requirement, the lab may submit the results of PE samples analyzed within the last 6 months.*

Response: The text will be corrected to reflect Galson Laboratories status. Galson Laboratories and EnChem New York State certifications are presented as Attachment 1 to this letter.

◆ ◆ ◆

Comment 4: Section 3.2 - Sample Locations: *Three sampling stations widely spaced may not be appropriate to adequately evaluate contaminate mobility and spatial distribution of and trends for PCBs in White and Wine Creeks. The sediment samples should be collected at depositional areas (where there is sufficient sediment to collect both a top 6 inch sample and a deeper sample), and at former locations that contained elevated contaminant concentrations. These locations include SPRDS Phase 2 sampling points White 11A (11.40 ppm), White-12A (1.690 ppm), White-12B (5.860 ppm), and Wine-1C (1.320 ppm). Figure 2 should include the SPRDS Phase 2 sampling locations and data in Reaches 10 through 12. In order to assure that annual sampling is conducted at the same locations, permanent markers and/or GIS coordinates should be used to identify each sample location.*

Response: The additional sampling locations will be included in the Plan and on Figure 2. These stations will be identified in the field using permanent markers.

◆ ◆ ◆

Comment 5: Section 3.4 - Sediment Monitoring: *Corers, core tube liners or dredges should be used instead of a scoop to collect sediments. The use of a scoop in flowing or deep water may result in a loss of some of the finer, surficial sediments where higher concentration of contaminants may be located. Both the top 6 inches and the deeper sample should come from the same core tube, reducing effort and increasing the usefulness of the data. A calibrated rod should be employed to measure sediment depth prior to finalizing* *sample locations. It is recommended that the cores be cut into shorter sections (rather than dividing the samples into two depth categories) in order to gain a better understanding of the long term fate of the PCBs. It may be more efficient to sink samplers into the sediment so that only a small lip protrudes above the sediment. In the event that the proposed sediment traps do not collect enough sediment, attempts at sediment collection should be made with other types of samplers (e.g. large funnel style samplers). Further, it may be appropriate to deploy these traps prior to field activities which may cause an increase in disturbance of stream sediments and subsequently bias the sediments collected from the trap. The location of these sediment traps should be clearly identified in Figure 2.*

Response: Cores and/or dredges will be used to collect sediment samples. We believe that using two depth categories for the cores, supplemented by sediment traps and fish samples, will be sufficient to monitor long-term trends in PCB concentrations. The exact sampling locations will be selected based on field reconnaissance and manual probing to identify prime depositional areas (e.g., thick, fine-grained sediment deposits). Sediment traps will be deployed prior to other field activities to avoid sediment disturbance. Sediment trap locations will be specified on Figure 2.

◆ ◆ ◆

Comment 6: Section 3.5 - Biota Monitoring: *The fish collected and analyzed for this study should be representative of the specific area of concern (i.e., resident fish that were born and remain in the area of concern). This will avoid confounding results due to additional exposure from other contaminated areas or a reduction in exposure if the fish spend time in less contaminated areas. Further, fish that migrate out of the White ,Wine Creek system during a portion of their life histories are not appropriate (e.g., the use of white suckers is likely not to be suitable) for this monitoring program. The age of the fish to be collected should be further discussed; fish are considered Young of Year (YOY) (0 years) from hatching until January, from January on they are considered yearlings or 1 year old fish. Establishing size slots from the literature and confirming by ageing the fish may be appropriate. It should be noted whether samples will be collected from the areas outlined in the shaded boxes (Figure 2).*

Response: As specified in the Plan, the biological monitoring will focus on the collection and analysis of yearling fish. Proposed target species are minnows (e.g. creek chub, bluntnose minnow). A literature search will be conducted prior to sampling to establish age/length relationships for the target species. This information will be used in the field to select appropriate-sized individuals. In addition, the reference to suckers (both white and hog suckers) on page 3-3 will be deleted, due to the possible migratory life history of these species.

◆ ◆ ◆

Comment 7: Section 6.0 - References: *The Guidance for Quality Assurance Project Plans (EPA QA/G-5, EPA /600/R-98/018, February 1998) should be referenced as a Quality Assurance Project Plan (QAPP) preparation guidance document.*

Response: The text will be modified as suggested.

◆ ◆ ◆

Comment 8: Appendix A-1: Surficial Sediment Sampling Procedures: *It should be specified that sediment samples will be decanted, since high moisture content can elevate analytical detection levels.*

Response: Appendix A-1 will be modified to include the fact that samples will be decanted when necessary.

✦ ✦ ✦

Comment 9: Appendix A-2: Sediment Core Sampling Procedures: *Lexan, a polycarbonate thermoplastic, is the proposed tubing material for sediment core sampling; however, the integrity of this material may be affected by the presence of organic constituents (i.e., PCBs). Samples can effectively be collected with a stainless steel push core device, a stainless steel tube, or a glass tube. It should be specified that prior to homogenization, sediment samples will be decanted since high moisture content can elevate analytical detection levels. The diameter of the tubing should be specified in the plan.*

Response: The sediment core sampling procedures will employ a 1 7/8" or 2" stainless steel tube and/or a push core with a brass push rod to extract sediment onto a stainless steel tray. Sediment samples will be decanted as specified in Appendix A-1.

✦ ✦ ✦

Comment 10: Appendix A-3: Sediment Trap Sampling Procedures: *It is indicated in the Placement Procedures and Sample Retrieval sections that the field crew will work downstream of the trap to minimize sediment resuspension. It is unclear if samplers will proceed in an upstream or downstream direction when placing and retrieving sediment traps. It is recommended that the crew proceed in a downstream direction for trap placement and in an upstream direction for trap retrieval. However, the crew should always approach each individual sampling point from a downstream direction, as indicated in the plan.*

Response: The text will be modified to reflect the fact that the crew will work downstream of the trap, and will proceed downstream for trap placement and upstream for trap retrieval.

