FORMER HERCULES/ CIBA-GEIGY FACILITY PART 373 DRAFT RENEWAL PERMIT FOR PUBLIC NOTICE JULY 24, 2026

EXECUTIVE SUMMARY/FACT SHEET

NEW YORK STATE | Department of Environmental Conservation

RCRA PART 373 PERMIT

EXECUTIVE SUMMARY/FACILITY FACT SHEET

Former Hercules/Ciba-Geigy
EPA ID No. NYD002069748
DEC Permit No. 5-5234-00008-00096

Queensbury, New York
Warren County

1.0 FACILITY PERMIT AND GENERAL INFORMATION

Permittee Name (Property Owner):	BASF Corporation
Permittee Name (PCC Operator):	Hercules LLC
Facility Name:	Former Hercules/Ciba-Geigy
Facility Location:	89 Lower Warren Street Queensbury, New York 12804-3890
EPA ID No.:	NYD002069748
DEC Permit No.:	5-5234-00008/00096
DEC DER No.:	557011
Facility Size:	65 Acres
Facility Latitude/Longitude:	43.310188, -73.603789
Commercial/Non-Commercial TSDF:	Non-Commercial (Post-Closure Care)
Facility Contact (Property Owner):	Stephen Havlik steve.havlik@basf.com 914-557-6009
Facility Contact (PCC Operator):	James Vondracek jevondracek@ashland.com 614-323-5448
DEC Contact/Responsible Permit Writer:	Kevin Chazhikattu kevin.chazhikattu@dec.ny.gov 518-402-8652
Initial/Renewal Permit:	Renewal
Permit Type (Yes/No): Operating Corrective Action	 No Yes

Post-Closure Care	Yes
Permit Term (5 or 10 years):	10 Years
Estimated Costs: Closure Corrective Action Post-Closure Care Total	 $0.00 $0.00 (Included in Post-Closure Care Costs) $11,801,767.48 $11,801,767.48
On-site Environmental Monitor(s):	Not Applicable

Facility Background

The Former Hercules/Ciba-Geigy Site (Site or Facility) is located in Warren County at 89 Lower Warren Street in Queensbury (Glens Falls), New York. The industrial facility property is approximately 65 acres in size and is in a largely industrial area. The Site consists of seven separate parcels of land. The Main Plant Site (MPS) area is approximately 45 acres and is bisected into two parcels (North and South Areas) by a railroad track belonging to the Delaware & Hudson Railroad. The Site includes the following parcels of land in addition to the MPS: the former Stormwater Impoundment Basin, East Area, Pretreatment Plant (PTP), North Lot, and Sliver Quarry (Figure 2). The Final Corrective Measures at the MPS are specified in the Statement of Basis for the Main Plant Site (NYSDEC, 1996). As shown in Figure 1, the facility is bounded to the north by Glens Falls Feeder Canal. The eastern boundary is land formally owned by the facility but sold after remediation and currently is the Perkins Recycling Corp Recycling Center. To the west is the Lehigh Cement Company Glens Falls Plant, and the Hudson River to the south. The MPS includes a hazardous waste consolidation area that has been referred to as the RCRA Cap Area currently undergoing post-closure care, and several solid waste management units (SWMUs) for which corrective measures are being maintained. There are currently no buildings on site except for the work trailer and the pump station building located east of the Main Plant Site. The RCRA Cap Area is located in the upper area of the MPS in the northwest corner of the property (Figure 2). The remaining portions of the Main Plant Site have a permeable cover. The Site contains a groundwater extraction system that was installed along the southern site perimeter to collect groundwater from the overburden and bedrock horizons. There is a monitoring well network and a groundwater and surface water sampling program in place. Maintenance is performed pursuant to the Inspection and Maintenance Plan (IMP) (EHS Support, 2023). A draft Site Management Plan/Post-Closure Plan (SMP/PCP) was submitted to NYSDEC. NYSDEC provided comments and the SMP/PCP is currently in the response to comments phase (EHS Support, 2021). However, based on discussions with NYSDEC, finalizing the draft SMP was postponed until a decision is made regarding Corrective Measures in the Sliver Quarry area. Once finalized, the draft SMP/PCP will formally include the IMP and other finalized documents.

Activities at the site date back to 1901 and initially involved the manufacture of wallpaper. In 1907, site operations expanded to include the manufacture of inorganic pigments, which eventually became the primary product line. Hercules Incorporated purchased the site in 1960 and subsequently sold it to Ciba-Geigy in 1979. Ciba-Geigy ceased production of pigments in 1989 and demolished the buildings on the site. On September 9, 1996, ownership of the Main Plant Site was transferred from Ciba-Geigy Corporation to Ciba Specialty Chemicals Corporation. Ciba-Geigy Specialty Chemicals Corporation was acquired by the BASF Corporation. Whereas Hercules was purchased and remains a wholly owned subsidiary corporation under Ashland Incorporated. Hercules and Ciba have entered into a cooperative agreement whereby Hercules is managing the corrective measures while BASF, which acquired Ciba, retains ownership of the site.

Portions of the MPS where the permeable cover was installed (Permeable Cover Area) are being developed as a solar power facility by a third party through a lease agreement with BASF Corporation, as documented in the Post-Closure Use Modification Request Report (TetraTech, 2022). As the report states, construction and operation of the solar power facility will be conducted in a manner that follows the draft SMP/PCP and allows the IMP to be implemented.

2.0 RCRA PERMITTED UNITS

There are no active hazardous waste management units (HWMU) permitted to operate at the facility. All previously permitted HWMUs have been closed in accordance with state and federal regulations. The site is currently regulated under Post Closure Care and Corrective Action under Title 6 of the New York Codes, Rules & Regulations (6 NYCRR) Part 373 as well as in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 557011, both of which are administered by the New York State Department of Environmental Conservation (NYSDEC).

3.0 POST-CLOSURE CARE SUMMARY

The following table summarizes the ongoing post-closure activities occurring at the facility:

Unit Designation	Post-Closure Activities Completed	Remaining Activities
SWMU-1: RCRA Cap Area - North Lagoon, North Waste Pile and South Waste Pile.	The area consolidates the former North Lagoon, North Waste Pile and South Waste Pile under a low-permeability cap comprised of geosynthetic and earthen materials constructed in 2004 to	Natural attenuation of groundwater with monitoring is continued according to the Groundwater and Surface Water Monitoring Plan

	comprised of geosynthetic and earthen materials constructed in 2004 to prevent air, surface water, and off-site soil exposures.	Water Monitoring Plan (which is being updated under this renewal permit).

4.0 CORRECTIVE ACTION SUMMARY

The following table summarizes the ongoing corrective action activities occurring at the facility:

SWMU/AOC Designation	Corrective Action Activities Completed	Remaining Activities
SWMU-1: RCRA Cap Area - North Lagoon, North Waste Pile and South Waste Pile.	Managed under Post-Closure Care (See Section 3.0 above)	Managed under Post-Closure Care (See Section 3.0 above)
SWMU-2: MPS Area North of Delaware & Hudson Railroad Property	MPS Area: A permeable cover was placed over the area in accordance with the 1996 Statement of Basis, with waste from other areas consolidated underneath.	MPS Area: Natural attenuation of groundwater with monitoring is continuing in accordance with the Groundwater and Surface Water Monitoring Plan (which is being updated under this renewal permit).
SWMU-3: MPS Area South of Delaware & Hudson Railroad Property	A permeable cover was placed over the area in accordance with the 1996 Statement of Basis. A groundwater extraction system was installed with French drains running underneath the permeable cover to collect any downgradient groundwater, including groundwater from SWMU-2. The bedrock groundwater extraction well system extracts impacted groundwater present north of the Hudson River. Extracted groundwater is pumped off-site to the Glens Falls Publicly Owned Treatment Works (POTW) in accordance with the city's permit.	Natural attenuation of groundwater with monitoring is continued according to the Groundwater and Surface Water Monitoring Plan (which is being updated under this renewal permit). The groundwater extraction system continues to operate according to the Inspection and Maintenance Plan.
SWMU-4: Industrial Sewer	Industrial sewer was decommissioned in place by sealing openings of pipes with concrete or grout and filling manholes with sand or crushed stone.	No Further Action

SWMU-5: Pretreatment Plant	Contaminated soil was excavated and placed under the permeable cover. The pretreatment plant was decommissioned. The final building and tank were removed in 2018.	Natural attenuation of groundwater with monitoring is continued according to the Groundwater and Surface Water Monitoring Plan (which is being updated under this renewal permit).
AOC-1: On-site Groundwater	An interim Groundwater Monitoring Plan (GWMP) included in the initial HWM Permit was implemented in 1991, and then a 1992 GWMP was approved and implemented. The GWMP was subsequently revised in 1997, 2004 (following CM implementation), 2015 and 2021. Monitoring wells were placed on the Main Plant site and adjacent off-site locations owned by the permittee including the North Lot and Pretreatment Plant.	The groundwater extraction system continues to operate according to the Inspection and Maintenance Plan. Natural attenuation of groundwater with monitoring is continued according to the Groundwater and Surface Water Monitoring Plan (which is being updated under this renewal permit).
AOC-2: Adjacent Off-Site Surface Water Sediments: Cement Company Pond	A sediment cover, which consists of a 1-foot-thick layer of crushed stone over a geotextile demarcation layer, was placed in 1999.	Maintenance of the cover continues according to the Inspection and Maintenance Plan.
AOC-3: Adjacent Off-Site Surface Water Sediments: Hudson River Sediments (Main Plant Site to the Baker's Falls Dam) Wetland west of the plant	Corrective Measures for Operating Unit (OU) 01, 02, and 03 included excavation of wastes along the Hudson River from the facility and elevated metal contamination in sediments downstream. Sediment was excavated and placed under the RCRA Cap. Rip-rap was installed for erosion control. The 2017 Supplemental RCRA Facility Investigation (RFI) determined corrective actions for OU02 and OU03 significantly reduced the site related contamination within the Hudson River sediments.	No Further Action

AOC-4: Hudson River Sediment downstream of the Baker's Falls Dam	The 2017 Supplemental RFI investigated sediment downstream of the facility and determined that navigational and PCB dredging activities performed by others significantly reduced contamination concentrations within the Hudson River sediments.	No Further Action
AOC-5: Soil Under Stormwater Impoundment Basin	Contaminated soils were excavated to a depth of 4 ft below ground surface (BGS) and placed under the permeable cover, and the area was backfilled with clean soil.	Periodic visual inspection to confirm no disturbances in accordance with the Inspection and Maintenance Plan.
AOC-6: Adjacent Off-Site Land Three Residences	Site investigations revealed air emissions from the site impacted off-site soils downwind of the emission points. Soil was excavated from three residential properties and replaced with clean fill material.	No Further Action
AOC-6: North Lot	Soils with contamination above the unrestricted soil cleanup objectives were excavated and consolidated under the permeable cover in 1999. The Toxicity Characteristic Leaching Procedure (TCLP) sampling results showed material removed was below regulatory limits.	No Further Action
AOC-7: Sliver Quarry Area	In 2013, soil samples were collected in the Canal Corporation Property, to support an assessment by BASF regarding potential property redeployment. Some sample results indicated concentrations exceeding industrial SCOs. Follow-up sampling has shown detections above unrestricted SCOs for site-related metals in the soil but no indications of leaching into the GW.	An investigation is being conducted and final remedy to be determined.

5.0 SITE MANAGEMENT

The facility has an NYSDEC-approved:

Yes	No	
☒	☐	Post-Closure Plan (Approved 03/05/15)
☒	☐	Groundwater Monitoring Program (Corrective Measures Groundwater Monitoring Plan) Approved 3/17/04, Last revised 05/12/21)
☐	☒	Site Management Plan (A draft SMP combined with a revised PCP was submitted on 06/11/2021. This needs additional updates to include the Sliver Quarry once the final corrective measures are decided. This will be done under the permit.)

5.1 Institutional Controls

The Facility is managed under this Permit as well as site restrictions directed by Soil Cleanup Objectives for Industrial Use. A Corrective Measures Study (CMS) was completed in 1994 to evaluate remedial alternatives, and the 1996 Statement of Basis was issued identifying the selected corrective measures. These measures have been implemented and are supported by institutional controls in the form of a deed notice restricting site use to industrial use and restricting groundwater usage. An environmental easement is required in this Permit under the deliverables in Module XIII. Once the easement is approved, it will specify soil and groundwater usage at the site and be attached to the Permit.

5.2 Engineering Controls

Numerous engineering controls are in place at the facility to prevent future exposure to contamination and/or restrict the further migration of contamination. These engineering controls are as follows:

- Permeable Cover at the Main Plant Site: A 2-foot-thick layer of clean soil and the remaining concrete building slabs where the old buildings existed. The cover compromises of 40 acres of the MPS divided by a railroad track. The material consolidated under the cover includes primarily metallic hazardous constituents from the prior on-site disposal of processed ore residue. Also, under the cover is material excavated from other portions of the site including the PTP, demonstrated to be non-hazardous when placed underneath the cover. The permeable cover consists of 18 inches of compacted select fill in gently sloped areas with 18 inches of clayey fill placed on the Hudson riverbank, 6 inches of topsoil and a vegetative cover.

Low-Permeability Cap at the Main Plant Site: An engineered low-permeability cover over the RCRA Cap Area (also referred to as “CAMU”) in the Northwest corner of the MPS. The cap has a geosynthetic membrane liner and covers 5 acres. The RCRA Cap Area comprises the North Lagoon Area with listed hazardous waste sludge contaminated with heavy metals, spent solvent-contaminated soil from the South Waste Pile and metal ore residue with some lagoon sludge from the North Waste Pile. Additionally, heavy-metal contaminated waste and sediment from approximately a 3,800-foot stretch of the Hudson River, adjacent and downstream from the site were deposited beneath the low-permeability cap. The cap extends beyond the former waste piles and lagoon area 150 feet to the east. The cap is designed to effectively contain materials, prevent release to the environment, and prevent contact by the public. The RCRA Cap Area has additional locked chain-linked fencing to prevent unauthorized entry. The cap consists of a 12-inch-thick cushion layer of granular fill, a geomembrane over a geosynthetic clay liner, geocomposite geonet-geotextile drainage layer leading to the runoff collection system, 18 inches of select fill, 6 inches of topsoil, and a vegetative cover. A groundwater barrier wall is located along the western side of the cap.

- Cement Company Pond: A sediment cover consisting of a 1-foot-thick layer of crushed stone over a geotextile demarcation layer.

- Overburden Groundwater Extraction System at the Main Plant Site: The objective of the Overburden Extraction System is to intercept groundwater flow in the overburden from the Main Plant Site before it discharges into the Hudson River. The system uses a French drain to collect the groundwater. The French drain was constructed with sumps equipped with submersible pumps, which convey flow from the sumps to the force main. The design was optimized in November 2016 by suspending pumping at one of three sumps in the French drain (Sump C), as detailed in the NYSDEC-approved Remedy Optimization Plan (ROP; EHS Support 2016).

- Bedrock Groundwater Extraction System at the Main Plant Site: The objective of the system is to intercept groundwater flow from the site, in Horizons A and B, which has shown constituent concentrations exceeding groundwater protection standards. The system comprises of 14 extraction wells in Horizon A, about 75 feet apart along the riverbank. Horizon B consists of 6 extraction wells, spaces 300 feet apart. As approved by the NYSDEC, the only active extraction well at the Site is EW-B5, which is located in the Central Area of the Site and screened in Horizon B and extracts water at an average rate of 300 GPD.

Rip-Rap: Rip-rap located along the riverbank is used to preserve the integrity of the Hudson River's bank and provide erosion control, thereby helping to prevent the movement of contaminated sediment under the cover. Additionally, rip-rap is used in other places for erosion control.

6.0 ISSUES AND CONCERNS

The following sections describe any potential issues or concerns for the facility related to its hazardous waste permit. Additionally, it includes information on any major changes made between the last issued permit and this renewal permit.

6.1 Environmental Risk Assessment

The Facility was evaluated as part of a RCRA Corrective Action Environmental Indicators determination, USEPA 2001 CA725 Current Human Exposures Under Control and 2002 CA750 Migration of Contaminated Groundwater Under Control. Based on these reviews, it was determined that contamination at the Facility did not pose imminent danger to human health or the environment, but that corrective action was required to control risks to health and environment. Corrective action programs have been implemented to clean up, restrict migration of, and prevent exposure to contamination.

6.2 Climate Leadership and Community Protection Act (CLCPA)

Pursuant to the requirements of Section 7(2) of the CLCPA, during its review of the permit renewal application the DEC has taken into consideration information regarding the facility's consistency with the CLCPA.

6.3 Community Risk and Resiliency Act (CRRA)

The Facility has demonstrated to the DEC that future physical climate risk, not limited to sea-level rise, storm surge and flood, was considered during the permit renewal process. The DEC has made a tentative assessment that the Facility is not at risk of adverse climate change impacts due to extreme weather events, and no additional actions are necessary at this time to improve the resiliency at the facility.

6.4 Environmental Justice (EJ)

The Facility is not located in a mapped Environmental Justice community and Disadvantaged Community (DAC). The project was reviewed in accordance with Commissioner's Policy (CP)-29. A public participation plan was developed and a fact sheet outlining the project will be mailed to the community within 0.5 miles of the project. It was determined a public participation meeting was not required since this renewal application will no longer be an operational permit and will only allow for remediation of the hazardous materials.

6.5 Unresolved Issues and Concerns

There are no unresolved issues or concerns with the Facility.

6.6 Compliance Schedule Items

The Permittee has not proposed to incorporate any items into the Permit renewal.

6.7 Public Participation

The draft Part 373\RCRA Renewal Permit will have a 45-day public notice comment period. Renewal Application documents and the draft Part 373\RCRA Renewal Permit as well as other pertinent documents are accessible at DEC Info Locator (Index of /data/DecDocs/557011 (ny.gov)), and at the Crandall Public Library, 251 Glen Street, Glens Falls, NY 12801. If no comments are received, the draft permit shall be issued as final. If comments are received, they shall be addressed in either a Response to Comments document or a direct response letter to the commentor(s).

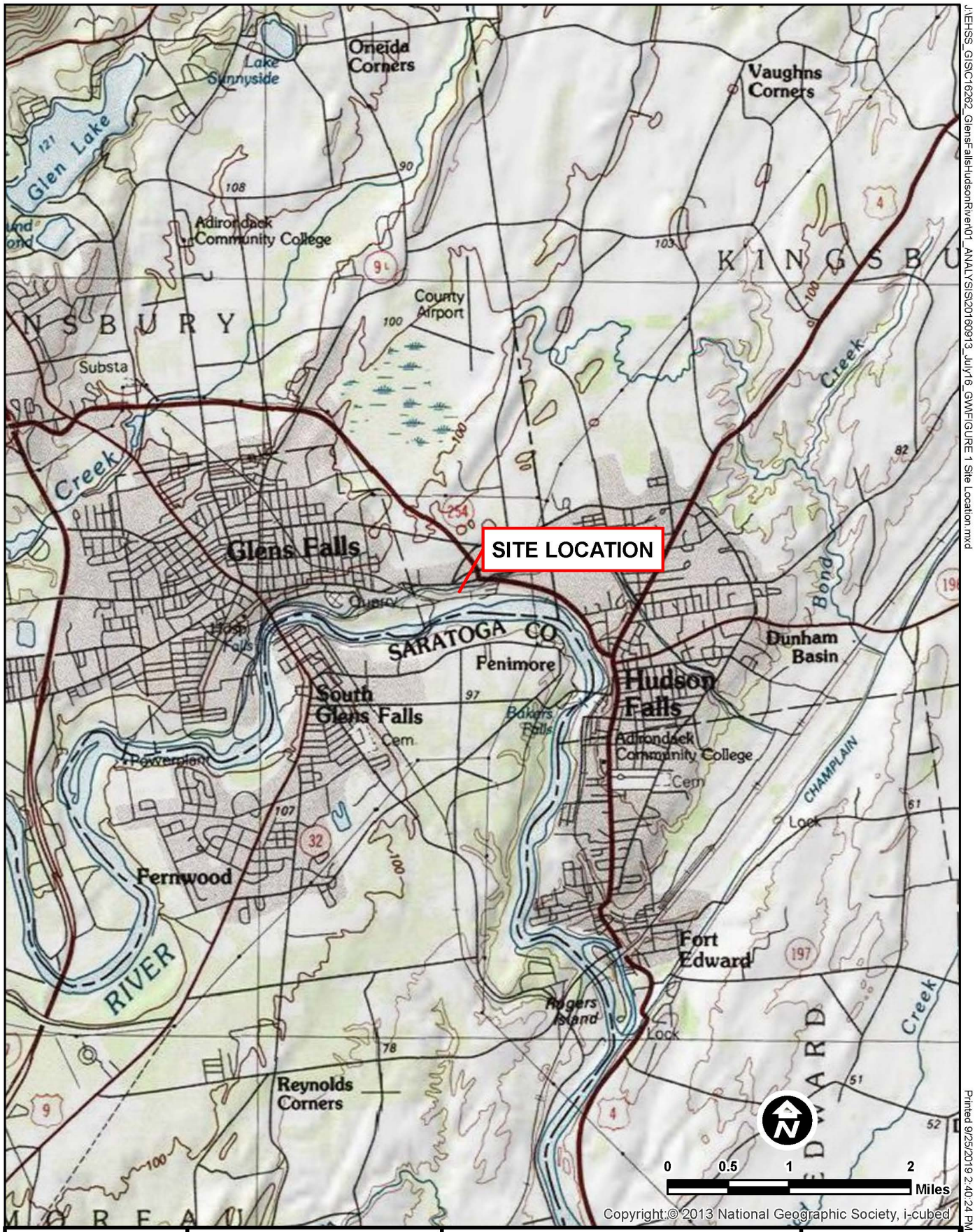
6.8 Significant Permit Modifications

The Permittee closed all permitted operating hazardous waste management units (HWMU). As such, the Facility is subject to Post Closure and Corrective Action permitting and the Department has made minor modifications to the Permit to remove HWMU content, update formatting, implement any new regulatory requirements and address technical concerns raised during the renewal process. The Groundwater Monitoring Plan will be updated based on current site conditions and cleanup objectives.

6.9 Upcoming Remedial Activities

Various RCRA remedial activities associated with soil and groundwater will be performed and covered under this Permit. There are no anticipated closures of any operating HWMUs during the life of this Permit. Remaining SWMUs and AOCs will be retained until cleanup goals are achieved.

Figure 1 – Facility Location

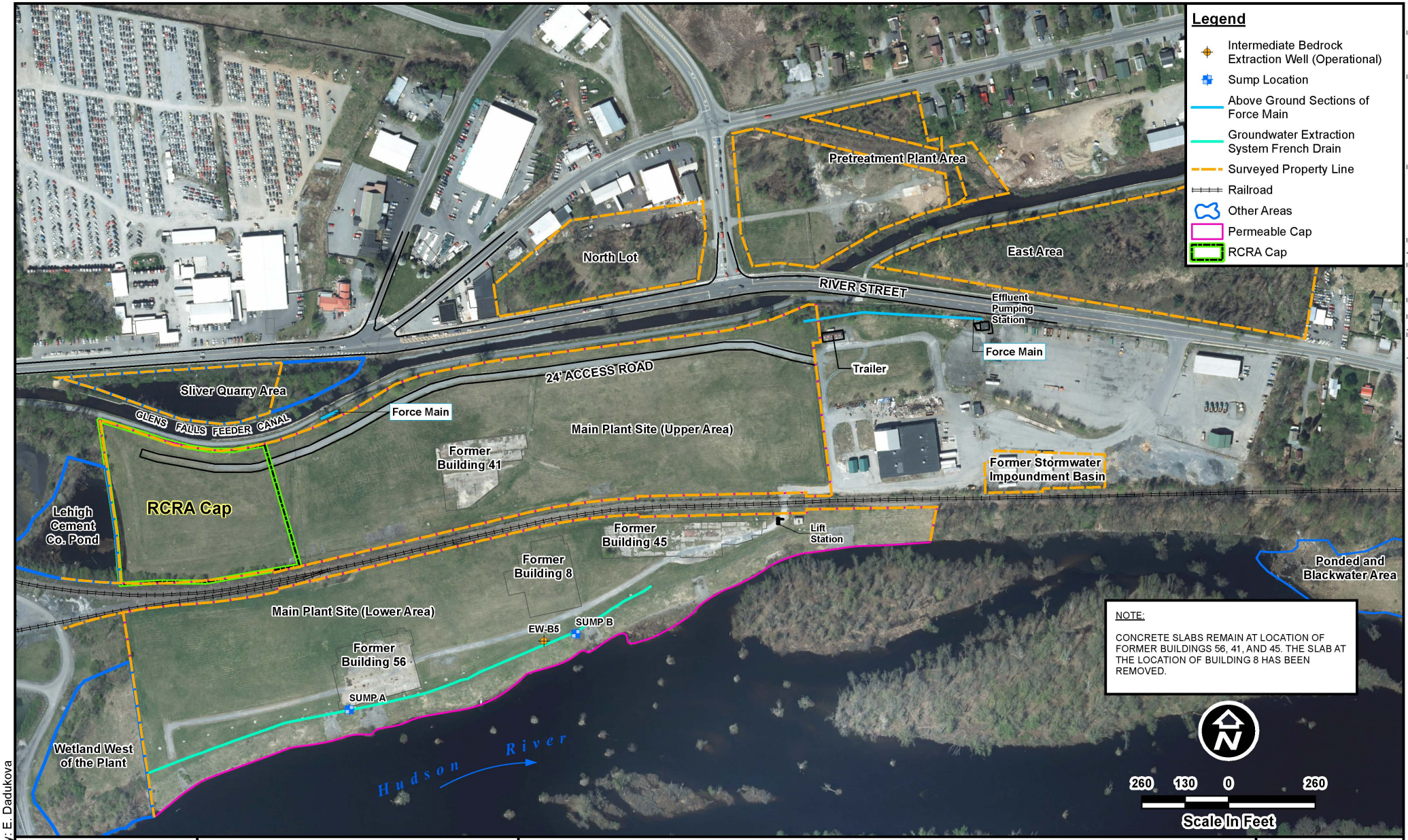


EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE LOCATION	FIGURE 1

J:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20160913_July16_GWF\FIGURE 1 Site Location.mxd

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Figure 2 – Site Boundary Map



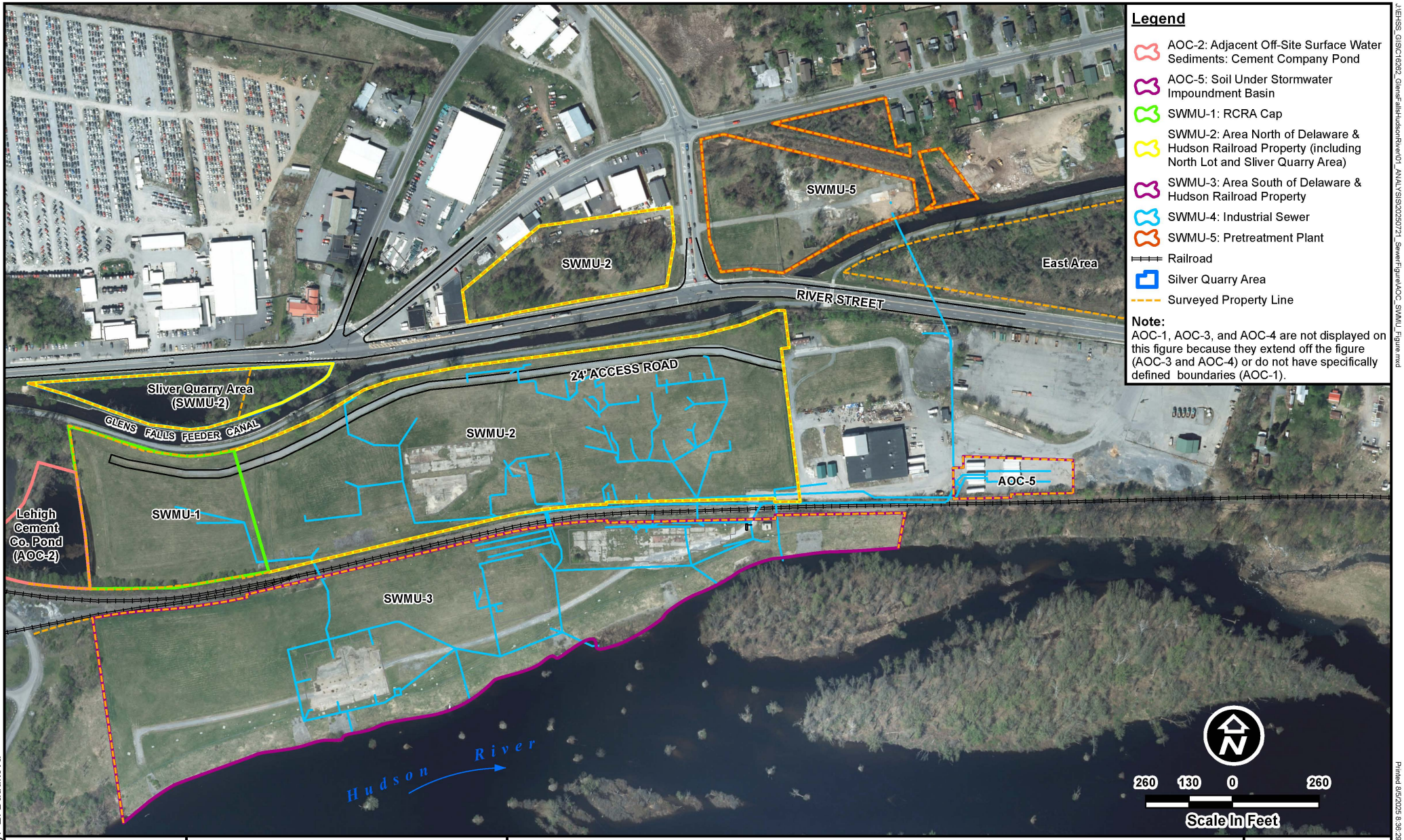
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EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE MAP	FIGURE 2

Figure 3 – Facility SWMUs and AOCs



Reviewed By: E. Dadukova

EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	AOC AND SWMU LOCATIONS SITE MAP	FIGURE 3

ACRONYMS

Acronyms for Part 373 Permit/Process

A
AOC - Areas of Concern
AST - Aboveground Storage Tank

B
BGS - Below Ground Surface

C
CA – Corrective Action
CAMU – Corrective Action Management Unit
CAP - Corrective Action Plan
CLCPA - Climate Leadership and Community Protection Act
CMI - Corrective Measures Implementation
CMS - Corrective Measures Study
COCs - Constituents of Concerns
CPP - Citizen Participation Plan
CQA - Construction Quality Assurance
CRRA - Community Risk and Resiliency Act

D
DAR - Division of Air Resources
DEC - Department of Environmental Conservation
DER - Division of Environmental Remediation
Department - Department of Environmental Conservation
DIR(s) - Document(s) Incorporated by Reference
DMM - Division of Materials Management
DOH - NYS Department of Health
DOW - Division of Water
DR - Deed Restriction
DUSR - Data Usability Summary Report

E
EC - Emergency Coordinator
EC - Engineering Control
ECL - Environmental Conservation Law
ED - Emergency Director
EDS - Electronic Document Standards
EE - Environmental Easement
ELAP - Environmental Laboratory Approval Program

F
FER - Final Engineering Report
FS - Feasibility Study

G
GOL - General Obligations Law
GW – Groundwater
GWM - Groundwater Monitoring
GWMP - Groundwater Monitoring Program

H
HHERA - Multi-pathway Human Health and Ecological Risk Assessment
HHRA - Multi-pathway Human Health Risk Assessment
Hr - Hour
HWM - Hazardous Waste Management
HWMU - Hazardous Waste Management Unit

I
I&M – Inspection & Maintenance
IC - Institutional Control
ICM - Interim Corrective Measures
ISCO - In-Situ Chemical Oxidation
ISCR - In-Situ Chemical Reduction
ISMP - Interim Site Management Plan

J

K

L
LDR - Land Disposal Restrictions
LQG – Large Quantity Generator

M
MCL - Maximum Contaminant Level
µg/L - micrograms per liter, in water
mg/kg - milligrams per kilogram, in soil
MNA - Monitored Natural Attenuation
MSL - Mean Sea Level

N
NFA - No Further Action
NFPA - National Fire Protection Association
NYCRR - New York Codes, Rules & Regulations
NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health

O
O&M - Operation & Maintenance
OGC - Office of General Counsel

OM&M - Operation, Maintenance & Monitoring
OSHA - Occupational Safety & Health Administration
OU - Operating Unit
OU - Operable Unit (under Corrective Action or 6NYCRR Part 375)

P
P&ID - Process and Instrumentation Drawing/Diagram
PCBs - Polychlorinated Biphenyls
PDF - Portable Document Format
PFAS - Per- and Polyfluoroalkyl Substance(s)
PHC - Principal Hazardous Constituents
POC - Point of Compliance
POHC - Principal Organic Hazardous Constituent
PPB - Parts per billion
PPM - Parts per million
PR - Preliminary Review
PR/VSI - Preliminary Review/Visual Site Inspection
PRR - Periodic Review Report

Q
QAPP - Quality Assurance Project Plan
QA/QC - Quality Assurance/Quality Control

R
RA - Remedial Action
RCRA - Resource Conservation & Recovery Act
RD - Remedial Design
RD/RA - Remedial Design/Remedial Action
RFA - RCRA Facility Assessment
RFI - RCRA Facility Investigation
RI - Remedial Investigation
ROD - Record of Decision
RP - Remedial Plan
RP - Responsible Party
RPL - Real Property Law
RSO - Remedial System Optimization
RTC(s) - Response(s) to TNOIA Comments

S
SAP - Sampling and Analysis Plan
SAPA - State Administrative Procedures Act
SAR -Sampling and Analysis Report
SB - Statement of Basis
SC - Site Characterization
SCG - Standard Criteria or Guidance
SCADA - Supervisory Control And Data Acquisition

SCOs – Soil Cleanup Objectives
SEQR - State Environmental Quality Review
SLERA - Screening Level Ecological Risk Assessment
SM - Site Management
SMP - Site Management Plan
SPDES - State Pollutant Discharge Elimination System
SSDSs - Sub Slab Depressurization System
SWMU - Solid Waste Management Unit
SV - Sampling Visit
SVE - Soil Vapor Extraction
SVI - Soil Vapor Intrusion
SVOCs - Semi-Volatile Organic Compounds

T
TOGS - NYSDEC's Division of Water's Technical and Operational Guidance Series
TNOIA(s) - Technical Notice(s) of Incomplete Application
TSDF - Treatment, Storage & Disposal Facility

U
UIC - Underground Injection Control
UL - Underwriters Laboratories
USDA - United States Department of Agriculture
USDOT - United States Department of Transportation
USEPA - United States Environmental Protection Agency
UV - Ultraviolet

V
VOCs – Volatile Organic Compounds
VSI - Visual Site Inspection

W
WAP - Waste Analysis Plan

X

Y

Z

NOTE: This list may not include all acronyms in the Permit

MODULE I
General Conditions

MODULE I
GENERAL CONDITIONS

The Permittee shall operate, monitor, and maintain the facility described herein, in compliance with the provisions of the New York State Environmental Conservation Law (ECL) Article 27, Title 9, Section 27-0900 et seq., the Federal Resource Conservation and Recovery Act (RCRA), including the Hazardous and Solid Waste Amendments of 1984 (HSWA) and the approved Permit application as further modified through Permit conditions set herein.

This Permit does not authorize the operation of any hazardous waste management unit requiring a 6 NYCRR Part 373 permit. This Permit is for Corrective Action and Post-Closure Care. The general conditions included herein related to Operating Permits are reserved in case facility hazardous waste operations change.

A. EFFECT OF PART 373 PERMIT

1. This Permit consists of the general and special conditions contained in this and the attached Modules, including the Attachments and documents incorporated by reference; and the applicable requirements of the New York State Environmental Conservation Law (ECL) Article 27, Title 9, Section 27-0900 et seq., and the following regulations:

   6 NYCRR 370 - Hazardous Waste Management System-General

   6 NYCRR 371 - Identification and Listing of Hazardous Wastes

   6 NYCRR 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities

   6 NYCRR 373 - Hazardous Waste Management Facilities

   6 NYCRR 374 - Management of Specific Hazardous Waste

   6 NYCRR 376 - Land Disposal Restrictions

   6 NYCRR 621 - Uniform Procedures

   6 NYCRR 624 - Permit Hearing Procedures

   The applicable regulations or requirements would be those which are in effect prior to final issuance of this Permit.

2. **All documents and reports required by this Permit must be certified pursuant to conditions established in 6 NYCRR 373-1.4(a)(5)(iv) and Condition O.4 of this Module and submitted in accordance with requirements set forward in Conditions O and W of this Module. Additionally, unless specifically exempted in this Permit, all information (e.g., documents and reports) required to be submitted by the Permittee must be approved by DEC. DEC does not require certain plans, documents or reports to be certified. The Permittee should verify if certification is required prior to submittal to the DEC.**

3. The following Guidance and Policy Documents are potentially relevant to this Permit.

The Permittee shall consider applicable Department guidance when conducting activities required by this Permit.

DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants

DEP 24-1 Permitting and Disadvantaged Communities

DER-10 Technical Guidance for Site Investigation and Remediation

DER-13 Strategy For Evaluating Soil Vapor Intrusion at Remedial Sites in New York

DER-23 Citizen Participation Handbook for Remedial Programs

DER-31 Green Remediation

DER-33 Institutional Controls: A Guide to Drafting and Recording Institutional Controls

PFAS Guidance: Sampling, Analysis, and Assessment of PFAS (revised April 2023)

TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations

4. The following Commissioner Policies are potentially relevant to this Permit. The Permittee shall consider applicable Department policies when conducting activities required by this Permit.

CP-29 Environmental Justice and Permitting

CP-39 Use of Enforcement Discretion for Discarded Mercury-containing Equipment

CP-43 Groundwater Monitoring Well Decommissioning

CP-44 Natural Resource Damages

CP-45 Procedure to Demonstrate Compliance with Financial Test Requirements (for financial assurance)

CP-51 Soil Cleanup Guidance

5. Compliance with this Permit during its term constitutes compliance, for purposes of enforcement, with 6 NYCRR Parts 370 through 374 and 376 except for the following requirements not included in the Permit:

   a. Requirements which become effective by statute, including amendments thereto;

   b. Requirements which are promulgated under 6 NYCRR 376 restricting the placement of hazardous wastes in or on the land;

   c. Requirements which are promulgated under 6 NYCRR 373-2 regarding leak detection systems for new and replacement surface impoundment, waste pile, and landfill units, and lateral expansions of surface impoundment, waste pile,

and landfill units. The leak detections system requirements include double liners, Construction Quality Assurance (CQA) programs, monitoring, action leakage rates, and response action plans, and will be implemented through the procedures of 6 NYCRR 373-1.7 for major modifications; or

d. Requirements which are promulgated under 6 NYCRR 373-3.27, 373-3.28, and 373-3.29, limiting air emissions.

6. The Permittee is authorized to manage hazardous waste in accordance with the conditions of this Permit. Any storage, treatment or disposal of hazardous waste not authorized by this Permit is prohibited unless exempt under 6 NYCRR 373-1.1(d). Issuance of this Permit does not authorize any injury to persons or property, any invasion of other private rights, or any infringement of federal, state or local laws or regulations.

7. The Permittee is authorized to manage only hazardous wastes which are generated at the Permittee's facility.

8. The Permittee is required to conduct corrective action in accordance with the conditions of this Permit.

9. The Permittee must submit plans, reports, specifications, implementation schedules and any subsequent amendments to those documents required by this Permit to the Department for review and comment. Following its review of a document, if the document requires formal Department approval (as determined by the Department), the Department may either approve the document as submitted or issue comments on the submittal. If the Department issues comments on the document, subsequent activities for the document must proceed in accordance with the following schedule:

   a. Meeting between the Permittee and the Department to discuss the document comments, if requested by the Permittee or deemed necessary by the Department; and,

   b. Submission of a revised document to the Department for approval within thirty (30) calendar days of the above-described meeting. (If the above referenced meeting is determined not to be necessary, the Permittee must submit a revised document for Department approval, according to a schedule specified by the Department, not to exceed forty-five (45) calendar days of the Permittee's receipt of comments from the Department).

   c. If the submission is not revised to the Department's satisfaction, the Department may revise the document and send the Permittee a notice of intent to modify the Permit to incorporate the revised document into the Permit, pursuant to 6 NYCRR 621.13.

10. All plans, reports, specifications and schedules required by the terms of this Permit, and all subsequent amendments to those documents, are incorporated by reference into

this Permit when written approval is issued by the DEC pursuant to 6 NYCRR 621.11, or 6 NYCRR 621.13. Upon incorporation, the provisions of each such document will be binding upon the Permittee and have the same legal force and effect as the requirements of this Permit.

11. The Permittee must place the submittal within the Facility's document repository within fifteen (15) calendar days of receipt of the Department's approval.

12. Informal advice, guidance, suggestion, or comment by the DEC must not be construed as relieving the Permittee of the Permittee's obligation to obtain such formal approvals as may be required by this Permit. The Permittee consents to and agrees not to contest the authority and jurisdiction of the DEC to enter into or enforce this Permit.

13. The Permittee must also comply with the following:

    6 NYCRR 373-1.1(f) – Uniform Procedures

    6 NYCRR 373-1.1(g) – Enforcement

    6 NYCRR 373-1.1(h) – Severability

14. The Permittee must maintain a current and complete paper copy or electronic copy on an electronic storage device (or equivalent method) of this Permit, including all Modules, Attachments and documents incorporated by reference, in at least one (1) location at the Facility for review by the DEC upon request.

15. For any Environmental Monitor(s) assigned to the Facility, the Permittee must maintain a complete set of all submittals required by this Permit in the office of the Environmental Monitor or as otherwise directed by the Environmental Monitor(s) as per **Condition T.2** of this Module.

16. In the event of a discrepancy between this Permit and any regulation, order on consent, other permit, or plans, reports, specifications, and schedules submitted pursuant to this Permit, the more stringent requirement applies, as determined by the Department.

B. PERMIT DOCUMENTS

The Permittee's Hazardous Waste Part 373/B Permit Renewal Application is attached, in whole or in part, to this Permit. Other documents pertinent to this Facility and that are listed below are incorporated by reference into this Permit. These documents are made part of this Permit, are binding upon the Permittee and have the same legal force and effect as the requirements of this Permit. The following documents are considered part of this Permit:

Modules

I	General Conditions
II	Corrective Action Requirements
III	RESERVED

IV RESERVED

V Land Disposal Unit(s) Post Closure Requirements

VI RESERVED

VII RESERVED

VIII RESERVED

IX RESERVED

X RESERVED

XI Groundwater Monitoring

XII RESERVED

XIII Scheduled Dates

Attachments

A. Permit Modification Log

B. Permit Renewal Application with overall Renewal Application Certification required per 6 NYCRR 373-1.4(a)(5)(iv), exclusive of its attachments

C. SWMU/AOC Current Conditions Report

D. Groundwater and Surface Water Monitoring Plan

E. Statements of Basis for OUs 01, 02, 03 and 04

F. Environmental Easement(s) or DEC-approved Covenant

G. Site Management Plan (SMP)/Post Closure Plan (PCP)

H. Closure, Post-Closure, and/or Corrective Action Cost Estimate(s)

I. On-going Corrective Actions Documents

J. Other Laws

Footnotes:

1. Each document referenced above includes the dated original submission and any subsequent Department approved document revisions.
2. If a document is necessary under the Permit and was not provided with the Permit Renewal Application, it will be required in accordance with Module XIII.

Document(s) Incorporated by Reference

1. MPS
   a. AWARE Incorporated, September 18, 1987, Final Report Preliminary Assessment Main Plant Site.
   b. AWARE Incorporated, January 25, 1989, Evaluation of Off-Site Bedrock Hydrogeology for the CIBA- GEIGY Glens Falls Facility, Glens Falls, New

York.
c. Eckenfelder, Inc., September 5, 1991, Site-Wide Soil Sampling Report (Interim RFI Report), CIBA-GEIGY Main Plant Site, Glens Falls, New York.
d. Eckenfelder Engineering P.C., July 1992, Site Wide Soil Sampling Report Addendum (Final RFI Report).
e. Eckenfelder Engineering P.C., March 4, 1993, RCRA Facility Investigation Report for Groundwater.
f. Eckenfelder Engineering P.C., February 24, 1994, 1993 Annual Groundwater Monitoring Report
g. Eckenfelder Engineering P.C., August 4, 1994, Corrective Measure Study for On-site Soils and Groundwater.
h. EHS Support LLC, January 2015, Site Conceptualization and Groundwater Corrective Measures Effectiveness Evaluation Report.
i. EHS Support LLC, November 3, 2016, Remedy Optimization Plan.
j. EHS Support LLC, March 15, 2019, Remedy Optimization Report.

2. PTP-specific reports
   a. Eckenfelder Engineering P.C., July 24, 1992, RFA Sampling Visit Pretreatment Plant.
   b. Eckenfelder Engineering P.C., August 1993, Groundwater Addendum for RFA Report for Pretreatment Plant SWMU.
   c. Eckenfelder Inc., October 13, 1994, RFI Report for the Pretreatment Plant SWMU.
   d. Brown and Caldwell, June 27, 2000, Groundwater Investigation Report, Area Southeast of Pretreatment Plant SWMU.

3. Sediment AOCs Reports
   a. Eckenfelder Inc., May 1994, RFI Phase I Report for Adjacent Surface Water Sediments AOC.
   b. Eckenfelder Inc., Normandeau Associates Inc., June 2, 1997, Phase II RFI Report for Adjacent Surface Water Sediments AOC for the Ciba Site.
   c. Eckenfelder Inc., May 8, 1998, Supplemental RFI Report Sediments AOC.
   d. Eckenfelder Inc., Brown and Caldwell, September 25, 1998, Additional Investigation Report, Sediments AOC.
   e. Brown and Caldwell, July 1999, Addendum to Additional Investigation Report Sediments AOC.

4. Off-Site Land AOCs
   a. Eckenfelder Inc., October 1994, RFI Report for Adjacent Off-Site Land AOC.
   b. McLaren/Hart Environmental Engineering., June 27, 1995. Revised Health Risk Assessment of Off-Site Soils for the CIBA-GEIGY Site, Glens Falls, New York.
   c. Eckenfelder Inc., July 1996, Phase II RFI Report Adjacent Off-Site Land AOC.
   d. Eckenfelder Engineering P.C, March 20, 1998, Corrective Measures Study Adjacent Off-Site Land AOC.
   e. Brown and Caldwell, December 11, 2000, Groundwater Investigation Report Area West of Main Plant Site.

Proposed modifications to this Permit, including modifications to the Permit Application

documents incorporated into this Permit, shall be addressed according to 6 NYCRR 373-1.7. The Permittee shall place a revision date on all pages of the proposed Permit modification application.

The Permittee must provide and maintain a log of all modifications made to this Permit, including modifications made to the Permit Application documents that are made part of this Permit. The log shall contain at a minimum the following information regarding an approved modification: (1) the name of the specific document being modified (e.g., contingency plan, security requirements, hazardous waste unit operations, etc.); (2) the effective date of the modification to the Permit; (3) the pertinent pages, sections, and/or attachments of the Permit and Permit Application documents subject to the modifications; (4) the revision date of the modifications; and (5) a brief statement regarding the nature of the modifications. The Permittee shall place the log at the beginning of this Permit along with a copy of the Department's approval letters, when applicable. The Permittee must replace the pages, sections, and/or attachments in the Permit and Permit Application with the modified pages, sections, and/or attachments.

C. DEFINITIONS

1. For the purposes of this Permit, the terms used herein shall have the same meanings as those provided in 6 NYCRR 370 through 374 and 376, and the terms defined in this Permit, unless this Permit specifically states otherwise. Where the terms are not otherwise defined, the meanings associated with such terms shall be as defined by a standard dictionary reference or the generally accepted scientific or industry meaning of the term.

