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**Final  
Site Safety and Health Plan Addendum  
for  
Occidental Chemical Corporation Property Data Gap and  
Lewiston-Porter Central School District Investigations  
at the Former Lake Ontario Ordnance Works (LOOW)  
Niagara County, New York**

**Addendum to the  
Phase IV Remedial Investigation of the  
Wastewater Treatment Plant (EU7)  
Site Safety and Health Plan**

August 2010

*Prepared for*

**U.S. Army Corps of Engineers  
Baltimore District**

**Contract W912DR-06-D-0002  
Delivery Order 0009**

*Prepared by*

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3 August 2010

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3 August 2010

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Date

## COMPLETION OF SENIOR TECHNICAL REVIEW

This document has been produced within the framework of the Earth Resources Technology, Inc. (ERT) and EA Engineering, Science, and Technology, Inc. (EA) quality management systems. As such, a senior technical review, as defined in the Quality Control Plan for this project, has been conducted. This included review of the overall design addressed within the document, proposed or utilized technologies and alternatives and their applications with respect to project objectives and framework of United States Army Corps of Engineers (USACE) regulatory constraints under the current Defense Environmental Restoration Program - Formerly Used Defense Sites (DERP-FUDS) No. C02NY0025 project, within which this work has been completed.

[REDACTED]

12 July 2010

[REDACTED] (EA)  
Senior Technical Reviewer

Date

## COMPLETION OF INDEPENDENT TECHNICAL REVIEW

This document has been produced within the framework of ERT's total quality management system. As such, an independent technical review, appropriate to the level of risk and complexity inherent in the project as defined in the Quality Control Plan (QCP) for this project, has been conducted. This included review of assumptions (methods, procedures, and material used in analyses), alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the project objectives. Comments and concerns resulting from review of the document have been addressed and corrected as necessary.

[REDACTED]

9 July 2010

[REDACTED]  
Independent Technical Reviewer (ERT)

Date

## CERTIFICATION

This Site-Specific Safety and Health Plan (SSHP) has been prepared under the supervision of, and has been reviewed by, a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene (ABIH).

[Redacted Signature]

9 July 2010

[Redacted Name]

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Date

Certified Industrial Hygienist (ABIH No. CP1254)

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**LIST OF ACRONYMS**

ABIH	American Board of Industrial Hygiene
AHA	Activity Hazard Analysis
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CNS	Central Nervous System
COPC	Chemicals of Potential Concern
CPR	Cardiopulmonary Resuscitation
CWM	Waste Management Chemical Services LLC
DERP-FUDS	Defense Environmental Restoration Program - Formerly Used Defense Sites
DOD	Department of Defense
EA	EA Engineering, Science, and Technology, Inc.
EM	Engineering Manual
ERT	Earth Resources Technology, Inc.
ES&H	Employee Safety and Health
EU	Exposure Unit
EU 7	Wastewater Treatment Plant
EU 8	Occidental Chemical Corporation Property
FS	Feasibility Study
FSP	Field Sampling Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDLH	Immediately Dangerous to Life and Health
LOOW	Lake Ontario Ordnance Works
MEC	Munitions and Explosives of Concern
mg/m <sup>3</sup>	milligrams per cubic meter
mRem	Milliroentgen equivalent in man
MSDS	Material Safety Data Sheets
N/A	Not Applicable
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PM	Project Manager
PPE	Personal Protective Equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
QCP	Quality Control Plan
RI	Remedial Investigation
RSP	Radiation Safety Plan
SSHO	Site Safety and Health Officer
SSHP	Site-specific Safety and Health Plan
STEL	Short-Term Exposure Limit
TLV	Threshold Limit Value
TNT	Trinitrotoluene
USACE	US Army Corps of Engineers
VOC	Volatile Organic Compound

## **1.0 INTRODUCTION**

Earth Resources Technology, Inc. (ERT) has been contracted by the U.S. Army Corps of Engineers (USACE), Baltimore District to develop a Site-specific Safety and Health Plan (SSHP) Addendum for activities related to the Occidental Chemical Corporation Data Gap Investigation and Lewiston-Porter Central School District School Investigation at the Former Lake Ontario Ordnance Works (LOOW). This SSHP Addendum establishes procedures to protect employees of ERT, subcontractors, USACE, and site visitors from potential safety and health hazards resulting from activities conducted during this project. This SSHP Addendum is an addendum to the previously accepted Final Health and Safety Plan (USACE/ERT, 2009a), although enough site-specific information has been included herein to minimize the need to refer to both documents during day to day field activities. This SSHP has been developed in accordance with requirements set forth in:

- 29 Code of Federal Regulations (CFR) 1910.120 - the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard;
- 29 CFR 1926 - the OSHA Safety and Health Regulations for Construction;
- ERT's Corporate Health and Safety Program; and
- USACE Safety and Health Requirements Engineering Manual (EM) 385-1-1 (USACE, 2008).

This SSHP Addendum has been prepared in order to provide safe procedures and practices for personnel performing site work. This SSHP Addendum was developed using contract information provided by USACE, Baltimore District and will refer to the requirements discussed in OSHA regulations, USACE EM 385-1-1, ERT's Corporate Health and Safety Program, and the previously accepted Final Health and Safety Plan (USACE/ERT, 2009a). A crosswalk checklist of EM 385-1-1 requirements and their location within this plan is provided in Appendix A. All of the above mentioned documents will be kept onsite (or will be readily available), and are incorporated into the SSHP Addendum by reference. The SSHP Addendum will also be transmitted to all site workers and subcontractors.

Elevated radioactivity is not expected to be encountered during the activities; however, a Radiation Safety Plan (RSP) (USACE/ERT, 2009b) has been developed to outline procedures for providing radiological screening. This RSP has been produced under separate cover, but is also included as part of this SSHP, incorporated by reference, and will be maintained on site with the SSHP Addendum.