✦ ✦ ✦

Comment 11: Appendix A-4: Fish Sampling Procedures: *According to the Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters guidance document, samples undergoing chemical analysis should not be wrapped with an inner label (Page 83). Another technique for sample identification should be provided as Step 20.*

Response: Samples will be identified using an exterior label.

✦ ✦ ✦

Comment 12: Appendix A-5: Field Sample Packaging, Handling, and Shipping Procedures: *Region 2 requires use of temperature blanks in coolers to verify that the samples have been maintained at 4°C. The temperature blank should consist of a sample container filled with non-preserved water (potable or distilled) and included in each cooler containing samples (soil and aqueous) being sent for analysis. The container should be labeled "USEPA COOLER TEMPERATURE INDICATOR" and dated. Temperature of the blank* *should be taken and recorded on the chain of custody record immediately upon receipt at the laboratory, prior to inventory and refrigeration.*

Response: Temperature blanks will be provided by the analytical laboratory. Appendix A-5 will be modified to include the use of temperature blanks during sample shipment to the laboratory.

◆ ◆ ◆

Comment 13: Appendix A-6: Field Cleaning/Decontamination Procedures, Sections III and IV: *The solvent rinse steps listed are inappropriate or unspecified. The solvent rinse should consist of one of the following options: 1) an acetone only rinse; or 2) a methanol followed by a hexane rinse. All solvents used should be pesticide grade or better. This step should be followed by a thorough rinse with deionized demonstrated analyte free water that is five times the volume of solvent used in the previous step*

Response:. Appendix A-6 will be revised to reflect the use of a solvent rinse involving methanol followed by hexane, using the appropriate grade solvent and water.

◆ ◆ ◆

Comment 14: Section 4.2, Page 4-1: *A designation of "D" for field duplicate samples is inappropriate. Field duplicate samples must be submitted to the lab as blind QC. Each duplicate sample must have a separate and unique sample identification number.*

Response: Field duplicate samples will be submitted blind to the lab, and will have a separate and unique identification number.

◆ ◆ ◆

Comment 15: Section 4.3.2., Page 4-1: *A temperature blank should be included in all sediment sample coolers. See Appendix A Comment 4 on temperature blanks.*

Response: A temperature blank will be included as noted in the response to comment 12.

◆ ◆ ◆

Comment 16: Section 4.4.1, Page 4-3 and Section 9.3.3, Page 9-2: *References to groundwater sampling equipment should be removed because this project only involves sediment and biota sampling.*

Response: References to groundwater sampling will be removed.

◆ ◆ ◆

Comment 17: Section 9.3, Page 9-1: *Acceptance criteria should be specified in the text for all analytical laboratory quality control samples.*

Response: Acceptance criteria will be specified on the text.

◆ ◆ ◆

Comment 18: Section 12.3, Page 12-2: *Table 4 outlines sample containers, preservation and holding time information, not spike recovery measurements as indicated in the text. This inconsistency should be corrected.*

Response: The text will be corrected.

◆ ◆ ◆

Comment 19: Table 2: *It is stated that a standard gravimetric analytical procedure will be used to determine percent lipids. A method should be referenced or the analytical procedure should be provided in the plan.*

Response: The lipid analytical method will be provided as an appendix to the Plan.

◆ ◆ ◆

Comment 20: Table 4: *The maximum holding time from sample collection should be clarified for sediment PCB samples to indicate 7 days to extraction and 40 days to analysis.*

Response: The holding time will be clarified as 7 days to extraction and 40 days to analysis.

◆ ◆ ◆

Comment 21: Section 11.5: *A map showing the route from the site to Oswego Hospital should be provided.*

Response: A map will be provided in Section 11.

◆ ◆ ◆

We hope that this letter satisfactorily addresses your comments on the *PCB Long-Term Monitoring Plan.* Once EPA approves the proposed revisions presented above, BBL will revise the appropriate pages of the Plan. The revised pages will be distributed for substitution in the original Plan document. If you have any further comments or questions, please contact me at your convenience.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

David J. Ulm
Vice President

DWH/mbl
X:\COMMON\MBL\49490842.WPD

cc: Chief, New York/Caribbean Superfund Branch, Office of Regional Counsel, United States Environmental Protection Agency, Region II - Attention: PAS Superfund Site Attorney
Director, Division of Hazardous Waste Remediation, New York State Department of Environmental Conservation - Attention: PAS Site Project Manager
Mr. Daniel Geraghty, New York State Department of Health
William C. Weiss, Esq., Niagara Mohawk Power Corporation
R. William Stephens, Esq., Raichle, Banning, Weiss & Stephens
Mr. James F. Morgan, Niagara Mohawk Power Corporation
M. Cathy Geraci, Blasland, Bouck & Lee, Inc.

Attachment 1

Laboratory Certifications

DOH STATE OF NEW YORK
DEPARTMENT OF HEALTH

Wadsworth Center The Governor Nelson A. Rockefeller Empire State Plaza P.O. Box 509 Albany, New York 12201-0509

Dennis P. Whalen
Executive Deputy Commissioner

MARCH 18, 1999

Dear Laboratory Director:

Please note that although your ELAP Certificate of Approval expires on 12:01 AM April 1, 1999, it is still valid until July 15, 1999, as per ELAP Certification Manual, No. 140, Page 13 of 42, dated 12/6/95, Part 55-2.4e NYCRR. "...during any extension or grace period permitted by this Subpart, a laboratory approval shall remain in force beyond the expiration date of the certificate of approval, unless such approval is specifically terminated or suspended in writing."

Notification regarding the issuance of 1999- 2000 ELAP Certificate(s) of Approval is pending receipt of all non-governmental laboratories' Total Adjusted Volumes and Approval of the 1999- 2000 ELAP Budget by the New York State Legislature.