2. The following additional terms used in this Permit are defined as such:

   a. Action Levels. For the purposes of this Permit, "action levels" are hazardous constituent concentrations for a specific environmental medium which if exceeded indicate a potential threat to human health or the environment. The exceedance of action levels may trigger further investigations, studies and corrective measures. Where available, action levels are based on appropriate promulgated standards established for a specific environmental medium. When promulgated standards are not available, action levels can be media-specific hazardous constituent concentrations derived from non-promulgated human health risk data or environmental risk data with the latter levels being protective of aquatic life or wildlife. An action level may be set at the background level for a hazardous constituent for which data are inadequate to set a human health or environmental health-based level. The action levels for groundwater are the more stringent of the following for each compound or constituent: 6 NYCRR 703.5, New York State Department of Health's Drinking Water Standards and the United States Environmental Protection Agency's Maximum Contaminant Levels (MCLs).

   b. Areas of Concern (AOC). Pursuant to the authority granted by 6 NYCRR 373-1.6(c)(2), an "area of concern" has been defined for purposes of this Permit to mean an area at the facility, or an off-site area, which is not at this time known to be a solid waste management unit (SWMU), where hazardous waste and/or hazardous constituents are present, or are suspected to be present, as a result of a release from

the facility. The term shall include areas of potential or suspected contamination as well as actual contamination. Such area(s) may require study and a determination of what, if any, corrective action may be necessary. All Permit references to and conditions for SWMUs shall apply to areas of concern.

c. Contamination. The presence of any hazardous constituent in a concentration which exceeds the naturally occurring concentration of that constituent in areas which should not be affected by the operations of the facility.

d. Corrective Action. For the purposes of this Permit, "corrective action" is a process that includes all activities related to the investigation, characterization and cleanup of a release of hazardous wastes or hazardous constituents from a solid waste management unit (SWMU) at a permitted or interim status treatment, storage and disposal facility (TSDF) to any environmental medium. The "corrective action" process includes all activities necessary to protect human health and the environment for all releases of hazardous waste or hazardous constituents at the facility, regardless of the time at which waste was placed in the unit. Corrective action may address releases to air, soil, surface water sediment, groundwater, or subsurface gas. Module II of this Permit contains a more detailed discussion of the corrective action process.

e. DEC or Department. New York State Department of Environmental Conservation

f. DER. Division of Environmental Remediation.

g. Environment or environmental media. "Environment" or "environmental media" means any water; water vapor; land, including land surface or subsurface; air; and, fish, wildlife, biota and all other natural resources.

h. Extent of Contamination. The horizontal and vertical area in which the concentrations of hazardous constituents in the environmental media being investigated are above the naturally occurring concentration of that constituent in areas which should not be affected by the operations of the facility.

i. Hazardous Constituents. For the purposes of this Permit, "hazardous constituents" are those constituents listed in Appendix 23 of 6 NYCRR 371 or any constituent listed in Appendix 33 of 6 NYCRR 373-2 as well as any emerging contaminants listed in 6 NYCRR Part 597.

j. Permittee. For the purposes of this Permit, "Permittee" herein refers to the party(ies) subject to this Permit. In addition, refer to Conditions S.2 and S.3 of this Module.

k. Priority Pollutant. Pursuant to 6 NYCRR 750-1.2(a)(67), "priority pollutant" means those pollutants listed in 40 CFR 122, Appendix D (see 6 NYCRR 750-1.24) as Organic Toxic Pollutants (volatiles, acid compounds, base/neutral compounds and pesticides), Metals, Cyanide and Total Phenols.

l. Release. For purposes of this Permit, "release" includes, but is not limited to, any

spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment of any hazardous waste, including hazardous constituents, unless expressly authorized under the terms of this Permit or otherwise permitted under law (e.g., SPDES permitted discharges).

m. Solid Waste Management Unit (SWMU). For purposes of this Permit, a "solid waste management unit" includes any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of hazardous or solid wastes. Such units include any area at the facility at which solid wastes have been routinely and systematically released. These units include certain areas associated with production processes that have become contaminated as a result of routine and systematic releases.

n. Unit. Includes, but is not limited to, any landfill, surface impoundment, waste pile, land treatment unit, incinerator, injection well, tank, container storage area, wastewater treatment unit, elementary neutralization unit, or recycling unit.

D. GENERAL PERMIT CONDITIONS [6 NYCRR 373-1.6]

1. 6 NYCRR 373-1.6 provide conditions applicable to all Part 373 Permits which are therefore incorporated into this Permit. The provisions are incorporated into and made enforceable under this Permit.

2. Oral Reports: The Permittee must orally report any noncompliance that may endanger health or the environment within 24 hours from the time the Permittee becomes aware of the circumstances. This noncompliance includes, but is not limited to:

   a. Information concerning release of any hazardous waste(s), hazardous constituents(s) or emerging contaminant(s) that may cause an endangerment to public drinking water supplies; and

   b. Any information of a release or discharge of hazardous waste(s), hazardous constituents(s) or emerging contaminant(s) or of a fire or explosion from the hazardous waste management (HWM) facility, which could threaten the environment or human health outside the facility.

   The oral reports must be made to the DEC using the New York State 24-hour oil and hazardous material spill notification number (800) 457-7362 and the National Response Center using its 24-hour number (800) 424-8802, or any designated telephone numbers which may subsequently replace those listed above. The Permittee must also provide such oral reports to DEC staff that are on-site at the time of, or subsequent to, a reportable incident. The information reported must include that listed at 6 NYCRR 373-1.6(a)(12)(vi)('b') and 6 NYCRR 373-2.4(g)(4)(ii).

   For a fire, explosion or release to the environment, the Permittee must also comply with the reporting requirements in **Condition L.3** of this Module.

3. Entry Upon Facility:

   a. The Permittee must allow, pursuant to 6 NYCRR 373-1.6(a)(9), entry upon the Facility (or areas in the vicinity of the Facility which may be under the control of the Permittee) at reasonable times by any duly designated officer or employee of the United States Environmental Protection Agency (USEPA), the DEC or any State agency having jurisdiction with respect to matters addressed pursuant to this Permit, and by any agent, consultant, contractor or other person so authorized by the DEC, upon presenting identification, for inspecting, sampling, copying records that must be maintained by this Permit, testing, and any other activities necessary to evaluate the Permittee's compliance with this Permit.

   b. Upon request, the Permittee must: (i) provide the DEC with suitable workspace at the Facility, including access to a telephone, to the extent available; and, (ii) allow the DEC full access to all records relating to matters addressed by this Permit. Raw data must be provided to the DEC upon request.

   c. In the event the Permittee is not the owner of the Facility property and is unable to obtain any authorization from third-party property owners necessary to provide access, the Permittee must immediately notify the Department and provide any requested assistance in obtaining such authorizations.

   d. The DEC shall have the right to take its own photographs, samples and scientific measurements and to obtain split samples, duplicate samples or both, as necessary to evaluate the Permittee's compliance with this Permit. The DEC shall make the results available to the Permittee in accordance with DEC policy.

4. Reservation of Rights

   a. Nothing contained in this Permit shall be construed as barring, diminishing, adjudicating, or in any way affecting any of the DEC's rights or authorities, including, but not limited to, the right to require performance of further investigations and/or response action(s), the right to, at any time, issue a notice of intent to modify, suspend or revoke this Permit in accordance with 6 NYCRR 621.13 and/or to exercise any summary abatement powers with respect to any person, including the Permittee.

   b. Except as otherwise provided in this Permit, the Permittee specifically reserves all rights and defenses under applicable law, and further reserves all rights respecting the enforcement of this Permit, including the rights to notice, to be heard, to appeal, and to any other due process. The existence of this Permit or the Permittee's compliance with it shall not be construed as an admission of liability, fault, wrongdoing, or breach of standard of care by the Permittee, and shall not give rise

to any presumption of law or finding of fact, or create any rights, or grant any cause of action, which shall inure to the benefit of any third party.

E. PERMIT MODIFICATION AND PERMIT TRANSFER [6 NYCRR 373-1.7 and 621]

1. Proposed modifications to this Permit, including modifications to the Attachments and documents incorporated by reference into this Permit, must be addressed in accordance with 6 NYCRR 373-1.7 and 621.

2. The Permittee must contact the DEC with respect to any and all proposed permit modifications requested by the Permittee. The DEC shall make the determination as to whether a proposed permit modification is a minor or major modification in accordance with 6 NYCRR 373-1.7 and 40 CFR 270.42. For the purposes of this Permit, as described in **Condition E.2.a** of this Module, the DEC will entertain proposed administrative modifications to this Permit that would not otherwise be required to follow the requirements of **Conditions E.2.b and/or E.2.c** of this Module. Administrative changes generally include in-kind replacements or minor updates to plans attached to this Permit or incorporated by reference. **However, the DEC must determine whether any and all changes are administrative modifications to this Permit**.

   a. For modifications determined by the DEC to be administrative, the Permittee shall make the change in the Permittee's copy of all affected Attachment(s) and/or document(s) incorporated by reference. Submittal to the DEC of a change that the DEC has determined is administrative in nature is not necessary. However, at the time of Permit renewal, the Permittee must incorporate all administrative changes into this Permit. The Permittee must record all administrative changes in the Permit Modification Log provided as **Attachment A** of this Permit in accordance with **Condition E.3** of this Module. **Note:** The DEC reserves the right to have its project manager, environmental monitor and/or permit writer request proposed administrative changes in writing by the Permittee's submission of a cover letter, written description of the proposed administrative modification and a clean copy of the modified affected pages for the DEC's review and approval.

   b. For modifications determined by the DEC to be minor pursuant to 6 NYCRR 373-1.7(c) and 40 CFR 270.42(a), the Permittee must receive written approval from the DEC before implementing the modification into this Permit, and subsequently follow the requirements of 6 NYCRR 373-1.7, 6 NYCRR Part 621 and DEC guidance for minor modifications.

   c. For modifications determined by the DEC to be major, the Permittee must treat the modification as a new application in accordance with 6 NYCRR 621.11 and follow the applicable requirements of 6 NYCRR 621.

3. The Permittee must maintain a log of all modifications requested and made to this Permit, including modifications made to the Attachments and documents incorporated by reference into this Permit. The log must conform to the DEC-approved format presented in **Attachment A** of this Permit and must be submitted with each modification request. The log must be filled out in its entirety, except for the issuance

date. Upon issuance of each Permit modification, the Permittee must place the updated log in **Attachment A** of this Permit along with a copy of the DEC's approval letters, when applicable, and replace all affected pages in the Modules, Attachments and/or documents incorporated by reference with the modified pages.

4. The DEC may at any time, at its discretion, modify this Permit under the terms of 6 NYCRR 621.13 in accordance with the requirements contained therein.

5. Permit Transfer: The Permittee must process all changes in Facility ownership and/or operational control in accordance with the requirements of 6 NYCRR 373-1.7(a), including the timeframes specified therein. Prior to undertaking a change in Facility ownership and/or operational control, the Permittee must provide written notification to the DEC and receive written approval from the DEC to allow transfer of this Permit. The Permittee must demonstrate to the DEC's satisfaction that the prospective transferee will be able to comply with all applicable laws and regulations, Permit conditions, financial assurance and other requirements to which the Permittee is subject. The written notification must include the identity of the transferee and of the nature and proposed date of the conveyance, and must notify the transferee in writing, with a copy to the DEC, of the applicability of this Permit including the corrective action program, as appropriate. The DEC will determine whether transfer of this Permit is acceptable and will require either a minor or major modification.

F. EXPIRATION AND CONTINUATION OF PERMITS [6 NYCRR 373-1.8]

1. Requests for continuation of this Permit must be submitted in accordance with 6 NYCRR 373-1.8 and 621.11.

2. No sooner than one (1) year and no later than one hundred eighty (180) calendar days before the expiration of this Permit, the Permittee must provide the DEC with a report regarding the matters identified in ECL 27-0913(3) occurring within two (2) years of the date of the report. The report must include any such matters involving the permitted Facility, all other facilities owned or operated by the Permittee and any duly incorporated parent or subsidiary managing hazardous wastes within the United States. The Permittee must supply such documents and pertinent details regarding the matters in the report as may be requested by the DEC.

3. The Permittee must schedule a "Pre-Application" meeting with the DEC at least two hundred seventy (270) calendar days prior to the expiration date of this Permit. Renewal applications with a significant change (as defined at 6 NYCRR 373-1.10(a)(1)) are subject to the requirements of 6 NYCRR 373-1.10.

4. Complete applications for permit renewal must be submitted at least one hundred eighty (180) calendar days before the expiration date of this Permit pursuant to 6 NYCRR 373-1.8(b).

5. At any time during the review of the renewal application, the DEC may request that the Permittee submit any additional information in writing which is necessary for determining the completeness of the application. Failure to provide such information by the date specified in the request may be grounds for denial of the application and

the extension allowed pursuant to Section 401(2) of the State Administrative Procedures Act.

G. TERMINATION OF PERMIT ACTIVITIES

1. Should the Permittee cease the hazardous waste management activities allowed by this Permit prior to the expiration of this Permit, then, pursuant to 6 NYCRR 373-1.6(d), the Permittee must continue to comply with the applicable closure, post-closure and corrective action conditions and requirements stipulated in this Permit.

2. If the Permittee certifies closure of all hazardous waste management units at the Facility, and the DEC accepts these closure certifications during the term of this Permit, and post-closure care or corrective action is determined to be necessary by the DEC, the Permittee may request to enter into another enforceable commitment document which is appropriate, pursuant to Environmental Conservation Law (ECL) Section 71-2727(3) in lieu of this Permit. The Permittee must enter into the appropriate enforceable commitment prior to the expiration of this Permit, or submit a renewal application as required by **Condition F. 4** of this Module.

H. FACILITY OPERATION

1. In accordance with 6 NYCRR 373-2.3(b), the facility must be designed, constructed, maintained and operated to minimize the possibility of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste(s) or hazardous waste constituents to air, soil, surface water or groundwater that could threaten human health or the environment.

2. The Permittee must at all times construct, operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee as designed in accordance with this Permit.

3. The Permittee must inspect the Facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of hazardous waste(s) or hazardous waste constituents to the environment, or a threat to human health pursuant to 6 NYCRR 373-2.2(g).

I. COMPLIANCE SCHEDULE

1. The Permittee must complete any activities referenced in **Condition A of Module XIII** of this Permit within the timeframes set forth therein and in accordance with 6 NYCRR 373-1.6(d).

2. The Permittee must submit reports in a DEC-approved format no later than 14 calendar days following each interim and the final compliance date that summarize the status of each of the activities listed in this Permit. These reports must be signed and certified pursuant to 373-1.6(a)(11) and 373-1.4(a)(5).

J. WASTE ANALYSIS [6 NYCRR 373-2.2(e)]

1. The Permittee must perform general waste analysis in accordance with the requirements of 6 NYCRR 373-2.2(e) and this Permit.

2. All laboratories utilized for the analysis of any closure, post-closure and/or corrective action samples must be certified under the New York State Department of Health's Environmental Laboratory Approval Program (ELAP). Any laboratory tests or sample analyses for which the commissioner of the New York State Department of Health (NYSDOH) issues certificates of approval must be performed by a laboratory certified to perform such tests or analyses pursuant to the NYSDOH Environmental Laboratory Approval Program.

K. PERSONNEL TRAINING PROGRAM [6 NYCRR 373-2.2(h)]

1. The Permittee must conduct personnel training in accordance with 6 NYCRR 373-2.2(h)(1), (2) and (3), and this Permit.

2. The Permittee must maintain training documents in accordance with 6 NYCRR 373-2.2(h)(4) and (5), and this Permit.

L. PREPAREDNESS AND PREVENTION, CONTINGENCY PLAN AND EMERGENCY PROCEDURES [6 NYCRR 373-2.3 and 2.4]

1. The Permittee must comply with the preparedness and prevention requirements in accordance with 6 NYCRR 373-2.3 and this Permit.

2. The Permittee must comply with contingency plan and emergency procedure requirements in accordance with 6 NYCRR 373-2.4 and this Permit.

3. Reporting of Fires, Explosions or Releases to the Environment

   a. Oral Reports: For fires, explosions or releases which could threaten human health or the environment outside of the facility, the Facility's Emergency Coordinator must immediately notify the DEC (using the New York State 24-hour oil and hazardous material spill notification number (518) 457-7362) and the local governmental official designated as the on-scene coordinator for that governmental area. This notification must be made in accordance with, and include the information required by 6 NYCRR 373-2.4(g)(4)(ii).

   b. Written Report: For any fire, explosion or release to the environment, except if the release is less than or equal to one (1) pound and immediately cleaned up, the Permittee must, within fifteen (15) calendar days of the incident, submit a written report to the DEC in accordance with, and include the information required by 6 NYCRR 373-2.4(g)(10).

M. WASTE REDUCTION REQUIREMENTS

1. The Permittee must comply with the requirements of Article 27, Title 9, Section 27-0908 of the ECL and 6 NYCRR 373-2.5(c)(2)(ix) relative to waste reduction requirements.

N. REQUIREMENTS FOR RECORDING AND REPORTING OF MONITORING RESULTS [6 NYCRR 373-1.6(b)]

1. The Permittee must comply with the recording, reporting and monitoring requirements listed in this Permit.

2. The Permittee must install, use and maintain monitoring equipment, utilize the approved methods, and report monitoring results as specified in this Permit, and 6 NYCRR 373-2.

O. DATA AND DOCUMENT STANDARDS

1. All analytical data required by this Permit, as well as all analytical data requested by the Department, must be submitted to the DEC in the standardized format in accordance with the DEC's Electronic Data Deliverable guidance (i.e., NYSDEC EQuIS™ database) within thirty (30) calendar days of receipt from the laboratory or at a schedule approved by the Department (see http://www.dec.ny.gov/chemical/62440.html). The Permittee may obtain Category A deliverables for routine sampling activities. At decision points where determinations of final actions are taken, the Permittee must obtain Category B deliverables and have all closure, post-closure and corrective action data validated by a third party prior to submission to the DEC. The individual performing the third-party validation must prepare a Data Usability Summary Report (DUSR) consistent with the guidelines of the DEC's Technical Guidance for Site Investigation and Remediation, DER-10. The DUSR must be submitted with the report containing the data in accordance with **Condition O.2** of this Module. The data deliverable submitted to the DEC must include the results of the data validation.

2. The Permittee must deliver to the DEC preliminary or final reports, specifications or drawings prepared pursuant to this Permit in an electronic format that complies with the DEC's Electronic Document Standards (EDS) or as otherwise directed by the DEC. All final documents are to be submitted in an electronic format that complies with the most recent DER EDS. Until such time as the DEC establishes an EDS, final documents are to be submitted as a PDF document (see Requirements For Submittal Of Electronic Documents - NYSDEC). Also, the Permittee must, at the request of the DEC, provide electronic versions of technical documents in MS Word and/or MS Excel, and plan drawings and/or other site drawings in AutoCAD, or other format suitable to the DEC.

3. In addition to electronic copies, the Permittee must provide paper copies of any document (e.g., reports, plans, data, specifications, drawings, etc.) requested by the Department in paper format or as may be specified in paper format in this Module.

4. All Permit Applications and Reports required by this Permit and other information requested by the DEC must be signed in accordance with the provisions of 6 NYCRR

373-1.4(a)(5), and include the following statement required by 6 NYCRR 373-1.4(a)(5)(iv): "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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."

P. FINANCIAL ASSURANCE

1. The Permittee must comply with all of the applicable requirements of 6 NYCRR 373-2.8 and this Permit. The definitions contained in 6 NYCRR 373-2.8(b) are applicable to the financial requirements within this Permit.

2. The Permittee must comply with this Permit and 6 NYCRR 373-2.6(l) for meeting the financial assurance requirements for corrective action for releases from any solid waste management unit located at the Facility, regardless of the time the waste was placed in the unit.

3. The Permittee must adjust for inflation all cost estimates required by 6 NYCRR 373-2.6(l), 373-2.8 and this Permit annually by April 1st or another DEC approved date, and provide additional financial assurance for this adjustment in accordance with 6 NYCRR 373-2.8 and **Condition P.6**. These adjustments must be independent of any requests to decrease cost estimates, unless the DEC has previously approved such a decrease (i.e., the inflationary adjustment must be made separately from any unapproved request for a decrease in the cost estimate). In addition, the total amount of any post-closure cost estimate must be established and maintained throughout the life of this Permit in at least the amount derived by multiplying the annual post-closure cost estimate by a minimum of thirty (30) years unless the DEC has approved a decrease in the post-closure care period for a unit or the Facility in accordance with 6 NYCRR 373-2.7(g)(1)(ii).

4. The Department-approved closure, post-closure and corrective action cost estimates are in **Attachments H** of this Permit. These cost estimates must be adjusted annually either by recalculating the cost estimate in current dollars, or by using an inflation factor in accordance with **Conditions P.3 and P.6** of this Module.

5. The Permittee must obtain approval in writing from the DEC prior to any reduction in the approved cost estimates and for any changes to the instrument(s) and/or mechanism(s) (e.g., type of instrument(s) and/or mechanism(s), the issuing company(ies)/institution(s) and/or a reduction in the dollar amount(s)).

6. Corrective Action Cost Estimates: For any and all corrective actions required under the authority of this Permit for any Solid Waste Management Units, both final and interim, the Permittee must submit for the DEC's approval, written estimates, in current dollars, which reflect all costs involved in implementing corrective action through DEC-approved completion. Such estimates must reflect the cost of hiring a third party to

perform the corrective action in accordance with 6 NYCRR 373-2.8(e)(1)(i). For the final corrective measure(s), the Permittee must provide such estimates with the submission of the Corrective Measures Implementation (CMI) work plan. For Interim Corrective Measures (ICM) requiring work plans, the Permittee must provide such estimates with the submission of each ICM work plan required by this Permit.

7. Short-Term Corrective Measures: For financial assurance of final or interim corrective measures for any Solid Waste Management Units required by DEC-approved work plans where the implementation schedule in the approved work plan(s) indicates anticipated completion of said action(s) within one (1) year, the Permittee must provide the DEC with a letter certifying that the Permittee has sufficient liquid financial resources to perform and complete the approved corrective measure(s) based on the DEC-approved cost estimate(s) required by **Condition P.6** of this Module. This letter must include a certification in accordance with 6 NYCRR 373-1.4(a)(5) and must be provided for the DEC's acceptance with the Permittee's submission of a final or interim corrective measures work plan(s). If the DEC notifies the Permittee that the certification is not acceptable, the Permittee must establish financial assurance for corrective measures in accordance with the requirements of financial assurance for Long-Term Corrective Measures as specified in **Condition P.8** of this Module within sixty (60) calendar days of said notification. If the corrective action(s) are not completed within one (1) year of the initial certification, the Permittee may request and the DEC, at its discretion, may approve up to a one (1) year extension of the certification. If the corrective action(s) has not been completed to the DEC's satisfaction at the end of the first year or a DEC-approved extension, the Permittee must, within sixty (60) calendar days, provide financial assurance in accordance with the requirements of financial assurance for Long-Term Corrective Measures as specified in **Condition P.8** of this Module.

8. Long-Term Corrective Measures: For final or interim corrective measures required for any Solid Waste Management Units by a DEC-approved work plan(s) where the implementation schedule in the approved work plan(s) indicates that the anticipated completion of the final or interim corrective action(s) will take longer than one (1) year, the Permittee must establish and maintain a DEC-approved financial assurance instrument(s) in accordance with 6 NYCRR 373-2.8(f). This financial assurance must be equal to the current dollar amount of the most recent DEC-approved final or interim corrective measures cost estimate(s) required by **Condition P.6** of this Module. The DEC-approved financial assurance must be one, or an allowable combination, of the financial assurance instruments, specified in 6 NYCRR 373-2.8(f)(1) through (4) and these instruments must be issued by an entity, or entities, that are legally and fiscally separate and distinct from the Permittee and any parent or subsidiary thereof. If the Permittee chooses to use either 6 NYCRR 373-2.8(f)(2) or (3) (or a combination thereof), the Permittee must revise or establish a Standby Trust Fund in accordance with said regulations. The Permittee must submit the instrument(s), for the DEC's approval, no later than sixty (60) calendar days after the DEC's approval of corrective measures work plan(s), or as required by the requirements of financial assurance for Short-Term Corrective Measures as specified in **Condition P.7** of this Module.

9. For any Permit modification request pertaining to the Closure Plan or Post-Closure Plan provided as **Attachment E**. of this Permit involving an increase in cost, the

Permittee must also submit a revised cost estimate, in current dollars, which includes the cost increases with appropriate third-party justification. For any new or modified corrective measure required by this Permit and submitted by the Permittee subsequent to the issuance of this Permit which involves an increase in the cost of corrective action, the Permittee must also submit for DEC approval, a revised cost estimate, as discussed in the preceding sentence.

10. Within sixty (60) calendar days of a modification of this Permit or DEC approval of a new or modified corrective measure involving an increase in a cost estimate, the Permittee must establish additional financial assurance to cover the amount of the increase in the cost estimate in accordance with the requirements of 6 NYCRR 373-2.8.

11. The Permittee must maintain the DEC-approved financial assurance instruments for closure, post-closure, corrective action, and third-party liability coverage. Changes in existing financial assurance instruments or replacement of existing financial assurance instruments must be approved by the DEC. The Permittee must provide annual evidence to the DEC within thirty (30) calendar days prior to the anniversary on which the initial approved financial assurance instrument was established, that all required instruments have been maintained and not allowed to lapse.

12. Within sixty (60) calendar days after any increase in the approved cost estimate, the Permittee must, in accordance with 6 NYCRR 373-2.8, either:

    a. Revise one or more of the DEC approved financial assurance instrument(s) to increase the instrument(s) amount by at least the amount of the increase in the approved cost estimate and submit the revised instrument(s) for DEC approval; or

    b. Submit an additional financial assurance instrument, or instruments from the allowable instrument types specified in 6 NYCRR 373-2.8 with an amount equal to at least the amount of the increase in the approved cost estimate and submit the additional instrument(s) for DEC approval.

13. If the Permittee elects to replace any instrument with new financial assurance instrument(s) as specified by 6 NYCRR 373-2.8, the new instruments must be issued by an entity, or entities, that are legally and fiscally separate and distinct from the Permittee and any parent or subsidiary thereof. Also, if applicable, any replacement instruments pertaining to post-closure and corrective action must be worded in accordance with 6 NYCRR 373-2.8(j) except that the words "post-closure and corrective action" must be substituted for the words "post-closure" in any such replacement instrument.

Q. COMMUNICATIONS

1. The Permittee must transmit all communications pursuant to this Permit to the DEC via electronic delivery to the recipients specified in **Condition W.1** of this Module. All deliverables must be transmitted in a DEC-approved format as specified in **Condition O** of this Module.

2. If requested by the DEC in lieu of or in addition to an electronic deliverable, the Permittee must transmit the requested written communications pursuant to this Permit to the DEC by United States Postal Service, by private courier service or by hand delivery to the following address:

   Supervisor, HW Corrective Action & Post Closure
   Division of Materials Management
   New York State Department of Environmental Conservation
   625 Broadway
   Albany, NY 12233-7256

3. The Permittee must submit additional copies of the specific deliverables identified in **Condition W** of this Module to the addresses and agencies listed therein.

R. PENALTIES

1. The Permittee's failure to comply with any term of this Permit constitutes a violation of this Permit and the ECL. Nothing herein abridges the Permittee's right to contest any allegation that it has failed to comply with this Permit.

2. Payment of any penalties must not in any way alter the Permittee's obligations under this Permit.

S. MISCELLANEOUS

1. The paragraph headings set forth in this Permit are included for convenience of reference only and must be disregarded in the construction and interpretation of any provisions of this Permit.

2. If there are multiple parties subject to this Permit, except where stated otherwise, the term "Permittee" must be read in the plural, the obligations of each such party under this Permit are joint and several, and the insolvency of or failure by any Permittee to implement any obligations under this Permit must not affect the obligations of the remaining Permittee(s) under this Permit.

3. If the Permittee is a partnership, the obligations of all general partners (including limited partners who act as general partners) under this Permit are joint and several and the insolvency or failure of any general partner to implement any obligations under this Permit must not affect the obligations of the remaining partner(s) under this Permit.

4. In any administrative or judicial action to enforce a condition of this Permit, the Permittee waives any objection to the admissibility as evidence of any data generated pursuant to this Permit.

5. Whenever materials or equipment are specified or described in this Permit using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, quality, performance and design criteria required. In all cases, unless the name is followed by words indicating that "no 'or equal' or substitution is allowed" or similar language, materials or equipment of other

suppliers may be accepted by the DEC if sufficient information is submitted by the Permittee to allow the DEC to determine that the material or equipment proposed is equivalent or equal to that named. Requests for review of "or equal" or substitute items of material and equipment will not be accepted by the DEC from anyone other than the Permittee. If the Permittee wishes to furnish or use an "or equal" or substitute item of material or equipment, the Permittee must make written application to the DEC for acceptance thereof, certifying that the proposed "or equal" or substitute will perform the same functions and achieve the same results called for by the general design, be similar and of equal substance and quality to that specified, and be suited to the same use as that specified.

6. The Permittee may submit a written request to the DEC for a clarification on compliance with any condition in this Permit. Any such request must be submitted at least thirty (30) calendar days prior to the date on which the Permittee must comply with the condition identified in the clarification request. In response, the DEC will provide the Permittee with a written clarification, detailing what constitutes compliance with the identified Permit condition. This clarification process shall in no way relieve the Permittee from the obligation to comply with all the terms and conditions of this Permit.

7. All data, information, and records concerning, created for or maintained by the Permittee for the operation, investigation or remediation of the facility and any contamination that has emanated from the facility, shall be preserved and made available to the DEC upon request, except for attorney-client privilege or work product protection doctrine material(s). The Permittee shall use its best efforts to ensure that all employees of the Permittee and all persons, including contractors and subcontractors who engage in activities under this Permit, are made reasonably available to, and cooperate with the DEC if information, whether written or oral, is sought.

8. <u>Special Conditions Concerning Future State and/or Federal Laws or Regulations</u>

   a. In the event that any State statutory or regulatory requirements are enacted, adopted, or promulgated which are applicable to the Permittee's Facility and address the need for and/or the nature and extent of post-closure care and/or corrective action, and such statutory or regulatory requirements are deemed by the Department to be more stringent than the post-closure care and/or corrective action requirements stipulated in this Permit, such statutory and regulatory requirements shall supersede the pertinent requirements of this Permit.

   b. In the event that any Federal statutory or regulatory requirements are enacted, adopted, or promulgated which are applicable to the Permittee's Facility and address the need for and/or the nature and extent of post-closure care and/or corrective action, such statutory or regulatory requirements shall supersede the pertinent requirements of this Permit to the extent that it is determined by the Department that such statutory or regulatory requirements afford equal or greater protection to continuing post-closure care and/or corrective action as is afforded by this Permit.

T. REQUIREMENTS FOR AN ON-SITE DEC ENVIRONMENTAL MONITOR

1. Number of DEC Environmental Monitors assigned to Facility: **Zero (0)**

2. The Permittee shall fund environmental monitoring services to be performed by or on behalf of the Department. These monitoring services will include, but not be limited to, the scope of work in an annual environmental monitoring work plan which is incorporated by reference and enforceable under this Permit.

3. The Permittee shall provide to the Department on an annual basis the funds necessary to support the activities set forth in the annual environmental monitoring work plan. The sum to be provided will be based on the annual budgeted amount and is subject to annual revision. Subsequent annual payments shall be made for the duration of this Permit or until the environmental monitoring services are no longer necessary, whichever comes first. The Permittee shall be billed annually, prior to the start of each State Fiscal Year (SFY) (April 1). If this Permit is to first become effective subsequent to April 1, the initial bill will be for an amount sufficient to meet the anticipated cost of the environmental monitoring services through the end of the current SFY.

4. The DEC may revise the required payment on an annual basis to include all costs of environmental monitoring services to the DEC. The annual revision may take into account factors such as inflation, salary increases, changes in the fringe benefits rate, changes in operating hours and procedures, changes in non-personal service costs (including travel, training, sampling and analytical, and equipment costs, etc.), and changes in the need for and level of environmental monitor services and supervision of such Environmental Monitor(s). Upon written request by the Permittee, the DEC shall provide that entity with a written explanation of the basis for any modification. If such a revision is required, the DEC will notify the Permittee of such a revision no later than sixty (60) calendar days in advance of any such revision.

5. Prior to making its annual payment, the Permittee will receive and have an opportunity to review an annual work plan that the DEC will undertake during the year.

6. Payments are to be in advance of the period in which they will be expended. Payments shall be made in full within thirty (30) calendar days of written notice by the DEC that a payment is due. The notice from the Department to the Permittee will provide information regarding to whom payments should be made payable and the address to which payments should be sent.

7. Failure to make the required payments is a violation of this Permit. The DEC reserves all rights to take appropriate action to enforce the above payment provisions.

8. The Environmental Monitor(s) shall, when present at the Permittee’s facility, abide by all of the Permittee’s health and safety and operational requirements and policies; if such requirements and policies exist and provided they are not inconsistent with Department policies and labor management contracts, and further provided, however, that this shall not be construed as limiting the environmental monitor's powers as otherwise provided for by law and shall not result in the Environmental Monitor(s)

being less protected than the Environmental Monitor(s) would be if they were to abide by State and Federal health and safety requirements.

9. The DEC's Environmental Monitor(s) must receive from the Permittee all general and site- specific safety training which is normally given to new facility/site employees for all areas of the facility or site. This training will be a supplement to the mandatory safety training that Environmental Monitors receive from the Department. Upon selection of the Environmental Monitor(s), the Permittee shall immediately furnish to the Environmental Monitor(s) any facility/site health and safety and operational requirements and policies. Within five (5) calendar days of any revision to the facility/site health and safety and operational requirements and policies, the Permittee shall furnish to the Environmental Monitor(s) the health and safety and operational requirements and policies.

10. The Environmental Monitor(s) shall be permitted to use environmental monitoring and data collection devices (e.g., photo ionization detectors, cameras, video recording devices, computers, cell phones, etc.) deemed necessary by the Department to evaluate and document observed conditions. Copies of the data or images collected from areas where confidentiality is a concern shall be provided to the Permittee upon their request. The Permittee may request the data and images be considered confidential information if appropriate.

11. It will remain the responsibility of the Permittee to contact the Spill Hotline or any Division within the Department regarding any required notification of any spill, release, exceedances etc. Notification to the Environmental Monitor(s) will not be considered sufficient to replace any required notifications.

12. The Environmental Monitor's office space in a building is to be kept in good operating condition, including watertightness, lighting, appropriate heating and cooling, electrical power, telephone service and prompt snow removal. Adequate parking shall be provided for the monitor.

U. SPECIFIC CONDITIONS

1. The Permittee must make reasonable attempts to organize training events for local fire companies or departments, and to also arrange inspections of the Facility by these entities. During each inspection the Permittee shall solicit recommendations from the fire company or department concerning minimum suggested inventories for firefighting and safety equipment to be maintained at the facility. A report of each inspection, including any and all recommendations made by fire company or department inspectors and the Permittee's plans for addressing these recommendations, must be submitted to the DEC by the Permittee within seven (7) calendar days of each inspection.

2. The Permittee must make a copy of the Emergency Response Plan containing and inventory sheet listing the amount and location of all emergency equipment available on-site, to all employees involved in emergency response.

3. Upon notification by the Permittee of any partial closure of a unit or portion thereof, or

of final closure of the Facility, the DEC will determine at the time of said closures whether additional samples, sampling points, sampling techniques/methods and/or sample analysis (i.e., in addition to Closure Plan requirements in **Attachment E** of this Permit) will be necessary to verify the effectiveness of decontamination or removal of components, equipment, structures and contaminated soils. These determinations will be based upon the history of operating practices and types of wastes handled at the unit/Facility and on the closure regulations and other requirements in effect at the time of closure of the unit/Facility. The operating record, the record of spills, the types of waste released, location of spills and the condition of any secondary containment systems will also provide data to be used in these determinations. Also, at the time of said closures, the DEC will determine whether more restrictive and/or additional criteria (i.e., more restrictive than, or in addition to Closure Plan criteria in **Attachment E** of this Permit) will be necessary to verify the effectiveness of decontamination or removal of components, equipment, structures and contaminated soils, based on the DEC's regulatory cleanup standards in effect at the time of said closures.

4. If the DEC determines that additional sampling and analysis or more restrictive and/or additional criteria are necessary at the time of unit/Facility closure, the DEC shall send the Permittee a notice of intent to modify this Permit in accordance with 6 NYCRR 621 to incorporate these requirements into the Permit. In the event the DEC issues such a notice of intent, the Permittee will be restricted from issuing a certification of closure for the unit/facility in accordance with 6 NYCRR 373-2.7(f), until the associated 6 NYCRR 621 Permit modification process is completed and any associated closure requirement(s) that might result from this modification process are satisfied.

5. The Permittee must submit to the Department the requisite ninety (90) calendar day notice for any sale and sixty (60) calendar day notice for any new proposed use or activities on the Site, including but not limited to any new tenant uses or activities, prior to any and all construction or fitting up or any other activity related to the commencement of that new activity, and otherwise comply with the Department's requirements.

6. The Permittee must obtain approval in writing from the Department for any sale of property within the facility boundary as well as for new proposed uses or activities on the Site, including but not limited to any new tenant uses or activities, prior to any and all construction or fitting up or any other activity related to the commencement of that new activity. The Department's review and approval shall take into consideration the proposed activities' use classification (i.e., industrial, commercial, etc.) and the current use restrictions in place at the Facility.

V. PUBLIC PARTICIPATION (INCLUDING 6 NYCRR 373-1.10)

1. Information Repository (6 NYCRR 373-1.10(c))

   The Permittee shall establish and maintain an Information Repository at the Crandall Public Library, 251 Glen Street, Glens Falls, NY 12801. The Permittee shall provide the DEC with thirty (30) calendar day notice of any change to the location of the repository. The Permittee will continue to maintain the information repository for the life of the Permit or until otherwise notified by the DEC.

The repository shall contain a copy of the final approved Part 373 Permit application, approved documents such as plans, reports, other relevant documents, the Part 373 Permit Executive Summary/Fact Sheet, public notices pertaining to the Part 373 Permit, copies of correspondence including enclosures and attachments from the effective date of the Permit between the DEC and the Permittee pertaining to the Permit or to compliance. Certain portions of the Permit, and other information within the repository, may be redacted as necessary to protect national security or due to public sensitivity.

The Permittee shall provide a written notice of the availability of the information repository to all individuals on the facility mailing list within one (1) month from the effective date of this Permit (except to those previously notified within one (1) year prior to the effective date of the Permit) and to all individuals on the facility mailing list one year before the expiration date of this Permit.

2. Other public participation activities to consider maintaining good community relations:

   a. Public Meetings

   b. Citizens Advisory Group Meeting

W. PLANS, REPORTS, SPECIFICATIONS, IMPLEMENTATION SCHEDULES AND OTHER SUBMITTALS

Submittals required by the Permit must be provided to the DEC and other identified Agencies as listed below. The list below identifies the DEC/Agencies staff by title that must receive submissions and indicates the types of submissions each must receive. At any time during the life of this Permit, the DEC may designate alternate titles or addresses to receive submissions (different than those indicated below), and direct the Permittee to make submissions to the alternate title or address. The list below also indicates whether the submission must be a paper or electronic copy. Where electronic copies are indicated, the submission must be in a form as required by **Condition O** of this Module. Submissions of electronic copies may be by e-mail or other methods acceptable to the DEC. Appropriate email addresses will be provided to the Facility at Permit issuance and whenever there is a staffing or email address change.

1. One (1) electronic copy of all submittals to:

   Project Manager, HW Corrective Action & Post Closure
   Bureau of Hazardous and Waste and Radiation Management
   New York State Department of Environmental Conservation
   625 Broadway, 9th Floor
   Albany, NY 12233-7256
   kevin.chazhikattu@dec.ny.gov

   Supervisor, HW Corrective Action & Post Closure
   Bureau of Hazardous and Waste and Radiation Management
   New York State Department of Environmental Conservation
   625 Broadway, 9th Floor

Albany, NY 12233-7256
P373permitting@dec.ny.gov

Regional Materials Management Engineer
New York State Department of Environmental Conservation
232 Golf Course Road
Warrensburg, NY 12885
katelyn.white@dec.ny.gov

Manager, Land and Redevelopment Programs Branch
Land, Chemicals & Redevelopment Division
U.S. Environmental Protection Agency, Region II
290 Broadway [25th floor]
New York, NY 10007-1866

2. One (1) paper copy and one (1) electronic copy of all financial assurance documents to:

   Financial Assurance Coordinator
   Bureau of Program Management
   Division of Environmental Remediation
   New York State Department of Environmental Conservation
   625 Broadway
   Albany, NY 12233-7012
   jennifer.dawson@dec.ny.gov

3. One (1) electronic copy of all waste reduction documents to:

   Pollution Prevention Unit
   Division of Materials Management
   New York State Department of Environmental Conservation
   625 Broadway
   Albany, NY 12233-7253
   pollutionprevention@dec.ny.gov

4. One (1) paper copy of all modification requests pertaining to this Permit to:

   Deputy Regional Permit Administrator
   Division of Environmental Permits
   New York State Department of Environmental Conservation
   232 Golf Course Road
   Warrensburg, NY 12885-1172
   dep.r5@dec.ny.gov

5. Where additional DEC staff are copied on the above submittals, the Permittee shall submit these copies electronically. In addition, the Permittee shall provide hard copies of any of the above submittal(s) when specifically requested by the Department.

MODULE II
Corrective Action Requirements

MODULE II
CORRECTIVE ACTION REQUIREMENTS

A. APPLICABILITY

1. Statute and Regulations: Article 27, Title 9, Section 27-0913, and 6 NYCRR 373-2.6(l) requires corrective action, including corrective action beyond the Facility boundary where necessary to protect human health and the environment, for all releases of hazardous wastes, including hazardous constituents listed in Appendix 23 of 6 NYCRR 371 or Appendix 33 of 6 NYCRR 373-2 as well as any newly added hazardous substances (i.e., emerging contaminants) in 6 NYCRR Part 597 (defined together as constituents), from any solid waste management unit (SWMU) at a storage, treatment or disposal facility that has ever sought a 6 NYCRR Part 373 or a federal RCRA permit, regardless of the time at which waste was placed in such unit. Pursuant to 6 NYCRR 373-1.6(c)(2), the Department may impose Permit Conditions as the Department determines necessary to protect human health and the environment (e.g., areas of concern (AOCs) as defined in **Module I** of this Permit).

2. **All documents and reports required by this Permit must be certified pursuant to conditions established in 6 NYCRR 373-1.4(a)(5)(iv) and Condition O.4 of Module I and submitted in accordance with requirements set forward in Conditions O and W of Module I. Additionally, unless specifically exempted in this Permit, all information (e.g., documents and reports) required to be submitted by the Permittee must be approved by DEC. DEC does not require certain plans, documents or reports to also be certified by NYS licensed professionals. The Permittee should verify if certification is required prior to submittal to the DEC.**

3. Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs): The Permittee must initiate and complete the corrective action process for all SWMUs and AOCs at the Facility. The conditions of this Module apply to:

   a. All the SWMUs and AOCs listed in **Table 1 of the SWMU/AOC Current Conditions Report in Attachment C** of this Module individually or in combinations.

   b. Any additional SWMU(s) and AOC(s) identified during the course of groundwater monitoring, field investigations, environmental audits or other means as described in **Condition C** of this Module.

   c. All SWMUs and AOCs located on-site and/or off-site are identified in **Table 1** of the **SWMU/AOC Current Conditions Report in Attachment C** as SWMUs/AOCs requiring Further Corrective Action or No Further Action.

   d. The Permittee need not undertake corrective action at any SWMU(s) and/or AOC(s) identified as No Further Action in **Table 1** of the **SWMU/AOC Current Conditions Report** in **Attachment C** provided there is no evidence of the release(s) of hazardous waste(s), constituent(s) from the SWMU(s) and/or AOC(s) threatening human health or the environment.

e. A determination of No Further Action shall not preclude the DEC from modifying this Permit in accordance with 6 NYCRR 621.13 in order to require further investigations, studies, monitoring, or corrective measures, if new information, subsequent analysis or new contamination indicates the release(s) or likelihood of release(s) that could pose a threat to human health or the environment.

NOTE: If the SWMU/AOC Current Conditions Report was submitted prior to issuance of this Permit, then it is included in **Attachment C** with the abovementioned table (**Table 1**) as required. If it is listed as an item to be submitted following Permit issuance under the Schedule of Deliverables (**Module XIII, Condition B**), then the abovementioned table (**Table 1**) must be included in the document as required. Upon the DEC's acceptance of said report, it will automatically be included in **Attachment C**.

B. STANDARD CONDITIONS FOR CORRECTIVE ACTION

1. The Permittee must perform any and all corrective action specified by **Condition A.3** of this Module and all conditions in this Permit.

2. The Permittee must follow the requirements for groundwater protection as specified in **Module XI** of this Permit, including any groundwater sampling and analysis plan which may be required therein.

3. The Permittee and its consultants/contractors performing corrective action activities must demonstrate completion of appropriate training in accordance with the information required in the health and safety plans.

4. Work Plans. All work plans submitted pursuant to this Module shall include:

   a. Quality Assurance/Quality Control protocols to ensure that data generated is valid and supported by documented procedures;

   b. Other plans (e.g., Quality Assurance Project Plan (QAPP)), specifications and protocols, as applicable;

   c. A schedule for starting specific tasks, completing the work and submitting progress and final reports; and

   d. Plans for the treatment, storage, discharge or disposal of wastes to be generated by activities described therein.

5. Quality Assurance/Quality Control. Any laboratory to be used pursuant to sampling required by this Module must be approved by the DEC prior to implementation. Certification by the New York State Department of Health (DOH) Environmental Laboratory Approval Program (ELAP) in the relevant analytical services is required. All laboratory deliverables must be submitted in accordance with **Condition O.1 of Module I**.

6. Health/Safety Plans. The Permittee shall develop, according to applicable Federal, State and local requirements, and submit to the DEC, health and safety plans that will be implemented to ensure that the health and safety of project personnel, plant personnel and the general public are protected. These plans are not subject to approval by the DEC.

7. Guidance Documents. When preparing the submissions described in this Permit Module, the Permittee shall take account of applicable guidance documents issued by the DEC and U.S. Environmental Protection Agency in a manner reflecting reasonable technical considerations.

8. Prior Submissions. The Permittee may have already submitted portions of information, plans, or reports required by this Permit Module and its attachments to the DEC pursuant to the terms of previous applications, consent orders, or plans. For those items the Permittee contends were submitted to the DEC, the Permittee may cite the specific document(s) it believes adequately addresses each of the individual items requested by this Permit Module and its attachments. The references, by document(s) shall be placed in the appropriate sections of the submissions that require the referenced information and data. If the DEC determines that it does not possess any of the referenced information, plans, or reports that the Permittee claims were previously submitted, the DEC will notify the Permittee and the Permittee shall submit the referenced documents within the time frame specified within the notification.

9. Compliance Schedule For Reporting And Submissions.

    a. The Permittee shall submit, to the DEC, signed progress reports, as specified in approved work plans pursuant to this Permit, of all activities (i.e., SWMU Assessment, Interim Measures, RCRA Facility Investigation, Corrective Measures Study) conducted pursuant to the provisions of the Corrective Action Compliance Schedules of this Permit Module, beginning no later than thirty (30) calendar days after the Permittee is first required to begin implementation of any requirement herein. These reports shall contain:

        i. A description of the work completed during the reporting periods;

        ii. Summaries of all findings made during the reporting period;

        iii. Summaries of all changes made during the reporting period;

        iv. Summaries of all contacts made with representatives of the local community and public interest groups during the reporting period;

        v. Summaries of all problems or potential problems encountered during the reporting period and actions taken to rectify problems;

        vi. Changes in personnel conducting or managing the corrective action activities during the reporting period;

vii. Projected work for the next reporting period; and

viii. Copies of daily reports, inspection reports, laboratory/monitoring data, etc., generated during the reporting period.

b. Upon request, copies of other relevant reports and data not identified in **Condition B.9.a** of this Module shall be made available to the DEC.

c. The DEC may require the Permittee to conduct new or more extensive assessments, investigations, or studies, based upon information provided in the progress reports referred to in **Condition B.9.a** of this Module, or upon other supporting information.

d. All work plans, reports, studies, designs and schedules required by the conditions of this Permit Module and its attachments are upon approval of the DEC, incorporated into this Permit by reference and become an enforceable part of this Permit. Any noncompliance with such approved work plans, reports, studies, designs and schedules shall constitute noncompliance with this Permit. Extensions of the specified final compliance dates for submissions may be granted by the DEC in accordance with the major permit modification procedures stipulated in **Module I** of this Permit.