### **1.1 Site History**

*This section of the original Phase IV Remedial Investigation (RI) SSHP Addendum (USACE, 2009a) has not been amended.*

### **1.2 Project Description**

The overall project objectives for the Occidental Chemical Corporation (EU 8) Data Gap Investigation and Lewiston-Porter Central School District School Historic Soil Disturbances Investigation include the following:

- Evaluate the extent of chromium and explosives constituents on the Occidental Chemical Corporation Property (EU 8). This will be addressed by collecting field screening and analytical soil samples and evaluating whether chromium and/or explosives constituents exceed site-specific preliminary remediation goals for soil, thereby resulting in a defined volume of impacted soil requiring attention.
- Evaluate the nature and extent of chemical constituents associated with various historic soil disturbances (mounds and pits) located in the undeveloped portion of the Lewiston-Porter Central School District School campus. This will be addressed by performing field reconnaissance of the soil disturbances, performing field screens of soil samples and submitting soil samples for laboratory analysis; and evaluating whether chemical constituents associated with former Department of Defense (DOD) activities impacted the area.

Data collected and evaluated from the Occidental Chemical Corporation Data Gap Investigation will be used to supplement previous sampling data for a Feasibility Study (FS) evaluation of the remedial options of previously observed chromium and explosive constituent impacts. Data collected from the Lewiston-Porter Central School District School Investigation will be used to determine if previous DOD activities adversely impacted the undeveloped lands associated with the school campus.

Field work will be performed in accordance with the guidelines contained in the Field Sampling Plan (FSP), presented under separate cover. Analytical data will be evaluated against applicable standards as discussed in the Quality Assurance Project Plan (QAPP), also presented under separate cover.

Various activities to be performed require communication of the potential risks, safe operational procedures and adherence to required Activity Hazard Analyses (AHAs). The following activities require an AHA:

- Site reconnaissance
- Site preparation/mobilization
- Manual and mechanical brush removal
- Decontamination of field equipment
- Environmental sampling
- Investigative Derived Waste (IDW) management

### **1.3 ERT Corporate Safety and Health Policy**

ERT's Safety and Health Program specifies that all ERT personnel are responsible for their safety and the safety of those working with them. However, it is also stated that the ultimate employee safety and health (ES&H) responsibility begins with the President of ERT and this responsibility radiates outward to all management, administrative, operations, and field personnel. To achieve this philosophy, ERT empowers all personnel with stop work authority regarding known or potential ES&H issues. Additionally, all ERT personnel are held accountable for performing their assigned tasks in a manner that promotes continuous, active hazard evaluation and safe task performance.

**1.4 Project Safety and Health Program**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## 2.0 ORGANIZATION OF PERSONNEL

<u>Role</u>	<u>Person</u>	<u>Contact Information</u>
ERT Program Manager	[REDACTED]	[REDACTED]
ERT Project Manager (PM)	[REDACTED]	[REDACTED]
ERT Certified Industrial Hygienist (CIH)	[REDACTED]	[REDACTED]
ERT Site Manager	[REDACTED]	[REDACTED]
ERT Site Safety and Health Officer (SSHO)	[REDACTED]	[REDACTED]
ERT Radiation Safety Officer	Pending	Pending
USACE Project Manager	[REDACTED]	[REDACTED]
USACE Technical Manager	[REDACTED]	[REDACTED]

Training certifications/qualifications for key staff are included in Appendix C

### 2.1 Program Manager

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### 2.2 Project Manager

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### 2.3 Project Certified Industrial Hygienist

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### 2.4 Site Manager

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

The Site Manager will be responsible for daily completion of site activities in accordance with the approved project planning documents. The Site Manager will be required to have OSHA 8-hour HAZWOPER Site Supervisor training in addition to current OSHA 40-hour HAZWOPER training. The responsibilities of the Site Manager include:

*Reviewing health and safety documentation to ensure compliance with this SSHP; and*

*Work with SSHO to identify, evaluate, and control hazards.*

During an emergency, the Site Manager will be responsible for initiating and coordinating responses. The Site Manager will be responsible for the following:

*Initiating the evacuation of the work site when needed, communicating with offsite emergency responders, and coordinating activities of onsite and offsite emergency responders; and*

*Determine if hazardous conditions are adequately alleviated prior to allowing resumption of work operations after an emergency.*

## **2.5 Site Safety and Health Officer**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

The SSHO will be onsite throughout the project and will be responsible for daily compliance with site safety and health requirements. The SSHO or their designee will be required to have OSHA 30-hour Construction Safety training in addition to current OSHA 40-hour HAZWOPER training.

The SSHO will have the following responsibilities:

- Monitor compliance with this SSHP;
- Ensure all site activities are performed in a manner consistent with ERT's Corporate Health and Safety Program and the SSHP;
- Interface with the CIH about onsite implementation of the SSHP;
- Direct daily health and safety activities onsite;
- In conjunction with the PM, ensure that all ERT's personnel and subcontractors designated to work at the project sites are qualified according to ERT's medical surveillance and training requirements;
- Report all incidents, accidents, and near misses to the PM, Site Manager and to the USACE PM or Authorized Site Representative and completes or oversees completion of Accident/Incident Report forms;
- Maintain health and safety equipment onsite;
- Inspect ongoing activities, and report any health and safety deficiencies to the Site Manager and Project Manager;
- Accompany or maintain communication with each work crew;
- Perform site monitoring to ensure that site personnel are adequately protected; and
- Conduct initial site-specific safety training and regular safety briefings for site personnel.

The SSHO will have the authority to take the following actions:

- Stop site activities if an "imminently dangerous" situation exists. The emergency situation will be immediately reviewed with the PM, and CIH and the USACE PM or Authorized Site Representative;
- Direct personnel to change a work practice if it is determined to be hazardous to the health and safety of site personnel; and
- Temporarily suspend an individual from site activities for infractions of the SSHP, pending discussion with the CIH.

Both the Site Manager and SSHO will be CPR/First Aid trained.

## **2.6 Environmental Field Technician**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **2.7 Field Personnel**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **2.8 Subcontractors**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

Various subcontractors will be utilized as the project proceeds. Anticipated subcontractors to be utilized are listed below.