Further verification of your laboratory's approved ELAP status is available by calling the Program Office at (518) 485-5570.

Sincerely,

Linda L. Madlin

Linda L. Madlin
Administrative Assistant
Environmental Laboratory
Approval Program

LLM:saw

BARBARA A. DEBUONO, M.D., M.P.H. Commissioner

Expires 12:01 AM July 15, 1999
ISSUED April 1, 1999
REVISED May 19, 1999

INTERIM CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 11626

Director: MR. JOSEPH UNANGST
Lab Name: GALSON LABORATORIES
Address : 6601 KIRKVILLE RD
EAST SYRACUSE NY 13057

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

- Characteristic Testing :
  - Corrosivity
  - Ignitability
  - Reactivity
  - TCLP
  - E.P. Toxicity
- rgeable Aromatics (ALL)
- Miscellaneous :
  - Asbestos in Friable Material
  - Cyanide, Total
  - Lead in Dust Wipes
  - Lead in Paint
  - Hydrogen Ion (pH)
- Purgeable Halocarbons (ALL)
- Acrolein and Acrylonitrile (ALL)
- Chlor. Hydrocarbon Pesticides (ALL)
- Haloethers (ALL)
- Metals II (ALL)
- Polynuclear Arom. Hydrocarbon (ALL)
- Phthalate Esters (ALL)
- Chlorophenoxy Acid Pesticides (ALL)
- Chlorinated Hydrocarbons (ALL)
- Metals I (ALL)
- Nitroaromatics Isophorone (ALL)
- Polychlorinated Biphenyls (ALL)
- Priority Pollutant Phenols (ALL)

Serial No.: 036207

Wadsworth Center

Property of the New York State Department of Health. Valid only at the address shown.
Must be conspicuously posted. Valid certificate has a red serial number.

DOH-3317 (3/95)

TOTAL P.03

NEW YORK STATE DEPARTMENT OF HEALTH

BARBARA A. DeBUONO, M.D., M.P.H. Commissioner

Expires 12:01 AM April 1, 1999
ISSUED April 1, 1998
REVISED August 4, 1998

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 11436

Director: MR. ERIC THOMAS
Lab Name: EN CHEM INC
Address : 525 SCIENCE DRIVE
MADISON WI 53711

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

- Chlor. Hydrocarbon Pesticides :
  - 4,4'-DDD
  - 4,4'-DDE
  - 4,4'-DDT
  - alpha-BHC
  - Aldrin
  - beta-BHC
  - Chlordane Total
  - delta-BHC
  - Dieldrin
  - Endrin aldehyde
  - Endrin
  - Endosulfan I
  - Endosulfan II
  - Endosulfan sulfate
  - Heptachlor
  - Heptachlor epoxide
  - Lindane
  - Methoxychlor
  - Toxaphene
- Wastewater Metals III :
  - Cobalt, Total
  - Molybdenum, Total
  - Tin, Total
  - Titanium, Total
  - Thallium, Total
- Polynuclear Aromatics (ALL)
- Priority Pollutant Phenols (ALL)
- TCLP Additional Compounds (ALL)
- Wastewater Miscellaneous :
  - Cyanide, Total
- Chlorophenoxy Acid Pesticides (ALL)
- Haloethers (ALL)
- Wastewater Metals II (ALL)
- Nitrosoamines (ALL)
- Polychlorinated Biphenyls (ALL)
- Purgeable Aromatics (ALL)
- Acrolein and Acrylonitrile (ALL)
- Benzidines (ALL)
- Chlorinated Hydrocarbons (ALL)
- Wastewater Metals I (ALL)
- Nitroaromatics and Isophorone (ALL)
- Organophosphate Pesticides (ALL)
- Phthalate Esters (ALL)
- Purgeable Halocarbons (ALL)

Serial No.: 103662

Wadsworth Center

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Must be conspicuously posted. Valid certificate has a red serial number.

DOH-3317 (3/97)

NEW YORK STATE DEPARTMENT OF HEALTH

BARBARA A. DEBUONO, M.D., M.P.H. Commissioner

Expires 12:01 AM April 1, 1999
ISSUED April 1, 1998
REVISED August 4, 1998

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 11436

Director: MR. ERIC THOMAS
Lab Name: EN CHEM INC
Address : 525 SCIENCE DRIVE
MADISON WI 53711

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

Characteristic Testing :
    TCLP
Haloethers (ALL)
Organophosphate Pesticides (ALL)
Priority Pollutant Phenols (ALL)
Miscellaneous :
    Cyanide, Total
Metals I (ALL)
Polynuclear Arom. Hydrocarbon (ALL)
Purgeable Aromatics (ALL)
Acrolein and Acrylonitrile (ALL)
Chlor. Hydrocarbon Pesticides (ALL)
Metals II (ALL)
Polychlorinated Biphenyls (ALL)
Purgeable Halocarbons (ALL)
Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Nitroaromatics Isophorone (ALL)
Phthalate Esters (ALL)

Serial No.: 103663

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DOH-3317 (3/97)

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Wadsworth Center The Governor Nelson A. Rockefeller Empire State Plaza P.O. Box 509 Albany, New York 12201-0509

Dennis P. Whalen
Executive Deputy Commissioner

MARCH 18, 1999

Rec'd 3/30/99

Dear Laboratory Director:

Please note that although your ELAP Certificate of Approval expires on 12:01 AM April 1, 1999, it is still valid until July 15, 1999, as per ELAP Certification Manual, No. 140, Page 13 of 42, dated 12/6/95, Part 55-2.4e NYCRR. "...during any extension or grace period permitted by this Subpart, a laboratory approval shall remain in force beyond the expiration date of the certificate of approval, unless such approval is specifically terminated or suspended in writing."