10. Compliance with Governmental Requirements: During investigative activities, interim corrective measures and final corrective measures (including, but not limited to, equipment decommissioning, excavation and unit demolition) required by this Module, the Permittee must ensure that the transportation, treatment, storage, discharge, and disposal of all contaminated materials generated as a result of such activities (including, but not limited to, soil, sediments, liquids, tanks, pipes, pumps, rubble, debris and structural materials) are performed in an environmentally sound manner pursuant to all applicable federal, State and local requirements, and in a way that is protective of human health and the environment. Nothing in this Module shall be construed to require the Permittee to proceed in a manner which is in violation of any such requirements.

11. Notifications:

a. Groundwater Contamination: If at any time the Permittee discovers that hazardous constituents in groundwater released from the Facility have migrated beyond the Facility boundary in concentrations that exceed action levels in the DEC's TOGS 1.1.1 (ambient values) and EPA's MCLs (see **Condition C.2(a) of Module I**), the Permittee must, within fifteen (15) calendar days of discovery, provide written notice to the DEC.

b. Air Contamination: If at any time the Permittee discovers that hazardous constituents in air have been released from a SWMU or AOC at the Facility, and have or are migrating to areas beyond the Facility boundary in concentrations that exceed action levels in the DEC's DAR-1, and that residences or other places at which continuous, long-term human exposure to such constituents might occur are located within such areas (see DER-13), the Permittee must immediately initiate all

appropriate actions necessary to mitigate the release to concentrations below the action levels or cease operation immediately. In addition, the Permittee must:

i. Immediately initiate any actions that might be necessary to provide notice to all individuals who have been, may have been or may become exposed to the released constituents; and

ii. Provide written notification to the DEC as well as DOH within fifteen (15) calendar days of such discovery.

c. Residual Contamination: If hazardous wastes or hazardous constituents are located within or have been released from SWMUs or AOCs and will remain in or on the land, including groundwater, after the term of this Permit has expired, the Permittee must record such information in an environmental easement and/or restrictive covenant to run with the land in favor of the State in accordance with **Condition F.2** of this Module or in some other instrument acceptable to the DEC which is normally examined during title search that will, in perpetuity, notify any potential purchaser of the property, of the types, concentrations and locations of such hazardous wastes or hazardous constituents.

d. Newly Discovered SWMUs and AOCs: The Permittee must notify the DEC, in writing, of any additional SWMUs and AOCs discovered during the course of groundwater monitoring, field investigations, environmental audits or other means within fifteen (15) calendar days of discovery. Thereafter, the Permittee must proceed with the assessment, investigation, evaluation and remediation of the SWMU and/or AOC as set forth in **Condition C** of this Module.

e. Newly Discovered Releases: The Permittee must notify the DEC, in writing, of any release(s) of hazardous wastes, including hazardous constituents, discovered during the course of groundwater monitoring, field investigations, environmental audits, or other activities no later than fifteen (15) calendar days of discovery. Such newly discovered release(s) may be from newly identified unit(s)/area(s), from unit(s)/area(s) for which, based on the findings of the RCRA Facility Assessment (RFA), the DEC had previously determined that no further investigation was necessary, or from unit(s)/area(s) investigated as part of a RCRA Facility Investigation (RFI). Based on the information provided in the notification, the DEC shall determine the need for further investigation of the release(s). If the DEC determines that such investigations are needed, the DEC shall, by written notification, require the Permittee to prepare an RFI Work Plan in accordance with **Condition D** of this Module. The DEC may, at its discretion, also require the Permittee to prepare an Interim Corrective Measures (ICM) Work Plan.

f. Emerging Contaminants: The DEC will notify the Permittee, in writing, of any additional investigations for emerging contaminants that may be necessary for the facility's SMWUs and AOCs. Once notified, the Permittee will have thirty (30) calendar days to prepare and submit a schedule for the investigation to DEC. Once the DEC approves the schedule, the Permittee must proceed with the assessment, investigation, evaluation and remediation of the SWMU and/or AOC as set forth therein.

12. Determination of No Further Action

    a. Based on the results of an RFA or an RFI for a particular SWMU or AOC, or combination of SWMUs and/or AOCs, and any other relevant information, the Permittee may submit an application to the DEC for a permit modification in accordance with **Section E of Module I**, 6 NYCRR 373-1.7(b) and 621 to terminate the subsequent corrective action requirements of this Module for the subject SWMU(s) or AOC(s). The permit modification application must contain information demonstrating:

        i. Hazardous waste or hazardous constituents are not detected in any applicable environmental media; or

        ii. Hazardous waste or hazardous constituents which have been detected are below background concentrations (pre-released conditions); or

        iii. Hazardous waste or hazardous constituents which have been detected do not pose a threat to human health or the environment.

        iv. The permit modification application must also include the information required in 6 NYCRR 373-1, 373-2 and 621.4(n).

    b. If, based upon review of the Permittee's request for a permit modification, the results of the RFI, and other information, including comments received during the forty-five (45) calendar day public comment period required for major permit modifications, the DEC determines that the release(s) or the suspected release(s) investigated are either non-existent or do not pose a threat to human health or the environment, the DEC may grant the requested modification.

    c. A determination of no further action shall not preclude the DEC from modifying this Permit in accordance with 6 NYCRR 621.13 in order to implement the following actions:

        i. Require the Permittee to perform such investigations as necessary to comply with the requirements of this Module if new information or subsequent analysis indicates that there are, or are likely to be, releases from SWMUs/AOCs/operable units that may pose a threat to human health or the environment; and/or,

        ii. Require continual or periodic monitoring of environmental media, if necessary, to protect human health and the environment, when site-specific circumstances indicate the release(s) of hazardous waste(s), including hazardous constituents, are likely to occur from any SWMU(s) and/or AOC(s) and/or operable units.

13. SWMU/AOC Current Conditions Report. With the completion of remedial requirements at a SWMU/AOC or when requested by the Department, the Permittee shall submit to the Department an updated **SWMU/AOC Current Conditions Report in Attachment C** providing current information regarding the status of

investigations or remedial work for all SWMUs and AOCs. The report must include, at a minimum, information regarding physical and operational description, waste types/characteristics, any known or suspected releases, and current status of corrective action, including beginning and completion dates of each applicable phase.

C. SCHEDULE FOR ASSESSMENT OF NEWLY IDENTIFIED OR DISCOVERED SWMUs AND AOCs

The information required herein must be submitted in accordance with the Newly Discovered SWMUs and AOCs Assessment Schedule as outlined in **Table II-1** of this Module.

1. Notification of Assessment: The Permittee must notify the DEC, in writing, of any additional SWMU(s) and/or AOC(s) not listed in the **SWMU/AOC Current Conditions Report andTable 1** in **Attachment C**, which are identified during the course of groundwater monitoring, field investigations, environmental audits, or other means. For new units managing solid waste only, or for other new unit(s), the Permittee may seek clarification from the Department as to whether the unit constitutes a SWMU requiring notification under this permit condition. Once such notification has been made, a newly installed SWMU (i.e., new use with no history of release) will receive a determination of no further action and will be processed by the Department as a notification. Should a subsequent release occur at such a unit, then the full notification, assessment and reporting procedures of this Module will apply.

2. SWMU/AOC Assessment Report: The Permittee must submit a SWMU/AOC Assessment Report to be included in **Attachment C**. This report must provide, at a minimum, the following information for each newly identified SWMU/AOC:

   a. Type of unit/area;

   b. Location of each unit/area on a topographic map of appropriate scale;

   c. Dimensions, capacities, and structural descriptions of the unit/area (supply available engineering drawings);

   d. Function of unit/area;

   e. Dates that the unit/area was operated;

   f. Description of the wastes that were placed or spilled at the unit/area;

   g. Description of any known releases from the unit/area (to include groundwater data, soil analyses, air monitoring data, and/or surface water/sediment data);

   h. The results of any sampling and analysis required for the purpose of determining whether releases of hazardous wastes, including hazardous constituents, have occurred, are occurring, or are likely to occur from the unit/area;

i. Whether this unit/area, individually or in combination with other units/areas listed in the **SWMU/AOC Current Conditions Report** in **Attachment C**, is a significant source of contaminant release; and

j. Proposed status (i.e., No Further Action/Supplemental Investigation/ Further Action).

3. SWMU/AOC Sampling and Analysis Plan: If determined necessary, the Permittee must submit to the DEC for approval a plan for sampling and analysis of specific environmental media including, but not limited to, groundwater, land surface and subsurface strata, surface water/sediment or air, as necessary to determine whether a release of hazardous waste, including hazardous constituents , from such unit(s) and/or area(s) has occurred, is likely to have occurred, or is likely to occur. The SWMU/AOC Sampling and Analysis Plan must demonstrate that the sampling and analysis program, if applicable, is capable of yielding representative samples and must include parameters sufficient to identify migration of hazardous waste, including hazardous constituents, from the newly discovered SWMU(s) and/or AOC(s) to the environment.

4. Subsequent Assessment Actions: Following submission of the SWMU/AOC Assessment Sampling and Analysis Plan set forth in **Condition C.3** of this Module, the Department may either approve the Sampling and Analysis Plan as submitted or issue comments on the Plan. If approved, the Permittee must implement sampling in accordance with **Table II-1**. If comments are issued, then subsequent activities for the Sampling and Analysis Plan shall proceed in accordance with **Condition A.9 of Module I** of this Permit.

5. SWMU/AOC Sampling and Analysis Report: The Permittee must follow the reporting requirements in the approved Plan and submit a SWMU/AOC Sampling and Analysis Report to the DEC. The Sampling and Analysis Report must describe all results obtained from the implementation of the approved Sampling and Analysis Plan.

6. Assessment Conclusions: Based on the results of the SWMU/AOC Sampling and Analysis Report, the DEC shall determine the need for further investigations at the specific unit(s) covered in the SWMU/AOC Assessment Report. If the DEC determines that such investigations are needed, the DEC shall, by written notification, require the Permittee to prepare and submit for approval an RFI Work Plan. In addition, the DEC may, at its discretion, require the Permittee to submit a Corrective Measures Study (CMS) or an ICM Work Plan if either is deemed necessary by the DEC to safeguard human health and the environment. Any additional activities required by the DEC must be undertaken in accordance with **Condition D** of this Module.

D. CORRECTIVE ACTION REQUIREMENTS

1. RCRA Facility Investigation: The Permittee must conduct, or have conducted, a RCRA Facility Investigation (RFI) to determine the nature and extent of known and suspected releases of hazardous constituents in groundwater and soil, originating from any location at the Facility, including a SWMU and/or AOC, as identified in **Table 1 of the SWMU/AOC Current Conditions Report** in **Attachment C**, and to gather data to support the Corrective Action Plan (CAP). The Permittee must conduct all items

associated with the RFI in accordance with schedule specified in **Table II-2** (RCRA Facility Investigation Schedule) of this Module and must address both on-site and off-site contamination**.**

a. The Permittee must submit, or have submitted, an RFI work plan to the DEC for the SWMU(s) and/or AOC(s) identified in **Table 1 of the SWMU/AOC Current Conditions Report** in **Attachment C**.

b. The RFI Work Plan shall include:

i. A Project Management Plan detailing a discussion of the technical approach to the investigation, schedules, and milestone reports;

ii. A Quality Assurance Project Plan to establish and document all sampling and monitoring procedures;

iii. A Data Management Plan to track investigation data and results; and

iv. A Health and Safety Plan for safe conduct of corrective action activities.

c. Along with RFI Work Plan, the Permittee shall include a section for a Description of Current Conditions. The section shall include, at a minimum:

i. Background information gathered during previous investigations or inspections and other relevant data;

ii. Nature, extent, and rate of migration of contamination, if known; and

iii. Past or current activities at the Facility.

d. Any proposed RFI Work Plan must be submitted for the DEC's review and approval/acceptance, and must include, at a minimum, a chronological description of the anticipated activities, a schedule for performance of those activities, and sufficient detail to allow the DEC to evaluate that RFI Work Plan.

e. All work plans prepared pursuant to this Module must be certified in accordance with 6 NYCRR 373-1.4(a)(5) and **Condition A.2** of this Module.

2. <u>RFI Implementation</u>

a. Upon approval of an RFI Work Plan by the DEC, the Permittee must implement such work plan in accordance with schedule specified in **Table II-2** of this Module. The Permittee shall present data of adequate technical quality to support the contention that no further action is required, or the development and evaluation of corrective measures alternatives presented in the CAP. RFI Implementation shall consist of:

i. Characterization of the environmental setting at the Facility, including the hydrogeology, soils, surface water, sediment, and air;

ii. Source characterization of all waste management areas at the Facility, including the nature of the unit and the type of waste place in the unit as described by chemical and physical characteristics;

iii. Contamination characterization, including analysis of hazardous waste or hazardous constituents from SWMUs and/or AOCs and the effects of such hazardous waste or hazardous constituents on environmental media; and

iv. Potential receptor identification describing the potential for human and environmental impact from contaminant exposure from the Facility.

b. The DEC must be notified at least seven (7) calendar days in advance of, and be allowed to attend, any field activities to be conducted under a DEC-approved work plan, as well as any pre-bid meetings, job progress meetings, substantial completion meeting and inspection, and final inspection and meeting.

c. During all field activities conducted under a DEC-approved work plan, the Permittee must have, on-site, a representative who is qualified to supervise the activities undertaken. Such representative may be an employee, or a consultant retained to perform such supervision.

d. The Permittee shall prepare an analysis and summary of the RFI(s) including results. This task, designated as Investigation Analysis, shall be included in the RFI Report. The objective of Investigation Analysis shall be to ensure that the investigation data are sufficient in quality and quantity to describe the nature and extent of contamination, potential threat to human health and the environment, and to produce the CAP. Investigation Analysis shall consist of:

i. Data analysis of the type and extent of contamination at each SWMU and/or AOC including sources and migration pathways; and

ii. Protection standards for environmental media must be compared to pre-released conditions, or other relevant protection standard.

e. Any final RFI report or final engineering report that includes construction activities must include “as built” drawings showing any changes made to the remedial design or the IRM.

f. The Permittee shall submit a schedule of activities and reports, to the DEC as required by **Table II-2** of this Module.

g. All final reports and final engineering reports prepared pursuant to this Module must be certified in accordance with 6 NYCRR 373-1.4(a)(5) and **Condition A.2** of this Module.

3. Compliance Schedule for Interim Corrective Measures (ICMs)

a. If at any time it is determined by the DEC that a release or, based on site-specific circumstances, a threatened release of hazardous wastes, including hazardous constituents from a SWMU, an AOC or a combination of SWMUs and/or AOCs poses a significant and immediate threat to human health or the environment, or that such condition jeopardizes the Permittee's ability to comply with any governmental permit, an ICM shall be submitted to the DEC for approval within thirty (30) calendar days of notice of such a determination. This study shall consider, among other relevant factors, the character, the extent, direction, the rate of release, the proximity to population, the exposure pathways, the effects of delayed action, and the evaluations of appropriate ICM(s) or the selection of a pragmatic and presumptive ICM. Upon approval of the study by the DEC, the Permittee shall implement the required ICM as specified by the DEC. Should a selected ICM involve an engineered action (e.g., pump and treat), then its design, implementation schedule and subsequent construction completion certification shall require approvals by the DEC. Nothing herein precludes the Permittee from taking immediate action to address the conditions described herein and promptly notifying the DEC.

b. In the event the Permittee discovers a release or based on site-specific circumstances, a threatened release of hazardous waste, including hazardous constituents, from a SWMU, an AOC, or a combination of SWMUs and/or AOCs, that poses a significant and immediate threat to human health or the environment, the Permittee shall identify ICMs to mitigate this threat. The Permittee shall immediately summarize the nature and magnitude of the actual or potential threat and the nature of the ICM being considered and notify the DEC. Within thirty (30) calendar days of notifying the DEC, the Permittee shall submit to the DEC, for approval, a focused CMS and follow the progression of events identified in **Conditions D.4, D.5 and D.6** of this Module as well as **Table II-3** of this Module.

c. The following factors may be considered by the DEC or Permittee in determining the need for interim corrective measures:

i. Time required to develop and implement a final corrective measure:

ii. Actual or potential exposure of human and environmental receptors:

iii. Actual or potential contamination of groundwater and sensitive ecosystems;

iv. Concentration of hazardous constituents in soils that have the potential to migrate to the air, groundwater or surface water; and

v. Other situations that may pose threats to human health and the environment.

4. <u>Corrective Measures Study (CMS)</u>

a. Should a CMS be required, the DEC shall notify the Permittee in writing. This notice shall identify the hazardous constituent(s) which have exceeded the action level(s) as well as those which have been determined to threaten human health and the environment given site-specific exposure conditions or due to additive exposure

risk. The notification shall specify target cleanup levels for hazardous constituents detected in each medium of concern and may also specify corrective measure alternatives to be evaluated by the Permittee during the CMS.

b. The DEC may require a CMS under the following conditions:

   i. If the concentrations of hazardous constituents in environmental media exceed their corresponding individual cleanup levels; or

   ii. If the concentrations of hazardous constituents in environmental media do not exceed their corresponding individual cleanup levels, but additive exposure risk due to the presence of multiple constituents is not protective of human health; or

   iii. If the concentrations of hazardous constituents in environmental media do not exceed corresponding individual cleanup levels, but still pose a threat to human health or the environment, given site-specific exposure conditions.

c. The Permittee shall submit to the DEC for review and approval a CMS for all SWMUs and/or AOCs that have been identified to have a release of hazardous waste or hazardous constituents, in accordance with the schedule specified in **Table II-3** (Corrective Measure Study Schedule) of this Module.

d. The CMS shall include:

   i. Identification and Development of the Corrective Measure Alternative or Alternatives:

      (1) Description of Current Situation

      (2) Establishment of Corrective Action Objectives

      (3) Screening of Corrective Measures Technologies

      (4) Identification of the Corrective Measure Alternative or Alternatives

   ii. Evaluation of the Corrective Measure Alternative or Alternatives:

      (1) Technical/Environmental/Human Health/Institutional

      (2) Cost Estimate

   iii. Justification and Recommendation of the Corrective Measure or Measures

      (1) Technical

      (2) Human Health

      (3) Environmental

iv. Target cleanup levels;

v. Provide a detailed description of the corrective measures evaluated and include an evaluation of how each corrective measure alternative meets the standards;

vi. Schedule for implementation of the corrective action(s) according to the timeframe and schedule contained in **Table II-3** of this Module;

vii. The Permittee in conjunction with the DEC shall establish site specific objectives for the corrective action. These objectives shall be based on public health and environmental criteria, information gathered during the RFI, EPA and New York State guidance, and the requirements of any applicable federal and state statutes. At a minimum, all corrective actions concerning groundwater releases from regulated units must be consistent with, and as stringent as, those required under 6 NYCRR 373-2.6; and

viii. Contain any additional information to support the DEC in the corrective measure selection decision-making process.

e. Upon approval of the CMS, the Permittee shall implement the corrective action(s) according to the schedule as approved in the CMS. The approved schedule for the CMS shall be incorporated in **Table II-3** of this Module.

f. The Permittee shall furnish or retain all personnel, materials, and services necessary for the implementation of the CMS.

5. Corrective Measures Selection: The DEC shall review and respond in writing to each corrective action submittal (e.g., plans, studies, reports, schedules, written submittals, etc) that the Permittee makes pursuant to this Permit Module in accordance with **Condition A.9 of Module I** of this Permit.

a. Under **Condition D.4** of this Module and any further evaluations of additional corrective measures under this study, the DEC shall select the corrective measure(s) that at a minimum will meet the following standards:

i. Be protective of human health and the environment;

ii. Attain media target cleanup levels selected by the DEC during the corrective measures selection process;

iii. Control the source(s) of release(s) so as to reduce or eliminate, to the maximum extent practicable, further releases of hazardous waste, including hazardous constituents, that might pose a threat to human health and the environment; and

iv. Meet all applicable waste management requirements.

b. In selecting the corrective measure(s) which meets the standards for corrective measures established under **Condition D.5.a** of this Module, the DEC shall consider the following evaluation factors, as appropriate:

i. Long-term reliability and effectiveness. Any potential corrective measure(s) may be assessed for the long-term reliability and effectiveness it affords, along with the degree of certainty that the corrective measure(s) will prove successful. Factors that shall be considered in this evaluation include:

(1) Magnitude of residual risks in terms of amounts and concentrations of hazardous waste, including hazardous constituents, remaining following implementation of the corrective measure(s), considering the persistence, toxicity, mobility and propensity to bioaccumulate of such hazardous wastes, including hazardous constituents:

(2) The type and degree of long-term management required, including monitoring and operation and maintenance;

(3) Potential for exposure of humans and environmental receptors to remaining hazardous wastes, including hazardous constituents, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal or containment;

(4) Long-term reliability of the engineering and institutional controls, including uncertainties associated with land disposal of untreated hazardous wastes, including hazardous constituents, and their residuals; and

(5) Potential need for replacement of the corrective measure(s).

ii. Reduction of toxicity, mobility or volume. A potential corrective measure(s) may be assessed as to the degree to which it employs treatment that reduces toxicity, mobility or volume of hazardous and/or mixed wastes, including hazardous constituents. Factors that shall be considered in such assessments include:

(1) The treatment processes the corrective measure(s) employs and materials it would treat;

(2) The amount of hazardous and/or mixed wastes, including hazardous constituents, that would be destroyed or treated;

(3) The degree to which the treatment is irreversible;

(4) The residuals that will remain following treatment, considering the persistence, toxicity, mobility and propensity to bioaccumulate such hazardous and/or mixed wastes, including hazardous constituents; and

(5) All concentration levels of hazardous and/or mixed waste, including hazardous constituents, in each medium that the corrective measure(s) must achieve to be protective of human health and the environment.

iii. The short-term effectiveness of a potential corrective measure(s) may be assessed considering the following:

(1) Magnitude of reduction of existing risks;

(2) Short-term risks that might be posed to the community, workers, or the environment during implementation of such a corrective measure(s), including potential threats to human health and the environment associated with excavation, transportation, and re-disposal or containment; and

(3) Time until full protection is achieved.

iv. Implementability. The ease or difficulty of implementing a potential corrective measure(s) may be assessed by considering the following types of factors:

(1) Degree of difficulty associated with constructing the technology;

(2) Expected operational reliability of the technologies;

(3) Need to coordinate with and obtain necessary approvals and permits from other agencies;

(4) Availability of necessary equipment and specialists;

(5) Available capacity and location of needed treatment, storage and disposal services; and

(6) Requirements for removal, decontamination, closure, or post- closure of units, equipment, devices or structures that will be used to implement the corrective measure(s).

v. Cost. The types of costs that may be assessed include the following:

(1) Capital costs;

(2) Operation and maintenance costs;

(3) Net present value of capital and operation and maintenance costs; and

(4) Potential future corrective measure costs.

c. The DEC shall select the final corrective measure(s) based on the information submitted by the Permittee in the RFI Report, the CMS, and/or other documents

or reports. The proposed remedy shall be set forth in a draft Statement of Basis (SB) prepared by the DEC for the Facility.

d. The selected remedy(ies) will be public noticed. The public will have the opportunity to review the reports and documents associated with the selected remedy(ies). Additionally, the public has the opportunity to comment on these and the proposed selected remedy(ies). The selected remedy(ies) could be modified based on comments received.

e. Once the SB has been finalized and incorporated into this Permit pursuant to 6 NYCRR 621.13 and **Condition D.6** of this Module, the Permittee must submit a Corrective Measures Implementation (CMI) Work Plan that provides for the development and implementation of final plans and specifications for implementing the remedial alternative set forth in this Permit (i.e., in the SB). This CMI Work Plan must, unless otherwise provided in writing by the DEC, be submitted in accordance with the schedule specified in **Table II-3** of this Module. The Permittee must commence implementation of the CMI Work Plan, in accordance with the schedule specified in **Table II-3** of this Module.

f. Once the selected remedy(ies) has been implemented, the Permittee must oversee the remedy effectiveness and performance in accordance with the schedule specified in **Table II-3** of this Module.

6. Permit Modification for Corrective Measures:

a. Based on the CMS, the DEC will select the corrective measure(s), prepare the draft SB, and initiate a permit modification to this Permit, pursuant to 6 NYCRR 373-1.7(b) and 6 NYCRR 621.14, which includes a forty-five (45) calendar day public comment period for the SB and the permit modification. The permit modification will specify the selected corrective measure(s) and include, at a minimum the following:

i. Description of all technical features of the corrective measure(s) that are necessary for achieving the standards for corrective measures established under **Condition D.5.a** of this Module, including length of time or which compliance must be demonstrated at specified points of compliance.

ii. All media cleanup standards for hazardous constituents, selected by the DEC, that the corrective measure(s) must achieve to be protective of human health and the environment.

iii. All requirements for achieving compliance with these cleanup standards.

iv. All requirements for complying with the standards for management of wastes.

v. Requirements for removal, decontamination, closure or post-closure of units, equipment, devices or structures that will be used to implement the corrective measure(s).

vi. A schedule for initiating and completing all major technical features and milestones of the corrective measure(s); and

vii. Requirements for submission of reports and other information.

b. Once the final SB has been issued, it is automatically incorporated in its entirety into this Permit.

7. Modification of Compliance Schedules

a. If at any time the Permittee determines that modification of any Compliance Schedule of this Permit Module is necessary because such schedules cannot be met, the Permittee must:

i. Notify the DEC in writing within fifteen (15) calendar days of such determination;

ii. Provide an explanation why the current schedule cannot be met; and

iii. Propose the date by which the Compliance Schedule can be met.

b. The DEC shall notify the Permittee in writing of the final decision regarding the Permittee's proposed modification to the Compliance Schedule.

c. Modification(s) to the Compliance Schedule pursuant to this procedure does not constitute a reissuance of this Permit.

d. All other modifications to this Permit Module must be made in accordance with **Module I** of this Permit.

8. Reporting Requirements

a. The Permittee shall submit to the DEC, when applicable, written progress reports of all activities conducted after the effective date of the approved CMS. The Permittee shall submit the first progress report in accordance with the schedule specified in **Table II-3** of this Module.

b. The progress reports shall contain:

i. A description of the work completed;

ii. Summaries of all the finding and all raw data;

iii. Summaries of all problems encountered during the reporting period and actions taken or to be taken to rectify problems; and

iv. Projected work for the next period.

c. The Permittee shall maintain copies of the reports, drilling logs and data at the facility or in another approved location (i.e. electronic repository) during the effective period of this Permit.

E. INACCESSIBLE SWMUS

If, based on, the RCRA Facility Assessment/RCRA Facility Investigation and subsequent documentation, the DEC has determined that there is a potential for release of hazardous waste and/or constituents from any inaccessible SWMU(s)/AOC(s) at the Facility, they will be identified in **Table 1 of** the **SWMU/AOC Current Conditions Report** in **Attachment C** as requiring further action.

For the above area(s), the Permittee shall submit to the DEC for approval a schedule for the preparation of an RFI Work Plan, no later than one-hundred and eighty (180) calendar days prior to the date when the SWMU(s) is anticipated to become accessible for such an investigation. Accessibility to the SWMU(s) shall be considered achievable when the impediment (e.g., buildings, structures, utilities) is demolished, abandoned, or is altered in a manner that would allow access to the SWMU(s). All such work shall proceed in accordance with the approved schedule.

Following submission of the RFI Work Plan set forth in this condition, subsequent activities for the Plan shall proceed in accordance with schedule specified in **Table II-2** of this Module.

F. OTHER REQUIREMENTS

1. Groundwater Requirements. Any Groundwater Monitoring Program that is required as part of this permit, shall be submitted as part of the Groundwater Monitoring Requirement in accordance with **Condition C of Module XI** of this Permit.

2. Environmental Easement

   a. If a SB, or other approved work plan, for the Facility relies upon one or more institutional and/or engineering controls, the Permittee (or the owner of the Facility) must submit to the DEC for approval an environmental easement and/or restrictive covenant to run with the land in favor of the State which must be:

      i. created and recorded pursuant to ECL Article 71, Title 36;

      ii. in a form and manner as prescribed by the DEC;

      iii. in compliance with General Obligations Law (GOL) § 5-703(1) and ECL § 71-3605(2); and,

      iv. recordable pursuant to Real Property Law § 291.

   b. Upon acceptance of the environmental easement and/or restrictive covenant by the State, the Permittee must comply with the requirements of **Condition F.2** of this Module.

c. Agents, employees or other representatives of the State may enter and inspect the property burdened by an environmental easement with reasonable prior notice to the property owner, to assure compliance with the restrictions identified by the environmental easement.

d. If the SB provides for no action other than implementation of one or more institutional controls, the Permittee must cause an environmental easement to be recorded under the provisions of **Condition F.2.a** of this Module.

e. If the Permittee does not cause such environmental easement to be recorded in accordance with **Condition F.2.a** of this Module, the DEC may file an Environmental Notice on the Facility.

3. Dispute Resolution

a. The Permittee may submit a written Notice of Dispute to the DEC related to the DEC's action on any of the Permittee's corrective action submittals required by or related to this Permit Module. Any such notices must be made within fifteen (15) calendar days of receiving the DEC correspondence which is the basis of the dispute and must be directed to the designated individual as defined in **Condition F.3.a.iii** of this Module. Such a notice must contain specific information describing the Permittee's position and including any relevant supporting documentation. The designated individual shall render a written decision and furnish a copy thereof to the Permittee. This written decision shall be the final DEC determination, unless the Permittee files a written appeal of that decision with the designated appeal individual within twenty (20) calendar days of receipt of that decision.

i. Upon receipt of the written appeal pursuant to **Condition F.3.a** of this Module, the designated appeal individual will review the record and decision. The designated appeal individual will take one of the following actions, with written notice to the Permittee:

(1) remand the matter to the program staff for further negotiation or information if it is determined that the matter is not ripe for review;

(2) determine that there is no need for further action, and that the determination of the designated individual is confirmed; or

(3) make a determination on the records as it exists.

ii. The decision of the designated appeal individual shall be the final DEC decision and represent the DEC's determination to proceed in accordance with **Condition F.3.b** of this Module.

iii. The designated individual to:

(1) hear disputes is a bureau director in the DEC's Division of Materials Management; and,

(2) to review dispute decisions is the assistant director of the DEC's Division of Materials Management.

b. In the event that the DEC issues a final decision in accordance with **Condition F.3.a.ii** of this Module, the DEC shall, pursuant to 6 NYCRR 621.13, send to the Permittee a notice of intent to modify this Permit with regard to the DEC's final decision in order to safeguard human health and the environment.

c. Upon receipt of a notice of intent from the DEC, the Permittee must act in accordance with 6 NYCRR 621.13(d) or the DEC's action will become effective on the date specified in the notice of intent. In the event that the Permittee acts in accordance with 6 NYCRR 621.13(d) within the specified timeframe, the procedure for permit modification will continue in accordance with 6 NYCRR 621.13.

4. Required Authorizations

a. The Permittee must use best efforts to obtain all Facility access, permits, easements, approvals, institutional controls, and/or authorizations necessary to perform the Permittee's obligations under this Permit, including all DEC-approved work plans and the schedules contained therein. If, despite the Permittee's best efforts, any access, permits, easements, approvals, institutional controls, or authorizations cannot be obtained, the Permittee must promptly notify the DEC and include a summary of the steps taken. The DEC may, as it deems appropriate and within its authority, assist the Permittee in obtaining the same.

b. If an interest in property is needed to implement an institutional control required by a work plan and such interest cannot be obtained, the DEC may require the Permittee to modify the work plan to reflect changes necessitated by the Permittee's inability to obtain such interest. Within fifteen (15) calendar days of receipt of such notice, the Permittee must elect in writing to either: a) modify the work plan as requested by the DEC within forty-five (45) calendar days, or b) invoke dispute resolution in accordance with **Condition F.3** of this Module.

5. Green Remediation

a. As part of the DEC's initiative, the Permittee must make best efforts to implement green remediation practices in the performance of the requirements of the Work, including but not limited to performance of a RCRA Facility Investigation, Corrective Measures Study, Interim Corrective Measure, Corrective Measures Implementation and Post-Closure/Effectiveness Evaluations to maximize to the extent practicable, sustainability, reduce energy and water usage, promote carbon neutrality, promote materials reuse and recycling, and protect and preserve land resources.

b. The Permittee must make best efforts to utilize concepts and techniques presented in the New York State Department of Environmental Conservation - DEC Program Policy DER-31/Green Remediation, most recent edition.

6. Institutional Measures

In order to minimize the impacts of the soil and groundwater contamination on the surrounding community the Permittee must:

a. Restrict public access to the facility.

b. Place a formal notification on approval of an environmental easement and/or restrictive covenant, or on some other instrument which is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that:

i. the land has been used to manage hazardous waste; and

ii. its use is restricted under 6 NYCRR 373-2.7, as if it were a "hazardous waste disposal facility."

7. System Down Time

If a remedial system is installed it shall be operated on a continuous basis. If any part of the system is inoperable (down) for a period of more than three (3) calendar days consecutively or for five (5) calendar days in a rolling thirty (30) calendar day period, the Permittee shall notify the DEC. The notification shall include a plan for restoring system operation as soon as possible.

8. Modifications of Remedial Systems

If, after review of the performance monitoring data, the DEC determines that the design or operation of the Remedial System is not sufficient to achieve the remedial criteria, the DEC may require Permittee to modify the design or operation of the system so as to achieve the remedial criteria. Alternatively, the DEC may require, in accordance with **Condition D.5.f** of this Module, that the Permittee investigate and evaluate the use of a different corrective measure for remediation. If necessary, the DEC or the Permittee may seek modification of this Permit pursuant to 40 CFR 270.41 or 270.42 and 124.5 to implement modification to the existing Corrective Measure Remedy.

Table II-1: Newly Discovered SWMUs and AOCs Assessment Schedule

Activity	Due Date[1]
Notification of Assessment	Fifteen (15) days of discovery
SWMU/AOC Assessment Report	Within thirty (30) days of notifying the DEC
SWMU/AOC Sampling and Analysis Plan Submittal, if necessary	Within sixty (60) days from submission of SWMU/AOC Assessment Report
SWMU/AOC Sampling and Analysis Plan Subsequent Assessment Actions, if necessary	• Meeting with the DEC • Submission of a revised Plan within thirty (30) days after the above-described meeting
SWMU/AOC Sampling and Analysis Plan Implementation	Initiate within thirty (30) days of SWMU/AOC Sampling and Analysis Plan approval
SWMU/AOC Sampling and Analysis Report	Within thirty (30) days of receipt by the Permittee of validated analytical data
Assessment Conclusions	If DEC determines that such investigations are needed, DEC shall, by written notification, require the Permittee to prepare and submit for approval a RCRA Facility Investigation Work Plan.

Footnotes:
1. Due Date changes may be made with written approval from the Department.

Table II-2: RCRA Facility Investigation Schedule

Activity	Due Date[1]
Submit Draft RFI work plan and schedule	Within ninety (90) days from submission of the SWMU/AOC Sampling and Analysis Report
Subsequent Assessment Actions, if necessary	• Meeting with the DEC • Submission of a revised Plan within thirty (30) after the above-described meeting
Begin RCRA Facility Investigation according to the approved RFI work plan and schedule	Within fifteen (15) days following written approval by the DEC
Submit RFI Report	Within thirty (30) days of receipt by the Permittee of validated analytical data
Assessment Conclusions	If the DEC determines that remedies are needed, the DEC shall, by written notification, require the Permittee to prepare and submit for approval a CMS Work Plan.

Footnotes:
1. Due Date changes may be made with written approval from the Department.

Table II-3: RCRA Corrective Measure Study Schedule

Activity	Due Date[1]
Submittal of CMS	Within one hundred and eighty (180) days after receiving the written notification from DEC of the requirement for a CMS. Following completion of the CMS, the DEC will select the corrective measure(s) from the corrective measure alternatives evaluated in the CMS.
Subsequent Assessment Actions, if necessary	• Meeting with the DEC. • Submission of a revised CMS within thirty (30) days after the above-described meeting.
Submit CMS Final Report	Within ninety (90) days of the DEC's approval of any draft/revised draft CMS.
Statement of Basis and Permit Modification – Public Participation	Forty-five (45) days for public notice. The public will have forty-five (45) days to review the selected remedy(ies) and submit comments
Responsiveness Summary	Within sixty (60) days of the close of the public comment period, the DEC shall provide a response for all the public comments received on the selected remedy(ies).
Permit Modification Approval	The final SB and permit modification shall become effective thirty (30) days after service of notice of the approval, unless another date is specified.
Submittal of the Corrective Measures Implementation (CMI) Work Plan	Within one hundred twenty (120) days of the effective date of the Permit modification.
Implementation of CMI Work Plan	The Permittee must commence implementation of the CMI Work Plan within thirty (30) days of the DEC's approval of such work plan.
CMI Construction	As specified in approved CMI Work Plan
CMI Construction Report	Within ninety (90) days following completion of construction
Progress Reports	As required, but the first shall be submitted within ninety (90) days after the CMI Work Plan is approved
Corrective Measures (Progress) Effectiveness and Performance Reports	Triennially, three (3) years after its construction/implementation.

Footnotes:
1. Due Date changes may be made with written approval from the Department.

MODULE III

RESERVED

MODULE IV
RESERVED

MODULE V
Land Disposal Unit(s)
Post Closure Care

MODULE V
LAND DISPOSAL UNIT(S) POST CLOSURE REQUIREMENTS

A. AUTHORIZED ACTIVITY

1. The Permittee is authorized for the Post-Closure of the former land disposal unit(s) used for the final disposal of hazardous wastes subject to the terms herein. Additionally, the land disposal unit(s) are also subject to Corrective Action as described in **Module II** of this Permit. **Table V-1** provides information regarding the closed land disposal unit(s) for this facility. **Figure 3** in the **Executive Summary** shows the location of these units.

2. In the event that the Facility has multiple land disposal units, the provisions of this Module apply individually to each unit.

Table V-1
Post Closure Units

Unit Designation[(1)]	Post Closure Activities Completed	Remaining Activities
SWMU-1: RCRA Cap Area - North Lagoon, North Waste Pile and South Waste Pile (Module V, Conditions K through O)	The area consolidates the former North Lagoon, North Waste Pile and South Waste Pile under a low-permeability cap comprised of geosynthetic and earthen materials constructed in 2004 to prevent air, surface water, and off-site soil exposures. Due to the consolidated nature of the RCRA Cap Area, the waste piles and lagoon are managed as one (1) unit.	Natural attenuation of groundwater with monitoring is continued according to the Groundwater and Surface Water Monitoring Plan (which is being updated under this renewal permit).

1. Applicable sections of this Module are denoted for each specific unit listed herein.

B. POST CLOSURE MONITORING AND INSPECTION FOR SURFACE IMPOUNDMENTS [6 NYCRR 373-2.2(g) and 6 NYCRR 373-2.11(d) and (f)]

1. The Permittee must perform monitoring and inspection of each surface impoundment authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.2(g)(2), 6 NYCRR 373-2.11(d)(4) and this Permit, including the Post Closure Plan **(Attachment E)** and the Compliance Monitoring Program Sampling and Analysis Plan (**Attachment D)** in this Permit.

2. For each inspection the Permittee must record the inspection as part of the facility record. As required by 6 NYCRR 373-2.2(g)(4), the facility's operating record must include information of any deficiency listed in 6 NYCRR 373-2.11(f)(2) is identified in any surface impoundment.

3. The Permittee must take action in response to any of the aforementioned deficiencies in accordance with 6 NYCRR 373-2.2(g)(3) and **Condition C** of this Module.

4. For any identified deterioration or malfunction of equipment or structures associated with a hazardous waste management unit that do not result in a release or create the potential for a release of hazardous waste from the unit's primary containment or for situations where the waste has been removed from the unit in accordance with **Condition C** of this Module, except for specific defects where other Permit conditions or the regulations require repairs within other specified time periods, the Permittee must either:

   a. Schedule and complete repairs to the defect within thirty (30) calendar days from the date the deficiency was first identified;

   b. Submit a proposed schedule for Department approval within seven (7) calendar days from the date the deficiency was first identified, if it is anticipated that it will take longer than thirty (30) calendar days to complete repairs. The proposed schedule must include the date for completing the repairs which must be within six (6) months from the date when the deficiency was identified; or

   c. The Permittee may request, and the Department may approve, extensions to the schedule provided the Permittee has adequately demonstrated that the extension is needed due to unforeseen circumstances or circumstances beyond the Permittee's control and that the delay will not lead to an environmental or human health hazard.

C. CLOSURE AND POST CLOSURE FOR SURFACE IMPOUNDMENTS [6 NYCRR 373-2.11(f)]

1. The Permittee has performed closure for each surface impoundment authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.11(f), 6 NYCRR 373-2.7 and the Department-approved Closure Plan and/or Post Closure Plan provided as **Attachment E** of this Permit.

2. For surface impoundments closed with waste residues or contaminated materials left in place, the Permittee must comply with the post closure requirements of 6 NYCRR 373-2.11(f)(2). The Permittee must also comply with the requirements post closure of 6 NYCRR 373-2.7(g), 6 NYCRR 373-2.8, and this Permit.

D. ACTION LEAKAGE RATE FOR SURFACE IMPOUNDMENTS [6 NYCRR 373-2.11(j)]

The Permittee must comply with the action leak rate for each landfill authorized by this Permit that is subject to 6 NYCRR 373-2.11(b)(3) and (4) in accordance with the requirements of 6 NYCRR 373-2.11(j) and this Permit.

E. RESPONSE ACTIONS FOR SURFACE IMPOUNDMENTS [6 NYCRR 373-2.11(k)]

The Permittee must perform the response actions for each landfill authorized by this Permit that is subject to 6 NYCRR 373-2.11(b)(3) and (4) in accordance with the requirements of 6 NYCRR 373-2.11(k), this Permit, and the Department-approved Response Action Plan.

F. POST CLOSURE MONITORING AND INSPECTION FOR WASTE PILES [6 NYCRR 373-2.2(g) and 6 NYCRR 373-2.12(e) and (h)]

The Permittee must perform monitoring and inspection of each waste pile authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.2(g)(2), 6 NYCRR 373-2.14(e)(2) and this Permit, including the Post Closure Plan **(Attachment E)** and the Compliance Monitoring Program Sampling and Analysis Plan (**Attachment D)** in this Permit.

G. CLOSURE AND POST CLOSURE FOR WASTE PILES [6 NYCRR 373-2.12(h)]

After making a reasonable effort, the Permittee was unable to feasibly remove or decontaminate all contaminated soils and perform closure for each waste pile authorized by this Permit in accordance with the requirements of 6 NYCRR 373 2.12(h), 6 NYCRR 373 2.7 and the Department-approved Closure Plan and/or Post Closure Plan provided as **Attachment E** of this Permit. Therefore, the Permittee must comply in accordance with the closure and post closure requirements that apply to landfills (**Conditions K through O** of this Module).

H. POST CLOSURE MONITORING AND INSPECTION FOR LAND TREATMENT [6 NYCRR 373-2.2(g) and 6 NYCRR 373-2.13(f) and (h)]

1. The Permittee must perform monitoring and inspection of each landfill authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.2(g)(2), 6 NYCRR 373-2.13(f)(2), 6 NYCRR 373-2.13(h)(3) and this Permit, including the Post Closure Plan **(Attachment E)** and the Unsaturated Zone Monitoring Program (**Attachment D)** in this Permit.

2. For each inspection the Permittee must record the inspection as part of the Facility record. As required by 6 NYCRR 373-2.2(g)(4), the Facility's operating record must include information of any deficiency listed in 6 NYCRR 373-2.13(h)(3) is identified in any landfill.

3. The Permittee must take action in response to any of the aforementioned deficiencies in accordance with 6 NYCRR 373-2.2(g)(3) and **Condition J** of this Section.

4. For any identified deterioration or malfunction of equipment or structures associated with a hazardous waste management unit that do not result in a release or create the potential for a release of hazardous waste from the unit's primary containment or for situations where the waste has been removed from the unit in accordance with **Condition J** of this Module, except for specific defects where other Permit conditions or the regulations require repairs within other specified time periods, the Permittee must either:

   a. Schedule and complete repairs to the defect within thirty (30) calendar days from the date the deficiency was first identified;

   b. Submit a proposed schedule for Department approval within seven (7) calendar days from the date the deficiency was first identified, if it is anticipated that it will take longer than thirty (30) calendar days to complete repairs. The proposed schedule must include the date for completing the repairs which must be within six (6) months from the date when the deficiency was identified; or

   c. The Permittee may request, and the Department may approve, extensions to the schedule provided the Permittee has adequately demonstrated that the extension is needed due to unforeseen circumstances or circumstances beyond the Permittee's control and that the delay will not lead to an environmental or human health hazard.

I. RECORDKEEPING FOR LAND TREATMENT [6 NYCRR 373-2.13(g)]

The Permittee must keep a record of hazardous waste application dates and rates in the operating record in accordance with 6 NYCRR 373-2.13(g).

J. CLOSURE AND POST CLOSURE FOR LAND TREATMENT [6 NYCRR 373-2.13(h)]

1. The Permittee has performed closure for each land treatment unit authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.13(h), 6 NYCRR 373-2.7 and the Department-approved Closure Plan and/or Post Closure Plan provided as **Attachment E** of this Permit.

2. The Permittee must comply with the Post Closure requirements of 6 NYCRR 373-2.13(h)(3). The Permittee must also comply with the requirements of 6 NYCRR 373-2.7(g), 6 NYCRR 373-2.8, and this Permit.

K. POST CLOSURE MONITORING AND INSPECTION FOR SECURED LANDBURIAL FACILITIES (HAZARDOUS WASTE LANDFILLS) [6 NYCRR 373-2.2(g), 6 NYCRR 373-2.14(e) and 2.14(g)

1. The Permittee must perform monitoring and inspection of each landfill authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.2(g)(2), 6 NYCRR 373-2.14(e)(2) and this Permit, including the Department-approved Post-Closure Plan **(Attachment E)** and the Department-approved Groundwater and Surface Water Monitoring Plan (**Attachment D)** in this Permit.

2. For each inspection the Permittee must record the inspection as part of the Facility record. As required by 6 NYCRR 373-2.2(g)(4), the Facility's operating record must include information of any deficiency listed in 373-2.14(g)(2) when identified in any landfill.

3. The Permittee must take action in response to any of the aforementioned deficiencies in accordance with 6 NYCRR 373-2.2(g)(3).

4. For any identified deterioration or malfunction of equipment or structures associated with a hazardous waste management unit that do not result in a release or create the potential for a release of hazardous waste from the unit's primary containment or for situations where the waste has been removed from the unit in accordance with **Condition M** of this Module, except for specific defects where other Permit conditions or the regulations require repairs within other specified time periods, the Permittee must either:

   a. Schedule and complete repairs to the defect within thirty (30) calendar days from the date the deficiency was first identified;

   b. Submit a proposed schedule for Department approval within fourteen (14) calendar days from the date the deficiency was first identified, if it is anticipated that it will take longer than 30 calendar days to complete repairs. The proposed schedule must include the date for completing the repairs which must be within six (6) months from the date when the deficiency was identified; or

   c. The Permittee may request, and the Department may approve, extensions to the schedule provided the Permittee has adequately demonstrated that the extension is needed due to unforeseen circumstances or circumstances beyond the Permittee's control and that the delay will not lead to an environmental or human health hazard.

L. SURVEYING AND RECORDKEEPING FOR SECURED LANDBURIAL FACILITIES (HAZARDOUS WASTE LANDFILLS) [6 NYCRR 373-2.14(f)]

The Permittee must perform surveying and recordkeeping for each landfill authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.14(f) and this Permit.

M. CLOSURE AND POST CLOSURE FOR SECURED LANDBURIAL FACILITIES (HAZARDOUS WASTE LANDFILLS) [6 NYCRR 373-2.14(g)]

1. The Permittee has performed closure for each landfill authorized by this Permit in accordance with the requirements of 6 NYCRR 373-2.14(g), 6 NYCRR 373-2.7 and the Department-approved Closure Plan and/or Post Closure Plan provided as **Attachment E** of this Permit.

2. The Permittee must comply with the post closure requirements of 6 NYCRR 373-2.14(g)(2). The Permittee must also comply with the requirements of 6 NYCRR 373-2.7(g), 6 NYCRR 373-2.8, and this Permit.

3. During the post closure period, if liquid leaks into a leak detection system, the Permittee must notify the Department of the leak, in writing, within seven (7) calendar days of detecting the leak. The Department may require modifying the Department-approved Groundwater and Surface Water Monitoring Plan (**Attachment D)** in this Permit to require compliance with the requirements of 6 NYCRR 373-2.6 in the event of a leak detection.