- Cabrera Services (Health Physicist support)
- Test America, Inc (Contract Laboratory support)
- DM Landscavation (brush removal)

Subcontractor supervisors and staff will follow, at a minimum, the procedures and reporting requirements specified in this plan. If at any time, the Site Manager or SSHO feels the subcontractor is disregarding safe work practices, the subcontractor supervisor will be notified immediately to implement corrective actions. If unsafe work practices continue by the subcontractor, they will be requested to stop work and leave the site by the Site Manager. ERT's contract manager will also terminate their subcontract agreement if the subcontractor cannot resolve the issues to the satisfaction of the ERT PM.

## **2.9 Visitors**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

Visitors will not be allowed within work exclusion zones without appropriate OSHA training and medical surveillance, and the permission of the Site Manager and/or SSHO. Authorized site visitors, defined as anyone who is not a regular project worker, such as a contracting agency and other Federal or local agency personnel, may visit the site per the project-specification, but will be responsible for the following items:

- Signing the Site Entry and Exit Log upon entering and exiting the site (Appendix B);
- Receiving the site hazard and safety instructions from the SSHO;
- Reviewing and complying with the essential elements of the SSHP;
- Entering only those areas of the site deemed permissible by the SSHO and Site Manager;
- Entering work exclusion zones only after presenting appropriate documentation and after having been granted permission from the SSHO and Site Manager, and donning appropriate personal protective equipment (PPE) to enter regulated work areas when such controls are required for entry; and
- Reporting any observed unsafe act and/or condition at, or affecting, the work site to the PM

### **3.0 REQUIRED TRAINING AND MEDICAL SURVEILLANCE**

#### **3.1 General Safety and Health Training**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **3.2 Site-Specific Training**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **3.3 Medical Surveillance**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended*

#### **3.4 First Aid/CPR**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has been amended to include the following.*

Members of the ERT filed team who are certified in First Aid and CPR are as follows:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

## **4.0 GENERAL SAFETY REQUIREMENTS**

### **4.1 SSHP Acknowledgment**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **4.2 Onsite Coordination**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **4.3 General Safety Rules**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

The general safety rules listed below apply to ERT and subcontractor personnel present at the former LOOW.

- Under no circumstance will field activities be conducted unless a competent person is present and aware of the activity;
- Eating, drinking, and smoking are prohibited on site, except in designated areas;
- All municipal wastes will be collected in dedicated trash canisters and removed from the site at the end of each work day and disposed of at an appropriate facility;
- All onsite personnel must wear protective clothing appropriate for designated level of protection (e.g., work boots) and personnel shall wash hands before eating and at the completion of work activities;
- Adequate lavatory facilities and wash stations will be provided to site personnel, in accordance with applicable OSHA regulation;
- An adequately stocked first-aid kit will be maintained; and
- All accidents, injuries, or possible exposures will be reported to the SSHO immediately and an accident report form will be completed. A copy of the incident report form is included in Appendix D.

#### **4.3.1 Buddy System**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **4.3.2 Disciplinary Procedure**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **4.3.3 Alcohol and Drug Abuse Prevention**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **4.4 Site Sanitation**

*This section has been included in this addendum only and is not present in the original Phase IV RI SSHP Addendum (USACE, 2009a).*

Temporary toilet(s) will be available for use at the Support Zone (further detailed in Section 6.1.2) and potable water will be available to allow field personnel to perform personal hygiene functions. Municipal trash will be kept in contractor grade garbage bags and removed from the site at the end of each work day.

## **5.0 ACTIVITY HAZARD ANALYSIS**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

The potential hazards associated with the project site include radiological, chemical, physical, and biological hazards. The potential for encountering chemical hazards will depend on the types and quantities of chemicals present and the type of work being performed. All personnel hours will be documented in the daily log book to track the number of man-hours and potential exposure. The potential for encountering physical and biological hazards will depend on the location and type of work being performed. The hazard assessment in this section is intended to communicate to site personnel the radiological, chemical, physical, and biological hazards and risks associated with site work. Activity Hazard Analyses are provided in Appendix E.

### **5.1 Radiological Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

Due to the area's proximity to sites with radiological impacts, field screening for radiological impacts will be conducted prior to mobilizing and while conducting certain activities associated with the Occidental Chemical Corporation Data Gap Investigation and Lewiston-Porter Central School District School Investigation. The RSP (USACE/ERT, 2009a) details procedures and techniques that will be utilized to ensure the health and safety of field personnel during RI activities and includes the AHA with respect to radiological hazards.

A radiation survey meter will be used initially upon site entry and during brush clearance activities. Readings will be taken from vegetation to be cleared. After background levels have been established, readings above two times the background level will prompt work to halt immediately. Work will not be performed if the dose rate is greater than 1 milliroentgen equivalent in man (mRem) per hour. Employees will evacuate the area and the SSHP will immediately contact the PM and the USACE PM or Authorized Site Representative. Work will not recommence until the site has been assessed by a health physicist.

### **5.2 Asbestos Containing Material Hazards**

*This section of the original Phase IV SSHP Addendum (USACE, 2009a) is hereby removed in its entirety.*

### **5.3 Chemical Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.3.1 Volatile Organic Compounds**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