Notification regarding the issuance of 1999- 2000 ELAP Certificate(s) of Approval is pending receipt of all non-governmental laboratories' Total Adjusted Volumes and Approval of the 1999- 2000 ELAP Budget by the New York State Legislature.

Further verification of your laboratory's approved ELAP status is available by calling the Program Office at (518) 485-5570.

Sincerely,

Linda L. Madlin

Linda L. Madlin
Administrative Assistant
Environmental Laboratory
Approval Program

LLM:saw

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Hazardous Site Control, Room 252
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-0927 FAX: (518) 457-8989

John P. Cahill
Commissioner

JUN 17 1999

Ms. Patricia Simmons
U. S. Environmental Protection Agency, Region II
Emergency & Remedial Response Division
290 Broadway
New York, NY 10007-1866

Dear Ms. Simmons:

Re: Pollution Abatement Services, Site No. 7-38-001, Oswego County
PCB Long-Term Monitoring Plan

The New York State Department of Environmental Conservation has reviewed the plan referenced above, and have the following comments:

3.4 Sediment Monitoring

1. Taking surficial sediment samples at a depth of 0 to 6 inches will not likely provide information about new sediment deposition or changes in the PCB levels in sediments at the sediment - surface water interface which my change if PCBs in the water column are partitioning to sediments already in place. An arbitrary, but more meaningful depth, would be 0 to 4 cm.

2. We do not believe that core sampling will have much value if the purpose of the plan is to monitor changes in PCB concentrations. Cores will only show historical levels of PCBs.

3. We endorse the use of sediment traps and the collection of yearling fish as the best methods of monitoring changes in PCB concentrations. In addition, we suggest the use of passive in situ chemical extractor samplers which are now being widely used to measure PCBs in the water column.

4. The plan calls for annual monitoring, but the number of years it will continue is not stated. Also, what criteria will be used to trigger a new investigation if the PCB levels continually increase?

Appendix C Health and Safety Contingency Plan
In Section 11. Emergency Procedures, include a map showing the route from the site to Oswego Hospital.

If you have any questions, please contact John Strang, of my staff, at (518) 457-0927.

Sincerely,
John R Strang for GJ Rider
Gerald J. Rider, Jr., P.E.
Chief, Operation and Maintenance Section

cc:
C. Dowd, F&W
P. Carella, F&W
R. Warland, Air
J. Kelleher, Water
J. Strang

June 11, 1999

M. Cathy Geraci, Project Manager
Blasland, Bouck & Lee, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214-0066

HAZAR
DIVISI

Rec'd 7/26/99
JMS

Dear Ms. Geraci:

The United States Environmental Protection Agency and the New York State Department of Environmental Protection have reviewed the draft *PCB Long-Term Monitoring Plan* associated with operable unit four (OU-4) of the Pollution Abatement Services Site in Oswego, NY. Our comments on the draft document are attached.

If you have any questions regarding this matter, I may be reached at (212) 637-3865.

Sincerely,

Patricia Simmons, Project Manager
Central New York Remediation Section

Attachment

COMMENTS ON THE PCB LONG-TERM MONITORING PLAN FOR THE POLLUTION ABATEMENT SERVICES SITE, OSWEGO, NY

Section 1.3 - Site History

Page 1-3, Paragraph 4: Please replace the last sentence with the following text, *"The supplemental RI report, issued in 1993, concluded that the contamination that was detected in the bedrock groundwater outside the containment system was attributable to the downward migration of contaminants through the lodgement till beneath the containment system, particularly beneath the area of leachate collection well LCW-4 where the lodgement till is relatively thin. The supplemental RI Report noted that the highest level of contaminants occurred in the vicinity of leachate collection well LCW-4 where downward hydraulic gradients existed prior to implementation of the IGR program. The report concluded that the IGR program effectively reversed these downward hydraulic gradients and mitigated releases from this source."*

Section 1.4 - Objective

A schedule for implementation of the tasks described should be included in the Plan.

The Plan should include a discussion of the methods that will be used to "periodically evaluate potential ecological risks". Specifically, more details should be provided on how risk will be determined from the data collected.

The Plan should state that based upon our 5-year reviews, EPA we will make a determination as to whether or not the monitoring needs to be continued, or if further action is necessary.

Section 2.1 - Contractors and Subcontractors

It is stated that Galson Laboratories is a New York State Analytical Services Protocol/CLP-certified laboratory for PCB analyses. Galson does not currently hold a contract with the Contract Laboratory Program (CLP); however, the lab is a participant of the New York State Department of Health Environmental Laboratory Approval Program. The text should be corrected.

Galson Laboratories and EnChem must demonstrate their capability to perform the required analyses through Performance Evaluation (PE) samples or New York State certifications. The PE samples or state certifications must be specific to the analysis and media required for this project. In order to fulfill this requirement, the lab may submit the results of PE samples analyzed within the last 6 months.

Section 3.2 - Sample Locations

Three sampling stations widely spaced may not be appropriate to adequately evaluate contaminant mobility and spatial distribution of and trends for PCBs in White and Wine Creeks. The sediment samples should be collected at depositional areas (where there is sufficient sediment to collect both a top 6 inch sample and a deeper sample), and at former locations that contained elevated contaminant concentrations. These locations include SPRDS Phase 2 sampling points White -11A (11.40 ppm), White-12A (1.690 ppm), White-12B (5.860 ppm) and Wine-1C (1.320 ppm).

Figure 2 should include the SPRDS Phase 2 sampling locations and data in Reaches 10 through 12.

In order to assure that annual sampling is conducted at the same locations, permanent markers and/or GIS coordinates should be used to identify each sample location.

Section 3.4 - Sediment Monitoring

Corers, core tube liners or dredges should be used instead of a scoop to collect sediments. The use of a scoop in flowing or deep water may result in a loss of some of the finer, surficial sediments where higher concentrations of contaminants may be located.