N. ACTION LEAKAGE RATE FOR SECURED LANDBURIAL FACILITIES (HAZARDOUS WASTE LANDFILLS) [6 NYCRR 373-2.14(n)]

The Permittee must comply with the action leak rate for each landfill authorized by this Permit that is subject to 6 NYCRR 373-2.14(c)(3) and (4) in accordance with the requirements of 6 NYCRR 373-2.14(n) and this Permit.

O. RESPONSE ACTIONS FOR SECURED LANDBURIAL FACILITIES (HAZARDOUS WASTE LANDFILLS) [6 NYCRR 373-2.14(o)]

The Permittee must perform the response actions for each landfill authorized by this Permit that is subject to 6 NYCRR 373-2.14(c)(3) and (4) in accordance with the requirements of 6 NYCRR 373-2.14(o), this Permit, and the Department-approved Response Action Plan.

MODULE VI
RESERVED

MODULE VII
RESERVED

MODULE VIII

RESERVED

MODULE IX
RESERVED

MODULE X
RESERVED

MODULE XI
Groundwater Monitoring

MODULE XI
GROUNDWATER MONITORING

A. APPLICABILITY

1. Statute and Regulations: Article 27, Title 9, Section 27-0913, 6 NYCRR Sections 373-1.5(a), 373-2.6(a). 373-2.6(c), 373-2.6(h) and 373-3.6(b), as well as unit specific regulations requiring groundwater monitoring, including all measures beyond the Facility boundary where necessary to protect human health and the environment, for all releases of hazardous wastes, including hazardous constituents listed in Appendix 23 of 6 NYCRR Part 371 or Appendix 33 of 6 NYCRR 373-2 as well as any newly added hazardous substances (i.e., emerging contaminants) in 6 NYCRR Part 597 (defined together as constituents), from any land-based unit under post-closure care or any solid waste management unit (SWMU) regardless of the time at which waste was managed or placed in such unit. Pursuant to 6 NYCRR 373-1.6(c)(2) and **Condition F.1 of Module II**, the Department may impose Permit conditions as the Department determines necessary to protect human health and the environment (such as Areas of Concern (AOCs). The conditions of this Module are applicable to all groundwater monitoring programs required pursuant to this Permit.

2. **All documents and reports required by this Permit must be certified pursuant to conditions established in 6 NYCRR 373-1.4(a)(5)(iv) and Condition O.4 of Module I and submitted in accordance with requirements set forward in Conditions O and W of Module I. Additionally, unless specifically exempted in this Permit, all information (e.g., documents and reports) required to be submitted by the Permittee must be approved by DEC. DEC does not require certain plans, documents or reports to be certified. The Permittee should verify if certification is required prior to submittal to the DEC.**

B. STANDARD CONDITIONS

1. Other regulatory programs: Sites and activities potentially impactful to the Facility's Groundwater Monitoring Program (GWMP) will be subject to this Module when the nature and extent of contamination and/or complexity of the issues warrant this determination.

2. Policies and Guidance Documents: The Permittee shall consider applicable Policies and Guidance Documents listed in **Conditions A.3 and A.4 of Module I** when conducting activities required by this Permit.

3. Groundwater Contamination: Groundwater notifications must be followed pursuant to **Condition B.11 of Module II**.

4. Groundwater Monitoring Period: When groundwater monitoring is required, the Permittee shall plan for a perpetual thirty (30)-year monitoring period for post closure or corrective action.

5. Groundwater Protection Standard: The Permittee must ensure that Groundwater Protection Standards are being met throughout the Site and, specifically, at any Point of Compliance or that remedial actions are taken to reduce contaminant levels to meet standards. The Facility's full listing of Constituents of Concerns (COCs) and their corresponding concentration limits are listed in **Table XI-1**. The COCs for which the Facility is required to perform groundwater monitoring sampling as well as their frequency may be found in the Facility's Groundwater Monitoring Program (GWMP).

6. Point of Compliance: The Permittee must ensure any Point(s) of Compliance (POC) is described in the Corrective Measures Study (CMS) as well as clearly delineated and represented in a Facility GWMP well map. Additionally, POCs must be listed in the GWMP as well as shown in a figure attached thereto.

7. Nothing in this Module shall be construed to require the Permittee to proceed in a manner which is in violation of any Permit conditions. The Permittee shall comply with all applicable requirements of this Permit as well as **Conditions A.5, P.1, and R.1 of Module I and B.10 of Module II**.

8. The Permittee is responsible to comply with all federal, state and local regulations in reference to Primary, Principal and Sole-Source Aquifer designations.

9. The Permittee is required to maintain and/or submit records in accordance with 6 NYCRR 373-1.4 and as described in either **Condition N of Module I** or in this Module.

10. A permit modification(s) is required when specific changes to groundwater monitoring plans, programs and wells, as listed in 6 NYCRR 373-1.7, 40 CFR 270.42 or as determined by the Department, are made. Permit modifications must be made in accordance with the regulations and **Condition E of Module I** of this Permit.

C. GROUNDWATER MONITORING PLAN(S) AND PROGRAM

A facility may have an overall Groundwater Monitoring Program (GWMP) for a sitewide GWM system or may have GWM Plans for multiple areas. When combined these GWM Plans provide the sitewide GWMP.

1. The Permittee must design, implement, and maintain a groundwater monitoring program/plan as required under this Permit and the applicable regulations. The program/plan shall discuss, at a minimum, the following:

    a. Proper identification and management of contaminated groundwater.

    b. Identification and description of the uppermost aquifer and aquifers hydraulically interconnected as established in 6 NYCRR 373-1.5(3)(iii) and (3)(v).

    c. A description of Facility activities.

    d. A description of other well types found on the premises of the facility (e.g., extraction, artesian, emergency use).

e. A list of adjacent properties and/or roadways to north, south, east and west and adjacent property types (e.g., residential, agricultural, commercial); nearby wetlands/water bodies, private drinking water wells on adjacent properties, and existing wells on the Facility (e.g. irrigation, agricultural, potable, industrial use, monitoring) and location; an aerial site map to demonstrate site layout (additional site maps may be necessary to show water bodies and existing well locations, utilities, etc.); and a written description of site layout (location of entrance, mulch piles, etc.)

f. A history of the Facility, prior uses specifically any land-based RCRA units and their capacity, known spills or activities that may impact water quality or indicate a potential presence of specific contaminants known point source.

g. A description of the surface and subsurface characteristics of the Facility, including geology, hydrogeology, and depth to groundwater. Identify any sources of contamination, possible migration pathways, and actual or potential receptors of contaminants on or through air, soil, bedrock, sediment, groundwater, surface water, utilities, and structures at the contaminated Facility, without regard to property boundaries.

h. Aquifer characteristics and hydrogeologic units to identify groundwater flow paths and rates including hydraulic conductivity, hydraulic gradient, effective porosity, aquifer thickness, degree of saturation, stratigraphy, degree of fracturing and secondary porosity of soils and bedrock, aquifer heterogeneity, groundwater discharge, and groundwater recharge areas.

i. A combined use of direct and indirect techniques to produce an efficient and complete characterization to define the hydrogeological conditions at the Facility including an identification of the following:

    i. The seasonal/temporal naturally and artificially induced (e.g., off-site production well pumping, agricultural use) variation in groundwater flow. The Permittee should take into consideration atypical seasonal changes with potential groundwater direction shift. The GWMP and reports must include a minimum discussion on hydraulic gradient, sustained well yield, hydraulic conductivity, permeability and an estimate of the rate of groundwater and contaminant flow in the aquifer with formulas.

    ii. Potential effluent zones to surface water and public drinking water supply intake infrastructure.

    iii. Engineering controls including trenches, liners, cover systems, and aquifer controls (e.g., lowering the water table). These shall be evaluated under design and failure conditions to estimate their long-term residual performance.

iv. Assessment and estimation of microbiological or chemical degradation which may attenuate target compounds or cause transformation of compounds potentially forming harmful chemical species.

2. The Permittee must include the following items for site characterization, including but not limited to:

   a. An inventory of their monitoring well network for both off-site and on-site wells. This inventory must also include the laboratory analyses of subsurface samples.

   b. Geophysical techniques.

   c. Structure contour maps.

   d. Cross-sections.

   e. Groundwater modeling.

   f. Topographic maps (1":200' scale) that show all features required by 6 NYCRR 373-1.5(a)(2)(xix), including:

      i. Map scale.

      ii. Aerial photography.

      iii. Location of the operational units within the hazardous waste facility as well as any area where hazardous waste is treated, stored, or disposed including equipment clean up areas.

D. GROUNDWATER MONITORING SYSTEMS

1. The Permittee must observe requirements as established, but not limited to, those found in 6 NYCRR 373-2.6 and 373-3.6.

2. Groundwater Level Measurements: The Permittee must measure and report the elevation of the potentiometric surface in all monitoring wells and/or piezometers within the off-site and on-site monitoring well network identified in the GWMP or the appropriate Groundwater Monitoring Report (GWMR).

   a. Water level measurements must have been collected within a 24-hour period. Within thirty (30) calendar days of completing these measurements, the Permittee shall use the water level data to evaluate the direction and rate of groundwater flow. The facility must specify any other situations in which all measurements need to be taken within a short time interval as is the case of tidally influenced aquifers, impacts from impoundments, pumping charges and dischargers (including artesian wells if existing), stressed aquifers by production wells, recharge due to sudden precipitation, etc.

b. Piezometers must be re-surveyed as required in the Facility's GWMP to determine the extent of subsidence or rise in the ground surface.

c. In cases where immiscible contamination is found during the characterization, water level should be adjusted to reflect true elevation.

d. Information gaps such as unidentified extraction wells in the vicinity, changes in seasonal precipitation causing groundwater plume shifting, formerly inaccessible areas, etc.

e. Assess off-site or on-site well pumping as it may affect both the rate and direction of groundwater flow.

Additionally, the Permittee must provide, and keep current, a Facility map showing the locations of the GWM wells as discussed in **Conditions B.5 and D.6** of this Module.

3. Description of Wells: The Permittee must maintain an inventory of their monitoring well network for both off-site and on-site wells. This inventory must also include the status (i.e., active/inactive), purpose (e.g., corrective action, post-closure, unit-specific), type (e.g., upgradient/downgradient, compliance, monitoring, piezometers, replacement wells), depth and location of these wells The Permittee may coordinate efforts to obtain this information with local authorities and/or DEC. The Permittee is responsible for notifying DEC on all changes in the well network, including but not limited to, decommissioning, abandonment, and unreported wells. The Permittee is responsible for updating this inventory every five (5) years, or within sixty (60) calendar days of addition of a new well, well decommissioning or replacement.

4. Monitoring Well Designations: The Permittee must ensure adequate placement of monitoring wells. This placement must include upgradient and downgradient monitoring wells relative to active and closed hazardous waste management units, solid waste management units and areas of concern at the Facility. Additionally, this placement must include screening of detection monitoring wells for the interception of predicted pathways of migration. The number of wells that shall be required shall be determined by DEC as the number necessary to achieve the performance objectives.

5. Plume Assessment Wells: The appropriately designated monitoring wells listed in the GWMP or GWMR shall be used to monitor the contaminant plume movement and to assess the effectiveness of the Post Closure Care or Corrective Action Program.

6. Documentation of Monitoring Wells: The Permittee must maintain an updated inventory of groundwater monitoring well information including but not limited to:

a. Date/time of original construction. Additionally, the inventory must include any well redevelopment or replacement information.

b. Well identification number. Wells must be properly identified in the administrative record as well as physically on the well protective casing, cover or flush mount.

c. Well type (e.g., upgradient/downgradient, compliance, monitoring, piezometers, replacement wells).

d. Well location (±0.5 ft).

i. Coordinates must be submitted in latitude/longitude coordinate system with a precision as required by DEC guidance.

ii. The Permittee must include a conversion factor or system whenever using Easting and Northing.

e. Well development method and date.

f. Unit(s) monitored.

g. Bore hole diameter and well casing diameter.

h. Casing materials.

i. Well depth (± 0.1 ft, must be the well bottom).

j. Ground elevation (± 0.01ft relative to mean sea level (MSL)).

k. Top-of-Riser elevation (± 0.01 ft).

l. Screened interval (ft. relative MSL).

m. Drilling and lithological logs.

n. Detailed drawing of well (include dimensions).

All depth or elevations may be reported in ft below ground surface (BGS), ft above mean sea level (AMSL) or ft below top of casing (BTOC). Whatever system is used must be consistent across all GWM systems/plans/program for the Facility. All documentation must include the necessary definitions, units or acronyms used therein.

If requested by DEC, the Permittee must provide a copy of the Monitoring Well documentation within five (5) business days.

E. WELL LOCATION, INSTALLATION AND CONSTRUCTION

The Permittee must submit a written proposal to install and maintain a groundwater monitoring system a minimum of forty-five (45) calendar days prior to planned installation. The Permittee must design all groundwater monitoring system(s) such that they comply with all applicable regulations and requirements. The Permittee may not install any wells without DEC approval, including any proposed replacement well(s).

1. The Permittee shall ensure that all wells are designed, installed, and maintained such that groundwater samples are representative of the true water quality. Additionally, the wells shall be designed, installed and monitored in such a manner to prevent interconnection between different hydrologic units.

2. The Permittee must ensure the use of adequate construction materials that are durable enough to resist chemical and physical degradation and do not interfere with the quality of groundwater samples. Specific well components that are of concern include well casings, well screens, filter packs, and annular seals or backfills. Emerging contaminants, chemicals or materials characterized by a perceived, potential, or real threat to human health or the environment or by a lack of published health standards, should be considered when selecting these materials.

3. The Permittee must ensure the drilling method used minimizes disturbance of the surface and subsurface materials. Any method used should not contaminate these materials as well as groundwater or surface water. Emerging contaminants, chemicals or materials characterized by a perceived, potential, or real threat to human health or the environment or by a lack of published health standards, should be considered when selecting these materials.

4. The Permittee must maintain documentation on the design and construction of the wells. Otherwise, a placement of a monitoring well will be considered inadequate for groundwater monitoring if no documentation is provided to the DEC.

5. The Permittee shall measure total well depth annually and report any monitoring well when sediment has entered the well and accumulated to a depth of one foot; or the accumulated sediment blocks ten (10) percent of the screen length, whichever is less. The Permittee must notify DEC within fifteen (15) calendar days of any need to redevelop a well or any sediment accumulation above ten (10) percent.

6. The Permittee must submit a written plan for any well abandonment or decommissioning prior to implementation. The Permittee may not abandon or decommission any wells without DEC approval. The Permittee must follow DEC's well decommissioning policy per **Condition A.4 of Module I**.

F. WELL MAINTENANCE

1. The Permittee is responsible for maintaining the GWM system and ensuring that all monitoring points yield representative samples of high integrity. During each sampling event the wells to be sampled shall be visually inspected for integrity. Any well found to be damaged beyond usability, blocked or broken, or that fails to recharge properly, shall be repaired, abandoned or replaced, if necessary, in accordance with the conditions of this Permit. Additionally, if the Permittee, or their contractor, observes any cracking or frost heaving of grout at any well, repairs shall be made and the top of the inner well casing will be resurveyed to ensure accurate definition of groundwater elevations. All repairs or replacements shall be completed prior to the next scheduled sampling event. Flush mounted wells shall be capped with a watertight seal. The integrity of this seal shall be inspected each time the wells are sampled.

2. The Permittee shall perform inspection activities within one hundred eighty (180) calendar days of the effective date of this Permit, and every three (3) years after the initial inspection. These inspections shall evaluate the exterior conditions and accessible parts of GWM wells as mentioned in **Condition F.1** above as well as assessing well performance and effectiveness in the GWMP (e.g., well screen depth versus plume locations). The Permittee shall report observations and maintenance actions in both an initial report and the Triennial Well Inspection Report as listed in **Table B and C of Module XIII**.

3. The Permittee shall maintain an inventory of all existing and historical wells throughout the facility and at off-site locations associated with the GWMP.

G. SAMPLING AND ANALYSIS PROCEDURES

1. The Permittee must ensure that the frequency of sample collection and the wells to be sampled are in accordance with the Groundwater Monitoring Schedule established in the GWMP or GWMR. These wells shall adequately characterize the nature and extent, both horizontal and vertical of groundwater contamination. The Permittee shall monitor groundwater quality throughout the compliance period to demonstrate conformance with the GWMP.

    a. The Permittee must prepare and submit a Sampling and Analysis Plan (SAP) and its corresponding Sampling and Analysis Report (SAR) to DEC pursuant to **Conditions C.3 and C.5 of Module II**, as may be necessary. Any new groundwater monitoring requirements necessary based on any new SAP or SAR would subsequently be incorporated into the GWMP.

    b. Any required SAP must include provisions for measurement of static water elevations in each well prior to each sampling event. A change in hydrologic conditions may necessitate modification to the design of the groundwater monitoring system.

2. Proposed sampling frequencies shall be submitted by the Permittee as part of the Permit application. The sampling frequency is determined on a case-by-case scenario and should reflect site-specific hydrogeological conditions. The minimum sampling is determined by the Department as defined in the GWMP and per 6 NYCRR 373-2.6(h), (i) and (j).

3. Unless specified in the Permit and/or approved modifications to the GWMP, the Permittee must include all active wells in sampling activities. Monitoring wells can only be removed from sampling activities after the review and approval of DEC.

4. The Permittee shall report water level data with the groundwater quality analytical results as specified in **Conditions C** of this Module and with a collection time inside a twenty-four (24) hour time span for a given well, unless otherwise approved by the Department in the GWMP.

5. The Permittee must collect field data parameters (e.g., pH, temperature, redox potential, dissolved oxygen, specific conductance) during sampling activities. Other field measurements may be required yet not limited to such as purged water collected and screened with photoionization detectors (PID) or organic vapor meters.

6. The Permittee shall take into account other indicator parameters additional to established hazardous constituents as described in 6 NYCRR 373-2.6(i) or as may be determined by the Department on a case-by-case basis.

7. The Permittee must note and report the presence of immiscible layers: Non-Aqueous Phase Liquids (NAPLs), and Dense Non-Aqueous Phase Liquids (DNAPLs) not detected in the aqueous phase.

8. At a minimum, the Permittee must use the techniques and procedures outlined in **Conditions G.9 through G.12** of this Module when obtaining and analyzing samples from the groundwater monitoring wells. The specific elements to be used must be established and discussed in the GWMP and GWMR.

9. Presampling Procedures

    a. Procurement, inspection, and calibration of equipment;
    b. Procurement and preparation of sample bottles;
    c. Storage and handling of sampling gear between uses;
    d. Personal protective equipment needed for sampling;
    e. Well purging techniques;
    f. Water level measuring techniques; and
    g. Laboratory notification/verification.

10. Sampling Procedures

    a. Use of sampling equipment;
    b. Field measurements and calibration techniques;
    c. Sampling parameters/sample handling techniques, including:
        i. sample containers to be used,
        ii. sample preservation techniques,
        iii. sample filtration techniques,
        iv. order of sample collection,
        v. sample labels, and
        vi. sample storage.
    d. Field QA/QC such as decontamination, blanks, duplicate measurements, etc;

e. Sample shipping and chain of custody procedures;

f. Health and safety/personal protection measures; and

g. Provisions for adequate disposal of purge water.

11. Background Information for each Monitoring Well/Piezometer

a. Well log;

b. Water level recovery rate of wells;

c. Measuring point elevation;

d. Normal purge volume of wells;

e. Background water quality values; and

f. Development/redevelopment history of the wells.

12. Data Management

The Permittee is responsible to maintain and update data from each well or piezometer after each sampling or monitoring event. The well record must contain the following information:

a. Well I.D. number and, if possible, designation as up or downgradient;

b. Depth of wells as installed and as measured in the most recent well inventory

c. Measuring point elevation;

d. Depth of water;

e. Purge volume;

f. Purge time (start/stop)

g. Sampling time;

h. Field parameters (e.g., temp., pH, S.C., TDS);

i. Physical condition of the well;

j. Important field observation related to sample integrity;

k. Names of sampling personnel;

l. Weather conditions;

m. Purge/sample date;

n. Concentration of required monitoring parameters;

o. Concentration of any other parameters analyzed;

p. Pertinent laboratory information (e.g., QA/QC problems); and

q. Water Elevation (quarterly water level measurements only).

13. Sample Analysis: Samples shall be analyzed based on most current USEPA Hazardous Waste Test Methods SW-846, using the most recent and stringent procedure at the time of analysis, unless the Department approves a different methodology prior to sampling. These samples must be analyzed by a laboratory with a NYS Environmental Laboratory Approval Program (ELAP) certification.

14. The Permittee is responsible to sample any wastes or other materials that may be generated as part of the GWMP and to ensure it is disposed of in accordance with all applicable regulations.

15. The GWMP should include provisions for measurement of static water elevations in each well prior to each sampling event.

16. The Permittee must report the presence of hazardous waste constituents that are consistently present in the monitoring wells exceeding established groundwater protection standards. DEC may require the Permittee to perform additional sampling and install additional wells to determine the horizontal and vertical extent of any contamination.

17. Inability to Obtain Samples: If the Permittee knows that a well (or multiple wells during a sampling event) may not provide representative samples (e.g., siltation, damage, obstruction beyond the facility's control), the Permittee shall within seven (7) calendar days of such knowledge notify DEC, in writing, of the problem and proposed remedy. Within fourteen (14) calendar days of such knowledge, the Permittee shall attempt to remedy the problem and, when appropriate, sample or re-sample the well(s), including the information in the GWMR for the assessment and resolution. If the Permittee is unable to resolve the problem within twenty-one (21) calendar days of such knowledge, the Permittee shall, through written notice to the DEC, provide information which describes the nature of the problem within seven (7) calendar days following the twenty-one (21) calendar day resolution period. Any instance of site safety hazards interfering with a sampling event shall be discussed with DEC.

18. The Permittee must include a section with detailed procedures for evacuating wells in their GWMP (e.g., low-flow vs high-flow techniques, use of dedicated equipment, purging times).

19. Insufficient Groundwater for Sampling: The Permittee must address, in their GWMR, wells with a history of pumping dry and discuss with DEC the order of sampling COCs. On wells in which the water table has lowered to consider the well dry and no longer adequate for sampling, DEC will make the determination on whether the well should be retained in the GWMP or replaced.

20. The Permittee is responsible for the characterization of all Investigation Derived Waste (IDW) generated during sampling activities. Characterization may include Toxicity Characteristics Leaching Procedure (TCLP) analysis. The Permittee shall treat, store and/or dispose of all IDW, including contaminated groundwater, in accordance with all applicable federal, state and local requirements.

21. At the request of the DEC, the Permittee shall allow the DEC and/or its authorized representatives to collect samples or splits of any samples collected by the Permittee pursuant to the requirements of this Permit. Similarly, at the request of the Permittee, the DEC will allow the Permittee or the Permittee's authorized representatives to take splits or duplicates of any samples collected by the DEC. The Permittee shall provide appropriate management of or disposal of purge water whenever samples are collected by the DEC.

22. Laboratory Reporting: As stated in **Condition G.9** above, all samples must be analyzed by an ELAP-certified laboratory. Additionally, the Permittee must provide DEC with ASP Category B deliverables for sample results in accordance with **Condition O.1 of Module I**. An associated Data Usability Summary Report (DUSR) must be prepared by a qualified and approved data validator and submitted along with all results.

23. Change in Analytical Laboratory: Whenever the Permittee changes analytical contractors, the Permittee shall submit to the Department, within thirty (30) calendar days of such a change, a copy of the new laboratory's New York State ELAP certification to be included in the permit application. This certification must state the expiration date, analytical test methods and parameters for which the laboratory is certified.

24. The Permittee is required to report the concentrations of any newly detected hazardous constituents found during analysis to the DEC in writing within seven (7) calendar days after receipt of analytical data. The Permittee must immediately incorporate these new constituents into the GWMP when the presence of new hazardous constituents is confirmed by resampling. If the Permittee chooses not to resample, the original detections will be considered valid detections, and the hazardous constituents must be added to the GWMP.

25. The Permittee must use the appropriate statistical procedure to evaluate groundwater monitoring data for each hazardous constituent detected as established in 6 NYCRR 373-2.6(h)(8) and (h)(9) or otherwise approved by the Department.

H. GROUNDWATER MONITORING PROGRAM TERMINATION CRITERIA

1. Request for Termination: The Permittee may submit a request for Termination of the Groundwater Monitoring Program whenever the Permittee determines that the cleanup in all or part of the on-site area/aquifer is achieving the Termination Criteria. The termination request must provide information that the Permittee's GWMP has met all groundwater protection standards set forth in monitoring parameters in **Table XI-1** for an appropriate number of consecutive sampling episodes determined by the DEC.

2. Termination Monitoring: Following a request for termination of the Groundwater Monitoring Program, the Permittee shall conduct Termination Monitoring to demonstrate that Termination Criteria continue to be achieved. At least sixty (60) calendar days prior to commencing Termination Monitoring, the Permittee shall submit a Termination Monitoring Plan for DEC review. That plan will describe the area (or wells) for which Termination Monitoring is proposed, and the monitoring plan,

including wells, which will be used to determine whether the Termination Criteria have been achieved. The Permittee may proceed with the Termination Monitoring Program, without DEC approval, at their own risk. Only those results which conform to a DEC-approved Termination Monitoring Plan shall be accepted by the Department.

3. Basis for Termination: The basis for the DEC's determination of whether the groundwater monitoring for a particular well or area can be terminated shall be if DEC concurs that the **Table XI-1** groundwater protection standards have been met for three (3) consecutive years of sampling for Termination Monitoring.

I. GROUNDWATER WELL DECOMMISSIONING OR REPLACEMENT

1. The Permittee is responsible to submit a Permit modification request, in accordance with **Condition B.10** of this Module, including a well decommissioning plan for any plugging, capping and abandonment of a GWMP well at the Facility. Once approved by the DEC and implemented, the Permittee must submit a GWM well decommissioning report to DEC for review and approval. All wells in the GWMP shall be decommissioned in accordance with **Condition A.4 of Module I** of this Permit. Once a well is decommissioned, the Permittee must update the GWMP and maintain changes in the GWMR to remove said well(s).

2. The Permittee must submit a Permit modification request, in accordance with **Condition B.10** of this Module, including a work plan for any well replacement proposal. The Permittee must receive DEC approval prior to a well replacement installation. The new well should retain the same vertical and horizontal characteristics as well as the original well as well as the screen depth should be at the same stratigraphic unit. DEC will review this on a case-by-case scenario.

TABLE XI-1
Groundwater Protection Standards[1]
Site Specific Parameters

Constituent	Concentration Limit, µg/L (micrograms per liter)[3]
Arsenic	25
Barium	1000
Cadmium	5
Chromium, Total [2]	50
Hexavalent Chromium [2]	50
Cyanide, Total [2]	200
Lead, Total	25
Mercury, Total	0.7
Selenium, Total	10
Acetone	50
Benzene	1
Chlorobenzene	5
cis-1,2-dichloroethene	5
1,2-Dichlorobenzene [2]	3
1,3-Dichlorobenzene [2]	3
1,4-Dichlorobenzene [2]	3
Methyl Ethyl Ketone	50
Tetrachloroethene	5
Toluene	5
trans-1,2-dichloroethene	5
Trichloroethene	5
Vinyl chloride	2
1,4-Dioxane	0.35
Perfluorooctane Sulfonic acid (PFOS)	0.0027
Perfluorooctanoic acid (PFOA)	0.0067

Footnotes:
1. If the facility has surface water requirements, they are captured in a monitoring plan.
2. This list contains all known Constituents of Concern (COCs) for the Facility, however, the Facility is currently subject to groundwater monitoring requirements for these particular COCs. Additional information may be found in the GWMP or GWMR.
3. The total concentration of all organic constituents, excluding pesticides, herbicides, vinyl chloride, and trihalomethanes, shall not exceed 100.0 ug/l.

MODULE XII
RESERVED

MODULE XIII

Scheduled Dates

MODULE XIII
SCHEDULED DATES

A. COMPLIANCE SCHEDULE

The Permittee must complete the following activities within the scheduled timeframes indicated in the following table in accordance with 6 NYCRR 373-1.6(d):

Item No.	Item	Requirement	Compliance Date[1]
1.	Not Applicable		

Footnotes:
1. The Permittee must comply with the reporting requirements of 6 NYCRR 373-1.6(d)(1)(iii) for each interim date and the final compliance date.

B. SCHEDULE OF DELIVERABLES

The Permittee must complete the activities indicated in the following table within the scheduled timeframes from the effective date of the Permit:

Item No.	Item	Requirement	Deliverable Date[1]
1.	Draft Site Management Plan (SMP) Update	Submit a draft SMP prepared in accordance with Modules I and II as well as DER-10 https://extapps.dec.ny.gov/fs/programs/der/templates/smptemplate1.docx. The SMP must be a comprehensive document, must consider and include all site management activities for the entire Facility, and must describe how the Permittee will manage the Facility to achieve remedial goals and objectives for the entire Facility as a whole.	Within ninety (90) days of a final remedy decision on the Sliver Quarry by DEC.
2.	Final SMP	Submit a final SMP acceptable to the Department prepared in accordance with DER-10.	Within forty-five (45) days of the NYSDEC approval of the draft SMP.
3.	SWMU/AOC Current Conditions Assessment Report	Module II, Condition B.13	Within ninety (90) days of the effective date of this Permit.
4.	Initial Well Inspection Report	Module XI, Condition F.2	Within one-hundred eighty (180) days of the effective date of this Permit.

Item No.	Item	Requirement	Deliverable Date[1]
6.	Groundwater Monitoring Plan/Program Update	Module XI, Conditions D.6 and G	Within one-hundred eighty (180) days of the effective date of this Permit.
7.	Environmental Easement (EE) Document Package Submittal	Module II, Condition F.2	Within ninety (90) days of a final remedy decision on the Sliver Quarry by DEC.
8.	Environmental Easement Finalization	Module II, Condition F.2	Within sixty (60) days of the approval of the EE Document Package by the Department.

Footnotes:
1. Deliverable Date changes may be made with written approval from the Department.

C. ROUTINE REPORTING

The Permittee must submit the following routine reports to the Department by the indicated due date in accordance with the requirements of this Permit (Note: the table below is intended to serve as a guide for certain routine reporting required by this Permit. However, the Permittee is still obligated to comply with all applicable regulations cited in this Permit and all conditions and requirements contained in the Modules, Attachments and documents incorporated by reference into this Permit, regardless of whether they are or are not listed in the table below.):

Item No.	Item	Frequency	Due Date[1]	Requirement
1.	Hazardous Waste Manifest Reporting	On-going	On-going	6 NYCRR 372.2 and 373-2.5(a)
2.	Annual Report	Annually, if required	March 1, if required	6 NYCRR 373-2.5(e)
3.	Hazardous Waste Reduction Plan Update/Report	Annually	July 1	ECL 27-0908 and Module I, Condition M
4.	SWMU/AOC Current Conditions Assessment Report	With the completion of remedial requirements at a SWMU/AOC or when requested by DEC	Within thirty (30) days of remedial completion or DEC request.	Module II, Condition B.13

Item No.	Item	Frequency	Due Date[1]	Requirement
5	Corrective Action and Post Closure Care Cost Estimate Adjusted for Inflation	Annually	Sixty (60) days prior to anniversary date of establishment of financial instrument	6 NYCRR 373-2.8(c)(2), 6 NYCRR 373-2.8(e)(2) and Module I, Condition P.3
6.	Evidence that Financial Assurance Instruments have been maintained and not lapsed	Annually	Thirty (30) days prior to anniversary of initial approval	Module I, Condition P.11
7.	Well Inspection Report	Triennially	Three (3) years after submittal of the Initial Report	Module XI, Condition F.2
8.	Groundwater Monitoring Reports	Annually, or as per approved GWMPs	March 1, or as per approved GWMPs	Module XI, Conditions C and D
9.	Groundwater Monitoring Well Inventory	Every five (5) years, or within sixty (60) days of when wells are modified	Dependent on activity	Module XI, Condition D.3 and Condition I

Footnotes:

1. Routine Date changes may be made with written approval from the Department.

ATTACHMENT A
Permit Modification Log

ATTACHMENT A
PERMIT MODIFICATION LOG

The permit may be modified for causes as allowed under 6 NYCRR 373-1.7 and 621.14. Modification shall be requested in writing as required by 6 NYCRR 621.13 and 621.14. Requests for modifications shall be submitted to designees as specified in **Condition W of Module I.**

An application for permit modification is processed pursuant to 6 NYCRR Part 621 and 373-1.7. Applications for minor modifications listed under 373-1.7(c) may be processed without being treated as a new application. For any other modification not explicitly listed as major under 373-1.7(d) or minor modification, the permittee may submit a request for permit modification and request that it be classified and administered as a modification under Part 373-1.7(c)(15). This request must include information supporting the requested classification. The Department shall determine whether the request qualifies to be administered as a modification or an application for a new permit in accordance with Part 621 – Uniform Procedures. In making this determination, the Department shall consider the degree to which the proposed changes are similar to those listed as minor modification under 373-1.7(c), the Federal Regulations under 40 CFR 270.42 and the following criteria:

Minor modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health and the environment.

Revision #	Affected permit modules, attachments, and/or documents incorporated by reference	Modified page number(s)		Permit modification request date	Permit modification issuance date	The nature of the modifications
		Old	New			

ATTACHMENT B

Permit Renewal Application, exclusive of Attachments

OMB# 2050-0024; Expires 04/30/2024

United States Environmental Protection Agency
RCRA SUBTITLE C SITE IDENTIFICATION FORM

1. Reason for Submittal (Select only one.)

☐	Obtaining or updating an EPA ID number for on-going regulated activities (Items 10-17 below) that will continue for a period of time.
☐	Submitting as a component of the Hazardous Waste Report for _____ (Reporting Year)
	☐ Site was a TSD facility, a reverse distributor, and/or generator of ≥ 1,000 kg of non-acute hazardous waste, > 1 kg of acute hazardous waste, or > 100 kg of acute hazardous waste spill cleanup in **one or more months of the reporting year** (or State equivalent LQG regulations)
☐	Notifying that regulated activity is no longer occurring at this Site
☐	Obtaining or updating an EPA ID number for conducting Electronic Manifest Broker activities
☑	Submitting a new or revised Part A (permit) Form

2. Site EPA ID Number

N	Y	D	0	0	2	0	6	9	7	4	8

3. Site Name

Ciba/Hercules Main Plant Site

4. Site Location Address

Street Address **89 Lower Warren Street**		
City, Town, or Village **Queensbury**		County **Warren**
State **New York**	Country **USA**	Zip Code **12804-3890**
Latitude	Longitude	☐ Use Lat/Long as Primary Address

5. Site Mailing Address ☑ Same as Location Street Address

Street Address		
City, Town, or Village		
State	Country	Zip Code

6. Site Land Type

☑ Private ☐ County ☐ District ☐ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

7. North American Industry Classification System (NAICS) Code(s) for the Site (at least 5-digit codes)

A. (Primary) **32513**	C.
B.	D.

8. Site Contact Information

☐ Same as Location Address

First Name **James**	MI **E**	Last Name **Vondracek**
Title **Remediation Project Manager**		
Street Address **1979 Atlas Street (Ashland, Inc. - EH&S - DS4)**		
City, Town, or Village **Hilliard**		
State **Ohio**	Country **USA**	Zip Code **43228**
Email **jevondracek@ashland.com**		
Phone **614-323-5448**	Ext	Fax **N/A**

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner

☐ Same as Location Address

Full Name **BASF Corporation**	Date Became Owner (mm/dd/yyyy) **8/6/1979**

Owner Type

☑ Private ☐ County ☐ District ☐ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

Street Address **100 Park Avenue**		
City, Town, or Village **Florham Park**		
State **New Jersey**	Country **USA**	Zip Code **07932**
Email **steve.havlik@basf.com**		
Phone **1-914-557-6009**	Ext	Fax **n/a**
Comments **Contact: Stephen Havlik, Senior Remediation Specialist**		

B. Name of Site's Legal Operator

☐ Same as Location Address

Full Name **Hercules Incorporated**	Date Became Operator (mm/dd/yyyy) **5/15/1990**

Operator Type

☑ Private ☐ County ☐ District ☐ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

Street Address **Hercules Plaza, 1313 N. Market Street**		
City, Town, or Village **Wilmington**		
State **Delaware**	Country **USA**	Zip Code **19894-0001**
Email **jevondracek@ashland.com**		
Phone **614-323-5448**	Ext	Fax **n/a**
Comments **Contact person James Vondracek, same as site contact.**		

10. Type of Regulated Waste Activity (at your site)

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities

☐ Y ☑ N	1. Generator of Hazardous Waste—If "Yes", mark only one of the following—a, b, c	
☐	a. LQG	-Generates, in any calendar month, 1,000 kg/mo (2,200 lb/mo) or more of non-acute hazardous waste (includes quantities imported by importer site); or - Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lb/mo) of acute hazardous waste; or - Generates, in any calendar month or accumulates at any time, more than 100 kg/mo (220 lb/mo) of acute hazardous spill cleanup material.
☐	b. SQG	100 to 1,000 kg/mo (220-2,200 lb/mo) of non-acute hazardous waste and no more than 1 kg (2.2 lb) of acute hazardous waste and no more than 100 kg (220 lb) of any acute hazardous spill cleanup material.
☐	c. VSQG	Less than or equal to 100 kg/mo (220 lb/mo) of non-acute hazardous waste.
☐ Y ☑ N	2. Short-Term Generator (generates from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section. *Note: If "Yes", you MUST indicate that you are a Generator of Hazardous Waste in Item 10.A.1 above.*	
☐ Y ☑ N	3. Treater, Storer or Disposer of Hazardous Waste—Note: Part B of a hazardous waste permit is required for these activities.	
☐ Y ☑ N	4. Receives Hazardous Waste from Off-site	
☐ Y ☑ N	5 Recycler of Hazardous Waste	
☐	a. Recycler who stores prior to recycling	
☐	b. Recycler who does not store prior to recycling	
☐ Y ☑ N	6. Exempt Boiler and/or Industrial Furnace—If "Yes", mark all that apply.	
☐	a. Small Quantity On-site Burner Exemption	
☐	b. Smelting, Melting, and Refining Furnace Exemption	

B. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g. D001, D003, F007, U112). Use an additional page if more spaces are needed.

N/A						

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes. Please list the waste codes of the State hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

N/A						

11. Additional Regulated Waste Activities (NOTE: Refer to your State regulations to determine if a separate permit is required.)

A. Other Waste Activities

☐ Y ☑ N	1. Transporter of Hazardous Waste—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Underground Injection Control
☐ Y ☑ N	3. United States Importer of Hazardous Waste
☐ Y ☑ N	4. Recognized Trader—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter
☐ Y ☑ N	5. Importer/Exporter of Spent Lead-Acid Batteries (SLABs) under 40 CFR 266 Subpart G—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter

B. Universal Waste Activities

☐ Y ☑ N	1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) - If "Yes" mark all that apply. Note: Refer to your State regulations to determine what is regulated.
☐	a. Batteries
☐	b. Pesticides
☐	c. Mercury containing equipment
☐	d. Lamps
☐	e. Aerosol Cans
☐	f. Other (specify) _____
☐	g. Other (specify) _____
☐ Y ☑ N	2. Destination Facility for Universal Waste Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities

☐ Y ☑ N	1. Used Oil Transporter—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Used Oil Processor and/or Re-refiner—If "Yes", mark all that apply.
☐	a. Processor
☐	b. Re-refiner
☐ Y ☑ N	3. Off-Specification Used Oil Burner
☐ Y ☑ N	4. Used Oil Fuel Marketer—If "Yes", mark all that apply.
☐	a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
☐	b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Pharmaceutical Activities

☐ Y ☑ N	1. Operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals—if "Yes", mark only one. Note: See the item-by-item instructions for definitions of healthcare facility and reverse distributor.
☐	a. Healthcare Facility
☐	b. Reverse Distributor
☐ Y ☑ N	2. Withdrawing from operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals. Note: You may only withdraw if you are a healthcare facility that is a VSQG for all of your hazardous waste, including hazardous waste pharmaceuticals.

12. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262, Subpart K.

☐ Y ☑ N	A. Opting into or currently operating under 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories— If "Yes", mark all that apply. Note: See the item-by-item instructions for definitions of types of eligible academic entities.
☐	1. College or University
☐	2. Teaching Hospital that is owned by or has a formal written affiliation with a college or university
☐	3. Non-profit Institute that is owned by or has a formal written affiliation with a college or university
☐ Y ☑ N	B. Withdrawing from 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories.

13. Episodic Generation

☐ Y ☑ N	Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category. If "Yes", you must fill out the Addendum for Episodic Generator.

14. LQG Consolidation of VSQG Hazardous Waste

☐ Y ☑ N	Are you an LQG notifying of consolidating VSQG Hazardous Waste Under the Control of the Same Person pursuant to 40 CFR 262.17(f)? If "Yes", you must fill out the Addendum for LQG Consolidation of VSQG hazardous waste.

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) OR Entire Facility (required)

☐ Y ☑ N	LQG Site Closure of a Central Accumulation Area (CAA) or Entire Facility.
	A. ☐ Central Accumulation Area (CAA) or ☐ Entire Facility
	B. Expected closure date: _____ mm/dd/yyyy
	C. Requesting new closure date: _____ mm/dd/yyyy
	D. Date closed : _____ mm/dd/yyyy ☐ 1. In compliance with the closure performance standards 40 CFR 262.17(a)(8) ☐ 2. Not in compliance with the closure performance standards 40 CFR 262.17(a)(8)

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

Item 6: NAICS Code entered describes past production. Since 1989, no production has occurred on-site and all production facilities were closed/demolished. There is no NAICS code for this type of site.

Item 8: Additional contact information: Elena Dadukova, EHS Support, Rehoboth Beach, Delaware 19971. elena.dadukova@ehs-support.com, 302-440-4401; responsible for permit application preparation; representative for operator.

Item 9A: Ciba Corporation is a wholly-owned subsidiary of BASF Corporation, and Ciba remains the legally responsible party for the permit. Ciba Corporation is a Permittee (owner).
Item 9B: Hercules Incorporated and Ciba Corporation entered into a cooperative agreement whereby Hercules is managing corrective measures while Ciba retains ownership of the site. Hercules is a wholly-owned subsidiary of Ashland Incorporated.

Permittees from the March 2015 Permit remain as Ciba Corporation and Hercules Incorporated.

19. Certification I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. **Note: For the RCRA Hazardous Waste Part A Permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy) 8/29/24
Printed Name (First, Middle Initial Last) Charles R Waltz	Title Sites Manager
Email charles.waltz@basf.com	

Signature of legal owner, operator or authorized representative James Vondracek	Date (mm/dd/yyyy) August 19, 2024
Printed Name (First, Middle Initial Last) James E Vondracek (operator)	Title Remediation Project Manager
Email jevondracek@ashland.com	

EPA ID Number | N | Y | D | 0 | 0 | 2 | 0 | 6 | 9 | 7 | 4 | 8 |

OMB# 2050-0024; Expires 04/30/2024

United States Environmental Protection Agency

HAZARDOUS WASTE PERMIT PART A FORM

1. Facility Permit Contact

First Name	James	MI	E	Last Name	Vondracek
Title	Remediation Project Manager				
Email	jevondracek@ashland.com				
Phone	614-323-5448	Ext		Fax	n/a

2. Facility Permit Contact Mailing Address

Street Address	1979 Atlas Street (Ashland, Inc. - EH&S - DS4)	
City, Town, or Village	Hilliard	
State Ohio	Country USA	Zip Code 43228

3. Facility Existence Date (mm/dd/yyyy)

N/A No current operations.

4. Other Environmental Permits

A. Permit Type	B. Permit Number	C. Description
E	0 0 2 G	Industrial waste water discharge to POTW

5. Nature of Business

The site was a former manufacturer of inorganic pigments. All operations ceased in 1989 and all facilities were demolished. The site is currently under Post-Closure Care.

6. Process Codes and Design Capacities

Line Number		A. Process Code			B. Process Design Capacity (1) Amount	B. Process Design Capacity (2) Unit of Measure	C. Process Total Number of Units	D. Unit Name

7. Description of Hazardous Wastes (Enter codes for Items 7.A, 7.C and 7.D(1))

Line No.		A. EPA Hazardous Waste No.				B. Estimated Annual Qty of Waste	C. Unit of Measure	D. Processes (1) Process Codes								D. Processes (2) Process Description (if code is not entered in 7.D1))

8. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements (**Figure A-1**).

9. Facility Drawing

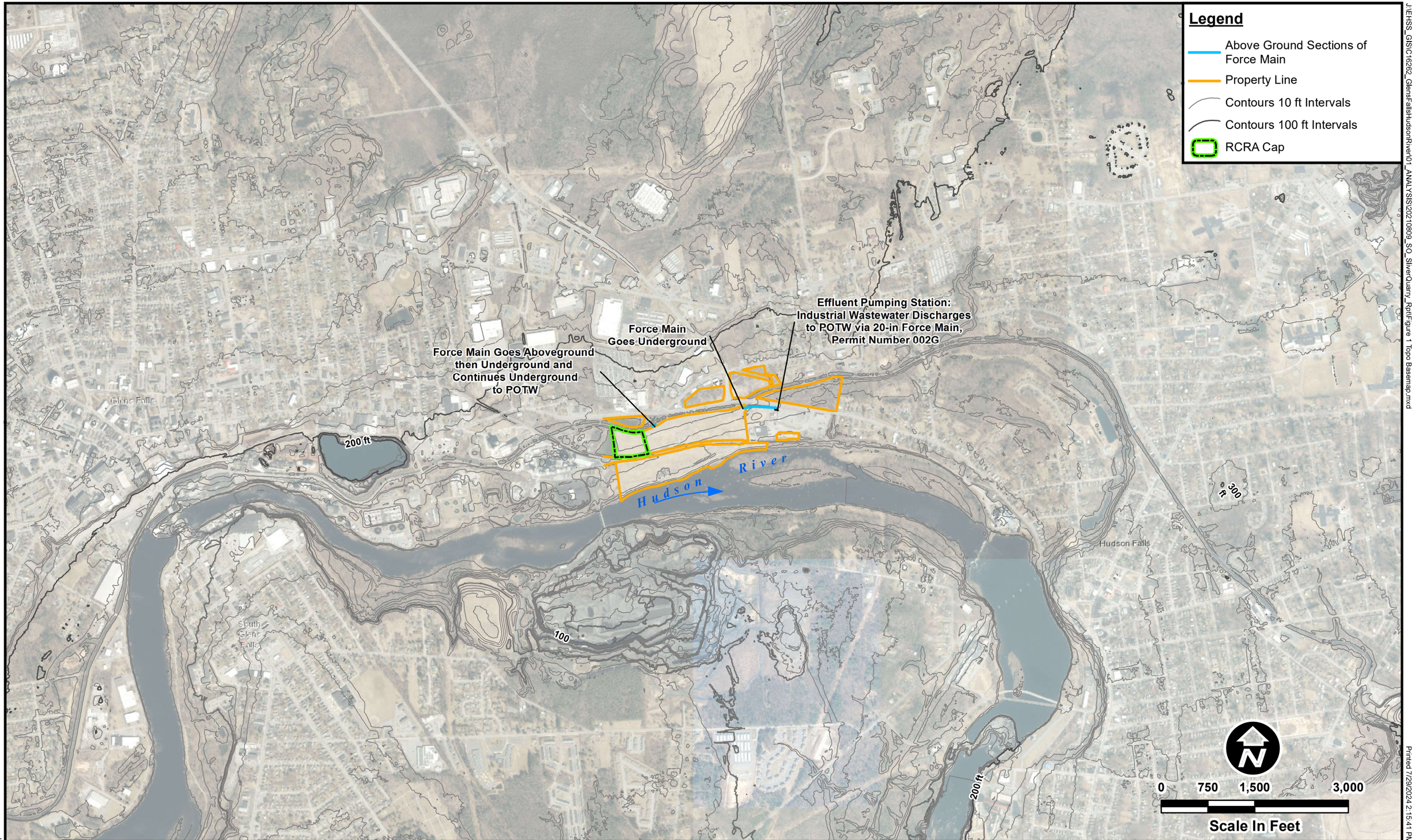
All existing facilities must include a scale drawing of the facility. See instructions for more detail (**Figure A-2**).

10. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. See instructions for more detail (see attached **Photo Log**).

11. Comments

Item 1 & 2: Contact for Hercules: James Vondracek, Contact for BASF: Stephen Havlik. Additional contact information: Elena Dadukova, EHS Support, elena.dadukova@ehs-support.com, 302-440-4401, responsible for permit application preparation, representative for operator Hercules.



Reviewed By:

EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE TOPOGRAPHIC MAP	FIGURE A-1

J:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20210809_SO_SilverQuarry_RptFigure 1 Topo Basemap.mxd

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EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE MAP	FIGURE A-2

Reviewed By: E. Dadukova

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PHOTOGRAPHIC LOG

Facility Name: Former Pacific Valves Facility	Facility Address: Glens Falls, New York	Date of Site Visit: July 25, 2024

Photo No. ***1.***	
Direction Photo Taken: Northeast	
Description: Effluent pumping station	
Photo No. ***2.***	
Direction Photo Taken: Northwest	
Description: Effluent pumping station	

Photo No.	***3.***
Direction Photo Taken: Northwest	
Description: 20-inch force main	



Photo No.	***4.***
Direction Photo Taken: Northeast	
Description: 20-inch force main	



Photo No.	***5.***
Direction Photo Taken: Northwest	
Description: 20-inch force main	



Photo No.	***6.***	
Direction Photo Taken: N/A		
Description: Lift station		

Photo No.	***7.***
Direction Photo Taken: South	
Date Taken: July 25, 2024 Description: RCRA cap	
Photo No.	***8.***
Direction Photo Taken: North	
Description: RCRA cap	

Photo No.	***9.***
Direction Photo Taken: East	
Description: RCRA cap	



Photo No.	***10.***
Direction Photo Taken: West	
Description: RCRA cap	



Photo No.	***11.***	
Direction Photo Taken: Southwest		
Description: Cement Company Pond (sediment cap)		
Photo No.	***12.***	
Direction Photo Taken: Northwest		
Description: Cement Company Pond (sediment cap)		

ATTACHMENT C
SWMU/AOC Current Conditions Report
(to be provided and approved during the Permit period)

ATTACHMENT D
Groundwater Monitoring Plan(s)/ Program
(to be replaced by updated approved document during the Permit period)

Groundwater and Surface Water Monitoring Plan

Ciba-Geigy/Hercules Site - NYSDEC Site #557011
Glens Falls, NY

Prepared for:

HERCULES

Prepared by:

EHS Support℠

May 2021

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Appendix 1 Purge/Sample Log



Acronyms

µg/L	micrograms per liter
µm	micrometer
bgs	below ground surface
COC	constituent of concern
CSM	Conceptual Site Model
DER	Division of Environmental Remediation
DI	deionized
DO	dissolved oxygen
EC	engineering control
EPS	effluent pumping station
GPS	global positioning system
GSMP	Groundwater and Surface Water Monitoring Plan
GWES	groundwater extraction system
HWM	Hazardous Waste Management
IC	institutional control
IDW	investigation-derived waste
mg/L	milligrams per liter
MPS	Main Plant Site
mS/cm	milliSiemens per centimeter
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolt
NTU	nephelometric turbidity unit
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
ORP	oxidation-reduction potential
PCP	Post-Closure Plan
POTW	publicly owned treatment works
PPE	personal protective equipment
PTP	Pretreatment Plant
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SB	Statement of Basis
SWQC	surface water quality criteria
TDS	total dissolved solids
TOC	top of casing

TOGS	Technical and Operational Guidance Series
USDOT	United States Department of Transportation
VOC	volatile organic compound
WAD	weak acid dissociable

Trademarks, trade names, company, or product names referenced herein are used for identification purposes only and are the property of their respective owners.

1 Introduction

On behalf of Hercules Incorporated ("Hercules"; previously acquired by Ashland LLC) and CIBA Corporation ("CIBA") (previously acquired by BASF Corporation), EHS Support LLC ("EHS Support") has prepared this Groundwater and Surface Water Monitoring Plan (GSMP) for groundwater and surface water sample collection and well decommissioning activities associated with the former Ciba-Geigy Corporation pigments manufacturing facility located at 89 Lower Warren Street in the Town of Queensbury near Glens Falls, New York ("the Site"; **Figure 1**). This GSMP was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) *DER-10 / Technical Guidance for Site Investigation and Remediation*, issued May 3, 2010 (NYSDEC, 2010) and 6 New York Codes, Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs, effective December 14, 2006 (NYSDEC, 2006).

1.1 Background

Corrective measure operations, maintenance, and monitoring are conducted for the Site under an NYSDEC Hazardous Waste Management (HWM) Post Closure Permit (NYSDEC Site No. 557011). A renewal of the Part 373 HWM Permit #5-5234-00008/00096 was issued by NYSDEC on March 5, 2015. Hercules and CIBA ("the Parties") are the permittees and share responsibility for ongoing environmental activities at the Site.

After the implementation of corrective measures, some contamination was left at the Site, which is hereafter referred to as "remaining contamination." Institutional controls and engineering controls (ICs and ECs) have been incorporated into the remedy to control exposure to the remaining contamination.

Additionally, an active groundwater remedy is in place at the Site that consists of a groundwater extraction system (GWES). Details related to the GWES operation are provided in the *Revised Remedy Optimization Report* (EHS Support, 2019a).

This GSMP details the groundwater and surface water sampling that will be performed as part of post-closure monitoring, to ensure that the remaining contamination does not pose a risk to public health or the environment.

1.2 Objectives

The objectives of the groundwater and surface water monitoring program are:

- Conduct groundwater and surface water elevation monitoring to assess hydraulic conditions, including performance of GWES operations.
- Implement low flow sampling to provide high-quality groundwater samples for the assessment of monitored parameter concentrations against water quality criteria and GWES performance goals and to assess trends in concentrations over time.
- Compare the concentrations of key Site constituents detected in groundwater to Class GA groundwater quality standards protective of fresh groundwater for drinking water sources. Comparison of groundwater data to GA standards is for reference only. Groundwater on-site is not used and use of on-site groundwater for any purpose is precluded (pursuant to the Deed Notice filed with Warren County).

- Conduct surface water sampling in the Hudson River near the Main Plant Site (MPS) to:
  - Assess the potential presence of monitored constituents from possible upstream sources.
  - Demonstrate that potential constituent mass flux from the Site is not leading to exceedances of NYSDEC surface water quality standards.
- Conduct surface water sampling for free cyanide in the Glens Falls Feeder Canal (Feeder Canal) to confirm that cyanide impacts in groundwater at the Pretreatment Plant Area (PTP Area) property are not leading to an exceedance of the applicable NYSDEC surface water quality standard.

The surface water and groundwater quality standards and guidance values referenced for this project are those in Table 1 of 6 NYCRR 703.5 (NYSDEC, 2020) and NYSDEC Technical and Operational Guidance Series (TOGS 1.1.1) (NYSDEC, 1998). The referenced surface water quality criteria (SWQC) are those published for Class C waters, selected based on New York's classification of the Hudson River in the Site vicinity as "Class C" water, including standards/guidance values for protection of human health (based on water supply or fish consumption) and protection of aquatic life from chronic and acute effects (designated as A[C] and A[A], respectively).

2 Environmental Setting

2.1 Site Geology

The unconsolidated and consolidated lithologies beneath the Site consist of glaciolacustrine and fluvial sediments (overburden) and underlying limestone bedrock. The overburden is a combination of industrial fill and fluvial/glaciolacustrine sands (with some silt and clay), with glaciolacustrine clay (and locally glacial till) at its base.

The bedrock is primarily limestone comprising three geologic formations: Glens Falls Limestone, Isle La Motte Formation (predominantly limestone), and Fort Ann Formation (predominantly calcitic dolostone or dolomitic limestone). The limestone bedrock can be characterized as massive, with limited to no intergranular porosity and with groundwater movement concentrated in fracture (secondary) porosity.

The historical structural forces that have acted upon the regional geology in the study area have created an enhanced secondary porosity of the limestone rock in the form of joints and fractures. Structural fractures formed parallel to bedding planes. The sub-horizontal bedding plane fractures are typically the main contributor to active groundwater flow through secondary porosity development. The more open and continuous these features are, the greater the influence they have on groundwater flow direction. Sub-vertical fractures may influence localized groundwater flow. High-angle joints, which formed almost 90 degrees to the bedding planes, also occur and are mostly mineralized; and hydraulic conductivity associated with these features is likely to be low. Relief of lithostatic load due to erosion during uplift (including isostatic uplift following glaciation) is likely to have been a significant contributor to the opening of horizontal or low-angle bedding fractures to form the water-bearing zones.

2.2 Main Plant Site

2.2.1 Summary of Conceptual Site Model

Historical pigment manufacturing operations at the MPS led to releases of constituents to soil and groundwater, with the primary constituents of concern (COCs) being hexavalent chromium and cyanide. The following is a summary of the hydrogeologic setting and contaminant fate and transport at the MPS. Details regarding these topics were most recently presented in the following reports:

- *Site Conceptualization and Groundwater Corrective Measures Effectiveness Evaluation Report* (EHS Support, 2015)
- *Remedy Optimization Plan* (EHS Support, 2016b)
- *Revised Remedy Optimization Report* (EHS Support, 2019a)

The MPS lies on the bank of the Hudson River. Four groundwater units have been characterized at the Site, with groundwater flow in the limestone bedrock controlled primarily by three zones of open, sub-horizontal, bedding-parallel fracture networks. The four groundwater units are listed below, from shallow to deep:

- *Overburden*: unconsolidated sediments
- *Horizon A (shallow)*: limestone – occurring approximately 40 feet below ground surface (bgs)
- *Horizon B (intermediate):* limestone – Horizon B fracture zone occurs approximately 60 feet bgs
- *Horizon C (deep):* limestone – occurring approximately 160 feet bgs

The bedding plane fracture zones generally become shallower towards the east, with Horizons A and B likely intersecting the top of the bedrock surface in the central and eastern parts of the MPS.

The groundwater flow within the four units is described as follows.

- *Overburden*: Groundwater flow in the overburden is to the south towards the Hudson River, with groundwater likely to discharge to the river under natural (pre-remediation) conditions. The overburden material (native lacustrine sediments, till, and fill) is variably saturated. The Overburden water-bearing zone includes the saturated portions of the fill and lacustrine sands and silts situated above the lacustrine clay unit (and local underlying till) or, where the clay unit is absent, above the bedrock surface. The water-bearing zone is locally thin and discontinuous, with unsaturated areas occurring near the Hudson River. The extent and/or existence of these areas varies with seasonal fluctuations in the groundwater table elevation.
- *Horizon A (shallow)*: Groundwater flow within Horizon A is generally in a southerly direction towards the Hudson River.
- *Horizon B (intermediate)*: Groundwater flow within Horizon B is generally in a southerly direction, with groundwater elevations below the elevation of the Hudson River.
- *Horizon C (deep)*: Horizon C groundwater elevations are below the elevation of the Hudson River, with groundwater flow generally to the west-southwest across the Site. There is a possibility that local dewatering of a quarry located southwest of the Site (on the south side of the Hudson River) may influence the direction of groundwater flow within Horizon C.

Groundwater flow is predominantly to the south, except where overburden groundwater is intercepted by the French Drain system, which is part of the GWES. Based on the data, the French Drain operations influence the groundwater gradient and achieve extraction and capture of overburden groundwater in the vicinity of former Buildings 56 and 8.

The vicinity of the former Buildings 56 and 8, referred to as the Central Area, are where the concentrations of hexavalent chromium and cyanide remain the highest in groundwater. Groundwater concentrations above GA standards are limited to the areas of the Site where the GWES (consisting of overburden French Drain Sumps A and B and intermediate bedrock extraction well EW-B5) continue to operate. Groundwater on-site is not used, and usage is precluded via IC (Deed Notice).

Figure 2 illustrates the alignment of the French Drain and the location of well EW-B5, as well as the locations of the monitoring wells currently present at the MPS.

2.2.2 Metals and Cyanide Speciation and Mobility

In 2015, the Parties performed an assessment of the potential fate and transport mechanisms and speciation of metals and cyanide in groundwater (EHS Support, 2016a). The assessment supported the use of filtered groundwater and surface water samples (utilizing 0.45 µm filters) for ongoing routine monitoring activities at the Site.

The additional sampling and analytical testing were completed in 2015 to assess the form and phase of metals and cyanide in groundwater in the Overburden Horizon. The scope entailed filtering groundwater with sequential size filters (1.0, 0.45 and 0.1 µm sizes) to explore the potential for metal species (particularly chromium) and non-metal species (total and weak acid dissociable [WAD] cyanide species) to be present in groundwater in association with colloids of varying sizes. Traditionally, metals are

analyzed as 'total' in unfiltered samples or 'dissolved' in filtered samples using 0.45 µm filters. A total metal concentration is representative of the entire mass of the metal in the sample and the dissolved fraction is representative of the mass fraction that has a higher potential for mobility, i.e., the fraction less than 0.45 µm in size. For a more detailed view of fate and transport of metals in groundwater, additional filtered samples were collected using 1.0 and 0.1 µm filters and analyzed to evaluate potential colloidal and dissolved phase concentrations of constituents.

Based on the results of total and dissolved sample analysis for metals (cadmium, chromium, lead, mercury, and vanadium), dissolved metals (where detected) in groundwater, with the exception of chromium and vanadium, were lower than total metals concentrations indicating that mobility is low for these constituents. Vanadium appears to be dominated by the dissolved species, which is expected to be mobile. These data indicate that cadmium, lead, and mercury (where detected) are present in large size colloids and not mobile in groundwater at the site. Cyanide is present in groundwater; however, the potential concentrations of WAD and free cyanide are generally low (comprising less than 10% of the total concentration), and under the site conditions (neutral to alkaline pH) WAD and free cyanide are unlikely to form. Chromium speciation is discussed further below.

Overall, where hexavalent chromium was detected, hexavalent chromium comprised all or nearly all of the chromium detected. This data supports the Conceptual Site Model (CSM) geochemical assessment findings that hexavalent chromium is present as soluble ions and is not precipitating and forming colloids (EHS Support, 2015). With the exception of well MW-OB34, the groundwater analytical results support the CSM finding that trivalent chromium at the site is present as primarily insoluble species and within colloid sizes unlikely to be mobile.

Turbidity levels were significantly lower in samples collected in 2015 compared to historical data with few exceptions. Elevated turbidity levels are associated with suspended solids. Metals adsorbed to suspended solids potentially have a lower mobility in groundwater than dissolved metals species, thus results from previous monitoring events (prior to 2015) likely overestimated the concentrations of metals that are mobile in groundwater at the site. Based on analysis of total and filtered samples, sampling using low flow techniques and 0.45 µm filters was deemed effective for evaluating the potential presence of dissolved phase metals in groundwater and subsequently approved by the NYSDEC for routine monitoring activities.

2.2.3 Recent Sampling Results

Analytical results for the Hudson River surface water samples show that concentrations are below applicable surface water quality standards. These results are consistent with the Conceptual Site Model, which indicates that attenuation processes are occurring on-site and within the hyporheic zone prior to discharge to the river, such that the potential flux of constituents from groundwater to the river is not sufficient to result in an exceedance of surface water quality standards.

The long-term trend at the MPS has been an overall decline in groundwater concentrations since the Corrective Measures were implemented in 2003. For example, the magnitude of the concentrations of constituents of interest in overburden groundwater at the historical source area well MW-OB14 (see **Figure 2** for well location) are one to two orders of magnitude lower than when sampling began in the early 1990s.

As detailed in the most recent *Groundwater and Surface Water Monitoring Report for the MPS* (EHS Support, 2021a) remaining GA standard exceedances for hexavalent chromium and cyanide are primarily focused in the Central Area of the MPS, including at overburden well MW-OB14; riverbank overburden wells (MW-OB30 through MW-OB34); the active intermediate bedrock extraction well EW-B5; and deep bedrock well AW-C11 (Horizon C). Multiple lines of evidence demonstrate that these concentrations are not adversely impacting surface water quality (EHS Support, 2019a), and groundwater usage is precluded via IC (Deed Notice).

2.3 Pretreatment Plant Area

2.3.1 Summary of Conceptual Site Model

The PTP Area is a property located to the north of the MPS and is the parcel where operational wastewater was treated during the period of historical operations at the MPS. Groundwater and surface water sampling have been conducted at the PTP Area since the mid-1990s, beginning with the Resource Conservation and Recovery Act (RCRA) Facility Investigation (Eckenfelder, 1992; Eckenfelder, 1993; Eckenfelder, 1994). Based on the historical investigations and monitoring data, only cyanide has been detected in overburden groundwater above NYSDEC GA standards. Cyanide concentrations in groundwater have declined significantly over time, and concentrations above the GA standard are limited to the eastern area of the property.

Bordering the PTP Area property are the Feeder Canal (located to the south) and a marsh area (located to the east). Groundwater generally flows to the east across the PTP Area property, with localized southerly flow in the southwest corner of the property. Shallow groundwater (overburden) is perched, occurring in the thin saturated zone above the lacustrine clay, and lateral groundwater flow is influenced by the configuration and undulations of the surface of the lacustrine clay beneath the property.

As described in the 1994 RFI (Eckenfelder, 1994), "*…the surface of the lacustrine clay unit dips to elevations below the base of the Feeder Canal east of the Pretreatment Plant beneath the marsh area. Thus, groundwater flowing toward the stream and marsh can either discharge to the surface water and eventually flow to the Feeder Canal, or flow under the canal."*

As further described in the 1996 Statement of Basis (SB) (NYSDEC, 1996), *"…the results from the temporary well points along the south side of the canal support the hydrogeologic model of the site. Here groundwater above the clay was absent from the area around the pipe bridge over the canal and to the west. Concentrations of cyanide were detected in the temporary well points installed further to the east indicating that the groundwater was passing beneath the canal in this area*."

2.3.2 Recent Sampling Results

As detailed in the most recent annual *Groundwater and Surface Water Monitoring Report for the PTP Area* (EHS Support, 2020), concentrations of cyanide in groundwater declined following cessation of the historical operations and have been stable to declining for more than a decade. Central area well MW-OB23 continues to have the highest concentration of cyanide detected at the property; however, Mann-Kendall calculations performed for this well demonstrate a declining trend in cyanide concentrations over the past 20 years.

Groundwater sampling data further demonstrates that cyanide concentrations detected in groundwater at the PTP Area property boundary and downgradient of the property have been below the GA standard of 200 micrograms per liter (µg/L) for at least a decade, including:

- MW-OB18 since 2002 (eastern property line)
- MW-OB21 since 2010 (off-Property, south of the Feeder Canal)
- MW-OB22 since 2006 (off-Property, south of the Feeder Canal)

It is noted that comparison of groundwater data to the GA standard is for reference, per DER-10 Guidelines (NYSDEC, 2010). The GA standard was established for the protection of fresh groundwater use as a drinking water source. However, groundwater on-site is not in use, and the use of groundwater for any purpose is precluded (pursuant to the Deed Notice filed with Warren County).

Free cyanide concentrations in surface water samples collected from within the Feeder Canal to the south and the marsh area to the east have routinely been in compliance with the applicable NYSDEC surface water criterion.

3 Monitoring Locations and Sample Analytes

The Site monitoring program is comprised of sampling activities on a semi-annual basis at the MPS (in the spring and fall) and on an annual basis at the PTP (in the fall). Each event includes the collection and analysis of groundwater samples and the gauging of groundwater levels at the sampled wells. The fall events also include the sampling and analysis of surface water samples adjacent to the Site, as well as gauging at a broader network of MPS monitoring wells representing each groundwater horizon (overburden, Horizon A, Horizon B, and Horizon C).

The sampling and analytical programs are summarized in **Table 1** and **Table 2,** and well construction details are provided in **Table 3**.

The locations of monitoring wells and surface water samples included in the monitoring program at the MPS are illustrated on **Figure 2** through **Figure 4**. **Figure 5** illustrates the locations of the monitoring wells and the surface water location that are included in the monitoring program at the PTP Area.

The basis for selection of the monitoring networks and analysis schedules for the MPS and PTP are discussed below. Details regarding field sampling methodologies and laboratory analytical methods are discussed in **Section 4**. Details regarding quality assurance (QA) and quality control (QC) measures, data quality objectives, data validation, and electronica data deliverables are provided in the *Quality Assurance Project Plan* for this Site (EHS Support, 2021b).

The monitoring network and analysis schedule may be modified based on the results of samples and measurements collected over time. Any change to the program will be proposed in writing to NYSDEC, with any reduction in monitoring frequency or scope subject to approval prior to implementing the change.

3.1 Fall Monitoring Program

3.1.1 Main Plant Site

The comprehensive monitoring events conducted at the MPS each fall include the sampling of wells in each area of the MPS (Western, Central, and Eastern) and in each groundwater horizon (overburden, Horizon A, Horizon B, and Horizon C), for the Site COCs in order to demonstrate current conditions and trends in water quality. Fall monitoring events also include water level gauging at a broader network of monitoring wells to support preparation of potentiometric surface maps and to support the evaluation of GWES performance. Finally, fall monitoring events at the MPS include sampling surface water in the Hudson River at locations upstream, adjacent to, and downstream of the MPS.

The sampling locations cover the following areas:

- Downgradient of the RCRA cap and historical waste handling/fill areas in the Western Area of the Site
- Within and downgradient of areas with persistent/elevated hexavalent chromium and/or cyanide in groundwater (historical process/fill areas in the Central Area of the Site)
- Shallow groundwater in the Eastern Area of the Site where French Drain Sump C is no longer operated, per the NYSDEC-approved Remedy Optimization Plan (EHS Support, 2016b)

- Surface water upstream (SW-4), adjacent (SW-3 and SW-2), and downstream (SW-1) of the key groundwater impact areas (note that the surface water sampling locations proposed may be slightly modified based on field conditions encountered to ensure safe sampling can be performed)

Groundwater and surface water samples will be collected at the locations summarized in **Table 1.** The fall monitoring event includes the analysis of key Site COCs in groundwater based on mobility (hexavalent chromium and cyanide), along with the analysis of dichlorobenzenes at one well. Surface water samples are analyzed for dissolved chromium and vanadium, hexavalent chromium, and free cyanide. Surface water samples are also analyzed for total dissolved solids (TDS) and hardness to assist in the documentation of GWES influence and for calculation of surface water quality standards/guideline values (as outlined in 6 NYCRR Part 703.5 [NYSDEC, 2020]) for comparison with sample analytical results.

3.1.2 Pretreatment Plant Area

Approximately 35 rounds of sampling have been performed at the PTP Area property. Historically, sampling was performed as often as semi-annually; the frequency of sampling and reporting has been annual since 2010. The last remaining aboveground historical wastewater treatment structures (i.e., the former PTP Building and tank T-110) were demolished and removed from the PTP Area in March 2018. Post-demolition soil and groundwater sampling were performed in May 2019, with the results provided to the NYSDEC in the *Soil and Groundwater Sampling Report for the Pretreatment Plant Area* (EHS Support, 2019b). The soil and groundwater samples collected at the PTP Area in May 2019 showed no evidence of a release of constituents of potential concern from former tank T-110 or from the sumps in the former PTP building.

The central area well MW-OB23 continues to have the highest concentration of cyanide on the property; however, Mann-Kendall calculations performed for this well demonstrate a declining trend in cyanide concentrations over the past 20 years.

A focused approach to sampling at the PTP Area will be performed during fall sampling events, with gauging and groundwater sample collection at well MW-OB23 and a downgradient well (MW-OB19) for cyanide analysis. A surface water sample will also be collected at one location in the Feeder Canal (SG-11) along the southern property boundary for free cyanide analysis, to confirm the continued compliance with the applicable NYSDEC surface water criterion. SG-11 is located near an opening in the north wall of the Feeder Canal that allows the stream east of the PTP to enter the canal; therefore, this is a more conservative sampling location than a sample location within the canal walls or in the marsh area to the east.

3.2 Spring Monitoring Program

Five wells at the MPS will be sampled during spring monitoring events to provide additional data to support the assessment of long-term concentration trends at those locations. The five monitoring wells for these focused events were selected because the wells either have persistently elevated concentrations of COCs (i.e., well EW-B5) or show a higher degree of variability than other wells at the Site, such that semi-annual groundwater monitoring is warranted (i.e., wells MW-OB14, MW-OB30, MW-OB32, and AW-C11).

4 Field Sampling Methodology

Water level gauging, groundwater sampling, and surface water sampling will be performed at the locations summarized in **Table 1** and analyzed using the laboratory methods summarized in **Table 2. Appendix 1** contains a template of the Site-specific purge/sample log.

4.1 Water Level Gauging

Water levels will be measured at the groundwater wells and staff gauges detailed in **Table 1.** In summary, the water level gauging program includes:

- Groundwater levels in monitoring wells prior to sampling (spring and fall events)
- Surface water level at staff gauge SG-12 in the Hudson River adjacent to the MPS (spring and fall events)
- Groundwater levels in additional monitoring wells at the MPS to support preparation of updated potentiometric surface maps for all groundwater horizons (fall events)

Well construction details for the wells included in the gauging programs for the MPS and PTP Area are provided in **Table 3**.

If possible, gauging will be completed within one 24-hour period (or as soon as achievable) at all wells scheduled for monitoring (including MPS and PTP wells when events are concurrent). Gauging will be conducted using an electronic level meter/interface probe that emits an audible/visual signal when in contact with water.

At each location, the well/gauge cap will be removed and any pressure/vacuum in the casing will be allowed to equilibrate prior to water level measurement. The gauge will be slowly lowered into the casing, avoiding contact with the casing wall, until reaching the water surface. The depth to water will be measured relative to the top of casing at the marked reference point (survey point). If a reference mark is not found on the top of casing, measurement will be referenced to the north side of the top of casing (standard reference for survey). The total well depth will also be measured by lowering the probe to the bottom of the well, making gentle contact to minimize the potential for disturbing the bottom sediments. The interface probe (and probe measure tape line that was introduced into the well) will be cleaned prior to use in each well.

The date, time, and depth to water and total depth measurements (to the nearest 0.01 foot) will be recorded in field logbooks. The depth to water data will be used in conjunction with top of casing survey data to evaluate water potentiometric surface levels and groundwater flow direction. The total well depths will be compared to well construction data to assess changes in well conditions (e.g., accumulation of sediment).

During the gauging program, visual observations of on-grade facilities (e.g., risers, monuments, well pads) will be made and signs of damage and/or conditions that may affect function will be recorded in field logbooks, along with any other observations (e.g., blockage/other issues encountered during gauging) that indicate repair and/or maintenance may be needed. Daily observations of general ambient weather conditions (e.g., sunny, rainfall, temperature) during the field activities will also be recorded in the field log books. The occurrence of rain events in the week prior to and during the sampling activities

will also be recorded. Barometric pressure will be measured by a transducer probe, with data recorded electronically.

4.2 Groundwater Sampling

4.2.1 Grab Sampling

Low-flow sampling cannot be performed at well EW-B5, which is an active groundwater extraction well screened in the intermediate bedrock groundwater horizon, or at active Sumps A and B in the French Drain; therefore, grab samples will be collected at these locations.

The sampling methodology for groundwater grab samples will be as follows:

1. The well or sump ID, date, time, name of personnel conducting sampling, and Site conditions (weather, barometric pressure) will be recorded on a field sampling log. Details regarding sampling equipment used (e.g., pump type, field parameter instruments, filters), field measurements made, sample names, and QC sample information (i.e., data for duplicate or matrix spike/matrix spike duplicate [MS/MSD] samples collected, and equipment blank samples collected before or after well samples) will also be recorded.
2. The cover will be removed, and a water level probe will be lowered into the well or sump until the water surface is detected, and the depth to water (relative to the top-of-casing [TOC] for monitoring wells or the top-of-vault for the French Drain sumps) will be recorded.
3. Grab groundwater samples will be collected using either a clean bailer or clean tubing and a pump appropriate for the depth of the well or sump.

4.2.2 Low-Flow Sampling

For all other groundwater wells included in the monitoring program, low-flow sampling methods will be employed to minimize disturbance, turbidity, and changes in water chemistry during sample collection, filtering, and bottling. Low flow sampling will be conducted in accordance with *US Environmental Protection Agency – Low Stress (low flow) Purging and Sampling Procedure* (USEPA, 2017). The goal of the low flow sampling is to collect samples that reflect inorganic loads (dissolved and colloidal-sized fractions) that are transported in groundwater through the subsurface under ambient flow conditions with minimal chemical and physical alterations due to sampling.

This sampling methodology aims to minimize hydraulic stress at the well/formation interface by maintaining low water level draw-downs and using low pumping rates during purging and sampling. Indicator field parameters (i.e., turbidity, dissolved oxygen [DO], specific conductivity, temperature, pH, and oxidation-reduction potential [ORP]) will be used to assess stabilization in water quality and determine when sampling will begin.

Low flow purging and sampling will be conducted using polyethylene tubing and either bladder pumps with adjustable flow control and disposable bladders or peristaltic pumps. The clean tubing placed in a given well may be left in-place for use in future sampling events. Monitoring of field parameters will be conducted using a flow through cell (closed system cell) and multi-parameter meter. Filtration will be conducted using disposable in-line 0.45 micrometer (µm) pore size filters. Thus, the only non-disposable/non-dedicated equipment used at each well will be the bladder pump (where applicable).

The bladder pump will be cleaned and have a new disposable bladder installed prior to use in each well (refer to **Section 4.6**).

Groundwater purging and sampling will be conducted as follows:

1. The well ID, date, time, name of personnel conducting sampling, and Site conditions (weather, barometric pressure) will be recorded on a field purging and sampling log. Details regarding sampling equipment used (e.g., pump type, field parameter instruments, filters), field measurements made, sample names, and QC sample information (data for duplicate or MS/MSD samples collected, and equipment blank samples collected before or after well samples) will also be recorded.
2. The well cap will be removed and a water level probe will be lowered into the well until the water surface is detected, and the depth to water (relative to the TOC) will be recorded. The level probe will remain in the well throughout purging and sampling.
3. The depth to the pump intake (relative to the TOC) will be recorded on the sampling log.
4. Whether using a bladder pump or a peristaltic pump, the depth to the pump intake should be at the mid-level (approximate) of the water column (calculated based on the depth to water and the total well depth measured during pre-sample gauging, refer to **Section 4.1**). Where the water column is above the well screen, the pump intake should be located at the mid-point of the screened/open bore interval. The pump intake shall be at least 2 feet above the bottom of the well.
5. The pump discharge tubing shall be connected to the flow through cell, and the discharge tubing from the cell shall be set to discharge to a bucket or other container for purge water collection. Tubing length from the well to the flow through cell and associated monitoring equipment shall be minimized to reduce impact of the ambient environment (e.g., temperature variance from downhole conditions). Connection to the flow through cell may be delayed as appropriate to minimize potential for significant particulate and/or sediment discharge into the cell.
6. The pump will be started at a low rate. The operating speed will be increased until discharge is achieved at a target rate within approximately 100 to 250 milliliters per minute (mL/min). The tubing will be monitored to ensure pump suction is not broken and to avoid kinking the line. Pumping rate adjustments and the corresponding time they are made will be recorded.
    a. The water level drawdown will be monitored and pumping rate adjusted to achieve steady pumping and stable drawdown of less than 0.3 feet; the pumping rate will be reduced if needed to minimize and achieve stable drawdown. If drawdown at the minimum flow rate achievable exceeds 0.3 feet, continue to monitor for stable drawdown. Record any pumping rate adjustments.
    b. Flow rates will be confirmed using a timer and graduated cylinder/bucket to collect purged water.
7. The water level will be recorded at maximum intervals of 2 to 3 minutes during the first 10 minutes of pumping, and at approximately 5 to 10-minute (or as appropriate) intervals thereafter to assess drawdown stability.
8. During purging, the field indicator parameters (i.e., turbidity, temperature, specific conductance, pH, DO, ORP) will be read and recorded at approximately 5-minute intervals (or such interval that allows complete flow-through cell volume change-out based on pump rate and cell volume).
    a. During purging, the flow-through cell should remain full (no draining/entrainment of air to ensure proper probe function).



   b. Conditions will be considered stabilized and ready for sample collection when the indicator parameters are stabilized over three consecutive readings as follows (USEPA, 2017):
      i. ±0.1 for pH
      ii. ±3% for conductivity (mS/cm)
      iii. ±10 millivolts (mV) for ORP
      iv. ±10% for DO (10% for values greater than 0.5 milligrams per liter [mg/L]; however, if three DO values are less than 0.5 mg/L, readings will be considered stabilized)
      v. Turbidity is ±10% (10% for values greater than 5 nephelometric turbidity units [NTU], if three values are less than 5 NTU, readings will be considered stabilized)
   c. Observations for parameter stabilization will follow stabilization of drawdown. Final purge volume should be greater than the stabilized drawdown volume plus the pump's tubing volume.
9. Once stabilization is established, sample collection should occur at the same rate as purging. The time and depth to water will be recorded when sample collection begins.
   a. Samples will be collected directly from the pump tubing line (after disconnection from the flow-through cell), and containers should be filled with minimal turbulence by allowing the water to flow from the tubing gently down the inside of the container. The bottom of the tubing should be held near the base/side of the sample container to minimize oxygenation and splashing of the sample, taking care not to bring the tubing in contact with the bottle or preservative that may be present in the bottle. Upon sample collection, sample containers will be sealed, labeled, and stored in a cooler with ice for transport to the laboratory under chain-of-custody documentation.
   b. Sample filtering will be conducted using disposable in-line cartridge filters (0.45 µm), connected directly to the pump discharge line, and the sample filtrate will be discharged directly (via tubing) into sample containers (as noted above). Alternatively, if in-line filtration cannot be achieved, vacuum assist filters (hand pump and cylinder apparatus) may be used. Further details regarding sample filtration methodology are provided in **Section 4.4**.
10. Where stabilization cannot be achieved or insufficient yield conditions are encountered, purging may be suspended, with the well allowed to recharge overnight and grab samples collected the following day (within 24 hours of purging). Such conditions and the associated rationale will be noted on the purge/sample log.

Groundwater sampling will be performed using the laboratory-supplied sample containers summarized in **Table 2**. Upon sample collection the sample containers will be sealed, labeled, and placed in a cooler with ice for transport to the laboratory under chain-of-custody documentation.

When sampling is completed, the time and depth to water will be recorded, the level meter and pump will be removed from the well, and the well cap will be closed. If desired, the tubing may be disconnected from the pump and left to remain in the well (hung by securing the top end to the well casing/cap) for re-use in future sampling events.

4.3 Surface Water Sampling

Surface water samples will be monitored for field parameters (DO, turbidity, pH, temperature, conductivity, and ORP) using field meters. Sampling data (personnel, date, time, field parameter measurements, and sample visual observations) will be recorded on field sampling logs. In addition, relevant observations regarding weather and other concurrent activities in the vicinity that may affect sampling conditions will be recorded. After sample collection, the sample containers will be sealed, labeled, and placed in a cooler with ice for transport to the laboratory under chain-of-custody documentation.

4.3.1 Main Plant Site

Surface water samples at the MPS will be collected from shore using a peristaltic pump and disposable tubing. The tubing will be secured to a polyvinyl chloride (PVC) pipe (or other stable fixed point) lowered into the water and held in place. The tubing will be lowered into the water to a depth within 6 to 12 inches below the water, but above the river bottom.

The pump will be started and water will be pumped through the tubing to a flow-through cell to measure field parameters. Observations will be recorded on the field sampling log. Immediately following the field parameter measurement, the discharge tubing will be disconnected from the flow-through cell and water will be pumped directly through the line into sample containers. Sample disturbance will be minimized by allowing the water to flow from the tubing gently down the inside of the container. The bottom of the tubing will be held near the base/side of the sample container to minimize oxygenation and splashing of the sample, taking care not to bring the tubing in contact with the bottle or preservative that may be present in the bottle.

Samples for chromium, hexavalent chromium, and vanadium analysis will be filtered in the field using disposable in-line cartridge filters (0.45 µm) connected directly to the pump discharge line, and the sample filtrate will be discharged directly (via pump tubing) into sample containers. Further details regarding sample filtration methodology are provided in **Section 4.4**.

4.3.2 Pretreatment Plant Area

Surface water samples collected at the PTP will be collected as grab samples from the canal using clean dip sample containers. The samples will be transferred from the dip to the laboratory-supplied sample containers, pouring slowly to minimize agitation. Field parameters will be measured on a split of the sample, and observations will be recorded on the field sampling log.

4.4 Field Filtering for Dissolved Analysis

Samples for dissolved metals analysis will be filtered in the field using 0.45 µm filters. Direct in-line filtering of groundwater and surface water from the low flow pump discharge line is preferred. For in-line filtering, pump flow rates should be as low as possible (based on the well purge methodology in **Section 4.2**). Polyethylene or polypropylene tubing should be used for the collection of samples. Field filtering steps will include:

- Attach the filter in-line assembly to the pump discharge line when groundwater field parameters have stabilized.

- Ensure the filters are pre-rinsed with groundwater and there are no air bubbles within the tubing or filter prior to sample collection.
- Ensure sample bottles have preservative as required per the analyte and analysis.
- Ensure each sample container is slightly overfilled and immediately sealed with no air bubbles.
- Label all sample containers filled with filtered groundwater with the sample location, date, time, and filter size.
- Place the samples in a cooler with ice for transport to the laboratory under chain-of-custody documentation.
- Use filters (or filtration units) at one location only and dispose of appropriately.

All sample collection and filtering activities are to be undertaken using the above methodology in conjunction with the USEPA low flow purging and sampling guidelines (USEPA, 2017) and the USGS Protocol for the Collection of Filtered Samples (USGS, 1994).

4.5 Sample Preparation and Shipment

Table 2 details the sample container requirements for each laboratory method. Groundwater and surface water sample containers will be pre-preserved as required to retard chemical and biological changes that may occur in response to changes in physical conditions. The chemical preservative will be added to the sample containers by the laboratory prior to shipment to the field. Once samples are collected in the pre-preserved containers, the containers will be checked for tightness, labeled, placed in re-sealable plastic storage bags, stored in a cooler containing ice/ice packs, and shipped to the laboratory under chain-of-custody documentation.

4.6 Quality Assurance/Quality Control

The sampling program will incorporate the following QA/QC procedures.

- Field instruments will be calibrated daily (at the start of field activities) in accordance with the manufacturer's directions. The make and model number of the equipment, date, time, and calibration data will be recorded in field logbooks.
- At least one equipment blank will be collected daily to assess the effectiveness of decontamination procedures. Following decontamination of the bladder pump, a clean bladder and tubing will be installed and a blank will be collected by submerging the pump into laboratory-grade water in a clean container, and pumping water through the sample train into sample containers provided by the laboratory. The blank sample ID, date, and time of collection, and note of the wells in which the pump was used before and after the blank collection will be recorded in the field logbook.
- One equipment blank will be collected from the surface water sampling train (peristaltic pump with tubing and in-line filter) prior to collection of surface water samples during the sampling event. The blank will be collected using laboratory-grade water and the same type of equipment, process, and handling procedures used to collect the surface water samples (pump laboratory-grade water through sample train to laboratory-supplied containers). The date, time, and identity of the blank will be included on the sample label and recorded in the field logbook along with details regarding how the blank was collected.
- Duplicate groundwater and surface water samples will be collected at a frequency of 5 percent (1 per 20 sampling locations) for each sample type (groundwater and surface water). Duplicate

samples will be collected and handled using the same methodology employed for original samples and will be analyzed for the same suite of analytes as the original samples.

- MS/MSD samples will be collected at a frequency of 1 per 20 sample locations for each media sampled (surface water and groundwater). The samples will be collected, handled, and analyzed the same as original samples. In the event that insufficient sample volumes can be achieved for MS/MSD sample collection (due to low yield of groundwater), a request will be submitted to the laboratory to prepare and analyze an MS/MSD sample from existing original sample volumes if possible.
- A trip blank will accompany all shipments of volatile organic compound (VOC) samples.
- Personnel will don clean gloves prior to collection of samples in each location (and as needed during sampling process to avoid contamination of samples). Samples will be collected in clean containers provided by the laboratory. The required preservative will be included in the bottles prepared by the laboratory.
- Sample containers will be filled such that no air remains in the container and then capped. Immediately following collection, the containers will be sealed (lids closed); labeled with the sample ID, date, time, and filter size (as applicable); put in a resealable plastic bag; and placed in a cooler with ice/ice packs for storage and transport to the laboratory. A temperature blank will be included with each cooler of samples for use by the laboratory to document the temperature upon receipt.
- Chain-of-custody documents will be prepared for each container (cooler) of samples transported to the laboratory. The chain-of-custody form will be completed in the field and will accompany the samples from the time of collection through shipment and receipt by the laboratory. Copies of completed chain-of-custody forms will be included in the laboratory reports.

4.7 Decontamination and Water Management

Decontamination procedures for field personnel and equipment will be followed to protect the health and safety of those present, to maintain sample integrity, and to minimize the movement of potential constituents between the work area and off-site locations. Non-dedicated (reusable) equipment used on-site will be decontaminated prior to beginning work, between sampling locations and/or uses, and prior to demobilizing from the Site.

4.7.1 Personal Decontamination

To avoid cross-contamination, disposable nitrile gloves will be worn by the sampling team and changed between sampling points.

4.7.2 Small Equipment Decontamination

Non-dedicated small groundwater sampling equipment may include, but is not limited to, water level meters or oil/water interface probes and pumps. Non-dedicated small equipment will be decontaminated at the sample locations. When possible, dedicated, pre-cleaned or disposable sampling equipment will be used down-hole (e.g., tubing).

The required decontamination tools and supplies are:

- Potable water
- Phosphate-free detergent (such as Alconox)



- Deionized (DI) distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes
- Personal protective equipment (PPE) in accordance with the Health and Safety Plan procedures

Non-dedicated equipment will be decontaminated prior to initial use, between locations, and before leaving the Site using a non-phosphate detergent wash, potable water rinse, and a DI/distilled water rinse.

The decontamination procedure described above is summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. DI/distilled water rinse

Disposable equipment and other trash generated during these activities will be contained and managed as solid waste.

4.7.3 Management of Investigation-Derived Waste

The following are types of investigation-derived waste (IDW) that will be containerized and discharged to the on-site effluent pumping station (EPS) for discharge to the publicly owned treatment works (POTW) along with groundwater pumped via the GWES:

- Decontamination fluids
- Purge water
- Groundwater displaced during well decommissioning

The following types of IDW will be containerized in United States Department of Transportation (USDOT)-approved 55-gallon steel drums and disposed of off-site as municipal waste:

- PPE
- Disposable sampling equipment
- Well construction debris (protective covers, concrete pads, and/or PVC casing, etc.)

The drums will be labeled with the type of IDW, locations collected, and date, and will be temporarily stored on-site. IDW will then be disposed of per the requirements of Section 3.3(e) of DER-10 (NYSDEC, 2010).

4.8 Well Decommissioning Procedures

Well decommissioning will follow procedures to satisfactorily decommission a groundwater monitoring well per *CP-43 Groundwater Monitoring Well Decommissioning Policy* (NYSDEC, 2009). Well decommissioning will be completed after the assessment of well construction information and current subsurface conditions. The appropriate decommissioning method(s) will be selected to protect groundwater and suit the conditions and circumstances, as outlined below.

The overburden monitoring wells at the Site monitor a single, unconfined water-bearing zone and are generally shallower than 25 feet bgs. Bedrock wells at the Site generally range in depth from 30 feet bgs to 160 feet bgs. The soil and groundwater in the vicinity of the wells are potentially contaminated.

The expected method for decommissioning wells at the Site is grouting in-place. Wells will be tremie grouted in-place to 5 ft bgs with the appropriate grout mixture. Once grouted, the PVC casing will be cut at 5 ft bgs.

Prior to decommissioning, the total well depth will be measured to verify location and to approximate the grout mixture amount. Grouting will take place before removing the protective casing to ensure no materials collapse into the well. The protective casing materials will be removed and the area will be backfilled and restored to match the surrounding ground surface (topsoil and grass, asphalt, concrete, etc.). Waste will be managed as described in **Section 4.7.3.**

The NYSDEC and property owners will be notified prior to any well decommissioning activities.

5 POTW Discharge Sampling

Groundwater is pumped as part of the corrective measures at the Main Plant Site utilizing sumps in the French drain (Sump A and Sump B) and an extraction well (well EW-B5). The groundwater is discharged to a wet well at the effluent pumping station (EPS) building at the Site to be equilibrated before being pumped to the City of Glens Falls POTW. After equilibration, the water is monitored for pH and flow in accordance with the POTW Industrial User Permit (City of Glens Falls, 2017). The pH meter and flow meter are calibrated annually.

The water quality is sampled on a quarterly basis from a port located at the POTW in accordance with the permit requirements. **Table 4** summarizes the POTW discharge sampling program, including the sampling frequency, the laboratory analytical parameters, and the permit limits.

6 Reporting Schedule

6.1 Groundwater and Surface Water Reporting

An annual groundwater and surface water monitoring report will be prepared and submitted to NYSDEC on March 1 of each year. The report will detail all groundwater and surface water sampling conducted at the MPS and PTP in the previous calendar year and will contain all information required under NYSDEC DER-10 (NYSDEC, 2010).

6.2 POTW reporting

The POTW discharge sampling results are reported quarterly to POTW. POTW sampling results are also included in the annual Operations and Maintenance Report submitted to NYSDEC on March 1 of each year.

7 References

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Tables

Table 1
Sampling and Gauging Summary - Groundwater and Surface Water Monitoring
Former Ciba-Geigy Facility, Glens Falls, NY

Gauge & Sample	Area of the Property	Sampling Frequency	Total Cyanide[1]	Chromium and Hexavalent Chromium[2]	Free Cyanide[3]	Vanadium[2]	1,2-, 1,3-, and 1,4-Dichlorobenzenes	Total Dissolved Solids[4]	Hardness	Sampling Pump
Overburden Groundwater Wells										
IP-4	MPS - Western	Annual	1	1						0.75" Bladder or Peristaltic Pump
MW-26 or MW-28 [5]	MPS - Western	Annual	1	1						Peristaltic Pump
MW-31	MPS - Eastern	Annual	1	1						1.75" Bladder Air Tank or Peristaltic Pump
MW-OB14	MPS - Central	Semi-Annual	1	1						1.75" Bladder Pump or Peristaltic Pump
MW-OB25	MPS - Central	Annual	1	1						1.75" Bladder Pump or Peristaltic Pump
MW-OB26	MPS - Central	Annual	1	1						1.75" Bladder Pump or Peristaltic Pump
MW-OB30	MPS - Central	Semi-Annual	1	1						Peristaltic Pump
MW-OB31	MPS - Central	Annual	1	1						Peristaltic Pump
MW-OB32	MPS - Central	Semi-Annual	1	1						Peristaltic Pump
MW-OB33	MPS - Central	Annual	1	1						Peristaltic Pump
MW-OB34	MPS - Central	Annual	1	1						Peristaltic Pump
MW-OB19	PTP	Annual	1							Peristaltic Pump
MW-OB23	PTP	Annual	1							Peristaltic Pump
AP-2	MPS - Annual Gauging Only									
BP-6										
BP-9										
MW-9										
MW-26										
MW-OB2										
MW-OB5										
MW-OB7										
MW-OB13										
MW-OB15										
MW-OB24										
MW-OB27										
WP-CC-12										
Sumps - Groundwater										
Sump A	MPS - Central	Annual	1	1						Grab
Sump B	MPS - Central	Annual	1	1						Grab
Shallow Groundwater Bedrock Wells										
AW-A11	MPS - Central	Annual	1	1						1.75" Bladder Normal
AW-A14	MPS - Central	Annual	1	1						1.75" Bladder Normal
MW-25S	MPS - Western	Annual	1	1						1.75" Bladder Normal
AW-A2	MPS - Annual Gauging Only									
AW-A4										
AW-A10										
AW-A15										
MW-19										
MW-27S										
MW-36S										
P-A1										

Table 1
Sampling and Gauging Summary - Groundwater and Surface Water Monitoring
Former Ciba-Geigy Facility, Glens Falls, NY

Gauge & Sample	Area of the Property	Sampling Frequency	Total Cyanide[1]	Chromium and Hexavalent Chromium[2]	Free Cyanide[3]	Vanadium[2]	1,2-, 1,3-, and 1,4-Dichlorobenzenes	Total Dissolved Solids[4]	Hardness	Sampling Pump
Intermediate Groundwater Bedrock Wells										
AW-B4	MPS - Central	Annual	1	1						0.75" Bladder
EW-B5	MPS - Central	Semi-Annual	1	1						Grab
AW-B18	MPS - Western	Annual	1	1			1			1.75" Bladder Normal
AW-B2	MPS - Annual Gauging Only									
AW-B3										
AW-B11										
AW-B17										
AW-B19										
AW-B20										
MW-10B										
MW-20D										
MW-25D										
MW-30D										
MW-36D										
MW-40B										
Deep Groundwater Bedrock Wells										
AW-C2	MPS - Western	Annual	1	1						1.75" Bladder Air Tank
AW-C11	MPS - Central	Semi-Annual	1	1						1.75" Bladder Air Tank
AW-C1	MPS - Annual Gauging Only									
AW-C7										
AW-C8										
AW-C9										
AW-C10										
MW-20C										
MW-36C										
Surface Water Samples										
SW-01	MPS - Downriver	Annual		1	1	1		1	1	Grab
SW-02	MPS - Central	Annual		1	1	1		1	1	Grab
SW-03	MPS - Central	Annual		1	1	1		1	1	Grab
SW-04	MPS - Upriver	Annual		1	1	1		1	1	Grab
SG-11	PTP	Annual			1					Grab
SG-12	MPS	Semi-Annual	Gauging Only							

Notes:
MPS = Main Plant Site
PTP = Pretreatment Plant Site
1 = Total cyanide is an unfiltered sample.
2 = Chromium, hexavalent chromium, and vanadium samples filtered in the field using 0.45 micrometer (µm) filters
3 = Free Cyanide is an unfiltered sample. Free Cyanide samples are to be collected per lab instructions.
4 = Total Dissolved Solids are to be laboratory-derived, not calculated.
5 = MW-28 has produced insufficient water for sampling during some previous groundwater sampling events. If well MW-28 is unable to be sampled, well MW-26 will be sampled as a substitute.