**5.3.2 Trinitrotoluene**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
<b>Volatile Organic Compounds (VOC)</b>				
Acetone	500 parts per million (ppm)/750 ppm	2,500 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, nose, throat; head-ache, dizziness, CNS depressant, dermatitis.
Bromoform	0.5 ppm	850 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, respiratory system; CNS depressant; liver, kidney damage.
Bromomethane (Methyl bromide)	1 ppm	Ca 250 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, respiratory system; muscular weakness, incoherence, visual disturbance, vertigo; nausea, vomiting, headache; malaise; hand tremor; convulsions; dyspnea; skin vesiculation. Liquid: frostbite; carcinogen.
2-Butanone (MEK)	200 ppm/300 ppm	3,000 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin, nose; headache, dizziness; vomiting; dermatitis.
Carbon disulfide	10 ppm	500 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Dizziness, headache, poor sleep, fatigue, nervousness, anorexia, low-weight; psychosis; polyneuritis; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects.
Carbon tetrachloride	0.1 ppm/0.3 ppm C 25 ppm	Ca 200 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; CNS depressant; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoherence; carcinogen.
Chlorobenzene	10 ppm	1,000 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin, nose; drowsiness, incoherence, CNS depressant.
Chloroethane (Ethyl chloride)	100 ppm	3,800 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Incoherence, inebriation; abdominal cramps; cardiac arrhythmia, cardiac arrest; liver, kidney damage.
Chloroform	10 ppm C 50 ppm	500 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; dizziness, mental dullness, nausea, confusion; headache, fatigue, anis; enlarged liver; carcinogen.
Chloromethane (Methyl chloride)	50 ppm/100 ppm	Ca 2,000 ppm	Inhalation, Skin/Eye Contact	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; Liquid: frostbite; reproductive, teratogenic effects; carcinogen.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
1,1-Dichloroethane (1,1-DCA)	100 ppm	3,000 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated skin; CNS depressant; liver, kidney, lung damage.
1,1-Dichloroethylene (1,1-DCE)	5 ppm/20 ppm	Ca	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, throat; dizziness, headache, nausea; liver and kidney dysfunction.
1,2-Dichloroethylene	200 ppm	1,000 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, respiratory system; CNS depressant.
1,3-Dichloropropene ( <i>cis-</i> & <i>trans-</i> )	1 ppm	N.D.	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin, upper respiratory system; eye, skin burns; lassitude, loss of appetite, diarrhea, vomiting, slowing of pulse; CNS depressant.
Ethylene dichloride (1,2-Dichloroethane)	10 ppm	50 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, corneal opacity; CNS depressant; nausea, vomiting; dermatitis; liver, kidney, CNS damage; carcinogen.
2-Hexanone (MBK)	5 ppm/10 ppm	500 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose; peritoneal neuritis; weakness, paresthesia; dermatitis; headache; drowsiness.
Hydrogen sulfide (H <sub>2</sub> S)	10 ppm/15 ppm C 20 ppm	100 ppm	Inhalation, Skin/Eye Contact	Irritated eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimitis, photo, corneal vesiculation; dizziness, headache, fatigue, irritability, insomnia; GI disturbance.
Methane	Simple asphyxiant	N.D.	Inhalation	Simple asphyxiant; at 1.5% creates oxygen depletion.
4-Methyl-2-pentanone (MIBK)	50 ppm/75 ppm	500 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin, mucous membranes; headache, narcosis, coma; dermatitis.
Methylene chloride	50 ppm C 1,000 ppm	Ca 2,300 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin; fatigue, weakness, sleepiness, light-headedness, nausea.
Styrene	20 ppm/40 ppm C 200 ppm	700 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose; respiratory system; headache, fatigue, dizziness, confusion, malaise, drowsiness, weakness, unsteady gait; narcosis; defatting dermatitis; possible liver injury, reproductive effects.
1,1,2,2-Tetrachloroethane (1,1,2,2-TECA)	1 ppm	100 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tend; dermatitis, monocytosis; kidney damage; carcinogen.
Tetrachloroethylene (PCE)	25 ppm/100 ppm C 200 ppm	Ca 150 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose, throat; nausea, flush face, dizziness, headache, liver damage.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
1,1,1-Trichloroethane (TCA)	350 ppm/450 ppm	700 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin; headache, lassitude, CNS depressant, poor equilibrium; dermatitis; cardiac arrhythmia; liver damage.
1,1,2-Trichloroethane (1,1,2-TCA)	10 ppm	Ca 100 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose; CNS depressant; liver, kidney damage, dermatitis; carcinogen.
Trichloroethylene (TCE)	50 ppm/100 ppm	Ca 1,000 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; headache, dizziness, vertigo, visual distortion, fatigue, giddiness, vomiting, dermatitis, nausea.
Vinyl chloride	1 ppm C 5 ppm	Ca N.D.	Inhalation, Skin/Eye Contact (with liquid)	Weakness, abdominal pain, GI bleeding, enlarged liver.
<b>Volatile Organic Compounds (BTEX)</b>				
Benzene	1 ppm/5 ppm	Ca 500 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose, skin, resp. system, nausea, headache, fatigue, dermatitis
Ethylbenzene	100 ppm/125 ppm	800 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, mucous membranes; headache, dermatitis, narcosis, coma
Toluene	50 ppm	500 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, insomnia, nervousness, muscle fatigue, dermatitis
Xylenes, total	100 ppm/150 ppm	900 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Dizziness, excitement, drowsiness, irritated eyes, nose and throat, nausea, vomiting, abdominal pain, and dermatitis
<b>Semivolatile Organic Compounds (SVOC)</b>				
Benzidine	Lowest feasible limit	Ca	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Hematosiis, secondary anemia from hemolysis, acute cystitis, acute liver disorders, dermatitis; painful, irregular urination.
Di-n-butyl-phthalate	5 mg/m <sup>3</sup>	4,000 mg/m <sup>3</sup>	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, upper respiratory system, and stomach.
1,2-Dichlorobenzene (o-DCB)	25 ppm/50 ppm	200 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose; liver and kidney damage, skin blisters.
1,4-Dichlorobenzene (p-DCB)	10 ppm	Ca 150 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Headache, eye irritation, profuse rhinitis, weight loss, nausea, vomiting.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
3-3' Dichlorobenzidine	N.D. <sup>(d)</sup>	Ca	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Skin sensitivity, dermatitis; headache, dizziness; caustic burns; frequent urination; dysuria; hematosia; GI upset; upper respiratory infection; carcinogen.
Diethyl phthalate	5 mg/m <sup>3</sup>	None	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin, nose, throat; headache, dizziness, nausea; lacrinitis; possible polyneuritis, vestibular dysfunction; pain, numbness, weakness, spasms in arms and legs.
Dimethyl phthalate	5 mg/m <sup>3</sup>	2,000 mg/m <sup>3</sup>	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, upper respiratory system; stomach pain.
Hexachlorobenzene	0.002 mg/m <sup>3</sup>	N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Liver; metabolic disorders; skin and nervous system effects
Hexachlorobutadiene	0.02 ppm	Ca N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	In animals: irritated eyes, skin, respiratory system; kidney damage; carcinogen.
Hexachlorocyclopentadiene	0.01 ppm	N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, respiratory system; eye, skin burns; lacrinitis; sneezing, coughing, dyspnea, salivating, pulmonary edema; nausea, vomiting, diarrhea.
Hexachloroethane	1 ppm	Ca 300 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, mucous membranes; carcinogen.
Isophorone	C 5 ppm	200 ppm	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, nose, throat; head-ache, nausea, dizziness, fatigue dermatitis, narcosis.
2-Methyl phenol (o-Cresol)	5 ppm	250 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, mucous membranes; CNS effects: confusion, depression, respiratory failure; dyspnea, irregular rapid respiration, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage.