Both the top 6 inches and the deeper sample should come from the same core tube, reducing effort and increasing the usefulness of the data. A calibrated rod should be employed to measure sediment depth prior to finalizing sample locations. It is recommended that the cores be cut into shorter sections (rather than dividing the samples into two depth categories) in order to gain a better understanding of the long term fate of the PCBs.

It may be more efficient to sink the samplers into the sediment so that only a small lip protrudes above the sediment. In the event that the proposed sediment traps do not collect enough sediment, attempts at sediment collection should be made with other types of samplers (e.g, large funnel style samplers). Further, it may be appropriate to deploy these traps prior to field activities which may cause an increase in disturbance of stream sediments and subsequently bias the sediments collected from the trap. The location of these sediment traps should be clearly identified in Figure 2.

Section 3.5 - Biota Monitoring

The fish collected and analyzed for this study should be representative of the specific area of concern (i.e., resident fish that were born and remain in the area of concern). This will avoid confounding results due to additional exposure from other contaminated areas or a reduction in exposure if the fish spend time in less contaminated areas. Further, fish that migrate out of the White, Wine Creek system during a portion of their life histories are not appropriate (e.g., the use of white suckers is likely not be suitable) for this monitoring program.

The age of the fish to be collected should be further discussed; fish are considered to be Young of Year (YOY) (0 years) from hatching until January, from January on they are considered yearlings or 1 year old fish. Establishing size slots from the literature and confirming by ageing the fish may be appropriate.

It should be noted whether samples will be collected from the areas outlined in the shaded boxes (Figure 2).

Section 6.0 - References

The *Guidance for Quality Assurance Project Plans* (EPA QA/G-5, EPA /600/R-98/018, February 1998) should be referenced as a Quality Assurance Project Plan (QAPP) preparation guidance document.

Appendix A - Standard Operating Procedures

Appendix A-1: Surficial Sediment Sampling Procedures
It should be specified that sediment samples will be decanted, since high moisture content can elevate analytical detection levels.

Appendix A-2: Sediment Core Sampling Procedures
Lexan, a polycarbonate thermoplastic, is the proposed tubing material for sediment core sampling; however, the integrity of this material may be affected by the presence of organic constituents (i.e., PCBs). Samples can effectively be collected with a stainless steel push core device, a stainless steel tube, or a glass tube.

It should be specified that prior to homogenization, sediment samples will be decanted since high moisture content can elevate analytical detection levels.

The diameter of the tubing should be specified in the plan.

Appendix A-3: Sediment Trap Sampling Procedures
It is indicated in the Placement Procedures and Sample Retrieval sections that the field crew will work downstream of the trap to minimize sediment resuspension. It is unclear if samplers will proceed in an upstream or downstream direction when placing and retrieving sediment traps. It is recommended that the crew proceed in a downstream direction for trap placement and in an upstream direction for trap retrieval. However, the crew should always approach each individual sampling point from a downstream direction, as indicated in the plan.

Appendix A-4: Fish Sampling Procedures
According to the *Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters* guidance document, samples undergoing chemical analysis should not be wrapped with an inner label (Page 83). Another technique for sample identification should be provided as Step 20.

Appendix A-5: Field Sample Packaging, Handling, and Shipping Procedures
Region 2 requires use of temperature blanks in coolers to verify that the samples have been maintained at 4°C. The temperature blank should consist of a sample container filled with non-preserved water (potable or distilled) and included in each cooler containing samples (soil and aqueous) being sent for analysis. The container should be labeled "USEPA COOLER TEMPERATURE INDICATOR" and dated. Temperature of the blank should be taken and recorded on the chain of custody record immediately upon receipt at the laboratory, prior to inventory and refrigeration.

Appendix A-6: Field Cleaning/Decontamination Procedures, Sections III and IV
The solvent rinse steps listed are inappropriate or unspecified. The solvent rinse should consist of one of the following options: 1) an acetone only rinse; or 2) a methanol followed by a hexane rinse. All solvents used should be pesticide grade or better. This step should be followed by a thorough rinse with deionized demonstrated analyte free water that is five times the volume of solvent used in the previous step.

Appendix B - Quality Assurance Project Plan

Section 4.2, Page 4-1: A designation of "D" for field duplicate samples is inappropriate. Field duplicate samples must be submitted to the lab as blind QC. Each duplicate sample must have a separate and unique sample identification number.

Section 4.3.2, Page 4-1: A temperature blank should be included in all sediment sample coolers. See Appendix A Comment 4 on temperature blanks.

Sections 4.4.1, Page 4-3 and Section 9.3.3, Page 9-2: References to groundwater sampling equipment should be removed because this project only involves sediment and biota sampling.

Section 9.3, Page 9-1: Acceptance criteria should be specified in the text for all analytical laboratory quality control samples.

Section 12.3, Page 12-2: Table 4 outlines sample containers, preservation and holding time information, not spike recovery measurements as indicated in the text. This inconsistency should be corrected.

Table 2: It is stated that a standard gravimetric analytical procedure will be used to determine percent lipids. A method should be referenced or the analytical procedure should be provided in the plan.

Table 4: The maximum holding time from sample collection should be clarified for sediment PCB samples to indicate 7 days to extraction and 40 days to analysis.

Appendix C - Health and Safety Contingency Plan

Section 11.5: A map showing the route from the site to Oswego Hospital should be provided.

From: Tom Gentile
To: Strang, John
Date: 6/7/99 1:56pm
Subject: Re: Comments on PAS PCB Long-Term Monitoring Plan

John, I have reviewed the report and have not identified any issues for the Division of Air Resources. Since the proposed remedy is for long term monitoring of biota and sediment, with no further large-scale removal of contaminated sediment there should be no air emissions issues. I could not find any information about the current sediment PCB concentrations or the congener profile in the plan. Are the sediment concentrations in excess of 50 ppm ?