Table 2
Laboratory Method Summary - Groundwater and Surface Water Monitoring
Former Ciba-Geigy Facility, Glens Falls, NY

Analyte	Groundwater Quality Standard GA standard[1] (µg/L)	Surface Water Quality Standard[1] Class A, B, C (µg/L)	Method Number	Media	Anticipated Reporting Limit (µg/L)	Sample Container Type	Container Volume (each in mL)*	No. Containers per sample	Preservation	Holding Time
Geochemistry Parameters										
Total Dissolved Solids	not screened	not screened	SM2540C	Water	10,000	Plastic	500	1	Cool, < 6 deg. C.	7 days
Hardness	not screened	not screened	SM2340C	Water	2,000	Plastic	250	1	HNO3 to pH<2	6 Months
Dissolved Metals										
Chromium	50	calculated*	SW846 6020A	Water	1.5	Plastic	250	1	Filtration + HNO_3 to pH<2	6 Months
Vanadium	n/a	190 A(A) 14 A(C)			2					
Hexavalent Chromium	50	16 A(A) 11 A(C)	EPA 218.6	Water	0.3	Plastic	125	1	Filtration + NH4OH/(NH4)2SO4	28 days
Cyanide										
Total Cyanide	200	9000 H(FC)	SW846 9012B	Water	10	Plastic	250	1	NaOH to pH>12, Cool, < 6 deg. C.	14 Days
Volatile Organic Compounds										
Dichlorobenzenes (1,2-; 1,3-; and 1,4-)**	3	5	SW846 8260C	Water	1	Glass VOA	40	3	HCl to pH<2, Cool, < 6 deg. C.	14 Days
Free Available Cyanide										
Free Cyanide	n/a	5.2 A(C) 22 A(A)	OIA-1677	Water	2	Glass VOA	40	1	lead-acetate strip test for sulfide 40 mL VOA with NaOH or if sulfide detected 40 mL VOA no preservative	14 Days or 24 hrs

Notes:
* = indicates A(A) and A(C) values are calculated based on hardness
** = GA standard for dichlorobenzenes (DCB) applies individually to isomers (1,2-DCB; 1,3-DCB; and 1,4-DCB). Surface water A(C) value applies to the sum of the isomers.
µg/L = micrograms per liter
A(C) = protective of fish propagation in fresh waters - applicable to dissolved phases only (acid soluble phase for vanadium)
A(A) = protective of fish survival in fresh waters - applicable to dissolved phases only (acid soluble phase for vanadium)
DCB method will allow reporting to less than 3 µg/L with applicable qualification
deg C = degrees Celsius
GA = protective of fresh groundwaters for drinking water source
H(FC) = protective of human health for fish consumption
HCl = hydrochloric acid
HNO3 = nitric acid
mL = milliliters
n/a indicates no screening value available. Total metals criteria may be used for screening dissolved metals that have no screening value available.
NaOH = sodium hydroxide
NH4OH = ammonium hydroxide
(NH4)2SO4 = ammonium sulfate
not screened = indicates not a site-related constituent; data used for geochemical assessment/developing surface water criteria only
NYCCR = New York Codes, Rules and Regulations
NYS = New York State
TOGS = Technical and Operational Guidance Series
VOA = volatile organic analysis
1 = 6 NYCCR 703.5, Table 1 Water Quality Standards Surface Waters (or Water Quality Guidance Values from NYS Dept. of Water TOGS 1.1.1 as noted.

Table 3
Well Construction Details
Former Ciba-Geigy Facility, Glens Falls, NY

Well ID	Horizon	Installation Date(s)		Flushmount/ Stick-up	Well Diameter (inches)	Installed Depth (ft. bgs)	Screen Length (ft.)	Screen Slot Size (inches)	Screened Interval (ft bgs)	Screen Type	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	Northing (NAD27)	Easting (NAD27)
MAIN PLANT SITE WELLS														
AP-2	Overburden	10/12/10	10/12/10	Flushmount	1	20	10	0.010	10 - 20	PVC	240.04	--	1205985.945	691911.996
IP-4	Overburden	05/14/92	05/14/92	Stick-up	1	8.5	3.5	0.010	5 - 8.5	PVC	249.40	245.30	1206327.230	691873.870
MW-26	Overburden	--	--	Stick-up	2	~8	5	unknown	3 - 8	PVC	242.10	235.90	1205830.160	691363.760
MW-28	Overburden	--	--	Stick-up	2	~12	5	unknown	7 - 12	PVC	240.20	239.40	1205892.940	691578.260
MW-31	Overburden	--	--	Stick-up	2	15	5	unknown	10 - 15	PVC	217.58	214.80	1206244.860	692844.890
MW-9	Overburden	--	--	Flush	2	unknown	unknown	unknown	unknown	PVC	246.25	240.30	1205999.240	691365.340
MW-OB13	Overburden	07/15/92	07/15/92	Stick-up	2	8	5	0.010	3 - 8	PVC	244.50	237.90	1206459.260	692548.536
MW-OB14	Overburden	07/10/92	07/10/92	Stick-up	2	18	10	0.010	8 - 18	PVC	241.65	237.90	1206206.404	692264.168
MW-OB15	Overburden	07/08/92	07/08/92	Stick-up	2	8	5	0.010	3 - 8	PVC	262.35	262.30	1206780.937	692497.482
MW-OB2	Overburden	07/25/91	07/25/91	Stick-up	2	17	10	0.010	7 - 17	PVC	284.70	281.20	1206710.310	691480.847
MW-OB24	Overburden	05/17/01	05/17/01	Flushmount	2	10.5	5	0.010	5.5 - 10.5	PVC	270.55	--	1206427.760	691568.480
MW-OB25	Overburden	05/11/01	05/11/01	Flushmount	2	10	5	0.010	5 - 10	PVC	238.45	--	1206066.740	692184.620
MW-OB26	Overburden	05/17/01	05/17/01	Flushmount	2	14	5	0.010	9 - 14	PVC	238.45	--	1206174.22	692443.87
MW-OB27	Overburden	05/10/01	05/10/01	Flushmount	2	11	5	0.010	6 - 11	PVC	239.15	--	1206466.500	693086.000
MW-OB30	Overburden	11/16/15	11/16/15	Stick-up	2	16	12	0.060	4 - 16	PVC	225.71	--	1205935.600	691967.128
MW-OB31	Overburden	11/16/15	11/16/15	Stick-up	2	12	8	0.060	4 - 12	PVC	226.02	--	1205956.300	692033.440
MW-OB32	Overburden	11/17/15	11/17/15	Stick-up	2	10	5	0.060	5 - 10	PVC	227.96	--	1205981.314	692116.749
MW-OB33	Overburden	11/18/15	11/18/15	Stick-up	2	15	10	0.060	5 - 15	PVC	224.03	--	1206045.434	692328.241
MW-OB34	Overburden	11/18/15	11/18/15	Stick-up	2	15	10	0.060	5 - 15	PVC	223.58	--	1206103.083	692448.917
MW-OB5	Overburden	09/28/91	09/28/91	Stick-up	2	12	7	0.010	7 - 12	PVC	263.70	260.70	1206387.986	691183.691
MW-OB7	Overburden	07/26/91	07/26/91	Stick-up	2	9	5	0.010	4 - 9	PVC	249.20	241.40	1206046.175	691274.606
WP-CC-12	Overburden	04/28/00	04/28/00	Stick-up	1	21.2	5	0.010	16.2 - 21.2	PVC	251.64	--	1205738.923	691038.272
AW-A10	shallow bedrock	10/31/00	11/03/00	Stickup	2	46	10	0.010	34-44	PVC	239.05	--	1205923.430	691760.190
AW-A11	shallow bedrock	05/17/01	05/22/01	Stickup	2	58	10	0.010	46-56	PVC	239.60	--	1205969.800	691892.700
AW-A14	shallow bedrock	05/22/01	05/24/01	Stickup	2	34.5	10	0.010	23-33	PVC	237.10	--	1206030.300	692188.600
AW-A15	shallow bedrock	06/06/00	06/13/00	Stickup	2	31	10	0.010	20-30	PVC	246.90	--	1206181.500	691718.800
AW-A2	shallow bedrock	09/19/91	09/27/91	Stickup	2	32	10	0.010	22-32	PVC	249.10	241.30	1206072.739	691286.621
BP-6	Overburden	10/08/10	10/08/10	Stick-up	1	23	10	0.010	13 - 23	PVC	236.74	--	1206206.698	692602.828
BP-9	Overburden	10/08/10	10/08/10	Stick-up	1	16	10	0.010	6 - 16	PVC	232.52	--	1206036.644	692275.949
AW-A4	shallow bedrock	07/10/91	07/29/91	Stickup	2	37	10	0.010	26.5-36.5	PVC	238.43	236.70	1205712.973	691165.645
MW-19	shallow bedrock	05/18/80	05/19/80	Stickup	3	41.5	31.5	OPEN	10-41.5	NA	249.10	243.30	1206162.060	691489.790
MW-25S	shallow bedrock	--	--	Stickup	3	39.4	9.8	OPEN	29.6-39.4	NA	241.55	235.60	1205843.010	691392.960
MW-27S	shallow bedrock	--	--	Stickup	2	42.5	9.5	unknown	33-42.5	PVC	240.80	239.00	1205890.120	691556.690
MW-36S	shallow bedrock	--	--	Stickup	3	33	9.4	OPEN	23.6-33	NA	264.85	260.80	1206384.456	691185.694
P-A1	shallow bedrock	07/25/91	08/16/91	Stickup	2	34.5	10	0.010	24-34	PVC	283.30	280.50	1206716.004	691486.5279
AW-B11	Intermediate Bedrock	11/01/00	11/08/00	Stickup	2	67	10	0.010	50-60	PVC	238.65	--	1205912.700	691715.300
AW-B17	Intermediate Bedrock	06/27/00	06/28/00	Stickup	2	47.7	10	0.010	36-46	PVC	238.70	--	1206213.300	692601.100
AW-B18	Intermediate Bedrock	06/09/00	06/15/00	Stickup	2	50.5	10	0.010	39-49	PVC	247.30	--	1206174.500	691689.500
AW-B19	Intermediate Bedrock	06/14/00	06/20/00	Stickup	2	46.9	10	0.010	36-46	PVC	245.75	--	1206278.000	692041.000
AW-B2	Intermediate Bedrock	07/24/91	09/25/91	Stickup	6	55	24	OPEN	31-55	NA	248.80	241.80	1206072.759	691312.794
AW-B20	Intermediate Bedrock	06/19/00	06/21/00	Stickup	2	31	10	0.010	21-31	PVC	243.65	--	1206401.200	692526.100
AW-B3	Intermediate Bedrock	10/03/91	11/05/91	Stickup	2	58.5	10	0.010	48-58	PVC	244.70	242.90	1205687.431	690937.954
AW-B4	Intermediate Bedrock	07/08/91	07/18/91	Stickup	2	47.5	10	0.010	35-45	PVC	238.25	235.30	1206055.126	692184.766
MW-10B	Intermediate Bedrock	06/25/92	08/04/92	Stickup	2	35	10	0.010	24-34	PVC	254.70	254.00	1206558.714	692324.894
MW-20D	Intermediate Bedrock	--	--	Stickup	3	55.1	10	OPEN	45.1-55.1	NA	266.90	261.30	1206402.750	691574.660
MW-25D	Intermediate Bedrock	--	--	Stickup	3	60.7	10	OPEN	50.7-60.7	NA	241.55	234.70	1205843.460	691403.630
MW-30D	Intermediate Bedrock	--	--	Stickup	3	51.5	9.7	OPEN	41.8-51.5	NA	217.10	215.00	1206255.380	692861.820

Table 3
Well Construction Details
Former Ciba-Geigy Facility, Glens Falls, NY

Well ID	Horizon	Installation Date(s)		Flushmount/ Stick-up	Well Diameter (inches)	Installed Depth (ft. bgs)	Screen Length (ft.)	Screen Slot Size (inches)	Screened Interval (ft bgs)	Screen Type	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	Northing (NAD27)	Easting (NAD27)
MW-36D	Intermediate Bedrock	--	--	Stickup	3	57.2	10	OPEN	47.2-57.2	NA	266.40	261.00	1206366.574	691189.387
MW-40B	Intermediate Bedrock	06/29/92	08/03/92	Stickup	2	53	10	0.010	42-52	PVC	284.55	281.80	1206767.035	691221.750
AW-C1	Deep Bedrock	07/25/88	08/03/88	Flush	2	144	10	unknown	133-143	PVC	283.50	--	1206757.457	691227.682
AW-C10	Deep Bedrock	06/23/92	08/06/92	Flush	2	137	10	0.010	126-136	PVC	254.95	--	1206570.019	692339.381
AW-C11	Deep Bedrock	05/30/01	06/08/01	Flush	2	158	10	0.010	143-153	PVC	238.45	--	1206054.500	692182.800
AW-C2	Deep Bedrock	08/04/88	08/12/88	Flush	2	169	10	unknown	156-166	PVC	241.10	--	1205830.970	691387.530
AW-C7	Deep Bedrock	10/02/91	12/02/91	Flush	2	155	10	0.010	145-155	PVC	245.31	--	1205692.720	690948.816
AW-C8	Deep Bedrock	07/23/91	09/11/91	Flush	2	162	15	0.010	147-162	PVC	249.10	--	1206081.308	691299.720
AW-C9	Deep Bedrock	08/12/92	08/15/92	Flush	2	127	10	0.010	117-127	PVC	251.60	--	1206645.020	692699.420
MW-20C	Deep Bedrock	07/12/91	09/13/91	Flush	2	160	10	0.010	150-160	PVC	269.25	262.00	1206420.236	691571.525
MW-36C	Deep Bedrock	07/26/91	09/17/91	Flush	2	160	10	0.010	148.5-158.5	PVC	266.60	261.70	1206395.425	691192.224
GWES FEATURES														
EW-B5	Intermediate Bedrock	01/05/01	01/10/01	Flush	8	51.8	15.8	OPEN	36-51.8	NA	235.75	--	1206155	692432
Sump A	Overburden	--	--	NA	NA	NA	NA	NA	NA	NA	239.89	--	1205951	691848
Sump B	Overburden	--	--	NA	NA	NA	NA	NA	NA	NA	236.39	--	1206176	692528
PREATREATMENT PLANT														
MW-OB19	Overburden	05/25/93	05/25/93	Stick-up	2	10	5	0.010	5 - 10	PVC	287.82	284.83	1207461.900	693566.140
MW-OB23	Overburden	12/18/96	12/18/96	Flushmount	2	6.5	4	0.020	3 - 6.5	PVC	287.05	285.10	1207573.450	693410.210

Notes:
-- = not available
amsl = above mean seal level
bgs = below ground surface
ft = feet
GWES = groundwater extraction system
NA = not applicable
NAD27 = North American Datum of 1927
PVC = polyvinyl chloride

Table 4
Sampling Event Summary - POTW Discharge Sampling
Former Ciba-Geigy Facility, Glens Falls, New York

Parameter	CAS Number	Media	Sampling Frequency	Laboratory Method	MRLs (mg/L)	MDLs (mg/L)	POTW Effluent Limitations[1] (mg/L)
Antimony	7440-36-0	W	Annual	EPA 200.8	0.005	0.0005	10
Ammonia	7664-41-7	W	Annual	EPA 350.1	0.25	0.1	40
Arsenic	7440-38-2	W	Annual	EPA 200.8	0.003	0.0015	0.25
Benzene	71-43-2	W	Annual	EPA 624	0.001	0.00043	0.1
Biochemical Oxygen Demand (BOD)	STL00311	W	Annual	SM 5210B	2	2	-
Boron	7440-42-8	W	Annual	EPA 200.7	0.1	0.036	5
Cadmium	7440-43-9	W	Annual	EPA 200.8	0.0005	0.00015	0.25
Calcium	7440-70-2	W	Annual	EPA 200.7	0.5	0.025	500
Chloroform	67-66-3	W	Annual	EPA 624	0.001	0.0005	1
Chromium, total	7440-47-3	W	Quarterly	EPA 200.8	0.005	0.0016	*See below 2*
Copper	7440-50-8	W	Annual	EPA 200.8	0.005	0.0017	1
Cyanide, total	57-12-5	W	Quarterly	EPA 335.4	0.1	0.025	3
Ethylbenzene	100-41-4	W	Annual	EPA 624	0.001	0.00033	0.1
Iron	7439-89-6	W	Annual	EPA 200.8	0.1	0.025	50
Lead	7439-92-1	W	Quarterly	EPA 200.8	0.0025	0.00098	0.8
Manganese	7439-96-5	W	Annual	EPA 200.8	0.005	0.0018	5
Mercury	7439-97-6	W	Quarterly	EPA 245.1	0.0002	0.00008	0.005
Methylene Chloride	75-09-2	W	Annual	EPA 624	0.005	0.0025	1
Naphthalene	91-20-3	W	Annual	EPA 625	0.01	0.0007	1
Nickel	7440-02-0	W	Annual	EPA 200.8	0.005	0.0019	2.3
Oil & Grease	STL00181	W	Annual	EPA 1664A	5.00	1.40	50
Pentachlorophenol	87-86-5	W	Annual	EPA 625	0.05	0.0018	-
2,4,6-Trichlorophenol	95-95-4	W	Annual	EPA 625	0.01	0.01	-
2,4,5-Trichlorophenol	88-06-2	W	Annual	EPA 625	0.01	0.00082	-
Phenols	STL00166	W	Quarterly	EPA 420.1	0.05	0.025	5
Silver	7440-22-4	W	Annual	EPA 200.8	0.001	0.0001	0.2
Toluene	108-88-3	W	Annual	EPA 624	0.001	0.00048	0.1
Total Suspended Solids	STL00161	W	Annual	SM 2540D	2.50	2.5	-
1,1,1 - Trichloroethane	71-55-6	W	Annual	EPA 624	0.001	0.00037	1
Xylene	1330-20-7	W	Annual	EPA 624	0.002	0.00057	0.1
Zinc	7440-66-6	W	Annual	EPA 200.8	0.02	0.0096	1.5

Notes:
- = No standard value
CAS = Chemical Abstracts Service
DQO = data quality objective
lb/day = pounds per day
MDL = method detection limit
mg/L = milligrams per liter
MRL = minimum reporting limit
POTW = publicly owned treatment works
W = water
1 = POTW Effluent Limitations are instantaneous maximums, except for mercury.
2 = Discharge for total chromium is 3.1 lb/day and will be based on the average of chromium sampling data and the quarterly average flow.
3 = The POTW Effluent Limitation for mercury is calculated as a quarterly average.

Figures

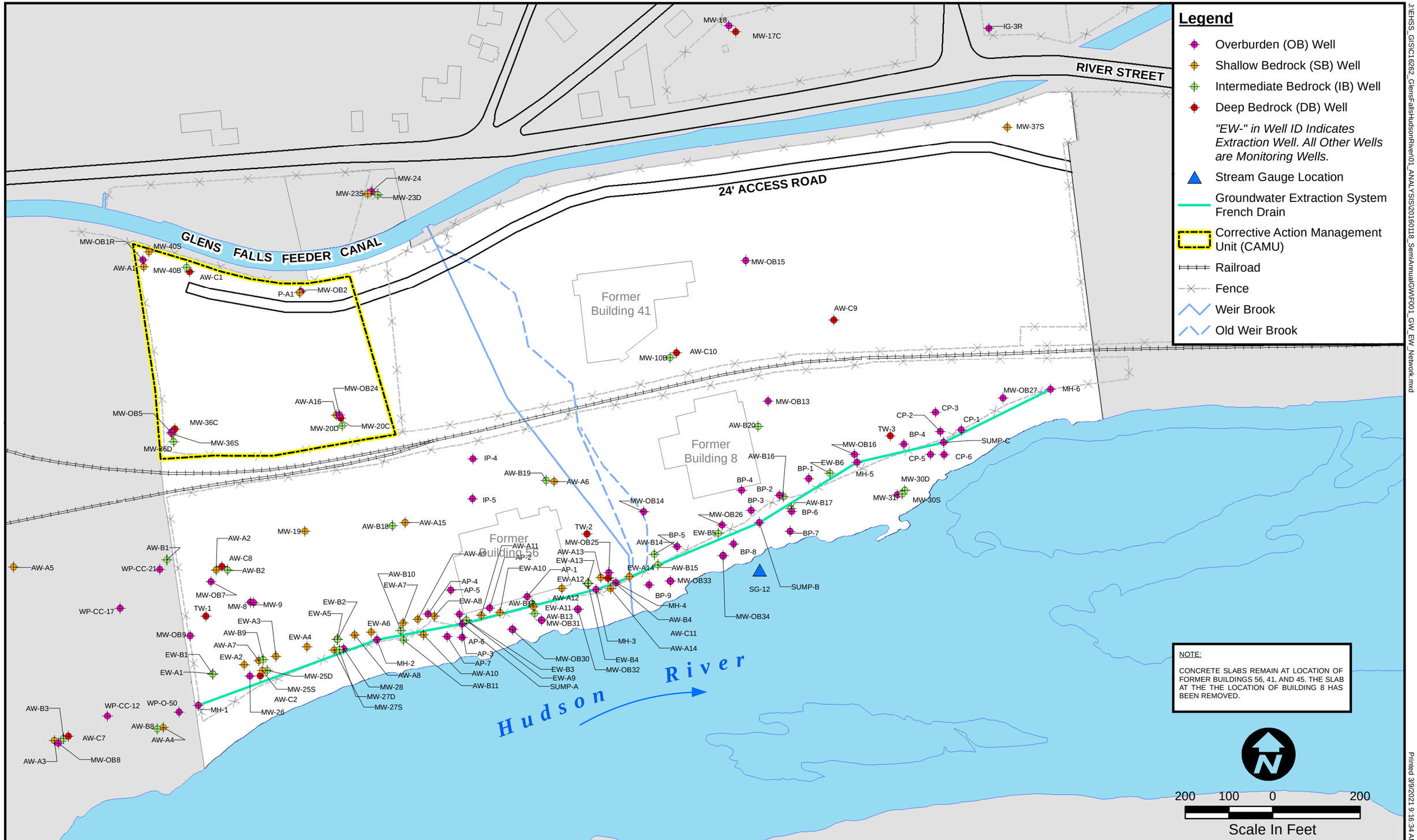


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Reviewed By: C. Reuter

EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE MAP	FIGURE 1



Legend

- Overburden (OB) Well
- Shallow Bedrock (SB) Well
- Intermediate Bedrock (IB) Well
- Deep Bedrock (DB) Well
- *"EW-" in Well ID Indicates Extraction Well. All Other Wells are Monitoring Wells.*
- Stream Gauge Location
- Groundwater Extraction System French Drain
- Corrective Action Management Unit (CAMU)
- Railroad
- Fence
- Weir Brook
- Old Weir Brook

EHS Support

FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

MAIN PLANT SITE - WELL AND STAFF GAUGE LOCATIONS

FIGURE 2

J:\EHS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20160118_SemiAnnualGWFF001_GW_EW_Network.mxd

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EW-B5

	2019-09-12	2019-10-01	2019-11-11	2019-12-10	2020-03-25	2020-06-17	2020-10-28
Cr.Hex	39000J	39000	60000	52000	40000	38000J	42000
Cr.Tot	48000	40000	67000	5100	49000J	49000	43000

MW-OB14

	2019-09-12	2019-12-09	2020-03-25	2020-06-16	2020-10-29
Cr.Hex	860	610	31	44	5000
Cr.Tot	1300	670	42J	54	5500

MW-OB25

	2019-09-12	2019-12-09	2020-03-24	2020-06-17	2020-10-28
Cr.Hex	780	290	180	360J	2400
Cr.Tot	790	320	190J	420	2600

AW-C11

	2019-09-11	2019-12-10	2020-03-24	2020-06-16	2020-10-27
Cr.Hex	1000J	0.48	0.32	3000J	1600
Cr.Tot	1300	100	57J	3200	1600

MW-OB32

	2019-09-10	2020-03-26	2020-10-28
Cr.Hex	1UJ	280	1.5
Cr.Tot	92	300J	110

MW-OB31

	2019-09-10	2020-03-26	2020-10-28
Cr.Hex	4.8J	13	5.5
Cr.Tot	110	240J	110

IP-4

	2019-09-11	2020-10-26
Cr.Hex	0.97J	0.29J
Cr.Tot	24	7.3

AW-B18

	2019-09-09	2020-10-26
Cr.Hex	0.3U	0.3U
Cr.Tot	1.1J	3

MW-OB26

	2019-09-12	2019-12-10	2020-03-26	2020-06-17	2020-10-29
Cr.Hex	18	29	25	40	12
Cr.Tot	22	34	32J	20	21

MW-OB34

	2019-09-10	2020-03-26	2020-10-28
Cr.Hex	0.3U	67	0.88
Cr.Tot	61	160J	100

SUMP B

	2019-09-12	2019-12-10	2020-03-25	2020-06-17	2020-10-28
Cr.Hex	140	140	170	130J	96
Cr.Tot	160	150	190J	140	100

SW-01

	2019-09-12	2020-03-25	2020-10-29
Cr.Hex	0.29J	0.3U	0.3U
Cr.Tot	1.5U	0.4J	0.38J

MW-31

	2019-09-10	2020-03-26	2020-10-27
Cr.Hex	0.49J	0.3U	0.39
Cr.Tot	8.2	8.9J	8.1

SW-02

	2019-09-12	2020-03-25	2020-10-29
Cr.Hex	0.4	0.3U	0.3U
Cr.Tot	1.5U	0.39J	1.5U

MW-OB33

	2019-09-10	2020-03-26	2020-10-28
Cr.Hex	2300J	2100	45
Cr.Tot	2500	2300J	2500

AW-B4

	2019-09-10	2019-12-10	2020-03-24	2020-06-16	2020-10-27
Cr.Hex	0.3J	1.8	0.84	3.4J	3.3
Cr.Tot	6.7	9.9	4.6J	7.2	7.5

AW-A14

	2019-09-12	2019-12-09	2020-03-24	2020-06-17	2020-10-27
Cr.Hex	0.27J	0.3U	0.3U	0.31	0.3U
Cr.Tot	3.4	2.8	2.7J	2.9U	3.1

SW-03

	2019-09-12	2020-03-25	2020-10-29
Cr.Hex	0.3U	0.3U	0.3U
Cr.Tot	1.5U	1.5U	0.39J

MW-OB30

	2019-09-10	2020-03-26	2020-10-29
Cr.Hex	29J	2400	140
Cr.Tot	97	3300J	220

MW-25S

	2019-09-11	2020-10-28
Cr.Hex	1.5J	4.7
Cr.Tot	22	18

MW-26

	2019-09-09	2020-10-27
Cr.Hex	0.3U	0.3U
Cr.Tot	2.9	2.9

AW-C2

	2019-09-10	2020-10-27
Cr.Hex	0.3U	0.3U
Cr.Tot	17	12

MW-28

	2019-09-10
Cr.Hex	0.98U
Cr.Tot	27

SW-04

	2019-09-12	2020-03-25	2020-10-29
Cr.Hex	0.3U	0.3U	0.3U
Cr.Tot	1.5U	1.5U	1.5U

AW-A11

	2019-09-12	2020-03-24	2020-10-27
Cr.Hex	50	68	38
Cr.Tot	64	68J	41

SUMP A

	2019-09-12	2019-12-10	2020-03-25	2020-06-17	2020-10-28
Cr.Hex	260	290	35	300J	200
Cr.Tot	320	320	380J	360	190

GLENS FALLS

CAMU

24' ACCESS ROAD

Former Building 8

Former Building 56

Hudson River

Legend

- Overburden Well
- Shallow Bedrock
- Intermediate Bedrock Well
- Deep Bedrock Well
- Surface Water Sample
- Sump
- Groundwater Extraction System French Drain
- Corrective Action Management Unit (CAMU)
- Railroad
- Fence
- Weir Brook
- Old Weir Brook

NOTE:

CONCRETE SLABS REMAIN AT LOCATION OF FORMER BUILDINGS 56, 41, AND 45. THE SLAB AT THE LOCATION OF BUILDING 8 HAS BEEN REMOVED.

RESULTS PROVIDED IN ORANGE TEXT EXCEED THE NYSDEC CLASS GA GROUNDWATER QUALITY STANDARD OF 50 ug/l

CONCENTRATIONS PROVIDED IN MICROGRAMS PER LITER (µg/L)

N

200 100 0 200

Scale In Feet

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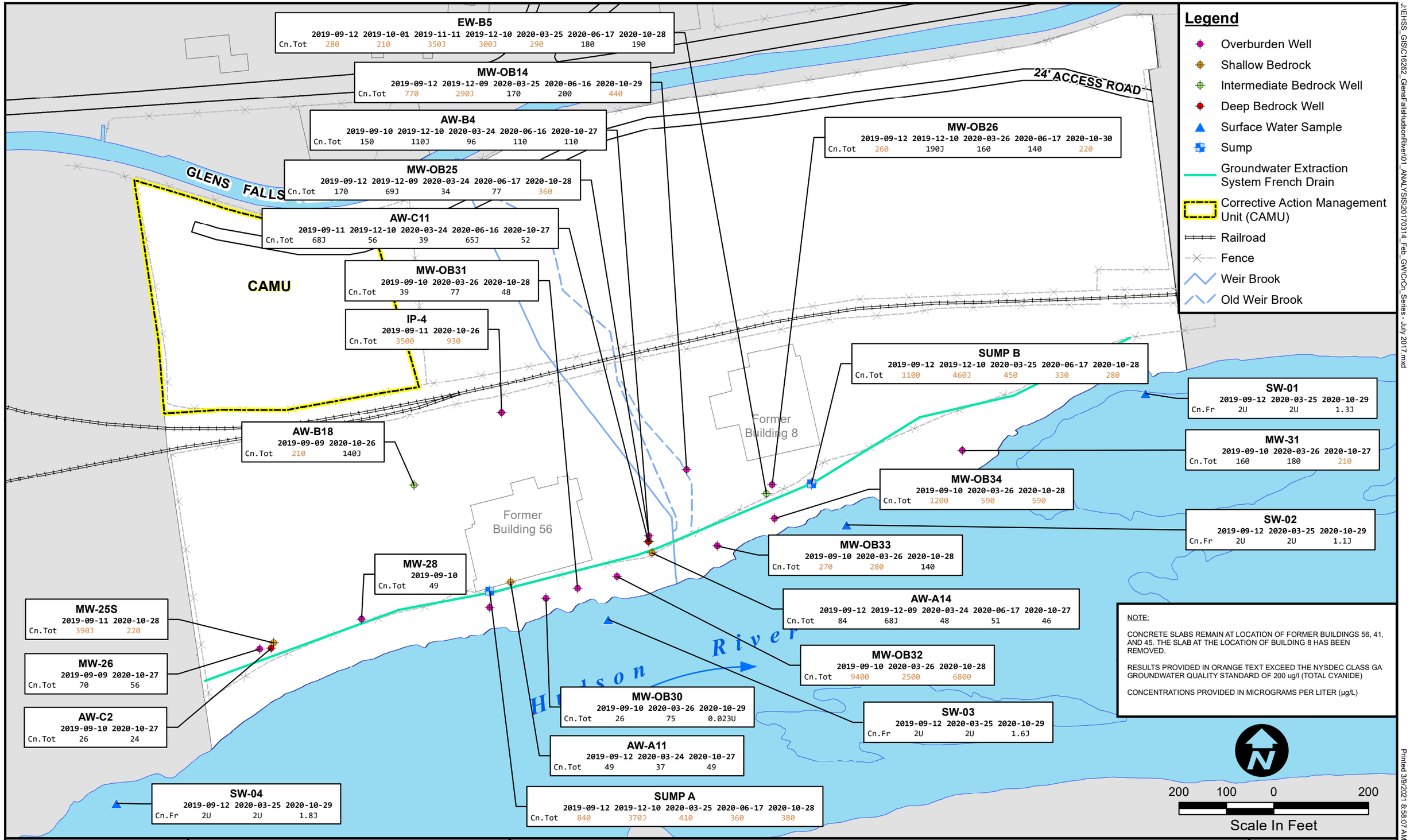
FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

MAIN PLANT SITE - RECENT CHROMIUM DATA

FIGURE 3

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FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

MAIN PLANT SITE - RECENT CYANIDE DATA

FIGURE 4

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693500 E

BRUSH

BRUSH

PRETREATMENT PLANT SWMU

P-1

MW-OB23

P-6

P-3

IG-1

MW-OB17

P-8

P-7

MW-OB18

P-10

SG-7

FORMER TANK

MW-OB19

PTP-SB01

SG-11

MW-OB22

P-14

MW-OB21

IG-2

P-11

P-12

SG-2

GLENS FALLS FEEDER CANAL

FLOW

IG-3R

MW-OB20

IG-4

RIVER STREET

BRUSH

B R U S H

FEEDER CANAL

BRUSH

Edge Of Woods

Legend

- Temporary Well Location
- Monitoring Well/Piezometer
- Staff Gauge
- Sampling and Gauging Location
- Pretreatment Plant Area Boundary
- Fence

Note:
SWMU = solid waste management unit

N

50 25 0 50

Scale In Feet

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FORMER CIBA-GEIGY/HERCULES SITE
GLENS FALLS, NY

PRETREATMENT PLANT AREA - WELL AND STAFF GAUGE LOCATIONS

FIGURE 5

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Appendix 1 Purge/Sample Log

GROUNDWATER SAMPLING LOG

Ashland Glens Falls, NY

Routine Groundwater & Surface Water Sampling Event

Sampling Personnel:	**Well ID:**			
Date:	**Original Install Depth:**		feet	
Weather:	**Screen Length:**		feet	
Time In: **Time Out:**	**Well Diameter:**		inches	

WELL INFORMATION

Depth to Water (from TOC):	(feet)		**Well Type:**	Flushmount ☐	Stick-Up ☐	
Depth to Water(From TOC) With Pump in place:	(feet)		**Well Locked:**	Yes ☐	No ☐	
Total Depth (from TOC):	(feet)		**Measuring Point Marked:**	Yes ☐	No ☐	
Length of Water Column :	(feet)		**Well Condition:**	Good ☐	Poor ☐	
			Well Condition Comments:			

WELL WATER INFORMATION

Volume of Water in Well:	(mL or gal)	
Pumping Rate of Pump:	(mL/min)	
Total Volume Removed:	(mL or gal)	

Volume Measurements	**(gal)**	**(ml)**	**Tubing/Well Size**
Tubing Volume per foot	**0.003**	**11.36**	**1/4" ID tubing**
Well Volume per foot	**0.041**	**155.18**	**1" diam. well**
	0.163	**616.95**	**2" diam. well**
	0.653	**2,471.60**	**4" diam. well**

EVACUATION INFORMATION

Pump ID:		**Pump Size:**	**Depth of Pump Intake:**	
Evacuation Method:	Bailer ☐	Peristaltic ☐	Bladder ☐	Other ☐
Tubing Used:	Teflon ☐	Polyethylene ☐	N/A ☐	
Water Quality Meter (type/Serial Number):				
Sampling Method:	Bailer ☐	Peristaltic ☐	Bladder ☐	Other ☐
Did well go dry?	Yes ☐	No ☐		
Final Depth to Water (prior to turning off pump):				
Barometric Pressure (At time of sampling) in mm/Hg:				

FIELD PARAMETER READINGS:

Time														
Rate (ml/min)														
Depth to Water (ft. TOC)														
Temperature (°C)														
pH														
Conductivity (mS/cm)														
Dissolved Oxygen (mg/L)														
Turbidity (NTU)														
ORP (mV)														

SAMPLE INFORMATION

Sample List:

- Diss. Chromium & Vanadium ☐
- Diss. Hexavalent Chromium ☐
- Total Cyanide ☐
- Free Cyanide ☐
- Total Dissolved Solids ☐
- Hardness ☐
- VOCs (Dichlorobenzenes) ☐

Sample ID:	
Start Time:	
End Time:	
MS/MSD: Yes ☐ No ☐	
Duplicate: Yes ☐ No ☐	
Total Bottles:	
Sampled By:	

Duplicate ID:	
Sample Time:	
Total Bottles:	
Sampled By:	
MS/MSD ID:	
Sample Time:	
Total Bottles:	
Sampled By:	

Observations (water color, clarity, etc.):

Free Cyanide Sulfide Test Strip: Positive (Black) / Negative (No change)

UNIT STABILITY

pH	**DO**	**Turb.**	**Cond**	**ORP**
± 0.1	± 10%	± 10%, <10NTU	± 3%	± 10 mV

Enclosure B Quality Assurance Project Plan

Quality Assurance Project Plan

Former Ciba-Geigy/Hercules Site – NYSDEC Site #557011
Glens Falls, New York

Prepared for:

HERCULES

Prepared by:

EHS Support

May 2021

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Figure 1: Project Organization Chart

Acronyms

ASP	Analytical Services Protocol
CLP	Contract Laboratory Program
DER	Division of Environmental Remediation
DER-10	Technical Guidance for Site Investigation and Remediation
DMM	Division Materials Management
DQO	data quality objective
EC	engineering control
ECL	Environmental Conservation Law
EDD	electronic data deliverable
EDP	EQuIS Data Processor
EIMS	Environmental Information Management System
ELAP	Environmental Laboratory Approval Program
EPS	effluent pumping station
GSMP	Groundwater and Surface Water Monitoring Plan
HWM	Hazardous Waste Management
IC	institutional control
LIMS	laboratory information management system
MDL	method detection limit
MRL	minimum reporting limit
MS/MSD	matrix spike/matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NTU	nephelometric turbidity unit
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PID	photoionization detector
POTW	publicly owned treatment works
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
SWQC	surface water quality criteria
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency

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1 Introduction

On behalf of Hercules Incorporated (previously acquired by Ashland LLC) and CIBA Corporation ("CIBA") (previously acquired by BASF Corporation), EHS Support LLC ("EHS Support") has prepared this Quality Assurance Project Plan (QAPP) for data collection activities associated with the former Ciba-Geigy Corporation pigments manufacturing facility located at 89 Lower Warren Street in the Town of Queensbury near Glens Falls, New York ("the Site"). This QAPP was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10), issued May 3, 2010 (NYSDEC, 2010) and 6 New York Codes, Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs, effective December 14, 2006 (NYSDEC, 2006).

1.1 Background

Corrective measure operations, maintenance, and monitoring are conducted for the Site under an NYSDEC Hazardous Waste Management (HWM) Post Closure Permit (NYSDEC Site No. 557011). A renewal of the Part 373 HWM Permit #5-5234-00008/00096 was issued by the NYSDEC on March 5, 2015. Hercules and CIBA ("the Parties") are the permittees and share responsibility for ongoing environmental activities at the Site.

After the implementation of corrective measures, some contamination was left at the Site, which is hereafter referred to as "remaining contamination." Institutional controls and engineering controls (ICs and ECs) have been incorporated into the remedy to control exposure to the remaining contamination.

This QAPP details the performance objectives for ongoing monitoring. Groundwater and surface water sampling are performed to ensure that the remaining contamination does not pose a risk to public health or the environment. Additionally, groundwater that is pumped from the Site as part of the corrective measures is sampled to demonstrate compliance with the publicly owned treatment works (POTW) Industrial User Permit for the Site (City of Glens Falls, 2017).

1.2 Objective

The objective of the environmental data collection and this QAPP is to collect data that adequately addresses NYSDEC requirements for ongoing groundwater and surface water sampling at the Site and demonstrates compliance with the City of Glens Falls POTW Industrial User Permit for the Site. The data quality objectives (DQOs) established for this project are based on the standards and guidance values established in the documents listed below:

- Surface water and groundwater quality standards and guidance values from Table 1 of 6 NYCRR 703.5 and NYSDEC Technical and Operational Guidance Series (TOGS 1.1.1) (NYSDEC, 1998), including:
  - Class GA groundwater quality standards protective of fresh groundwater for drinking water sources; and
  - Surface water quality criteria (SWQC) for Class C waters, selected based on New York's classification of the Hudson River in the Site vicinity as "Class C" water, including standards/guidance values for protection of human health (based on water supply or fish

consumption) and protection of aquatic life from chronic and acute effects (designated as A[C] and A[A], respectively).
- POTW Industrial User Permit limits (City of Glens Falls, 2017)

It is noted that comparison of groundwater data to GA standards is for reference only. Groundwater on-site is not used and use of on-site groundwater for any purpose is precluded (pursuant to the Deed Notice filed with Warren County).

1.3 Project Organization

The project team consists of clients, consultants, subcontractors, laboratories, property owners, and public agencies. Team members are illustrated in the project organization chart provided as **Figure 1**. Primary team members for the execution of this QAPP are also summarized below.

The **Consultant Project Manager** (Cassie Johnson, EHS Support) will manage personnel involved in the project and will be responsible for scope of work execution, cost tracking, and schedule tracking. The consultant project manager will also oversee the preparation of project deliverables and provide certification of documents as a Qualified Environmental Professional where required under NYSDEC DER-10 guidelines.

The **NYS Professional Engineer** (Kristin VanLandingham, PE, EHS Support) will provide final technical review of project deliverables, overall direction on the technical aspects of the project, and certification of documents as a New York State (NYS) Professional Engineer where required under NYSDEC DER-10 guidelines.

The **Field Project Manager** (Cody Hume, Antea Group) will manage the field operation, maintenance, and monitoring teams. The Field Project Manager will oversee operations and maintenance for all corrective measures; field sampling efforts; implementation of health and safety procedures; and will update the Hercules Project Manager and Consultant Project Manager on project progress. Specific responsibilities of the Field Project Manager are as follows:

- Ensure proper operation and maintenance of the Site's corrective measures.
- Organize and coordinate the activities of subcontractor(s), field crew, and sampling activities.
- Arrange for permits, utility clearances, and surveying, when required.
- Coordinate with the Project Chemist as needed for ordering of the appropriate number of sample containers and coolers from the analytical laboratory.
- Provide the Consultant Project Manager with a copy of the chain-of-custody form within one working day of sample delivery to the analytical laboratory.
- Deliver copies of all logbook pages and sample collection forms completed during each phase of the delineation to the Consultant Project Manager at the end of each phase of the investigation.
- Prepare project deliverables during the reporting phase of the project.

The **Laboratory Project Manager** will oversee performance of all analytical tests conducted as part of the project. The Laboratory Project Manager is responsible for (1) providing a confirmation of sample receipt within one working day of sample receipt and (2) notifying the Consultant Project Manager of any sample integrity issues (e.g., holding time exceedance, chain-of-custody discrepancies) promptly when discovered. The confirmation of sample receipt will include the following:

- Sample login sheet that summarizes sample identifications, as entered into the laboratory information management system (LIMS), and the analyses requested for each sample.
- Summary of the target analytes to be reported for each analysis requested.
- Summary of any discrepancies or sample integrity issues noted during sample login.

The Laboratory Project Manager is also responsible for submitting the final data package, including a hard copy deliverable and electronic data deliverable (EDD), within the requested turnaround time. Laboratory analyses will be performed by Eurofins TestAmerica, Inc. of Savannah, Georgia. Eurofins TestAmerica, Savannah, is an analytical laboratory certified by the State of New York and participates in the National Environmental Laboratory Accreditation Program (NELAP) (Laboratory Certification ID # 10842). The laboratory contact information is listed below:

Eurofins TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Phone: 912-250-0280
Contact: Eddie Barnett
Email: Eddie.Barnett@Eurofinset.com

The **Project Chemist** (Amy Coats, EHS Support) will complete data validation in accordance with this QAPP and communicate with the Consultant Project Manager on the project. Specific responsibilities of the Project Chemist are as follows:

- Verify completeness of the data packages (via “hard copy” and EDD) and verify that the hard copy and EDD match.
- Notify the Field Team Project Managers and Consultant Project Manager of sample integrity issues and data package deliverable issues; all members of the project team will be copied on any of these notifications.
- Notify the Laboratory Project Managers of sample receipt issues, data turnaround issues, and data package discrepancies or omissions.
- Evaluate if sampling procedures, laboratory analyses, and project documentation conducted as part of the project are in accordance with this QAPP and NYSDEC requirements.
- Provide a data review summary in conformance with NYSDEC Data Validation guidance.
- Serve as the official contact for all quality assurance (QA) matters.
- Respond to QA needs, resolve problems, and answer requests for guidance or assistance.
- Review the implementation of the DQOs and the adequacy of the data or products generated based on quality objectives, as necessary.
- As applicable and appropriate, coordinate and conduct internal and subcontractor audits of selected project and program activities for adherence to the project and program plans.
- Confer with the project team on the steps to be taken for corrective actions, and track items of nonconformance until corrected; confer with the Consultant Project Manager to resolve an inadequate corrective action.
- Review audit and nonconformance reports to determine areas of poor quality or failure to adhere to established procedures.

Resumes for personnel can be supplied as requested.

1.4 Quality Assurance Glossary

The following terms are defined in DER-10 and used in this QAPP document.

- "Analytical Services Protocol" or "ASP" means NYSDEC's compilation of approved United States Environmental Protection Agency (USEPA) laboratory methods for sample preparation, analysis, and data handling procedures.
- "ELAP" (Environmental Laboratory Approval Program) means a program conducted by the New York State Department of Health (NYSDOH) which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing. Information regarding ELAP is available at the NYSDOH Wadsworth Laboratory website.
- "Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.
- "Method reporting limit" or "MRL" means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits.
- "Nephelometric Turbidity Unit" or "NTU" is the unit by which turbidity in a sample is measured.
- "Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis.

2 Project Scope

This section provides a general outline of the scope of groundwater and surface water sampling discussed in the *Groundwater and Surface Water Monitoring Plan* (GSMP) (EHS Support, 2021) and POTW discharge sampling that is required for the Site. A summary of the sampling program is provided below.

2.1 Groundwater and Surface Water Sampling

A table summarizing the groundwater and surface water sampling program, including the groundwater well and surface water sample identification numbers, sampling frequency, and laboratory analytical parameters, is provided in **Table 1**. The locations of groundwater wells and surface water sampling locations are provided in the GSMP.

2.2 POTW Discharge Sampling

Groundwater is pumped as part of the corrective measures at the Main Plant Site utilizing sumps in a French drain (Sump A and Sump B) and an extraction well (well EW-B5). The groundwater is discharged to a wet well at the effluent pumping station (EPS) building at the Site to be equilibrated before being pumped to the City of Glens Falls POTW. After equilibration, the water is monitored for pH and flow in accordance with the POTW Industrial User Permit (City of Glens Falls, 2017). The pH meter and flow monitor are calibrated annually where they discharge to the POTW.

The water quality is sampled on a quarterly basis from a port located at the POTW in accordance with the permit requirements. **Table 2** summarizes the POTW discharge sampling program, including the sampling frequency and the laboratory analytical parameters.