4-Methyl phenol (p-Cresol)	5 ppm	250 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, mucous membranes; CNS effects: confusion, depression, respiratory failure; dyspnea, irregular rapid respiration, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
4-Nitroaniline	3 mg/m <sup>3</sup>	300 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated nose, throat; cyanosis, ataxia; tacer, tachypnea; dyspnea; irritability; vomiting, diarrhea; convulsions; respiratory arrest; anemia; methemo.; jaundice.
N-Nitrosodimethylamine	N.D. <sup>(d)</sup>	Ca N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	nausea, vomiting, diarrhea, abdominal cramps; headache; fever; enlarged liver, jaundice; decreased liver, kidney, pulmonary function; carcinogen.
Pentachlorophenol (PCP)	0.5 mg/m <sup>3</sup>	2.5 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose, throat; sneezing, coughing; weakness, anorexia, low-weight; sweating; headache, dizziness; nausea, vomiting; dyspnea; chest pain; high fever; dermatitis.
Phenol	5 ppm/C 15.6 ppm	250 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, nose, throat; weight loss, dark urine, liver and kidney damage, muscle ache, skin burns, dermatitis, tremors, convulsions.
1,2,4-Trichlorobenzene	C 5 ppm	N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, mucous membrane; liver/kidney damage, possible teratogenic effects.
<b>Semivolatile Organic Compounds (PAH)</b>				
Benzo[a]anthracene	0.2 mg/m <sup>3</sup> <sup>[a]</sup>	Ca 80 mg/m <sup>3</sup> <sup>[a]</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Suspected human carcinogen.
Benzo[a]pyrene	0.2 mg/m <sup>3</sup> <sup>[a]</sup>	Ca 80 mg/m <sup>3</sup> <sup>[a]</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Suspected human carcinogen.
Benzo[b]fluoranthene	0.2 mg/m <sup>3</sup> <sup>[a]</sup>	Ca 80 mg/m <sup>3</sup> <sup>[a]</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Suspected human carcinogen.
Chrysene	0.2 mg/m <sup>3</sup> <sup>[a]</sup>	Ca 80 mg/m <sup>3</sup> <sup>[a]</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Suspected human carcinogen.
Naphthalene	10 ppm/15 ppm	250 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Eye irritation, headache, confusion, vomiting, profuse sweating, abdominal pain.
<b>Explosive Compounds</b>				
Cyclonite (RDX)	0.5 mg/m <sup>3</sup>	N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; headache, irritability, fatigue, weakness, tremors, nausea, dizziness, vomiting, insomnia, convulsions.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
2,4-Dinitrotoluene (DNT)	0.2 mg/m <sup>3</sup>	Ca 50 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Anoxia, cyanosis; anemia, jaundice; reproductive effects; carcinogen.
2,4,6-Trinitrotoluene (TNT)	0.1 mg/m <sup>3</sup>	500 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Mechanical damage possible from explosion. Orange staining on exposed skin. Irritated skin, mucous membrane; liver damage, jaundice; cyanosis; sneezing; cough, sore throat; peritoneal neuritis, muscular pain; kidney damage; cataract; sensitized dermatitis; leukocytosis; anemia, cardiac irregularity.
<b>Polychlorinated Biphenyls (PCB)</b>				
Chlorodiphenyl-42% chlorine (Aroclor 1242)	1 mg/m <sup>3</sup>	Ca 5 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; chloracne, dermatitis, liver damage, reproductive effects.
Chlorodiphenyl-54% chlorine (Aroclor 1254)	0.5 mg/m <sup>3</sup>	Ca 5 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes; chloracne, liver damage, reproductive effects.
<b>Organochlorine Compounds (Pesticides)</b>				
Aldrin	0.25 mg/m <sup>3</sup>	Ca 25 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Headache, dizziness, nausea, vomiting, myoclonic jerks of limbs, cloni/tonic convulsions.
Chlordane	0.5 mg/m <sup>3</sup>	Ca 100 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, tremors, convulsions, anuria.
Dieldrin	0.25 mg/m <sup>3</sup>	Ca 50 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Headache, dizziness, nausea, vomiting, sweating, myoclonic limb jerks, clonic/tonic convulsions, coma.
Dichlorodiphenyltric hloroethane (4,4'-DDT)	1.0 mg/m <sup>3</sup>	Ca 500 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin; paresis of tongue, lips, face and hands; tremor, dizziness, confusion, headache, fatigue, convulsions, vomiting.
Endosulfan	0.1 mg/m <sup>3</sup>	N.D.	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache.
Endrin	0.1 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Epileptic convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion, lethargy, weakness; anorexia.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
Heptachlor	0.05 mg/m <sup>3</sup>	Ca 35mg/m <sup>3</sup>	Inhalation, Ingestion, Absorption, Skin/Eye Contact	In animals: tremor, convulsions; liver damage; carcinogen.
Methoxychlor	10 mg/m <sup>3</sup>	Ca 5,000 mg/m <sup>3</sup>	Inhalation, Ingestion	In animals: fasc., trembling, convulsions; kidney, liver damage; carcinogen.
<b>Metals</b>				
Antimony (Sb)	0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Irritated eyes, skin, nose, throat, mouth; coughing, dizziness, headache, nausea, vomiting, diarrhea, stomach cramps, insomnia, loss of smell.
Arsenic (As)	0.01 mg/m <sup>3</sup>	Ca 5 mg/m <sup>3</sup> (as As)	Inhalation and Ingestion via particulates, Skin/Eye Contact	Ulceration of nasal septum, dermatitis, gastrointestinal bleeding.
Barium (Ba)	0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Upper resp. irritation, muscle spasm, slow pulse, irritated eyes, skin.
Beryllium (Be)	0.002 mg/m <sup>3</sup> C 0.005 mg/m <sup>3</sup>	Ca 4 mg/m <sup>3</sup>	Inhalation via particulates, Skin/Eye Contact	Berylliosis (chronic exposure): anorexia, low-weight; weakness, chest pain; cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritated eyes; dermatitis; carcinogen.
Boron oxide	10 mg/m <sup>3</sup>	2000 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates	Eye, skin, and upper respiratory irritant; cough.
Cadmium (Cd)	0.005 mg/m <sup>3</sup>	Ca 9 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates	Pulmonary edema, dyspnea, cough, chest tight, subs pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anos., emphysema, prot., mild anemia; carcinogen.
Chromium (Cr), total	0.5 mg/m <sup>3</sup>	250 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Histological fibrosis of lungs; irritated eyes and skin.
Cobalt (Co)	0.02 mg/m <sup>3</sup>	20 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Irritation of nasal membranes, pharynx, nasal perforation, eye irritation.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
Copper (Cu)	1 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	Inhalation via particulates, Skin/Eye Contact	Irritated eyes, upper respiratory system; metal fume fever: chills, muscular ache, nausea, fever, dry throat, cough, weakness, lassitude; metallic or sweet taste; discoloration of skin, hair.
Lead (Pb)	0.050 mg/m <sup>3</sup>	100 mg/m <sup>3</sup> (as Pb)	Inhalation and Ingestion via particulates, Skin/Eye Contact	Lassitude, insomnia, pallor, anoxia, weight loss, constipation, abdominal pain, colic, anemia, wrist paralysis.
Lithium (Li)	-	-	Inhalation and Ingestion via particulates	Corrosive to skin, eyes, and respiratory tract; lung edema.
Manganese (Mn)	0.2 mg/m <sup>3</sup> C 5 mg/m <sup>3</sup>	500 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates	Parkinson ' s; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea, rales, flu-like fever; low-back pain; vomiting; malaise; fatigue; kidney damage.
Mercury (Hg)	0.01/0.03 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Dizziness, nausea, vomiting, diarrhea, constipation, skin burns, emotional distance.
Nickel (Ni) (insoluble/soluble)	0.1 mg/m <sup>3</sup>	Ca 10 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Sensitive skin, asthma, nasal cavity irritation, pneumonitis, carcinogen.
Selenium (Se)	0.2 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Irritation eyes, skin, nose, and throat; headache, chills, dyspnea, bronchitis, metallic taste, garlic breath, liver/spleen damage.
Silver (Ag)	0.01 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Blue-gray eyes, nasal septum, throat, skin; irritability, ulceration of skin; GI disturbance.
Thallium (Tl)	0.1 mg/m <sup>3</sup>	15 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact, Absorption	Nausea, diarrhea, abdominal pain, vomiting, tremor, chest pain, pulmonary edema.
Vanadium (V)	C 0.05 mg/m <sup>3</sup>	35 mg/m <sup>3</sup>	Inhalation and Ingestion via particulates, Skin/Eye Contact	Irritated eyes, skin, throat; green tongue, metallic taste, eczema, cough, wheezing, bronchitis.
<b>Radioactivity</b>				