>>> John Strang 06/03/99 03:31PM >>>
I am compiling the Department's comments on the above plan. We are planning to send a finalized comment letter to EPA by June 11, 1999. Please send any comments to me. Thank you.
John Strang

CC: Higgins, John; Rider, Jerry; Warland, Robert

From: John Strang
To: Gentile, Tom
Date: 6/16/99 4:11PM
Subject: PAS PCB Long-Term Monitoring Plan

Tom,

Thank you for reviewing the above Monitoring Plan with regard to air emissions issues. To answer your e-mail query, the current sediment PCB concentrations had a high value of just 11 ppm.

John Strang

John
FYA 6/5/99

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
Bureau of Habitat, Room 576
50 Wolf Road, Albany, New York 12233-4756
Phone: (518) 457-6178 FAX: (518) 485-842

2 1999
BUREAU OF
HAZARDOUS

John P. Cahill
Commissioner

MEMORANDUM

TO: Gerald Rider, Division of Environmental Remediation

FROM: Paul Carella, Division of Fish, Wildlife and Marine Resources

SUBJECT: Pollution Abatement Services PCB Long-Term Monitoring Plan, April 1999

DATE: May 28, 1999

I have reviewed the plan referenced above, and my comments follow:

1. Taking surficial sediment samples at a depth of 0 to 6 inches will not likely provide information about new sediment deposition or changes in the PCB levels in sediments at the sediment - surface water interface which my change if PCBs in the water column are partitioning to sediments already in place. An arbitrary, but more meaningful depth, would be 0 to 4 cm.

2. I do not believe that core sampling will have much value if the purpose of the plan is to monitor changes in PCB concentrations. Cores will only show historical levels of PCBs.

3. I endorse the use of sediment traps and the collection of yearling fish as the best methods of monitoring changes in PCB concentrations. In addition, I suggest the use of passive in situ chemical extractor samplers which are now being widely used to measure PCBs in the water column.

4. The plan calls for annual monitoring, but the number of years it will continue is not stated. Also, what criteria will be used to trigger a new investigation if the PCB levels continually increase?

If you have any questions, please call me at 457-9015.

Paul Carl

Biologist 1 (Ecology)

cc: Christina Dowd/SS/RK/ET
    Mindy Pensak, USEPA
    Chad Covey, Region 7

BBL
BLASLAND, BOUCK & LEE, INC
engineers & scientists

Transmitted Via Federal Express

April 20, 1999

Chief, Central New York Remediation Section
New York Remediation Branch
Emergency and Remedial Response Division
United States Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, NY 10007-1866

Re: Pollution Abatement Services Superfund Site
Fourth Operable Unit
Oswego, New York
PCB Long-Term Monitoring Plan
BBL Project #: 0364.36444 #2

Attention -- Pollution Abatement Services Superfund Site Remedial Project Manager:

On behalf of Niagara Mohawk Power Corporation and General Motors Corporation (the Settling Defendants), please find enclosed seven copies of the PCB Long-Term Monitoring Plan that has been prepared in connection with the fourth operable unit (OU4) of the Pollution Abatement Services (PAS) Superfund Site located in Oswego, New York. The enclosed Plan has been prepared in accordance with the requirements outlined in the OU4 Consent Decree between the United States Environmental Protection Agency and the Settling Defendants. That Consent Decree was lodged by the Court on December 15, 1998.

Please feel free to call William C. Weiss, Esq. of Niagara Mohawk Power Corporation at (315) 428-6944 if you have any questions or require any additional information.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

M. Cathy Geraci

M. Cathy Geraci
Associate

MCG/cmd
48291750.WPD

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Fax (315) 449-0017 • www.bbl-inc.com
Offices Nationwide

cc: Chief, New York/Caribbean Superfund Branch, Office of Regional Counsel, United States Environmental Protection Agency, Region II -- Attention: PAS Superfund Site Attorney (w/out encl.)
Chief Environmental Enforcement Section, Environment and Natural Resources Division, United States Department of Justice, Re: DOJ # 90-11-2-2A (w/out encl.)
Director, Division of Hazardous Waste Remediation, New York State Department of Environmental Conservation -- Attention: PAS Site Project Manager (six copies)
William C. Weiss, Esq., Niagara Mohawk Power Corporation (one copy)
R. William Stephens, Esq., Raichle, Banning, Weiss & Stephens (one copy)
Mr. James F. Morgan, Niagara Mohawk Power Corporation (one copy)
Mr. David J. Ulm, Blasland, Bouck & Lee, Inc. (one copy)

From Patricia Simmons
USEPA

"Appendix B"

STATEMENT OF WORK

Pollution Abatement Services Superfund Site

1. WORK TO BE PERFORMED

Because the remedy selected in the Environmental Protection Agency's ("EPA's") September 30, 1997 Record of Decision (the "1997 ROD") for the Pollution Abatement Services Superfund Site (the "Site"), no further action with long-term monitoring, may result in sediment contamination concentrations remaining above ecologically protective levels, the objective of the work to be conducted under this Consent Decree is to monitor the levels of PCBs in the sediments and in fish in White and Wine Creeks and the adjacent wetlands. The PCB long-term monitoring results will be used to assess the threat on a periodic basis. If it is justified by this assessment, remedial action may be implemented to address the sediment contamination.