3 Analytical Methods

3.1 Groundwater and Surface Water Samples

Groundwater samples collected from permanent monitoring wells will be collected in accordance with the USEPA Low Flow Purging and Sampling Guidelines (USEPA, 2017) and the GSMP for the Site (EHS Support, 2021). Groundwater samples collected from active sumps and the active groundwater extraction well (well EW-B5) and surface water samples will be collected as grab samples.

Refer to **Table 1** for the following details for each sample location, including:

- Sampling frequency
- Analytical parameters to be measured at each location

Refer to **Table 3** for the following details for each sample location, including:

- Analytical methods to be used per matrix with minimum reporting requirements
- Sample preservation to be used per analytical method and sample matrix
- Sample container volume and type to be used per analytical method and sample matrix (sample containers will be properly washed, decontaminated, and appropriate preservative will be added [if applicable] prior to their use by the analytical laboratory; containers with preservative will be tagged as such)
- Sample holding time to be used per analytical method and sample matrix, in accordance with the NYSDEC ASP requirements

Field measurements will be collected and recorded at each sampling location for pH, dissolved oxygen, turbidity, specific conductivity, temperature, and oxidation-reduction potential. For permanent monitoring wells, a minimum of three measurements will be recorded in accordance with the purging and sampling requirements.

3.2 POTW Discharge Samples

Table 2 provides for the following details for POTW discharge sampling:

- Sampling frequency for each laboratory analyte
- Analytical methods to be used per matrix with minimum reporting requirements

4 Quality Assurance Sampling

Pursuant to DER-10 Technical Guidance for Site Investigation and Remediation, QA samples will be collected as described in the following sections.

4.1 Duplicate Samples

Duplicate samples will be collected during groundwater and surface water sampling at a frequency of 1 per 20 samples per media per sampling event. Duplicate samples will be identified as DUP-## (i.e., DUP-01). The corresponding sample will be recorded on the field notebook and/or sample log for later data verification and validation.

4.2 Matrix Spike, Matrix Spike Duplicate, and Equipment Blank Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected during groundwater and surface water sampling at a frequency of 1 per 20 samples per media per sampling event. The MS/MSD indicates the sample will be collected in triplicate. Each sample will be given the same name; however, a note for the lab to run the samples as MS and MSD will be written on the chain-of-custody form.

Equipment blank samples will also be collected during groundwater and surface water sampling at a frequency of 1 per media per day. They are collected by using laboratory provided de-ionized water. The de-ionized water is rinsed over or through decontaminated field sampling equipment and analyzed at the laboratory for the constituents of concern. Equipment blank samples will be identified as EB-## (i.e., EB-01). The corresponding sample will be recorded on the field notebook and/or sample log for later data verification and validation.

4.3 Trip Blank Samples

Trip blanks are prepared in the laboratory and must accompany all samples required for analysis of VOCs (1 trip blank sample per cooler containing VOC samples). Trip blanks must be recorded on the chain-of-custody form. The trip blank will be recorded with the date prepared by the laboratory and will be identified as TB-## (i.e., TB-01).

A trip blank sample will accompany each cooler containing a POTW discharge sample that will be analyzed for VOCs. A trip blank sample will also accompany each cooler containing a groundwater sample that will be analyzed for dichlorobenzenes.

4.4 Sample Custody

The DER-10 guidance indicates that field samples must be sent to the laboratory as soon as practicable. Samples shall not be left unattended or out of the custody of the sampler. Samples shall remain in the possession of the field personnel or within a locked vehicle or job trailer prior to shipment to the laboratory.

Each shipment should contain a chain-of-custody form for the sample contents. Refer to the detailed scope of work provided in the SMP for sample packing procedures.

For groundwater samples, a custody seal must be securely affixed to the outside of each cooler being shipped to the laboratory to verify samples have not been tampered with during transit.

5 Data Quality Objectives

This section outlines the site-specific DQOs. The DQOs are provided in **Table 2** (for POTW discharge sampling) and **Table 4** (for groundwater and surface water samples).

5.1 Laboratory Data Quality Objectives

5.1.1 POTW Discharge Samples

The analytical DQOs for POTW discharge samples are the limits necessary to demonstrate compliance with the POTW Industrial User Permit (City of Glens Falls, 2017). The DQOs, minimum reporting limits (MRLs), and MDLs for POTW discharge samples are summarized on **Table 2.**

5.1.2 Groundwater and Surface Water Samples

The analytical DQOs for groundwater are the Class GA Groundwater Standards published in NYSDEC Environmental Conservation Law (ECL) Regulation Chapter 10, Division of Water, Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations.

The analytical DQOs for surface water are SWQC for Class C waters, selected based on New York's classification of the Hudson River in the Site vicinity as "Class C" water, including standards/guidance values for protection of human health (based on water supply or fish consumption) and protection of aquatic life from chronic and acute effects (designated as A[C] and A[A], respectively).

Table 4 compares these DQOs to the laboratory MRLs and MDLs.

5.2 Field Data Quality Objectives

5.2.1 Decontamination

In addition to the QA sampling described in **Section 4**, additional precautions will be taken to ensure sampling devices are free from contaminants. A designated decontamination area will be established prior to commencing field activities.

All sampling equipment will be decontaminated prior to the start of field implementation and after each sampling event to minimize the risk of cross contamination. The decontamination chain will generally consist of a four-step process that includes a non-phosphate detergent washing station (e.g., Alconox), tap water rinse, distilled water rinse station, and air-drying station.

5.2.2 Field Calibration and Maintenance

Field equipment will be calibrated to the manufacturer's specifications on a daily basis at the beginning of the day. This information will be recorded in a calibration logbook.

Field equipment will be inspected prior to each sampling event and at the end of each day (i.e., water level meter, sampling pump, photoionization detector [PID], etc.) for needed maintenance.

5.2.3 Sample Packaging and Shipment

The general sample packing and shipment procedures are summarized as follows:

- Pack the ice in zip-locked type, double plastic bags. Seal the drain plug of the cooler with tape to prevent melting ice from leaking out of the cooler. The field crew could also request coolers without drain plugs from the laboratory.
- Line the bottom of the cooler with bubble wrap to prevent breakage during shipment.
- Check screw caps on sample containers for tightness and, if not full, mark the sample volume level of liquid samples on the outside of the sample containers with indelible ink.
- Affix sample labels onto the containers.
- Wrap all glass sample containers with bubble wrap (or heavy-duty paper towels) to prevent breakage.
- Place samples in a sturdy cooler(s). Pack cooler with ice.
- Line the sample cooler with a laboratory supplied plastic liner, or a clean disposable plastic garbage bag.
- Enclose chain-of-custody documentation within a zip-locked type plastic bag affixed to the underside of the cooler lid.
- Fill the empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and possible breakage during shipment.
- Secure the custody seal on the outside of each cooler using clear tape.

5.2.4 Field Notes

The following information will be recorded in a field logbook and/or on appropriate field forms:

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances to fixed locations
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Sample matrix (e.g., groundwater)
- Type of sampling equipment used
- Field instrument readings and calibration
- Field observations and details related to analysis
- Locations of duplicate, MS/MSD, and field blanks/equipment blank samples
- Integrity of samples (e.g., weather conditions, noticeable odors, colors)
- Pertinent sample/lithology descriptions
- Sample preservation
- Shipping arrangements (delivery, pickup, or ship)
- Name of recipient laboratory

5.2.5 Daily Field Reports

A daily field activity report will be prepared for each day of sampling. This report will include:

- Project name
- Facility name and location
- Name of sampler

- Names of other personnel on-site and responsibilities
- Date and time
- Weather conditions
- Time started and ended
- Health and safety notations
- Field calibration information for any field equipment employed during sampling
- Description of the sampling activities by location and sampling interval
- Visitors on-site during sampling
- Departures from the sampling plan and other miscellaneous problems or information pertinent to the project

Daily reports will be signed with the date and time by the person collecting the samples and will be submitted at the end of the sampling event to the EHS Support Consultant Project Manager. These reports will be archived in the project files.

6 Data Deliverables and Validation Reports

Category B data reports will be produced by the laboratories for all groundwater and surface water samples, and data validation will be performed by the Project Chemist for these samples pursuant to the details indicated in this section.

6.1 Data Deliverables

All laboratory data deliverables for groundwater and surface water sampling will be prepared in accordance with Category B data deliverable as defined by NYSDEC ASP. Each report will contain at a minimum the following:

- Sample Delivery Group Narrative
- Name and address of laboratories performing analysis as well as certification summaries
- Chain-of-custody forms
- Test analyses results
- Calibration reports
- Surrogate recoveries when applicable
- Blank results
- Spike recoveries
- Duplicate results when applicable
- Internal standard area and retention time summary
- Chromatograms
- Raw data files
- Any other specific information as described in the most current NYSDEC ASP

6.2 Data Validation

Category B deliverables will be provided by the laboratory for groundwater and surface water samples, and a limited data validation review will be performed. Validation reports will be prepared for all laboratory analysis and will provide an evaluation of the analytical data to determine if the data meets the site-specific criteria for data quality and data use. Each validation report will be completed by a designated environmental professional who is fully capable of conducting the validation. Preparation of a validation report will include a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

Validation reports will be developed by reviewing and evaluating each analytical data package. In order for the validation report to be acceptable, the following questions will be considered:

- Is the data package complete as defined under the requirements for the most current NYSDEC ASP Category B or USEPA Contract Laboratory Program (CLP) data deliverables?
- Have all holding time criteria been met?
- Do the QC data (i.e., blanks, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls, and sample data) fall within the protocol-required limits and specifications?
- Have the data been generated using established and agreed upon analytical protocols?
- Have the correct data qualifiers been used and are they consistent with the most current NYSDEC ASP?

- Have any QC exceedances been specifically noted in the validation report and have the corresponding results been updated in the database to reflect validated data?

Once the data package has been reviewed and the above questions answered, the validation report will describe the samples and the analytical parameters, including data deficiencies, analytical protocol deviations, and any QC problems having an effect on the data quality or usability.

7 Electronic Data Deliverables

The NYSDEC's DER and the Division Materials Management (DMM) have adopted a standardized EDD format for all data submitted to NYSDEC. EDDs will be prepared in accordance with the NYSDEC EDD Manual, most recent version v.4, dated November 2018.

The NYSDEC has implemented an Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS™ from EarthSoft® Inc. ("EarthSoft"). Hercules has identified a database manager to ensure laboratory data will be formatted to meet the guidelines specified by NYSDEC prior to submitting the complete data packages, including ensuring the supporting tables are complete.

For guidance purposes, the following steps are provided to assist in submitting data in the EDD format and are from the NYSDEC website.

7.1 Step 1: Initial Setup

Download the following files to prepare the data submission to produce a properly formatted EDD. User manuals are available to provide detailed instructions on data preparation as well as identification of data fields that NYSDEC requires for data submittals.

- The EDD Quickstart Guide (PDF) provides concise steps for preparing the EDD. The user manual is more detailed and provides additional information.
- The Electronic Data Deliverable Manual (PDF) (November 2018) details the steps and procedures to prepare an EDD and contains table and field header definitions. Note that this manual will continue to be updated. Updates will be incorporated, as applicable.
- NYSDEC format files are templates in Microsoft Excel that are used to prepare the data submittal in the EDD format. The database manager will download and submit the template appropriate to the type of data.
- The Valid Value files are tables in Microsoft Excel that provide data for a number of the fields that make up the EDD format. If there is no appropriate value on the list of valid values, the database manager will request that it be added by sending an email to the NYSDEC EIMS Administrator at NYENVDATA@gw.dec.state.ny.us. The request will include the company contact information, the name of the valid value reference list, the new value needed, and any other helpful information.

7.2 Step 2: Check your EDD

The database manager will download and install the EQuIS Data Processor (EDP) to check their properly NYSDEC DER EDD formatted file. EDP's software was created by EarthSoft and the database manager will be redirected to their site to download the EDP and NYSDEC EDD format file. EarthSoft's EDP user guide (PDF) and NYSDEC's EDP Quickstart guide (PDF) are available to guide users through the installation of EDP.

EDP performs a series of formatting checks on the EDD and identifies a select group of errors in the data file prior to submission. After completing the EDP review, data providers will review the Final Checklist for Submission of EDDs to NYSDEC which documents various items that are not yet checked and detected automatically using EDP but refer to critical fields required by NYSDEC to be populated in the



EDD. Without completing these fields, the EDD will not load into the database. Compliance with this checklist will expedite a successful EDD submission to NYSDEC.

The database manager will register the EDP software with EarthSoft (this is free); instructions on this are located in the EDP guide. The DEC EIMS Administrator typically provides an email within 2 business days confirming the software registration, along with a user login id and password to submit the checked EDD. If the DEC EIMS Administrator does not provide a confirmation email within 2 days, the database manager will contact the DEC EIMS Administrator at NYENVDATA@gw.dec.state.ny.us, rather than attempt to reregister.

The valid values used by EIMS are periodically updated for the EDP; therefore, it is important to use the most recent version of the EDP and NYSDEC format file. The DEC website in conjunction with the EarthSoft website will have the most up-to-date EDP and format file. The database manager will periodically check this website to verify that the most current version of the EDP and format file are being used.

7.3 Step 3: Submit your EDD

When the EDD has cleared the EDP checker, the database manager will select the Sign and Submit option in the EDP software and use the NYSDEC user id and password to produce a properly named and formatted .ZIP file. If the submission package is less than 25 MB in size, the database manager will email the zipped file to NYENVDATA@gw.dec.state.ny.us or if the file is larger than 25 MB it will be submitted via a web link or CD-ROM to the NYSDEC project manager.

8 References

EHS Support. 2021. Groundwater and Surface Water Monitoring Plan. March.

City of Glens Falls. 2017. Industrial User Permit No. 002F. Issued to Hercules LLC and BASF Corporation by the City of Glens Falls, Water and Sewer Board of Commissioners. April 21.

NYSDEC. 1998. Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (October 22, 1993, Reissue Date June 1998, as modified and supplemented by the January 1999 Errata Sheet and the April 2000 and June 2004 Addenda).

NYSDEC. 2006. Title 6 of the Official Compilation of the New York Codes, Rules, and Regulations, Part 375, Environmental Remediation Programs (6 NYCRR Part 375). December.

NYSDEC. 2010. Program Policy, Division of Environmental Remediation (DER), Technical Guidance for Site Investigation and Remediation (DER-10). May 3.

USEPA. 2017. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. September 19.

Tables

Table 1
Sampling Event Summary - Groundwater and Surface Water Monitoring
Former Ciba-Geigy Facility, Glens Falls, NY

Gauge & Sample	Area of the Property	Sampling Frequency	Total Cyanide[1]	Dissolved Chromium and Hexavalent Chromium[2]	Free Cyanide[3]	Dissolved Vanadium[2]	1,2-, 1,3-, and 1,4-Dichlorobenzenes	Total Dissolved Solids[4]	Hardness
Overburden Groundwater Wells									
IP-4	MPS - Western	Annual	1	1					
MW-28 [5]	MPS - Western	Annual	1	1					
MW-31	MPS - Eastern	Annual	1	1					
MW-OB14	MPS - Central	Semi-Annual	1	1					
MW-OB25	MPS - Central	Annual	1	1					
MW-OB26	MPS - Central	Annual	1	1					
MW-OB30	MPS - Central	Semi-Annual	1	1					
MW-OB31	MPS - Central	Annual	1	1					
MW-OB32	MPS - Central	Semi-Annual	1	1					
MW-OB33	MPS - Central	Annual	1	1					
MW-OB34	MPS - Central	Annual	1	1					
MW-OB19	PTP	Annual	1						
MW-OB23	PTP	Annual	1						
Sumps - Groundwater									
Sump A	MPS - Central	Annual	1	1					
Sump B	MPS - Central	Annual	1	1					
Shallow Groundwater Bedrock Wells									
AW-A11	MPS - Central	Annual	1	1					
AW-A14	MPS - Central	Annual	1	1					
MW-25S	MPS - Western	Annual	1	1					
Intermediate Groundwater Bedrock Wells									
AW-B4	MPS - Central	Annual	1	1					
EW-B5	MPS - Central	Semi-Annual	1	1					
AW-B18	MPS - Western	Annual	1	1			1		
Deep Groundwater Bedrock Wells									
AW-C2	MPS - Western	Annual	1	1					
AW-C11	MPS - Central	Semi-Annual	1	1					
Surface Water Samples									
SW-01	MPS - Downriver	Annual		1	1	1		1	1
SW-02	MPS - Central	Annual		1	1	1		1	1
SW-03	MPS - Central	Annual		1	1	1		1	1
SW-04	MPS - Upriver	Annual		1	1	1		1	1
SG-11	PTP	Annual			1				

Notes:
µm = micrometer
MPS = Main Plant Site
PTP = Pretreatment Plant Site
1 = Total cyanide is an unfiltered sample.
2 = Chromium, hexavalent chromium, and vanadium samples filtered in the field using 0.45 µm filters
3 = Free Cyanide is an unfiltered sample. Free Cyanide samples are to be collected per lab instructions.
4 = Total Dissolved Solids are to be laboratory-derived, not calculated.
5 = MW-28 has produced insufficient water for sampling during some previous groundwater sampling events. If well MW-28 is unable to be sampled, well MW-26 will be sampled as a substitute.

Table 2
Sampling Event Summary and DQOs - POTW Discharge Sampling
Former Ciba-Geigy Facility, Glens Falls, New York

Parameter	CAS Number	Media	Sampling Frequency	Laboratory Method	MRLs (mg/L)	MDLs (mg/L)	POTW Effluent Limitations[1] (mg/L)
Antimony	7440-36-0	W	Annual	EPA 200.8	0.005	0.0005	10
Ammonia	7664-41-7	W	Annual	EPA 350.1	0.25	0.1	40
Arsenic	7440-38-2	W	Annual	EPA 200.8	0.003	0.0015	0.25
Benzene	71-43-2	W	Annual	EPA 624	0.001	0.00043	0.1
Biochemical Oxygen Demand (BOD)	STL00311	W	Annual	SM 5210B	2	2	-
Boron	7440-42-8	W	Annual	EPA 200.7	0.1	0.036	5
Cadmium	7440-43-9	W	Annual	EPA 200.8	0.0005	0.00015	0.25
Calcium	7440-70-2	W	Annual	EPA 200.7	0.5	0.025	500
Chloroform	67-66-3	W	Annual	EPA 624	0.001	0.0005	1
Chromium, total	7440-47-3	W	Quarterly	EPA 200.8	0.005	0.0016	*See below 2*
Copper	7440-50-8	W	Annual	EPA 200.8	0.005	0.0017	1
Cyanide, total	57-12-5	W	Quarterly	EPA 335.4	0.1	0.025	3
Ethylbenzene	100-41-4	W	Annual	EPA 624	0.001	0.00033	0.1
Iron	7439-89-6	W	Annual	EPA 200.8	0.1	0.025	50
Lead	7439-92-1	W	Quarterly	EPA 200.8	0.0025	0.00098	0.8
Manganese	7439-96-5	W	Annual	EPA 200.8	0.005	0.0018	5
Mercury	7439-97-6	W	Quarterly	EPA 245.1	0.0002	0.00008	0.005
Methylene Chloride	75-09-2	W	Annual	EPA 624	0.005	0.0025	1
Naphthalene	91-20-3	W	Annual	EPA 625	0.01	0.0007	1
Nickel	7440-02-0	W	Annual	EPA 200.8	0.005	0.0019	2.3
Oil & Grease	STL00181	W	Annual	EPA 1664A	5.00	1.40	50
Pentachlorophenol	87-86-5	W	Annual	EPA 625	0.05	0.0018	-
2,4,6-Trichlorophenol	95-95-4	W	Annual	EPA 625	0.01	0.01	-
2,4,5-Trichlorophenol	88-06-2	W	Annual	EPA 625	0.01	0.00082	-
Phenols	STL00166	W	Quarterly	EPA 420.1	0.05	0.025	5
Silver	7440-22-4	W	Annual	EPA 200.8	0.001	0.0001	0.2
Toluene	108-88-3	W	Annual	EPA 624	0.001	0.00048	0.1
Total Suspended Solids	STL00161	W	Annual	SM 2540D	2.50	2.5	-
1,1,1 - Trichloroethane	71-55-6	W	Annual	EPA 624	0.001	0.00037	1
Xylene	1330-20-7	W	Annual	EPA 624	0.002	0.00057	0.1
Zinc	7440-66-6	W	Annual	EPA 200.8	0.02	0.0096	1.5

Notes:
- = No standard value
CAS = Chemical Abstracts Service
DQO = data quality objective
lb/day = pounds per day
MDL = method detection limit
mg/L = milligrams per liter
MRL = minimum reporting limit
POTW = publicly owned treatment works
W = water
1 = POTW Effluent Limitations are instantaneous maximums, except for mercury.
2 = Discharge for total chromium is 3.1 lb/day and will be based on the average of chromium sampling data and the quarterly average flow.
3 = The POTW Effluent Limitation for mercury is calculated as a quarterly average.

Table 3
Laboratory Method Summary - Groundwater and Surface Water Monitoring
Former Ciba-Geigy Facility, Glens Falls, NY

Analyte	Groundwater Quality Standard GA standard[1] (µg/L)	Surface Water Quality Standard[1] Class A, B, C (µg/L)	Method Number	Media	Anticipated Reporting Limit (µg/L)	Sample Container Type	Container Volume (each in mL)*	No. Containers per sample	Preservation	Holding Time
Geochemistry Parameters										
Total Dissolved Solids	not screened	not screened	SM2540C	Water	10,000	Plastic	500	1	Cool, < 6 deg. C.	7 days
Hardness	not screened	not screened	SM2340C	Water	2,000	Plastic	250	1	HNO3 to pH<2	6 Months
Dissolved Metals										
Chromium	50	calculated*	SW846 6020A	Water	1.5	Plastic	250	1	Filtration + HNO_3 to pH<2	6 Months
Vanadium	n/a	190 A(A) 14 A(C)			2					
Hexavalent Chromium	50	16 A(A) 11 A(C)	EPA 218.6	Water	0.3	Plastic	125	1	Filtration + NH4OH/(NH4)2SO4	28 days
Cyanide										
Total Cyanide	200	9000 H(FC)	SW846 9012B	Water	10	Plastic	250	1	NaOH to pH>12, Cool, < 6 deg. C.	14 Days
Volatile Organic Compounds										
Dichlorobenzenes (1,2-; 1,3-; and 1,4-)**	3	5	SW846 8260C	Water	1	Glass VOA	40	3	HCl to pH<2, Cool, < 6 deg. C.	14 Days
Free Available Cyanide										
Free Cyanide	n/a	5.2 A(C) 22 A(A)	OIA-1677	Water	2	Glass VOA	40	1	lead-acetate strip test for sulfide 40 mL VOA with NaOH or if sulfide detected 40 mL VOA no preservative	14 Days or 24 hrs

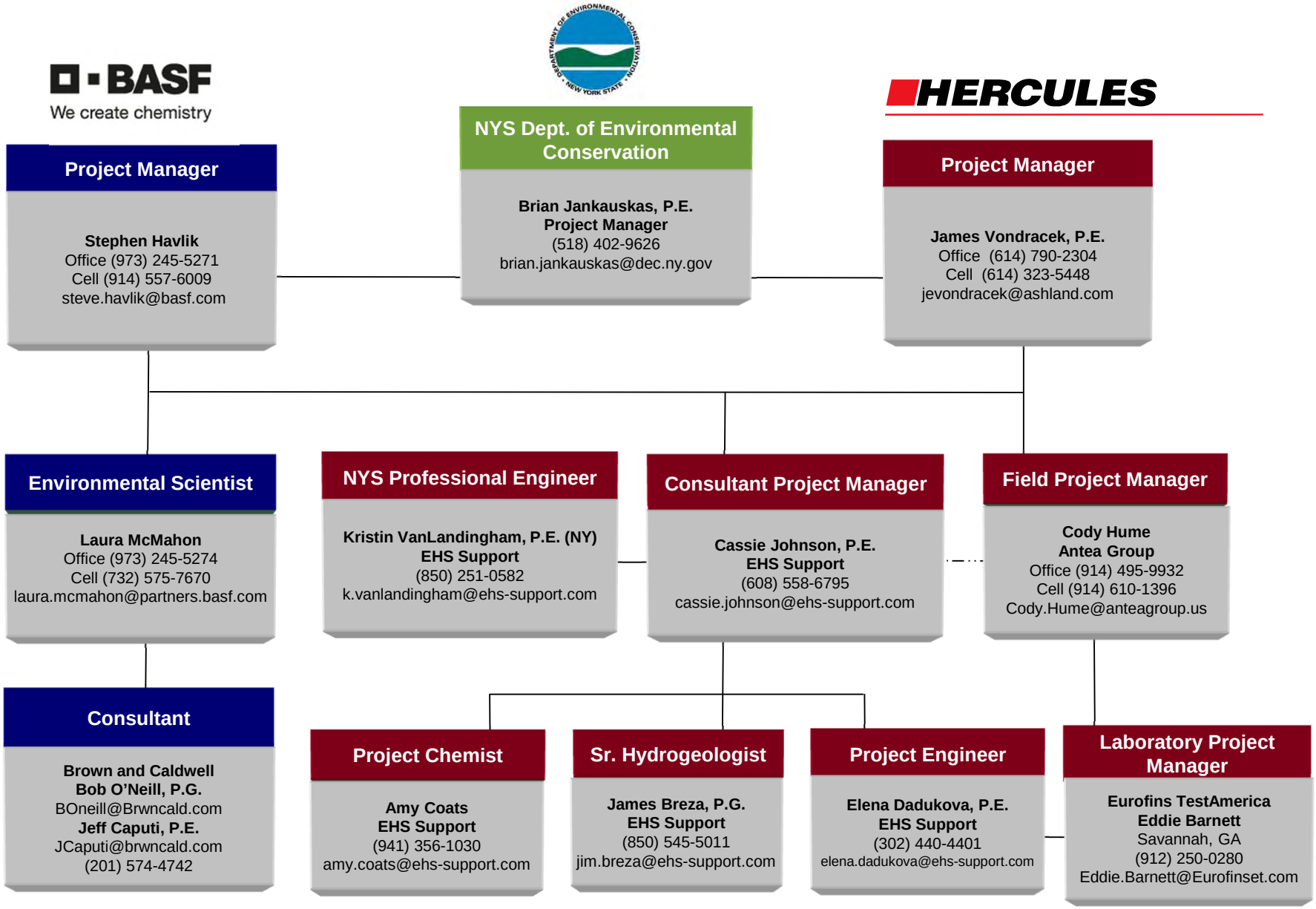
Notes:
* = indicates A(A) and A(C) values are calculated based on hardness
** = GA standard for dichlorobenzenes (DCB) applies individually to isomers (1,2-DCB; 1,3-DCB; and 1,4-DCB). Surface water A(C) value applies to the sum of the isomers.
µg/L = micrograms per liter
A(C) = protective of fish propagation in fresh waters - applicable to dissolved phases only (acid soluble phase for vanadium)
A(A) = protective of fish survival in fresh waters - applicable to dissolved phases only (acid soluble phase for vanadium)
DCB method will allow reporting to less than 3 µg/L with applicable qualification
deg C = degrees Celsius
GA = protective of fresh groundwaters for drinking water source
H(WS) protective of health for water drinking water source (groundwater and surface water values for zinc are TOGS 1.1.1 water quality guidance values)
H(FC) = protective of human health for fish consumption
HCl = hydrochloric acid
HNO3 = nitric acid
mL = milliliters
not screened = indicates not a site-related constituent; data used for geochemical assessment/developing surface water criteria only
n/a indicates no screening value available. Total metals criteria may be used for screening dissolved metals that have no screening value available.
NaOH = sodium hydroxide
NH4OH = ammonium hydroxide
(NH4)2SO4 = ammonium sulfate
NYCCR = New York Codes, Rules and Regulations
NYS = New York State
TOGS = Technical and Operational Guidance Series
VOA = volatile organic analysis
1 = 6 NYCCR 703.5, Table 1 Water Quality Standards Surface Waters (or Water Quality Guidance Values from NYS Dept. of Water TOGS 1.1.1 as noted).

Table 4
DQOs for Groundwater and Surface Water Sampling
Former Ciba-Geigy Facility, Glens Falls, New York

Parameter	CAS Number	Laboratory Method	Media	MRLs (µg/L)	MDLs (µg/L)	Groundwater Quality Standard GA standard[1] (µg/L)	Surface Water Quality Standard[1] Class A, B, C (µg/L)
Chromium	7440-47-3	SW846 6020A	W	1.5	0.36	50	calculated[2]
Vanadium	7440-62-2		W	2	1.2	n/a	190 A(A) 14 A(C)
Hexavalent Chromium	18540-29-9	EPA 218.6	W	0.3	0.23	50	16 A(A) 11 A(C)
Total Cyanide	57-12-5	SW846 9012B	W	10	5	200	9000 H(FC)
1,2-Dichlorobenzene[3]	95-50-1	SW846 8260C	W	1	0.79	3	5 A(C)
1,3-Dichlorobenzene[3]	541-73-1	SW846 8260C	W	1	0.78	3	5 A(C)
1,4-Dichlorobenzene[3]	106-46-7	SW846 8260C	W	1	0.84	3	5 A(C)
Total Dissolved Solids	n/a	SM2540C	W	10000	4000	not screened	not screened
Hardness	n/a	SM2340C	W	2000	525	not screened	not screened
Free Cyanide	57-12-5F	OIA-1677	W	2	1.69	n/a	5.2 A(C) 22 A(A)

Notes:
µg/L = micrograms per liter
A(C) = protective of fish propagation in fresh waters
A(A) = protective of fish survival in fresh waters
CAS = Chemical Abstracts Service
DCB = dichlorobenzenes
DQO = data quality objective
GA = protective of fresh groundwaters for drinking water source
H(FC) = protective of human health for fish consumption
MRL = minimum reporting limit
MDL = method detection limit
n/a = not applicable
not screened = indicates not a site-related constituent; data used for geochemical assessment/developing surface water criteria only
W = water
1 = 6 NYCCR 703.5, Table 1 Water Quality Standards Surface Waters (or Water Quality Guidance Values from NYS Dept. of Water TOGS 1.1.1 as noted).
2 = A(A) and A(C) values are calculated based on hardness.
3 = GA standard for DCB applies individually to isomers (1,2-DCB; 1,3-DCB; and 1,4-DCB). Surface water A(C) value applies to the sum of the isomers. DCB method will allow reporting to less than 3 µg/L with applicable qualification.

Figures



EHS Support

Figure 1. Project Organization Chart
Former Ciba-Geigy Facility, Glens Falls, New York

03/01/2021

October 21, 2024

Kevin Chazhikattu,
New York State Department of Environmental Conservation
Division of Materials Management, Haz Waste CA & PCC
625 Broadway
9th Floor
Albany, NY 12233-7015

Subject: **Response to Comments**
Proposed Groundwater Monitoring Well Decommissioning List and Schedule Letter
Response to Agency Comments
Former Ciba-Geigy/Hercules Site, Glens Falls, New York
EPA ID NYD002069748 / NYSDEC Site No.: 557011

Dear Mr. Chazhikattu:

On behalf of Hercules LLC ("Hercules," a wholly-owned subsidiary of Ashland Inc.) and CIBA Corporation ("CIBA," previously acquired by BASF Corporation), EHS Support LLC ("EHS Support") is submitting the enclosed revision to the *Summary of PTP[1] Area Monitoring Wells, Temporary Piezometers, In-Situ Sampling Points, and Staff Gauges and Decommissioning Recommendation ("*PTP Wells Decommissioning Letter*"),* for the former Ciba-Geigy/Hercules site in Glens Falls, New York ("the Site"). As a matter of background, Ashland Inc. and BASF Corporation (referenced herein as "the Parties"), are responding on behalf of the permittees for the Site, Hercules and CIBA.

The New York State Department of Environmental Conservation (NYSDEC) provided comments regarding the August 2024 *Decommissioning Letter* via a letter on September 27, 2024. The comments provided by NYSDEC are listed below, with the Parties' response in italics following each comment. The enclosed PTP Wells Decommissioning Letter (**Enclosure A**) incorporates the Parties' proposed edits.

1. NYSDEC – Comment 1: Table 1 Historical Cyanide Concentrations Detected in Pretreatment Plant Area does not include any units for the samples. If you could include the units so we can better understand the numbers and ensure future staff have a clear understanding of the units of measurement for this data.

   Parties' Response: Table 1 was updated to include notes that were inadvertently left out.

2. NYSDEC – Comment 2: Although it is mentioned in Table listing In-Situ Sampling Points and in the historical install and sampling information, Wells PTP-SB01, P-6, P-9, and P-10 does not appear in Figure 1.

   Parties' Response: Figure 1 was updated to include wells that were inadvertently left out. There is no piezometer identified as P-9.

[1] PTP = Pre-Treatment Plant

3. NYSDEC – Comment 3: Based on the figures given in the Part A Application, there appears to be conflicting information on the location of the wells.

   Parties' Response: Locations of several well were inadvertently mislabeled on Figure 1. Also, some wells, not displayed on the original figure, were added. Updated Figure 1 included in the PTP Wells Decommissioning Letter depicts the most accurate location of wells in the PTP Area.

4. NYSDEC – Comment 4: The request for decommissioning shows IG-3, P-7, and P-8 which are indicated to have been replaced in 2012 as IG-3R, P-7R, and P-8R when the piezometers were replaced. Were the wells replaced in the same coordinates as the historic wells or where they placed near but not in the exact same location? If in the same location, are the parties requesting the decommissioning of IG-3R, P-7R, and P-8R, instead of the historic wells IG-3, P-7, and P-8 as indicated in the table? If not in the same location, are the parties requesting the decommissioning of the old wells, while keeping the replaced units.

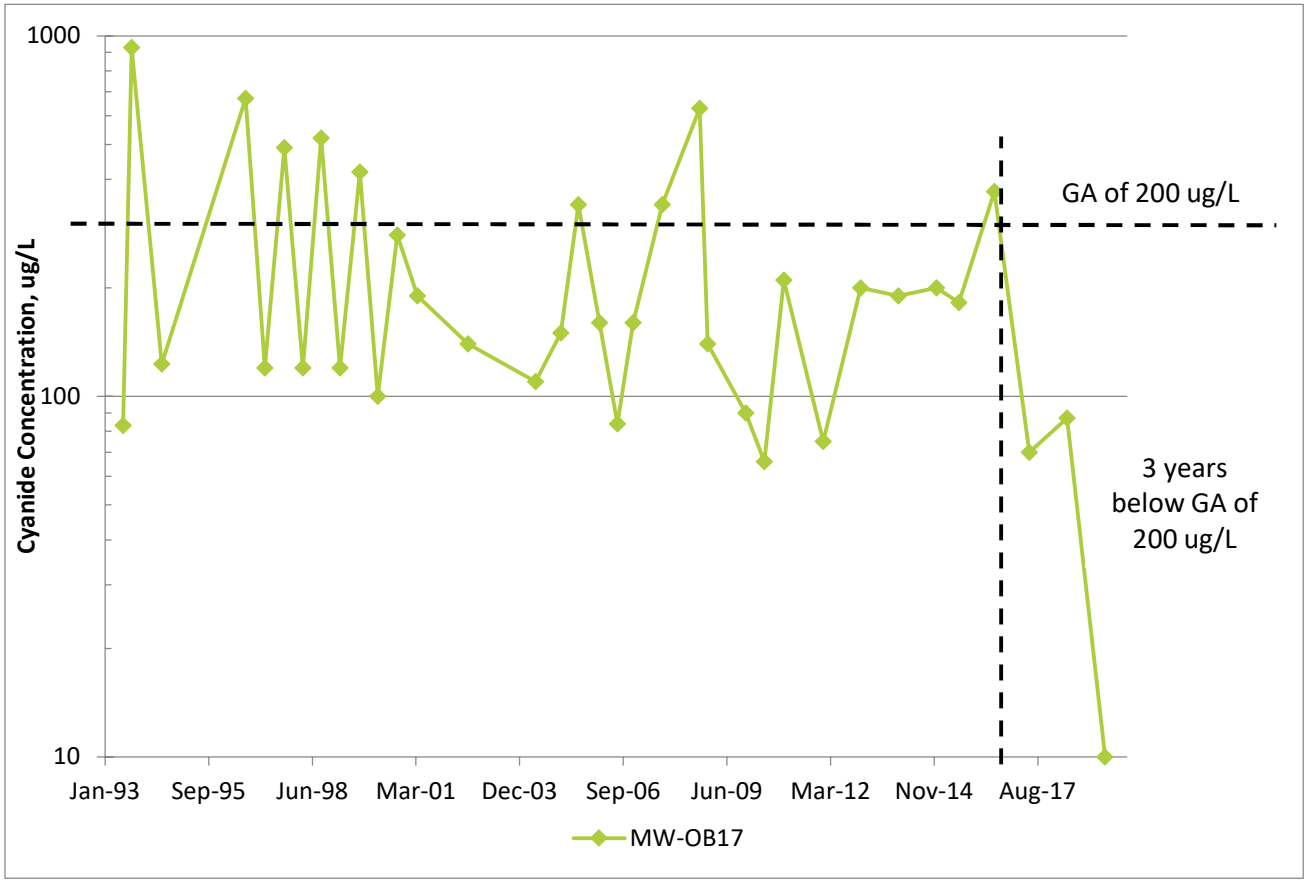
   Parties' Response: The original wells P-7, P-8, and IG-3 were abandoned per NYSDEC requirements in 2012 as documented in the 2012 Groundwater Monitoring Report (Antea Group, 2012, see letter quote below). The 2012 Groundwater Monitoring Report also includes a description of the installation of the replacement wells IG-3R, P-7R, and P-8R. The Parties are requesting to decommission the replacement wells IG-3R, P-7R, and P-8R.

   > *"… P-7 and P-8 (located on the Pretreatment Plant SWMU property) were inspected to determine whether repairs could be made to the existing. well casings, which were observed to be damaged. Based on the inspections, it was determined that repairs would not be possible to the wells, and a reinstallation of the wells would be required. Additionally, monitoring well IG-3 was inspected due to its lack of a protective casing. During this inspection, it was noted that the well was constructed entirely of slotted well screen. Due to the improper construction of this monitoring well, IG-3 was also scheduled to be reinstalled. On October 16th and 17th, 2012, monitoring wells MW-OB1, P-7, P-8, and IG-3 were properly abandoned per NYSDEC requirements, and reinstalled to the same approximate depths as the original monitoring wells."*

5. NYSDEC – Comment 5: Based on the historical sampling shown in Table 1, P-6, P-7, P-8, P-10, P-11, P-12, and P-14 appear to have cyanide concentrations higher than the GA standard (TOGS 1.1.1), with no evidence to show a downward progression. P-15, P-15 have no sampling record shown, however it was supposed to be used to determine the groundwater flow direction. Based on the historical concentrations of MW-OB17, the concentration shows a steady decrease over several years, and then a sudden increase above the GA standards. Therefore, it has not been demonstrated that the concentrations will no longer exceed GA standards. As such, this well must be kept as a precautionary measure.

Parties' Response: ***Table 1*** *provides a summary of cyanide concentrations detected at well MW-OB17. After five years of cyanide levels below the GA Water Quality Standard of 200 µg/L, an increase was observed in July 2016. However, this was followed by three consecutive sampling events over the next three years, showing a consistent decline in cyanide concentrations, all below the regulatory threshold. Specifically, cyanide levels were recorded at 70J µg/L in June 2017, 87J µg/L in June 2018, and 10UJ µg/L in June 2019 (J indicates estimated values), as illustrated in the graph below. No cyanide was detected during the June 2019 sampling event.*

Current data indicate that elevated cyanide concentrations are now restricted to the eastern area of the PTP, particularly at monitoring well MW-OB23, located in the central area of the PTP Area, with downgradient levels at well MW-OB19 meeting regulatory standards. Well MW-OB17, located on the western side of the PTP Area and positioned side-gradient to the impacted zone (with groundwater flow in PTP Area from northwest to southeast), is no longer relevant for ongoing monitoring. The current monitoring program approved by NYSDEC includes wells MW-OB23 and MW-OB19. Moreover, a Deed Notice is in place and prevents groundwater use in the PTP Area, ensuring no risk to human health. Therefore, based on these findings, the Parties propose to decommission well MW-OB17. This action is justified by the stable decline in cyanide concentrations and the well's location outside the primary area of concern.



6. NYSDEC – Comment 6: Due to regulations, the decommissioning of these wells is a major permit modification, which must be submitted by the permittee(s). This is the basis for NYSDEC

Comment 3. A major permit modification requires public notice. If it is decided to do a permit modification, it will have to be public noticed and issued prior to the permit expiration. Otherwise, it could be implemented through the renewal permit instead (which also requires public notice).

Parties' Response: The Parties included the PTP Wells Decommissioning Letter in the Hazardous Waste Management Permit Application with intent to incorporate the decommissioning effort into the Hazardous Waste Management Permit renewal process.

7. NYSDEC – Comment 7: Is there any portion of a landfill cap or other cap near the wells requested for decommissioning? If so, there are steps required to minimize possible damage to the cover.

Parties' Response: There is no cap within the PTP Area or near the wells requested for decommissioning.

8. NYSDEC – Comment 8: While the use of CP-43 is mentioned in the Groundwater and Surface Water Monitoring Plan (EHS Support, May 2021), the well decommissioning memorandum does not mention the decommissioning method for each well. The four primary methods are listed in section 2.1 of the CP-43. My suggestion for including this would be to add it under the proposed action in Table 2. In addition, it is no longer advised to use coated bentonite pellets as the coating may contain PFAS.

Parties' Response: Section 4.8 of the Groundwater and Surface Water Monitoring Plan (EHS Support, May 2021) includes the procedure proposed to be used for future well decommissioning at the Site. Procedure includes following statements:

> *"Well decommissioning will be completed after the assessment of well construction information and current subsurface conditions. The appropriate decommissioning method(s) will be selected to protect groundwater and suit the conditions and circumstances, as outlined below."*
>
> *"The expected method for decommissioning wells at the Site is grouting in-place. Wells will be tremie grouted in-place to 5 ft bgs with the appropriate grout mixture. Once grouted, the PVC casing will be cut at 5 ft bgs."*

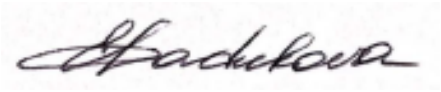
9. NYSDEC – Comment 9: The letter needs to address management of any derived waste generated from decommissioning activities. Should any materials come from contaminated sources, then the appropriate sampling method (TCLP, discrete sampling, etc.) and disposal method needs to be listed.

Parties' Response: Section 4.7.3 of the Groundwater and Surface Water Monitoring Plan (EHS Support, May 2021) includes procedures that will be followed for management of any derived waste generated from decommissioning activities. Specifically, the groundwater displaced during well decommissioning will be containerized and discharged to the on-site effluent pumping station (EPS) for discharge to the publicly owned treatment works (POTW) along with groundwater pumped via the GWES. Any derived waste generated from well/piezometer decommissioning activities will be removed and placed in 55-gallon drums for waste characterization and off-site disposal. The drums will be labeled with the type of investigation-derived waste (IDW), locations collected, and date, and will be temporarily stored on-site. IDW will then be disposed of per the requirements of Section 3.3(e) of DER-10 (NYSDEC, 2010). Documentation of waste characterization sampling results and disposal will be provided in the next Groundwater and Surface Water Monitoring Report.

Closing

Please contact Elena Dadukova at 302-440-4401 regarding any questions or for further discussion. If the enclosed revised version of the PTP Wells Decommissioning Letter is acceptable to NYSDEC, please provide the Parties with written approval.

Sincerely,



Elena Dadukova
Project Manager

Enclosures

cc: Michael Izdebski, New York State Department of Health
Angela Martin, New York State Department of Health
Lynn Winterberger, NYSDEC
John Swartwout, NYSDEC
James Vondracek, Ashland Inc.
Stephen Havlik, BASF Corporation
Laura McMahon, Brown and Caldwell
Bob O'Neill, Brown and Caldwell
Jeff Caputi, Brown and Caldwell
Kristin VanLandingham, PE, EHS Support LLC
Jim Breza, EHS Support LLC
Stacey Koch, EHS Support LLC

Enclosure A Summary of PTP Area Monitoring Wells, Temporary Piezometers, In-Situ Sampling Points, and Staff Gauges and Decommissioning Recommendation (Revised October 2024)

MEMORANDUM

To: Kevin Chazhikattu

From: Elena Dadukova, EHS Support LLC
Meredith Duncan, EHS Support LLC
Jim Breeza, EHS Support LLC

Date: August 16, 2024 – Revised October 21, 2024

Re: Summary of PTP Area Monitoring Wells, Temporary Piezometers, In-Situ Sampling Points, and Staff Gauges and Decommissioning Recommendation

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The purpose of this memo is to address the New York State Department of Environmental Conservation (NYSDEC) request for a document detailing the Pretreatment Plant (PTP) Area's historical groundwater analytical data and justification for the decommissioning (abandonment) of each monitoring well, temporary piezometer, in-situ sampling point, and staff gauge located at the PTP. This document provides a summary of the installation, sampling, and findings for each well, piezometer, sampling point, and staff gauge, supporting the recommendation for their decommissioning. This historical overview ensures that all relevant information is considered before proceeding with the decommissioning process and provides supporting information for NYSDEC files.

Hercules LLC ("Hercules," a wholly owned subsidiary of Ashland Inc.) and Ciba-Geigy Corporation ("Ciba-Geigy," previously acquired by BASF Corporation) are requesting the decommissioning of 25 wells, piezometers, sampling points, and staff gauges located in the PTP Area: 5 monitoring wells, 11 temporary piezometers, 4 in-situ sampling points, and 5 staff gauges. These points are recommended for decommissioning because groundwater monitoring data collected from the PTP Area indicates that cyanide concentrations have declined and remained below NYSDEC GA Standards at most wells since 2010. If sampling points are not properly decommissioned/abandoned, they could potentially be accessed by trespassers and may be subject to vandalism, providing a direct channel for a potential vandal(s) to release contaminants directly into the aquifer. Therefore, decommissioning these monitoring points is both justified and necessary.

Background

The PTP Area, located north of the Main Plant Site (MPS), was historically used for operational wastewater treatment. Groundwater and surface water sampling have been conducted at the PTP Area since the mid-1990s, beginning with the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (Eckenfelder Engineering, P.C., 1992 and 1993); and the RCRA Facility Investigation (RFI) (Eckenfelder Inc., 1994). Historical investigations and monitoring data indicate that only cyanide has been detected in overburden groundwater above NYSDEC GA standards. Cyanide concentrations

have significantly declined over time, and concentrations above the GA standard are now limited to the eastern area of the property.

Groundwater generally flows to the east across the PTP Area, with localized southerly flow in the southwest corner. Shallow groundwater (overburden) is perched in a thin, saturated zone above lacustrine clay, with lateral groundwater flow influenced by the configuration and undulations of the clay surface beneath the property.

In November 1991, the RFA of the PTP was initiated to characterize soil and groundwater conditions and evaluate potential environmental impacts from PTP operations. The RFA was conducted in two phases. The first phase evaluated soil quality, installed piezometers and staff gauges (i.e., Glens Falls Feeder Canal and unnamed surface drainage features), and monitored water levels to assess groundwater flow, with results and proposed monitoring well locations presented in the RFA-Sampling Visit Report. In the second phase, monitoring wells were installed, sampled, and analysed for groundwater quality. The proposed well locations were revised and approved in late 1992 and early 1993, with the wells installed in May 1993 and sampled in June and September 1993.

The following section provides additional details on each phase of installation and sampling. Staff gauges SG-1, SG-2, SG-6, SG-7, SG-8, and SG-11 were installed during various phases of work between 1991 and 2000. SG-11 was initially installed in the east area and was later reinstalled in the current location.

Historical Well Installation and Sampling

This section provides an overview of the historical groundwater sampling and well installation efforts in the PTP Area from 1991 to 2018. The objective of these activities was to determine groundwater flow direction, evaluate the spatial distribution of cyanide contamination, and guide the selection and installation of both temporary piezometers and monitoring wells. The following chronological overview highlights the key installations and sampling events, along with the findings and significant changes observed over the years.