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
Radionuclides	100 milliREM/year <sup>(b)</sup> [Total effective dose equivalent for public or workers assumed not to be radiation workers.]	N/A <sup>(c)</sup>	In addition to external penetrating gamma radiation, possible exposures may be associated with inhalation and incidental ingestion. Beta particles are usually energetic enough to result in radiation exposure to the skin. Alpha particles are not energetic enough to expose the skin, as the skin's layer of dead cells is thick enough to stop particles from penetrating. For alpha particles, the routes of exposures of concern are inhalation and ingestion.	Acute symptoms will not be caused by the expected levels of radioactivity. Skin redness, dermatitis, hair loss, eye inflammation, genetic damage, cancer, tissue, and organ damage are caused by acute high level doses of 200 rad or higher. Technical overexposures at or just above regulatory limits are not accompanied with any of the traditional radiation sickness symptoms or cancer, as limits incorporate a large safety factor. For these effects to occur, the exposures need to be prolonged (occurring over an occupational lifetime and exposures well above regulatory limits) or acute (where large doses, such as hundreds of rads, are delivered over a brief time period, e.g., in minutes or hours).
<b>Other Constituents</b>				
Boron trifluoride	C 1 ppm	25 ppm	Inhalation and Skin/Eye Contact	Irritated eyes, skin, nose, respiratory system; epistaxis (nosebleed); eye, skin burns. In animals: pneumonia, kidney damage.
Hydrazine	0.01 ppm	Ca 50 ppm	Inhalation, Ingestion, Absorption, Skin/Eye Contact	Irritated eyes, skin, nose, throat; temporary blindness; dizziness, nausea; dermatitis; eye, skin burns. In animals: bronchitis, pulmonary edema; liver, kidney damage; convulsions; carcinogen.
Lithium hydride	0.025 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	Inhalation, Ingestion, Skin/Eye Contact	Irritated eyes, skin; eye, skin burns; mouth, esophagus burns (if ingested); nausea; muscular twitches; mental confusion; blurred vision.
Asbestos	0.1 fibers/cc	Ca N.D.	Inhalation, Ingestion, and Skin/Eye Contact	Asbestosis (chronic exposure); breathing difficulties; interstitial fibrosis; restricted pulmonary function; finger clubbing; irritated eyes. Carcinogen.