2 PROJECT SUPERVISION/MANAGEMENT, PROJECT COORDINATOR

The PCB long-term monitoring will be under the direction and supervision of a qualified, New York State-licensed, professional engineer (hereinafter, "Supervising Contractor"), and will meet any and all requirements of applicable federal and state laws. The EPA has approved the Settling Defendants' selection of Blasland, Buock & Lee as their Supervising Contractor for the purposes of [illegible] Decree. The Settling Defendants shall notify the EPA and New York State Department of Environmental Conservation ("NYSDEC"), in writing, of the names of [illegible] contractors and subcontractors proposed to be used in the development and implementation of the work to be performed Selection of any such engineer, contractor, or subcontractor shall be subject to approval by the EPA

3. PCB LONG-TERM MONITORING PLAN

Within ninety (90) days after the lodging of this Consent Decree, The Settling Defendants shall submit to EPA and the State a Long-Term Monitoring Plan for the Site. This plan shall provide for the PCB long-term monitoring associated with the remedy set forth in the 1997 ROD, in accordance with this Consent Decree and the 1997 ROD.

As discussed further below, the PCB Long-Term Monitoring Plan shall provide for annual monitoring of PCB levels in the sediments and biota in the creeks and wetlands adjacent to the Site, and shall include the following components: (a) methodology for the selection of a contractor(s); (b) methodology for the implementation of the PCB long-term monitoring plan; (c) Quality Assurance Project Plan ("QAPP"); and (d) Health and Safety Contingency Plan ("HSCP").

a. <u>Methodology for the Selection of a Contractor(s)</u>

The Plan shall describe how long-term monitoring contractors and subcontractors will be procured.

b. <u>Methodology for the Implementation of the PCB Long-Term Monitoring Plan</u>

(1) The methods that will be employed to ensure that the PCB long-term monitoring activities are performed properly and in a timely manner shall be described.

(2) The plan shall include the following:

i. A discussion of potential problems which may arise during monitoring events, and remedies for such problems;

ii. A discussion of alternative procedures in the event that conditions at the Site, i.e., elevated water levels, prohibit a monitoring event from being conducted at the scheduled time;

iii. A PCB long-term monitoring schedule that identifies the frequency of monitoring events and the timing of those events.

(3) The methodology for monitoring shall include:

i. An explanation of the way(s) the sampling, analysis, testing, and monitoring will produce data for the PCB long-term monitoring;

ii. A detailed description of the sampling, analysis, and testing to be performed, including sampling methods;

iii. A map depicting sampling locations; and

iv. A schedule for performance of specific tasks.

(4) All sampling and monitoring shall be performed in accordance with the "Region II CERCLA Quality Assurance Manual", Revision 1, EPA Region II, dated October 1989, and any updates thereto or an alternate EPA-approved test method, and the guidelines set forth in this Consent Decree. Biota sampling shall be performed in accordance with EPA's "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Fish Sampling and Analysis" (EPA 823-R-95-007), Volume I, United States Environmental Protection Agency, Office of Water, 1995, and "Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters" (EPA/600/R-92/111), United States Environmental Protection Agency, Office of Research and Development, 1993. All testing methods and procedures shall be fully documented and referenced to established methods or standards.

(5) The sediment monitoring that will be performed as part of the PCB long-term monitoring shall include annual sampling of the sediments and sediment cores (to be taken in the same locations as the sediment samples) in White and Wine Creeks and the adjacent wetland areas, during the spring, at locations upstream, adjacent to, and downstream of the Site. The actual sampling locations shall be defined in the PCB Long-Term Monitoring Plan discussed above.

(6) Sediment traps shall be installed upstream of reach 10 and downstream of reach 12 to help determine if migration of contaminants onto or away from the Site is occurring.

(7) The biota monitoring that will be performed as part of the long-term monitoring shall include the collection of several fish samples during the spring (before spawning). The fish to be collected shall be yearlings (i.e., they have only been in the system for one year), and shall be of the same sex and species. Each sample shall consist of several fish, and shall be collected in the same locations as the sediment samples. The locations and frequency of the biota samples, what type of biota samples will be collected, and specifications for the collection and preparation of the samples shall be described. (It should also be noted whether collection is for human health or ecological purposes.)

d. Quality Assurance Project Plan

(1) EPA has approved a Quality Assurance Project Plan ("QAPP") under Administrative Order on Consent Index No. 10221. The approved QAPP will be reviewed for consistency with the PCB Long-Term Monitoring Program as described herein and in the Consent Decree. An addendum to the approved QAPP shall be developed by the Settling Defendants to include the requirements for biota monitoring established in this Consent Decree. Any further changes deemed necessary for the monitoring program activities shall also be developed, as an addendum to the approved QAPP, by the Settling Defendants, and approved by the EPA prior to the commencement of any sampling, testing, and monitoring activities.

Any addendum to the approved QAPP shall be developed in accordance with the "Region II CERCLA Quality Assurance Manual," Revision 1, EPA-Region II, dated October, 1989, and any updates thereto, and all other guidance as specified in this Consent Decree. The addendum to the QAPP shall include, at a minimum, the following items:

i. Title Page
ii. Table of Contents
iii. Project Description
iv. Project Organization and Responsibility
v. Quality Assurance Objectives
vi. Sampling Procedures
vii. Sample Custody
viii. Calibration Procedures and Frequency
ix. Analytical Procedures
x. Data Reduction, Validation and Reporting
xi. Internal Quality Control Checks
xii. Performance and Systems Audits
xiii. Preventive Maintenance
xiv. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness
xv. Corrective Action
xvi. Quality Assurance Reports to Management