**Table 5-1. Summary of Known and Potential Chemicals of Concern at the Former Lake Ontario Ordnance Works (LOOW), Niagara County, New York.**

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
Phosgene	0.1 ppm	2 ppm	Inhalation and Skin/Eye Contact	Irritated eyes; dry burning throat; vomiting; cough, foamy sputum, dyspnea, chest pain, cyanosis.

(Source: USACE/EA, 2005)

#### **5.4 Physical and Biological Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.1 General Physical Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.2 Fire/Explosion Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.3 Noise Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.4 Electrical Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.5 Utilities**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.6 Weather Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.7 Cold Stress**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

##### **5.4.8 Heat Stress**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.4.9 Material Handling/Moving/Lifting**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.4.10 Brush Clearance**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.4.11 Slips, Trips, Falls**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **5.5 Biological Hazards**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.5.1 Poisonous Plants**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.5.2 Insect Bites/Stings**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.5.3 Animal Bites**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.5.4 Bacteria**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **5.5.5 Humans**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **5.6 Hazard Communication**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **5.7 CWM Emergency Response Procedures**

*This section of the original Phase IV SSHP Addendum (USACE, 2009a) is hereby removed in its entirety.*

## **6.0 SITE ACCESS**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

Site access will be coordinated with the USACE Technical Manager or Authorized Site Representative who will notify the Occidental Chemical Corporation and/or Lewiston-Porter Central School District School of the proposed work schedule.

### **6.1 Site Control**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **6.1.1 Activities Not Requiring Work Zones**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **6.1.2 Activities Requiring Work Zones**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) is hereby replaced in its entirety by the following.*

Vegetation clearance, direct push and surface soil sampling, field analytical screening, groundwater sampling, and equipment decontamination will require the establishment of work zones.

The three separate work zones that will be established for each of these activities include:

- The exclusion zone (EZ) ;
- The contamination reduction zone (CRZ); and
- The support zone (SZ).

The EZ for sampling will consist of a 10-foot (ft) radius from sampling locations. The EZ for non-essential personnel during brush clearance will consist of a 15-ft radius. Exclusion zones will also be verbally explained and maintained to site visitors or onlookers. Proper PPE will be worn when working in the EZ (see Section 2.9). The radius of the EZ may be expanded or decreased based on environmental monitoring results and as deemed appropriate by the SSO.

The CRZ shall be immediately adjacent to the EZ and shall have equipment for appropriate decontamination and receptacles for used disposable supplies. Based on previous investigations, the expected concentrations of contaminants suggest that personnel decontamination will consist of simply removing and disposing of PPE or removal and bagging of soiled outer garments (e.g., coveralls), if worn. Potable water and an eye wash solution will be available in the CRZ.

If elevated levels of contaminants are encountered, as discussed in Section 5 work will stop and the site will be evaluated. If protection is to be upgraded, the EZs and CRZs shall become more stringent and visually demarcated. The EZ will be located within 25 ft of field-investigation activities where respiratory protection is required. The CRZ will be expanded to include a non-

phosphate detergent scrub station and potable water rinse station prior to removing and disposing of chemically protective coveralls, boot covers, and outer gloves.

The SZ shall consist of the site vehicle and will also contain emergency response equipment including phone and first aid supplies. Activities will be largely dispersed throughout the investigation areas and field teams will carry minimal first-aid components. There will be no temporary construction buildings for this project; therefore the following items will not be required:

- Facilities;
- Fencing;
- Anchoring systems for temporary structure;
- Access routes to the temporary structure;
- Spacing requirements of 09.A.19;
- Temporary power; and
- Temporary ramp, trestle, scaffold and platform approval.

The SZ and site access roads will be located as depicted in Figure 6-1.