(2) In order to provide quality assurance and maintain quality control, with respect to PCB long-term monitoring samples to be collected, The Settling Defendants shall ensure that the following requirements are met:

i. Quality-assurance and chain-of-custody procedures shall be performed in accordance with standard EPA protocol and guidance;

ii. Laboratories engaged for the analyses of samples which must be in good standing with EPA's Contract Laboratory Program ("CLP"), or have demonstrated their ability to perform all tasks required under the CLP;

iii. In the event that the laboratory utilized by The Settling Defendants is not CLP-certified for a relevant set of parameters, The Settling Defendants shall ensure that the laboratory will analyze performance evaluation samples submitted by EPA for those parameters for quality assurance purposes;

iv. The laboratory utilized for analyses of samples shall perform all analyses in accordance with the accepted EPA methods, as documented in the "Contract Lab Program Statement of Work for Organic Analysis," Revision 9, 1994 (or the latest revision), and the "Contract Lab Program Statement of Work for Inorganic Analysis," Revision 11, 1992 (or the latest revision), or other EPA approved methods;

v. All data shall be validated upon receipt from the laboratory;

vi. The validation package being submitted (checklist, report, and Form #1 containing the final data) to EPA, shall be prepared in accordance with the provisions of Subparagraph vii. below;

vii. All analytical data shall be validated in accordance with the procedures stated in the "EPA Region II Contract Lab Program Organics Data Review and Preliminary Review (SOP #HW-6, Revision 8)", dated January, 1992 (or the latest revision)or EPA-approved equivalent procedures.

(a) Upon request by the EPA, The Settling Defendants shall promptly provide the EPA with any unvalidated results of all sampling and/or tests or other data generated by The Settling Defendants with respect to the implementation of this Consent Decree;

viii. The Settling Defendants shall require full CLP or CLP-equivalent deliverables from the laboratory for the analytical data from monitoring; and upon the EPA's request, The Settling Defendants shall submit to the EPA the full documentation for this sampling; and

ix. The Settling Defendants shall ensure that all contracts with the laboratory, utilized by The Settling Defendants for analyses of samples, provide for access of EPA personnel and authorized representatives of the EPA for the purpose of ensuring the accuracy of laboratory results related to the Site.

e. <u>Health and Safety Contingency Plan</u>

EPA has approved a Health and Safety Contingency Plan ("HSCP") under Administrative Order on Consent Index No. 10221. The approved HSCP will be reviewed for consistency with all activities performed under this Consent Decree. Any changes deemed necessary to the HSCP shall be developed as an addendum to the approved HSCP by The Settling Defendants to address the protection of public health and safety and the response to contingencies that could impact public health, safety, and the environment. Any addendum to the approved HSCP shall conform to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120; and shall satisfy the requirements of the "Occupational Safety and Health Guidance for Hazardous Waste Site Activities," (October, 1985, DHH 5 NIOSH Publication No. 85-115), and the additional Occupational Safety and Health Administration, U.S. Department of Labor ("OSHA") requirements cited below.

All site activities shall be performed in such a manner as to ensure the safety and health of personnel so engaged. All site activities shall be conducted in accordance with all pertinent general industry (29 C.F.R. Part 1910) and construction (29 C.F.R. Part 1926) OSHA standards, and the EPA's <u>Standard Operating Safety Guides</u> (OSWER, 1988) as well as any other applicable state and municipal codes or ordinances. All site activities shall comply with those requirements set forth in OSHA's final rule entitled "Hazardous Waste Operations and Emergency Response," 29 C.F.R. §1910.120, Subpart H. The addendum to the HSCP shall include, at a minimum, the following items:

i. Plans showing the location and layout of any temporary facilities to be constructed on or near the Site;

ii. A description of the known hazards and evaluation of the risks associated with the Site and the potential health impacts related to the site activities;

iii. A list of key personnel and alternates responsible for site safety, response operations, and protection of the public;

iv. A description of levels of protection (based on specified standards) to be utilized by all personnel;

v. A delineation of work, decontamination, and safe zones, and definitions of the movement of zones;

vi. A description of decontamination procedures for personnel and equipment, and handling and removal of disposable clothing or equipment;

vii. Incidental emergency procedures which address emergency care for personnel injuries and exposure problems, and containment measures. These procedures shall include evacuation routes, internal and external communications procedures for response to fire, explosion, or other emergencies, the name of the nearest hospital and the route to that hospital. Local agencies with the capability to respond to emergencies shall be identified and their capabilities shall be described, and a description of the procedures for informing the community of these measures shall be outlined;

viii. A description of the personnel medical surveillance program in effect;

ix. A description of the monitoring procedures for personnel safety;

x. A description of the routine and special personnel training programs; and

xi. A description of an air monitoring program to determine concentrations of airborne contaminants, to which workers on Site and persons near the Site boundary may be exposed. The results of work-zone air monitoring may be used as a trigger for implementing site-boundary air monitoring.

5. APPROVAL AND IMPLEMENTATION OF PCB LONG-TERM MONITORING PLAN

EPA will either approve the PCB Long-Term Monitoring Plan or require modification of it in accordance with the procedures set forth in this Consent Decree. Upon approval of the PCB Long-Term Monitoring Plan by EPA, Settling Defendants shall implement the activities required under the PCB Long-Term Monitoring Plan.

6. MODIFICATIONS TO THE APPROVED PCB LONG-TERM MONITORING PLAN

During performance of the PCB Long-Term Monitoring, Settling Defendants may identify and request EPA approval for changes to the approved PCB Long-Term Monitoring Plan, as necessary, to complete the work. EPA will either approve, disapprove, or require modification of any requests for changes in accordance with the procedures set forth in this Consent Decree.

7. REMEDIAL ACTION COMPLETION REPORT

Within ninety (90) days after Settling Defendants conclude that the Remedial Action has been fully performed, Settling Defendants shall submit a Remedial Action Completion Report to EPA and the State, summarizing and evaluating the monitoring data generated pursuant to the PCB Long-Term Monitoring Plan. In the report, a registered professional engineer and Settling Defendants' Project Coordinator shall state that the Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree. The Remedial Action Completion Report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If EPA concludes, based on the initial or any subsequent Remedial Action Completion Report and after a reasonable opportunity for review and comment by the State, that the Remedial Action has been performed in accordance with this

Consent Decree, EPA will so certify in writing to Settling Defendants.