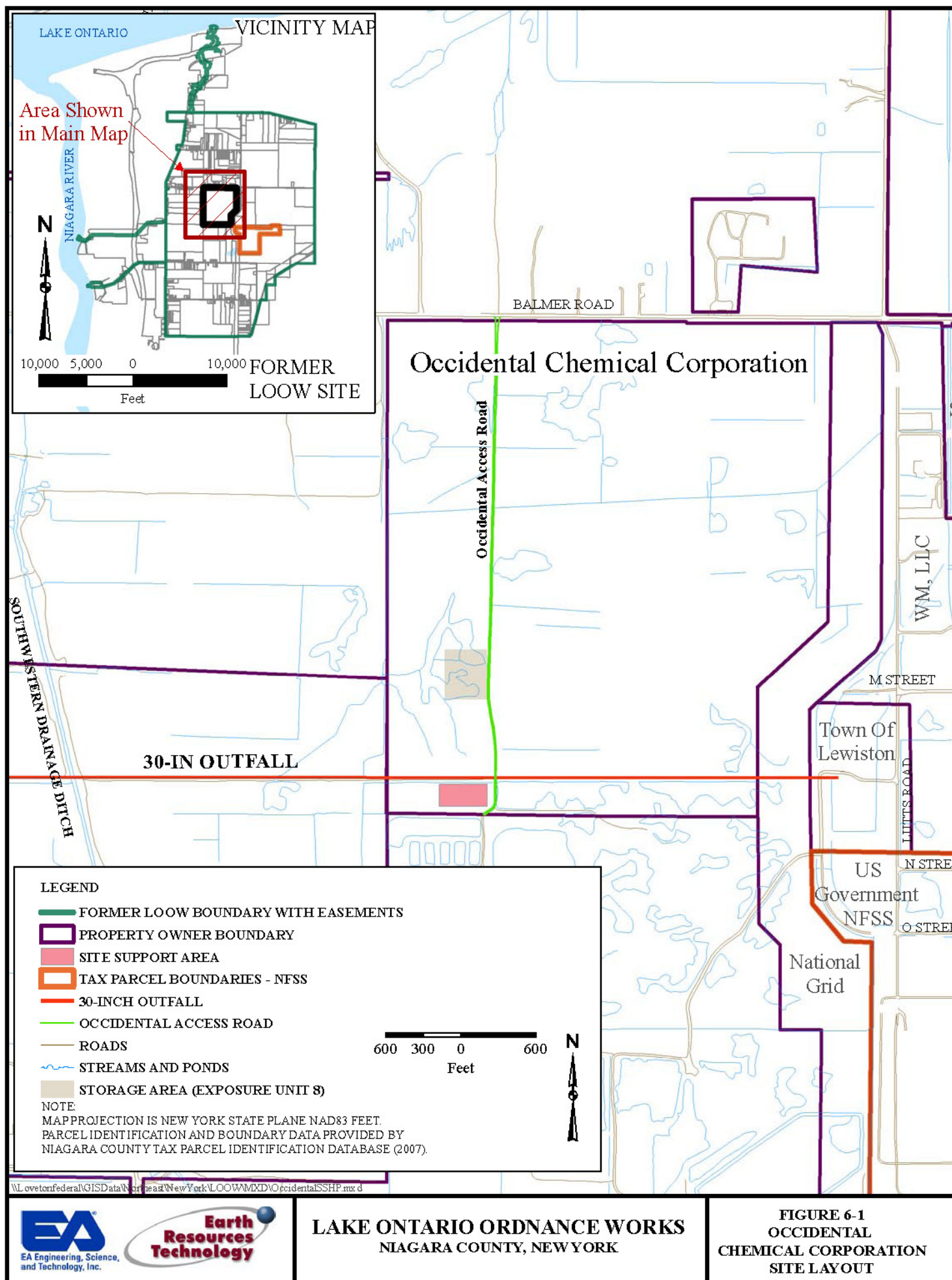


Figure 6-1. Occidental Chemical Corporation Site Layout

## **7.0 SAFETY MEETINGS**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **7.1 Pre-Entry Briefing / Daily Safety Meeting**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **7.2 Daily Safety Meeting**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **8.0 PERSONAL PROTECTIVE EQUIPMENT AND ENVIRONMENTAL MONITORING PROGRAM**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **8.1 General PPE Requirements**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **8.2 Initial Requirements / Upgrade or Downgrade of PPE Levels**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **8.3 Real-Time Monitoring**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **8.4 Action Levels**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **8.5 Inspection and Maintenance of Protective Equipment**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **9.0 SPILL CONTAINMENT**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **10.0 DECONTAMINATION**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **11.0 EMERGENCY RESPONSE PLAN**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **11.1 Emergency Response Equipment**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **11.2 Communication**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **11.3 Pre-Planning**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **11.4 Emergency Incident Procedures**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

### **11.5 Emergency Notification Procedures**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has been replaced in its entirety.*

Emergency telephone numbers and directions to the nearest hospital are provided in Table 10-1 and in Appendix G, along with maps showing the routes to the nearest hospitals. The field personnel will immediately stop work and report to the Site Manager under the following potential emergency situations:

- Medical emergency;
- Discovery of unanticipated hazards [e.g., drums, heavily contaminated materials, etc.];
- Overexposure of personnel to onsite contaminants;
- Cold/heat-related injury or heat stress;

Onsite emergencies may ultimately be handled by offsite emergency support personnel. Initial response and first-aid treatment, however, will be available through onsite personnel. In case of a hazardous materials emergency, the Site Manager will assume control and direction of the emergency response until arrival of off-site emergency personnel. The Site Manager will work with the SSHO to identify and evaluate hazards. Emergency responders and communications will be coordinated and controlled through the Site Manager.

In the event of an emergency, the information available at that time will be properly evaluated and the appropriate steps will be taken to implement the emergency response procedures. The Site Manager (or SSHO if the Site Manager is part of the emergency) will assume command of the situation. He/she will call the appropriate emergency services, evacuate personnel to the pre-

designated evacuation location as needed, and take other steps necessary to gain control over the emergency.

Provide the following information when reporting an emergency:

1. Name and location of person reporting;
2. Location of accident/incident;
3. Name and affiliation of injured party;
4. Description of injuries, fire, spill, or explosion;
5. Status of medical aid and/or other emergency control efforts;
6. Details of chemicals involved;
7. Summary of accident, including suspected cause and time it occurred; and
8. Temporary control measures taken to minimize further risk.

This information will not be released to parties other than those listed in this section and emergency response team members. After emergency response agencies have been notified and supplied appropriate response information, the ERT PM will be notified. The ERT PM will immediately notify the USACE PM of all incidents, no matter how severe, as soon as possible, but no later than four hours.

#### **11.6 Personnel Injury/Medical Emergency**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

#### **11.7 Fire/Explosion Emergencies**

*This section of the original Phase IV RI SSHP Addendum (USACE, 2009a) has not been amended.*

## **12.0 REFERENCES**

USACE, 2008. *Safety and Health Requirements*, Engineering Manual 385-1-1. September.

USACE/Prepared by EA, 2005. *Addendum II to the Health and Safety Plan for Phase I Remedial Investigation at the Former Lake Ontario Ordnance Works, Niagara County, New York, for Phase III Remedial Investigation – Underground Lines*.

USACE/Prepared by Earth Resources Technology, Inc (ERT), 2009a. *Final Safety and Health Plan for Phase IV Remedial Investigation/Feasibility Studies at the Former Lake Ontario Ordnance Works, Niagara County, New York*. June.

USACE/Prepared by Earth Resources Technology, Inc (ERT), 2009b. *Radiation Safety Plan Addendum for Phase IV Remedial Investigation/Feasibility Studies at the Former Lake Ontario Ordnance Works, Niagara County, New York*. January.

**APPENDIX A**  
**Checklist of EM 385-1-1 Requirements**

**APPENDIX B**  
**Site Entry and Exit Log**

**APPENDIX C**  
**SSHP Compliance, Review Record, and Training Records**

**APPENDIX D**  
**Incident Reporting Form**

**APPENDIX E**  
**Activity Hazard Analyses**

**APPENDIX F  
MSDS Information**

**APPENDIX G**  
**Emergency Contacts and Emergency Medical Care Locations**

**APPENDIX H  
USACE Form 3394**

**APPENDIX I  
ERT OSHA 300A Reporting Data**