1991

As part of the RFA of the PTP Area, nine 1-inch-diameter polyvinyl chloride (PVC) piezometers (P-1, P-3, P-6, P-7, P-8, P-10, P-11, P-12, and P-14) were installed in 1991 at the PTP to determine groundwater flow direction and guide the selection of permanent well locations (Eckenfelder Engineering, P.C., 1992). The piezometers were constructed of 1-inch-diameter PVC pipe to a depth range of 8-11 feet below ground surface (ft bgs), with an approximately 5-foot screen.

1993

Three overburden wells (MW-OB17, MW-OB18, and MW-OB19) were installed in 1993 as part of the groundwater evaluation component of the RFA (Eckenfelder Engineering, P.C., 1993). The well locations were selected based on the groundwater flow directions assessed using water level data from the nine piezometers mentioned above. Monitoring well MW-OB17 was located upgradient of the facility, while MW-OB18 was located downgradient of the primary clarifiers, treatment tanks, and tile line. Monitoring

well MW-OB19 was positioned downgradient of the old chemical treatment building and several former storage tanks. Groundwater samples collected from these wells in June and September of 1993 were analyzed for metals, total cyanide, volatile organic compounds, and semi-volatile organic compounds (Eckenfelder P.C., 1993 and Eckenfelder Inc., 1994). The only constituent detected at concentrations above the Groundwater Protection Concentrations established at the time in the Hazardous Waste Management (HWM) Permit was total cyanide. During the RFA MW-OB19 exhibited the highest cyanide concentrations.

1994

As part of the RFI of the PTP area, groundwater samples from the nine piezometers and three monitoring wells were collected and analyzed for total cyanide, providing coverage across both central locations and the boundaries of the PTP Area. Additionally, two piezometers (P-15 and P-16) were installed. Piezometer P-16 was installed north of the stream near SG-1, and P-15 was installed on the east side of the marsh, north of the Feeder Canal (Eckenfelder Inc., 1994). The piezometers were constructed of approximately 1-1/4-inch diameter black steel pipe with an approximately 1.5-foot interval of stainless-steel screen and a cast iron drive point at the base. The annulus between each piezometer and respective boring was backfilled with auger cuttings. In-situ groundwater sampling from the overburden was attempted at 10 locations, designated IG-1 through IG-10, by installing temporary sampling points. Locations IG-1 through IG-4 were located north of the Feeder Canal in the western part of the PTP area, and IG-5 through IG-10 were located south of the Feeder Canal. These temporary in-situ groundwater sampling points used 1-inch-diameter to 1.25-inch-diameter PVC pipes with screens ranging from 3-6 feet long (0.010-inch-slot screen) and 1.5-inch-diameter drive-points. A steel rod connected to the Geoprobe unit was inserted through the PVC pipe to the drive-point, and the pipe was hydraulically driven below the water table. After allowing the water level to stabilize, samples were collected from the temporary sampling points. The samples were analyzed for total cyanide. No groundwater was encountered at locations IG-5 and IG-6. Attempts to remove the PVC pipes from locations south of the Feeder Canal were unsuccessful, leaving portions of the pipes in the ground. These holes were sealed by filled them with bentonite. The pipes in IG-1 through IG-4 were left as temporary water level monitoring points (Eckenfelder Inc., 1994).

1996

Four overburden monitoring wells (MW-OB20, MW-OB21, MW-OB22, and MW-OB23) were installed after the RFI to support groundwater monitoring at the PTP area. MW-OB20 was positioned near the southwest boundary of the PTP Area, while downgradient wells MW-OB21 and MW-OB22 were installed off-site, south of the Feeder Canal. MW-OB23 was placed in the central area of the PTP where the highest cyanide concentrations in groundwater had been previously encountered. MW-OB23 measured the highest cyanide concentration at the time of initial sampling and continues to show the highest levels of total cyanide.

2012

Several PTP piezometers (IG-3R, P-7R, and P-8R) were replaced and reinstalled at approximately the same depths as the original monitoring wells (Antea Group, 2013).

2016-2018

Between 2016 and 2018, tank and building decommissioning and demolition activities were carried out in the PTP Area following NYSDEC's approval of the Work Plan. This included the cleaning and removal of the 500,000-gallon aboveground storage tank (AST) (AST-110) and the demolition of the former PTP building, as documented in the *AST Decommissioning Report* (Antea Group, 2016) and the *AST & Pretreatment Plant Decommissioning and Demolition Report* (Antea Group, 2018). Following the decommissioning effort, a temporary well was installed at soil boring PTP-SB01, and a groundwater sample was collected. The temporary well was a 1-inch-diameter PVC well, screened from 5 to 15 ft bgs with a 5-foot PVC riser. The annular space was left open for potential future removal of the well. Groundwater samples from this well were analyzed for total cyanide, total chromium and hexavalent chromium. Total chromium and hexavalent chromium concentrations were below GA standards. Cyanide levels in groundwater beneath former AST-110 were detected at 320-420 micrograms per liter (µg/L) (PTP-SB01), which was consistent with expected concentrations at the time based on upgradient well MW-OB23.

Monitoring Assessment Summary

Selection of the monitoring networks and analysis schedules for the PTP Area is outlined in the *Groundwater and Surface Water Monitoring Plan* (GSMP) (EHS Support, 2021). In accordance with the GSMP, groundwater samples are currently collected from two wells in the PTP Area (MW-OB19 and MW-OB23) and one surface water location (SG-11), and are analyzed for total cyanide (**Figure 1** and **Table 1**).

Since 2010, representing 14 years of monitoring data, cyanide groundwater concentrations in the PTP Area and downgradient of the PTP Area have consistently been below the GA Standard of 200 µg/L, except for wells MW-OB17, MW-OB19, and MW-OB23, as shown in **Table 1**. Historically, the highest cyanide levels were detected in the central area of the PTP Area at well MW-OB23, located immediately adjacent to the historical wastewater tank, and well MW-OB19, located downgradient of MW-OB23; however, concentrations detected in wells MW-OB19 and MW-OB23 have declined significantly following the cessation of historical operations, and have remained stable or decreasing for over a decade. Mann-Kendall trend analysis of well MW-OB23 cyanide concentrations confirms a downward trend in cyanide concentrations at well MW-OB23 over the past 20 years. Free cyanide levels in surface water have been either below or near the detection limit of 2 µg/L.

Cyanide concentrations in groundwater above the GA Standard is limited to one monitoring point (MW-OB23), with concentrations downgradient from MW-OB23 below the GA Standard along the PTP Area property boundary (i.e., at MW-OB18). Free cyanide levels in surface water directly downgradient of the PTP Area (SG-11) are below applicable surface water standards (5.2 µg/L), and a Deed Notice is in place to prevent groundwater use on the site. Given these conditions, the residual cyanide in groundwater at the PTP Area does not pose a risk to human health or the environment.

Conclusion and Recommendations

Groundwater monitoring data collected from the PTP Area indicates that cyanide concentrations have declined and remained below NYSDEC GA Standards since 2010. Historically high levels have decreased and stabilized following the end of PTP operations. Current data show that elevated concentrations are now confined to specific areas (eastern area of the PTP), particularly monitoring well MW-OB23 located in the central area of the PTP Area, with downgradient levels meeting regulatory standards. Surface water directly downgradient of the PTP area also exhibits free cyanide levels below applicable surface water quality standards. A Deed Notice prevents groundwater use in the PTP Area, ensuring no risk to human health.

Based on historical and recent sampling results (**Table 1**) and the intended uses of the temporary piezometers and in-situ sampling locations (delineation points to locate monitoring wells during the Remedial Investigation phase), it is recommended to decommission all the monitoring wells, temporary piezometers, in-situ sample locations, and staff gauges in the PTP Area. This includes 5 monitoring wells, 11 temporary piezometers, 4 in-situ sampling points, and 5 staff gauges. The reason and rationale for decommissioning these monitoring points are presented in **Table 2**. Monitoring wells MW-OB19 and MW-OB23, along with staff gauge SG-11, will be retained as active monitoring points and are currently included in the groundwater monitoring program. An upgradient piezometer P-1 will not be decommissioned at this time per NYSDEC request on September 29, 2023 (P-1 is not included in the current groundwater monitoring program).

Listed in the table below are the monitoring points recommended for decommissioning in the PTP Area:

Monitoring Wells	Temporary Piezometers	In-Situ Sampling Points	Staff Gauges
MW-OB17	P-3	IG-1	SG-1
MW-OB18	P-6	IG-2	SG-2
MW-OB20	P-7R	IG-3R	SG-6
MW-OB21	P-8R	IG-4	SG-7
MW-OB22	P-10	PTP-SB01	SG-8
	P-11		
	P-12		
	P-14		
	P-15		
	P-16		

References

Antea Group. 2013. *2012* Groundwater Monitoring Report, Former CIBA-Geigy/Hercules Plant Site, 89 Lower Warren Street, Queensbury, NY.

Antea Group. 2016. *AST Decommissioning Report*. February.

Antea Group. 2018. *AST & Pretreatment Plant Decommissioning and Demolition Report*. August

Eckenfelder Engineering, P.C. 1992. *RFA Sampling Visit Pretreatment Plant*.

Eckenfelder, Engineering, P.C. 1993. Groundwater Addendum to the RFA report for Pretreatment plant SWMU Ciba-Geigy Site, Glens Falls, New York.

Eckenfelder Inc.1994. *RFI Report for the Pretreatment Plant SWMU, Ciba-Geigy Site, Glens Falls, New York*. October.

EHS Support. 2021. Groundwater and Surface Water Monitoring Plan and Quality Assurance Project Plan. March.

Tables

Table 1 - Revised October 2024
Historical Cyanide Concentrations Detected in Pretreatment Plant Area
Former Ciba-Geigy/Hercules Site - Glens Falls, NY
Hercules LLC
Glens Falls, New York

Sample Date	P-1	P-3	P-6	P-7R	P-8R	P-10	P-11	P-12	P-14	MW-OB17	MW-OB18	MW-OB19	P-15	P-16	IG-1	IG-2	IG-3R
Jun-93	-	-	-	-	-	-	-	-		83	**237**	**2000**			-	-	-
Sep-93	-	-	-	-	-	-	-	-		**928**	**387**	**1080**			-	-	-
Jul-94	**624**	91	**5280**	**417**	**2230**	**5700**	**448**	**531**	**277**	123	**380**	**229**	NS	NS	86	103	74
Sep-96	**660**	-	-	-	-	-	-	-		**670**	**330**	-			-	-	-
Mar-97	**350**	-	-	-	-	-	-	-		120	**340**	-			-	-	-
Sep-97	**510**	-	-	-	-	-	-	-		**490**	ND	-			-	-	-
Mar-98	**260**	-	-	-	-	-	-	-		120	**350**	-			-	-	-
Sep-98	**540**	-	-	-	-	-	-	-		**520**	**390**	-			-	-	-
Mar-99	**240**	-	-	-	-	-	-	-		120	**280**	-			-	-	-
Sep-99	**360**	-	-	-	-	-	-	-		**419**	**300**	-			-	-	-
Mar-00	**300**	-	-	-	-	-	-	-		100	**290**	-			-	-	-
Sep-00	200	-	-	-	-	-	-	-		**280**	190	-			-	-	-
Apr-01	**280**	-	-	-	-	-	-	-		190	**240**	-			-	-	-
Aug-02	**220**	-	-	-	-	-	-	-		140	180	**900**			-	-	-
May-04	140	-	-	-	-	-	-	-		110	140	**630**			-	-	-
Jan-05	110	-	-	-	-	-	-	-		150	140	**470**			-	-	-
Jul-05	140	-	-	-	-	-	-	-		**340**	150	**690**			-	-	-
Jan-06	96	-	-	-	-	-	-	-		160	180	96			-	-	-
Jul-06	120	-	-	-	-	-	-	-		84	86	**380**			-	-	-
Dec-06	77	-	-	-	-	-	-	-		160	160	89			-	-	-
Sep-07	180	-	-	-	-	-	-	-		**340**	200	-			-	-	-
Sep-08	140	-	-	-	-	-	-	-		**630**	-	**280**			-	-	-
Dec-08	60	-	-	-	-	-	-	-		140	-	170			-	-	-
Dec-09	60	-	-	-	-	-	-	-		90	-	170			-	-	-
Jun-10	89	-	-	-	-	-	-	-		66	-	**250**			-	-	-
Dec-10	73	-	-	-	-	-	-	-		**210**	-	41			-	-	-
Dec-11	36	-	-	-	-	-	-	-		75	54	54			-	-	-
Dec-12	110	-	-	-	-	-	-	-		200	59	59			-	-	-
Dec-13	78	-	-	-	-	-	-	-		190	83	180			-	-	-
Dec-14	51	-	-	-	-	-	-	-		200	35	96			-	-	-
Jul-15	-	-	-	-	-	-	-	-		182	102	182			-	-	-
Jul-16	-	-	-	-	-	-	-	-		**370**	57	140			-	-	-
Jun-17	-	-	-	-	-	-	-	-		70 J	93	**250 J**			-	-	-
Jun-18	-	-	-	-	-	-	-	-		87 J	110 J	180 J			-	-	-
May-19	-	-	-	-	-	-	-	-		-	-	-			-	-	-
Jun-19	-	-	-	-	-	-	-	-		10 UJ	100 J	29 UJ			-	-	-
Jun-20	-	-	-	-	-	-	-	-		-	-	**300**			-	-	-
Nov-21	-	-	-	-	-	-	-	-		-	-	**210**			-	-	-
Oct-22	-	-	-	-	-	-	-	-		-	-	**270 J**			-	-	-
Oct-23	-	-	-	-	-	-	-	-		-	-	170			-	-	-

Notes:
BOLD value indicates concentration above GA Water Quality Standard.
* Only free cyanide result available
µg/L = micrograms per liter
- = not applicable

DRY = unable to sample due to dry well conditions
J = indicates value is estimated
U = indicates analyte was not detected above reporting limit shown
NS = not sampled

Table 1 - Revised October 2024
Historical Cyanide Concentrations Detected in Pretreatment Plant Area
Former Ciba-Geigy/Hercules Site - Glens Falls, NY
Hercules LLC
Glens Falls, New York

Sample Date	IG-4	IG-7	IG-8	IG-9	IG-10	MW-OB20	MW-OB21	MW-OB22	MW-OB23	SG-1	SG-2	SG-6	SG-7	SG-8	SG-11	PTP-SB01
Jun-93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sep-93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jul-94	147	121	29	195	28											-
Sep-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar-97	-	-	-	-	-	62	**490**	**460**	**3100**	-	-	-	-	-	-	-
Sep-97	-	-	-	-	-	60	**480**	88	**2400**	-	-	53 N	48 N	12 N	-	-
Mar-98	-	-	-	-	-	49	**510**	46	**1600**	-	-	6.6	40	7.4	-	-
Sep-98	-	-	-	-	-	58	**720**	140	**1900**	-	-	64	38	27 N	-	-
Mar-99	-	-	-	-	-	27	**570**	61	**2000**	-	-	29	30	15	-	-
Sep-99	-	-	-	-	-	145	**870**	120	**5000**	-	-	64	< 10	60	-	-
Mar-00	-	-	-	-	-	19	**690**	70	**7200**	-	-	6.4	23	13	-	-
Sep-00	-	-	-	-	-	98	**470**	120	**2500**	-	-	36	< 5	7.5	-	-
Apr-01	-	-	-	-	-	21	**420**	190	**1000**	-	-	24	22	23	-	-
Aug-02	-	-	-	-	-	100	**540**	**300**	**4500**	-	-	< 5	< 5	< 5	-	-
May-04	-	-	-	-	-	46	**360**	77	**2200**	-	-	24	22	8.8	-	-
Jan-05	-	-	-	-	-	94	**480**	46	**1500**	-	-	-	-	-	-	-
Jul-05	-	-	-	-	-	73	**410**	**340**	**2900**	-	-	-	-	-	-	-
Jan-06	-	-	-	-	-	62	**330**	-	**1100**	-	-	-	-	-	-	-
Jul-06	-	-	-	-	-	**330**	**360**	84	40	-	-	-	-	-	-	-
Dec-06	-	-	-	-	-	-	**360**	36	**1600**	-	-	-	-	-	-	-
Sep-07	-	-	-	-	-	56	**290**	40	**2100**	-	-	-	-	-	-	-
Sep-08	-	-	-	-	-	40	**280**	10	**4000**	-	-	-	-	-	-	-
Dec-08	-	-	-	-	-	50	**300**	ND	-	-	-	-	-	-	-	-
Dec-09	-	-	-	-	-	50	**260**	30	**980**	-	-	-	-	-	-	-
Jun-10	-	-	-	-	-	30	**210**	17	**1700**	-	-	-	-	-	-	-
Dec-10	-	-	-	-	-	-	190	24	**2300**	-	-	-	-	-	-	-
Dec-11	-	-	-	-	-	160	180	19	**910**	-	-	-	-	-	-	-
Dec-12	-	-	-	-	-	170	76	21	**1900**	-	-	-	-	-	-	-
Dec-13	-	-	-	-	-	-	140	17	**1100**	14	9	31	31	31	31	-
Dec-14	-	-	-	-	-	87	100	16	**690**	-	-	19	18	15	15	-
Jul-15	-	-	-	-	-	DRY	119	-	**1800**	-	-	-	<10 J	-	<10 J	-
Jul-16	-	-	-	-	-	-	96	-	**2500**	-	-	-	DRY	-	<10	-
Jun-17	-	-	-	-	-	51 J	85 J	-	**1400 J**	-	-	-	7.9 J	-	<10	-
Jun-18	-	-	-	-	-	-	140 J	-	**2000**	-	-	-	<10	-	3.2 J	-
May-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**420**
Jun-19	-	-	-	-	-	28 J	62J	-	**670 J**	-	-	-	<2*	-	2.1*	-
Jun-20	-	-	-	-	-	-	-	-	**1000**	-	-	-	<2*	-	<2*	**310**
Nov-21	-	-	-	-	-	-	-	-	**780**	-	-	-	-	-	-	-
Oct-22	-	-	-	-	-	-	-	-	**3000 J**	-	-	-	-	-	-	-
Oct-23	-	-	-	-	-	-	-	-	**1600**	-	-	-	-	-	<2*	-

Notes:
BOLD value indicates concentration above GA Water Quality Standard.
* Only free cyanide result available
µg/L = micrograms per liter
- = not applicable

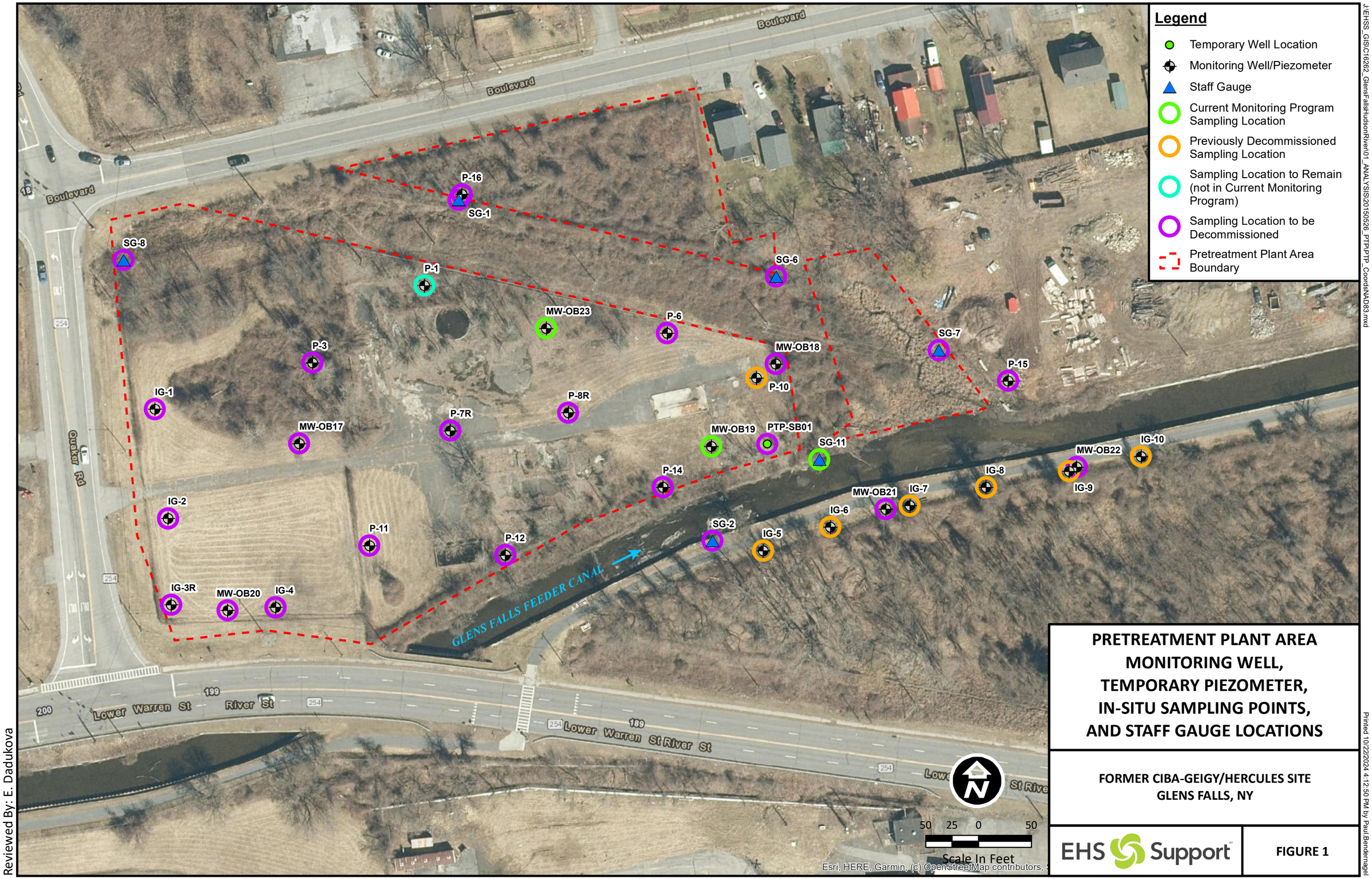
DRY = unable to sample due to dry well conditions
J = indicates value is estimated
U = indicates analyte was not detected above reporting limit shown
NS = not sampled

Table 2
Summary of Well Decommissioning Evaluation
Former Ciba-Geigy/Hercules Site - Glens Falls, NY
Hercules LLC
Glens Falls, New York

Well ID	Proposed Action	Justification
P-1	Retain: upgradient well	Temporary piezometers were installed to determine groundwater flow direction, evaluate the spatial distribution of cyanide, and guide the selection of permanent well locations and are no longer needed.
P-3	Decommission	
P-6	Decommission	
P-7R	Decommission	
P-8R	Decommission	
P-10	Decommission	
P-11	Decommission	
P-12	Decommission	
P-14	Decommission	
MW-OB17	Decommission	Cyanide concentration is less than GA standard since 2017.
MW-OB18	Decommission	Cyanide concentration is less than GA standard since 2002.
MW-OB19	Retain: used in current monitoring program	Remains in current monitoring program and is analyzed for cyanide in groundwater.
P-15	Decommission	Temporary piezometers installed to determine groundwater flow direction. Piezometers are no longer needed because groundwater flow in the study area has been determined.
P-16	Decommission	
IG-1	Decommission	These in-situ sampling points were installed to evaluate the spatial distribution of cyanide and are no longer needed.
IG-2	Decommission	
IG-3R	Decommission	
IG-4	Decommission	
IG-5	No action	Monitoring point has been decommissioned (does not exist).
IG-6	No action	
IG-7	No action	
IG-8	No action	
IG-9	No action	
IG-10	No action	
MW-OB20	Decommission	Cyanide concentration is less than GA standard since 2007.
MW-OB21	Decommission	Cyanide concentration is less than GA standard since 2010.
MW-OB22	Decommission	Cyanide concentration is less than GA standard since 2006.
MW-OB23	Retain: used in current monitoring program	Remains in current monitoring program and is analyzed for cyanide in groundwater.
SG-1	Decommission	No exceedances of GA standard or applicable surface water quality standards for total cyanide.
SG-2	Decommission	No exceedances of GA standard or applicable surface water quality standards for total cyanide.
SG-6	Decommission	No exceedances of GA standard or applicable surface water quality standards for total cyanide.
SG-7	Decommission	No exceedances of GA standard. Analysis for free cyanide indicate no exceedances of applicable surface water standard.
SG-8	Decommission	No exceedances of GA standard or applicable surface water quality standards for total cyanide.
SG-11	Retain: used in current monitoring program	Remains in current monitoring program and is analyzed for free cyanide in surface water.
PTP-SB01	Decommission	Temporary groundwater sampling point as part of tank decommissioning effort and is no longer needed.

Note: decommissioning will be conducted in accordance with the CP-43 Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009) and procedures in the approved Groundwater and Surface Water Monitoring Plan (EHS Support, 2021)

Figures



PRETREATMENT PLANT AREA MONITORING WELL, TEMPORARY PIEZOMETER, IN-SITU SAMPLING POINTS, AND STAFF GAUGE LOCATIONS

FORMER CIBA-GEIGY/HERCULES SITE
GLENS FALLS, NY

EHS Support℠

FIGURE 1

Reviewed By: E. Dadukova

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Printed 10/22/2024 4:12:50 PM by Paul Bendernagel

Enclosure B Certification Pages

Certification Page – Permittee, Hercules LLC

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James Vondracek/Remediation Project Manager

Date

Certification Page – Permittee, BASF Corporation

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Stephen K. Havlik/BASF Senior Remediation Project Manager

Date

May 11, 2026

Kevin Chazhikattu
New York State Department of Environmental Conservation
Division of Materials Management, Haz Waste CA & PCC
625 Broadway
9th Floor
Albany, NY 12233-7015

Subject: **Pretreatment Plant (PTP) Monitoring Well Inspection Summary**
Former Ciba-Geigy/Hercules Site, Glens Falls, NY
(Site No. 557011; EPA ID NYD002069748)

Dear Mr. Chazhikattu:

On behalf of Hercules LLC ("Hercules", a wholly-owned subsidiary of Ashland Inc.) and CIBA Corporation ("CIBA", previously acquired by BASF Corporation), EHS Support LLC ("EHS Support") is submitting a summary of the monitoring well inspection conducted at the Pretreatment Plant (PTP) portion of the former Ciba-Geigy/Hercules Site ("Site") located at 89 Lower Warren Street in the Town of Queensbury near Glens Falls, New York. Hercules and CIBA are the Site permittees and share responsibility for ongoing environmental activities at the Site. The Parties previously submitted a letter dated August 11, 2023 titled *Proposed Groundwater Monitoring Well Decommissioning List and Schedule – Pretreatment Plant Area*, which provided PTP-specific information regarding monitoring wells proposed for decommissioning. In conjunction with NYSDEC's review of that submittal, the Parties received comments indicating that potentiometric maps should be prepared for the PTP Area as part of groundwater monitoring. Therefore, the objective of this evaluation was to assess whether the existing PTP monitoring well network is sufficient and usable to support preparation of potentiometric maps for the PTP Area.

Summary of field Activities

EHS Support personnel performed an inspection of accessible monitoring wells at the PTP Area on April 14, 2026. The inspection included documenting general well condition, collecting basic field observations, and measuring depth to water and total well depth. Where present, sediment and debris accumulation and potential screen obstruction were also noted. Monitoring wells P-15 and P-6 were not located during the inspection. Surface reconnaissance included targeted search with a metal detector in the vicinity of the presumed well locations. These two wells are assumed lost or previously decommissioned. The inspection results are summarized in the attached **Table 1**.

In general, the inspected wells were located and gauged; as indicated in **Table 1**. The table also summarizes measured current well depths versus installed depths to support evaluation of potential sediment accumulation or other changes that may affect usability for monitoring.

As part of assessing well usability for gauging and potentiometric mapping, EHS Support evaluated potential sedimentation-related loss of the open screen interval. To evaluate potential screen plugging, EHS Support compared the measured current well depth (from top of casing to bottom, converted to feet below ground surface [bgs] using the reference point) to the installed well depth and screen length (where available). These calculations assume the loss in measured well depth reflects sediment accumulation from the bottom of the well upward into the screened interval.

Groundwater elevation data collected during the April 14, 2026 gauging event (Table 1) were used to develop a potentiometric surface map for the PTP Area, consistent with NYSDEC's request for a PTP-specific evaluation. The resulting potentiometric surface map (**Attachment 1**) indicates generally east-southeasterly groundwater flow toward SG-11 at the Feeder Canal and is similar to the flow direction documented historically. The potentiometric surface map is provided as **Attachment 1** to this submittal.

Conclusion

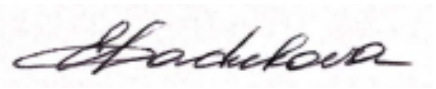
Table 2 lists all permanent wells, piezometers, and temporary monitoring points located within the PTP Area. This table identifies the monitoring locations by proposed status, including wells designated for gauging only, wells proposed for continued gauging and sampling, wells proposed for decommissioning, and wells that have been previously decommissioned or are no longer available due to damage or loss. The table also provides the technical basis and justification for each proposed designation.

Based on the April 14, 2026 inspection and gauging results, the Parties propose to use the wells identified in **Table 2** for annual groundwater elevation gauging at the PTP Area, consistent with historical practice and the current conditions. Wells in the annual gauging network identified as having substantial screen plugging, as summarized in **Table 1**, will be scheduled for well redevelopment prior to future annual gauging events, as needed. Redevelopment activities will include removal of accumulated sediment through surging or bailing, followed by verification that the well depth has been restored.

Permanent monitoring wells proposed for decommissioning have demonstrated stable conditions, with at least ten consecutive monitoring events showing cyanide concentrations below the GA groundwater standard. The remaining monitoring locations proposed for decommissioning, including piezometers which were intended to be temporary and temporary groundwater sampling points ("IG" locations), were originally installed to evaluate groundwater flow direction, assess the spatial distribution of cyanide, and support the selection of permanent monitoring well locations. These objectives have been met, and the temporary installations are no longer needed for ongoing site monitoring.

Please contact me at 302-440-4401 if you have any questions regarding the enclosed well inspection or the PTP Area potentiometric surface map included with this submittal.

Regards,



Elena Dadukova
Project Manager, EHS Support LLC

cc: Michael Izdebski - New York State Department of Health
Lynn Winterberger - NYSDEC
Kevin Wood – NYSDEC
Aseem Kumar – NYSDEC
Alanna Mitchell – NYSDEC
Jim Vondracek - Ashland Inc.
Steve Havlik - BASF Corporation
Kristin VanLandingham, PE - EHS Support LLC
Stacey Koch - EHS Support LLC
Laura McMahon - Brown & Caldwell
Bob O'Neill - Brown & Caldwell
Jeff Caputi - Brown & Caldwell

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

James Vondracek

James E Vondracek, Remediation Project Manager

Name/Title

May 12, 2026

Date

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

Stephen K Havlik

Name/Title
Stephen K Havlik
Senior Remediation Project Manager

May 13, 2026

Date

Certification Page

I, Kristin A. VanLandingham, P.E., certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

Kristin A. VanLandingham, P.E.
NYS Professional Engineer License No. 089610

05/12/2026

Date



Tables

Table 1
Summary of PTP Well Evaluation
Pretreatment Plant (PTP) Monitoring Well Inspection Summary
Former Ciba-Geigy/Hercules Site, Glens Falls, NY

Well ID	Include in Annual Gauging	Date of Inspection	April 14, 2026 Field Mearusement Depth to Bottom (ft TOC)	April 14, 2026 Field Mearusement Water Level Depth (ft TOC)	Installed Depth (ft bgs)	REF-Ground Surface (length of stick -up or depth to ref point)	Current Well Depth (ft bgs)	Well Depth Difference (Initial vs Actual)	Well Screen Length (ft)	Percent Length of Screen Plugged (ft)	Top of Casing Elevation (ft amsl)	April 14, 2026 Groundwater Elevation (ft amsl)
IG-1	Yes	4/14/2026	8.10	5.55	5.5	3.18	4.92	0.58	3.0	19%	288.79	283.24
IG-2	Yes	4/14/2026	11.40	7.30	8.8	2.76	8.64	0.11	3.0	4%	289.77	282.47
IG-3R	No	4/14/2026	17.50	7.45	14.5	2.85	14.65	-0.20	10.0	0%	289.27	281.82
IG-4	No	4/14/2026	11.70	10.79	8.5	3.33	8.37	0.13	3.0	7%	291.74	280.95
MW-OB17	Yes	4/14/2026	14.80	6.80	11.0	2.84	11.96	-0.96	6.0	0%	289.91	283.11
MW-OB18	Yes	4/14/2026	12.75	8.78	9.5	3.58	9.17	0.33	5.0	0%	287.67	278.89
MW-OB19	Yes	4/14/2026	9.55	7.68	10.0	2.64	6.91	**3.09**	5.0	**62%**	287.64	279.96
MW-OB20	Yes	4/14/2026	10.45	9.40	8.5	2.13	8.32	0.18	4.0	5%	288.80	279.40
MW-OB23	Yes	4/14/2026	8.44	5.15	6.5	1.95	6.49	0.01	3.5	0%	287.05	281.90
P-1	Yes	4/14/2026	8.13	5.25	8.0	3.05	5.08	**2.92**	5.0	**58%**	287.73	282.48
P-3	No	4/14/2026	9.90	4.25	8.0	1.78	8.12	-0.12	5.0	0%	287.28	283.03
P-7R	No	4/14/2026	14.10	5.50	12.6	2.23	11.87	0.74	8.0	9%	288.19	282.69
P-8R	No	4/14/2026	12.65	4.50	9.6	3.01	9.64	-0.04	6.0	0%	287.24	282.74
P-11	Yes	4/14/2026	13.10	7.90	11.0	2.07	11.03	-0.03	5.0	0%	290.31	282.41
P-12	Yes	4/14/2026	9.75	6.30	8.0	2.50	7.25	0.75	5.0	15%	287.86	281.56
P-14	No	4/14/2026	9.95	7.00	8.0	2.30	7.65	0.35	8.0	4%	287.50	280.50
P-16	No	4/14/2026	4.70	3.00	3.0	1.95	2.75	0.25	1.5	17%	285.55	282.55

Notes:
Bold text indicates that well needs redevelopment.
amsl = above main sea level
ft = feet
TOC = top of casing
REF = reference point

Table 2
Summary of Well Decommissioning Evaluation
Pretreatment Plant (PTP) Monitoring Well Inspection Summary
Former Ciba-Geigy/Hercules Site, Glens Falls, NY

Well ID	Gauge Only	Gauge and Sample	Decommission	Previously Decommissioned or Lost	Justification	Reference Document, if applicable
IG-1	X				Retain for annual potentiometric maps	--
IG-2	X				Retain for annual potentiometric maps	--
IG-3				X	Previously decommissioned in 2012. Replacement piezometer installed.	2012 Groundwater Monitoring Report. Antea.
IG-3R			X		These in-situ sampling points were installed to evaluate the spatial distribution of cyanide and are no longer needed.	--
IG-4			X		These in-situ sampling points were installed to evaluate the spatial distribution of cyanide and are no longer needed.	--
IG-5				X	In situ sampling point was decommissioned in July 1994 after attempted sample collection (no saturation was encountered at location).	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
IG-6				X	In situ sampling point was decommissioned in July 1994 after attempted sample collection (no saturation was encountered at location).	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
IG-7				X	In situ sampling point was decommissioned in July 1994 after sample collection.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
IG-8				X	In situ sampling point was decommissioned in July 1994 after sample collection.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
IG-9				X	In situ sampling point was decommissioned in July 1994 after sample collection.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
IG-10				X	In situ sampling point was decommissioned in July 1994 after sample collection.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
MW-OB17	X				Cyanide concentration is less than GA standard since 2017. Retain for annual potentiometric maps only.	--
MW-OB18	X				Cyanide concentration is less than GA standard since 2002. Retain for annual potentiometric maps only.	--
MW-OB19		X			Remains in current monitoring program and is analyzed for cyanide in groundwater.	--
MW-OB20			X		Cyanide concentration is less than GA standard for **ten consecutive rounds** since 2007.	Annual Groundwater and Surface Water Monitroing Report Pretreatment Plant Area. EHS Support. November 2020

Table 2
Summary of Well Decommissioning Evaluation
Pretreatment Plant (PTP) Monitoring Well Inspection Summary
Former Ciba-Geigy/Hercules Site, Glens Falls, NY

Well ID	Gauge Only	Gauge and Sample	Decommission	Previously Decommissioned or Lost	Justification	Reference Document, if applicable
MW-OB21			X		Cyanide concentration is less than GA standard for **ten consecutive rounds** since 2010. Located on accessible walking path outside of facility fence.	Annual Groundwater and Surface Water Monitroing Report Pretreatment Plant Area. EHS Support. November 2020
MW-OB22			X		Cyanide concentration below GA standard for **twelve consecutive rounds** since 2006. Located on accessible walking path outside of facility fence.	Annual Groundwater and Surface Water Monitroing Report Pretreatment Plant Area. EHS Support. November 2020
MW-OB23		X			Remains in current monitoring program and is analyzed for cyanide in groundwater.	--
P-1	X				Retain for annual potentiometric maps	--
P-3			X		Temporary piezometers were installed to determine groundwater flow direction, evaluate the spatial distribution of cyanide, and guide the selection of permanent well locations and are no longer needed.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
P-6				X	Well lost.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
P-7				X	Previously decommissioned in 2012. Replacement piezometer installed.	2012 Groundwater Monitoring Report. Antea.
P-8				X	Previously decommissioned in 2012. Replacement piezometer installed.	2013 Groundwater Monitoring Report. Antea.
P-7R	X				Retain for annual potentiometric maps	--
P-8R	X				Retain for annual potentiometric maps	--
P-10			X		Temporary piezometers were installed to determine groundwater flow direction, evaluate the spatial distribution of cyanide, and guide the selection of permanent well locations and are no longer needed.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
P-11	X				Retain for annual potentiometric maps	--
P-12	X				Retain for annual potentiometric maps	--
P-14			X		Temporary piezometers were installed to determine groundwater flow direction, evaluate the spatial distribution of cyanide, and guide the selection of permanent well locations and are no longer needed.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
P-15				X	Well lost.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.

Table 2
Summary of Well Decommissioning Evaluation
Pretreatment Plant (PTP) Monitoring Well Inspection Summary
Former Ciba-Geigy/Hercules Site, Glens Falls, NY

Well ID	Gauge Only	Gauge and Sample	Decommission	Previously Decommissioned or Lost	Justification	Reference Document, if applicable
P-16			X		Temporary piezometers installed to determine groundwater flow direction. Piezometers are no longer needed because groundwater flow in the study area has been determined.	1994 RFI Report for the Pretreatment Plant SWMU. Eckenfelder.
PTP-SB01			X		Temporary groundwater sampling point as part of tank decommissioning effort and is no longer needed.	Soil and Groundwater Sampling Report for the Pretreatment Plant Area. EHS Support. October 2019.
SG-1			X		Total cyanide concentrations were below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L). Free cyanide was not analyzed in samples from this location.	Summary of PTP Area Monitoring Wells, Temporary Piezometers, In-Situ Sampling Points, and Staff Gauges and Decommissioning Recommendation. EHS Support. August 2024.
SG-2			X		Total cyanide concentrations were below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L). Free cyanide was not analyzed in samples from this location.	
SG-6			X		Total cyanide concentrations were below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L). Free cyanide was not analyzed in samples from this location.	
SG-7			X		Available data indicate total cyanide concentrations are below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L) and free cyanide concentrations are below applicable surface water standards (5.2 ug/L). No Class GA standards are established for free cyanide.	Annual Groundwater and Surface Water Monitroing Report Pretreatment Plant Area. EHS Support. November 2020
SG-8			X		Total cyanide concentrations were below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L). Free cyanide was not analyzed in samples from this location.	Summary of PTP Area Monitoring Wells, Temporary Piezometers, In-Situ Sampling Points, and Staff Gauges and Decommissioning Recommendation. EHS Support. August 2024.
SG-11		X			Available data indicate total cyanide concentrations are below applicable surface water standard (9,000 ug/L) and below the GA standard (200 ug/L) and free cyanide concentrations are below applicable surface water standards (5.2 ug/L). No Class GA standards are established for free cyanide. SG-11 serves as point of compliance in the monitoring program.	--

Enclosures



OVERBURDEN POTENTIOMETRIC SURFACE AT PRETREATMENT PLANT: APRIL 14, 2026

FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NEW YORK

EHS Support

ATTACHMENT 1

Reviewed By: E. Dadukova

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Printed 5/8/2026 4:52:48 PM by Paul.Bendernagel

Addendum to the 2021 Groundwater and Surface Water Monitoring Plan

The listed items below are to be incorporated into the Groundwater and Surface Water Monitoring Plan (GSMP) update to replace the existing 2021 GSMP public noticed under this permit renewal in accordance with the Schedule of Deliverables in Module XIII of this Permit. This serves as public notice for the GSMP changes mentioned herein.

1. The following pieces of information will be included in the revised 2021 GSMP to make it complete based on Module XI Groundwater Monitoring of this Draft Permit. Where appropriate, relevant information will be incorporated directly into the revised GSMP, and where more detailed background is available in prior technical documents, the revised GSMP will cite those reports as supporting references.

    a. A written description of historical facility activities surrounding the land-based RCRA units (North Waste Pile, South Waste Pile, Surface Impoundment) including historical information on deposited wastes and spills. The transition to the Corrective Action Management Unit (CAMU) and activities resulting in a corrective action monitoring plan will also be included. A written description of the site layout will be included and the more recent Figure 2 in the Executive Summary depicting SWMUs/AOCs will replace Figure 1 of the 2021 GSMP. A summary of adjacent properties/roadways to the north, south, east, and west and adjacent property types; nearby wetlands/water bodies and private drinking water wells on adjacent properties will be included in the written description.

    b. The groundwater monitoring requirements require both hydraulically upgradient and downgradient wells, with downgradient wells located at the limit of the waste management area (CAMU). Wells that are at the Point of Compliance (POC) and upgradient wells will be clearly identified in the well inventory and sampling tables as well as depicted in a separate figure focused around the CAMU (after Figure 2). Polygons showing the extent of waste within the RCRA Cap and the extent of the cap will be included to the extend possible. It is understood that this site has groundwater impacts from multiple sources, which would cause the POC wells to show contamination that may not be directly from the CAMU. An existing cluster

of wells (MW-OB7, AW-A2, AW-C8, and AW-B2) downgradient of the CAMU will be added to the current monitoring network to further support evaluation of groundwater conditions downgradient of the CAMU. Surface water sampling locations (SG-1, SG-2, SG-3, and SG-4) in the Hudson River will remain as POCs for the Main Plant Site (MPS) as a whole due to their location at the downgradient receptor.

c. Identification of groundwater flow rates, rate of contaminant flow, hydraulic conductivity (from Table 4-2 of the 2004 CMGMP), effective porosity, aquifer thickness, degree of saturation, degree of fracturing, and secondary porosity of soils and bedrock, and aquifer heterogeneity.

d. Identification of seasonal/temporal naturally and artificially induced variations in groundwater and contaminant flow, including variations based on the seasonal changes to the Hudson River elevation, operational releases of upstream Hudson River dams, and Feeder Canal operation.

e. Impacts due to the cessation of dewatering activities were described in the 2025 Groundwater and Surface Water Monitoring Report (GSMR). A description of the effects to groundwater at the site (Horizon A, B, and C) will be updated in the background or a groundwater hydraulics section similar to the GSMRs. Appendix D of the 2025 GSMR will be included as well. A description of engineering controls including the groundwater extraction system, permeable cover, and RCRA Cap.

f. An assessment and estimation of microbiological or chemical degradation which may attenuate target compounds or cause transformation of compounds potentially forming harmful chemical species.

g. A short discussion of any boring logs or other geophysical techniques that have been used at the site along with a reference to any relevant reports.

h. Inclusion of the most recent structure contour maps.

i. Inclusion of the most recent cross sections in the east-west direction and also north-south, if available.

j. Groundwater modeling.

k. Background information for each monitoring well/piezometer including the well log, water level recovery rate, measuring point elevation, normal purge volume of wells, background water quality values, and

development/redevelopment history of the wells (e.g. Table 4-2 from the 2004 Corrective Measures Groundwater Monitoring Plan (CMGMP)).

2. The following new sections will be created or current sections updated to include information that makes the GSMP more comprehensive.

    a. A description of the Triennial Well Inspection and when it will take place (during Spring or Fall sampling). A separate inspection checklist or expansion of the information included in the Well Condition section in Appendix 1 - Purge/Sample Log to include checking for cracks or frost heaving, and integrity of the seal for flush mounted wells.

    b. Section 6.1 will be expanded to discuss what information gets reported in the annual GSMR similar to Section 3.4.4 of the 2004 CMGMP. Some information to include will be the well record as written in Condition G.12 of Module XI, potentiometric maps for the PTP and each hydrogeologic unit at the MPS, field parameters, gauging and purging summary, Mann-Kendall calculations, analytical results, etc.

    c. Inclusion of a section describing the well maintenance activities of Condition F.1 of Module XI and reference Section 8.7 of the 2023 Inspection & Maintenance (I&M) Plan.

    d. A brief summary of the GWES similar to the beginning of Section 2 of the I&M Plan will be included to provide the background information to make this plan more comprehensive as the monitoring of the GWES is described herein. References to the I&M Plan to replace the Remedy Optimization Report (ROR) references will be updated as necessary.

3. Introduction (pg. 1 of GSMP). The effective date of 6 NYCRR Part 375 will be updated to December 31, 2025 in accordance with the most recent change.

4. Objectives (pg. 1 of GSMP). The existing Deed Notice description will be revised to update the description of the Deed Notice to reflect that it will be replaced by an Environmental Easement.

5. Environmental Setting (pg. 3 of GSMP). Additional information from the ROR that may have value in characterizing the geology and hydrogeology of the site will be included. This will include information regarding the known fracture pathways and discharge of groundwater from the bedrock units into the Hudson River.

6. Summary of Conceptual Site Model (pg. 6 of GSMP). MW-OB17 has hits every 5-7 years, indicating that there is residual contamination. Therefore, the last sentence of the first paragraph, will be revised from “are limited” to “are generally limited.” Until this cyclic exceedance ceases, that area (i.e. the western area) shall be considered contaminated.

7. All the wells in the PTP network, excluding those allowed to be decommissioned, will be gauged. The following wells will be gauged for water level at least annually in addition to the current gauging network to support the annual generation of a potentiometric map for the PTP in addition to the maps currently produced for the MPS: IG-1, IG-2, MW-OB17, MW-OB18, MW-OB20, P-1, P-7R, P-8R, P-11, and P-12.

8. It has been agreed that wells MW-OB17, MW-OB20, and P-7R will be sampled for one additional round of sampling to assess current conditions at the PTP. Further assessment of these wells by the facility (including sampling results) will be submitted in the annual GSMRs.

9. The general steps for evaluating a well for redevelopment will be incorporated. Some factors this will be based on include observed performance deficiencies, such as sediment accumulation affecting well function, reduced recharge, turbidity, or other indications that represent gauging or sampling may be compromised. Rather than using a fixed 10% screen-blockage criterion to trigger well redevelopment, each well will be evaluated separately, considering the purpose of the location, screen length, construction, and observed performance during field activities. The 10% or 1-ft criterion will be used as an initial screening tool to identify wells that may warrant further evaluation. The resulting evaluations and any redevelopment actions will be documented in the GWMRs. The general approach to completing well redevelopment prior to future annual gauging events will also be included.

10. Groundwater and Surface Water Reporting (pg. 20 of GSMP). The GSMR will contain all information required under DER-10, this plan (the GSMP), and Module XI of the permit.

11. Table 2 Laboratory Method Summary of GSMP. EPA Methods will be revised to the most updated method and include language for using the most recent method (e.g. SW846 8260D or most recent method).

12. Table 3 Well Construction Details of GSMP. The Northing and Easting will be updated to NAD83, as it is the most recent horizontal datum and the format referenced in DER-10.

13. Project Organization (QAPP pg. 2 and Figure 1). The project organization will be updated to include the most current team members.

ATTACHMENT E

Statement(s) of Basis, Closure Plan(s) and/or Post Closure Care Plan(s)

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York, 12233-7250
(518) 457-6934 Fax (518) 457-0629

Michael D. Zagata
Commissioner

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

STATEMENT OF BASIS

FOR

Ciba Specialty Chemicals Corporation And Hercules Incorporated
Main Plant Site
Lower Warren Street
Glens Falls, NY 12801
EPA I.D.: NYD002069748

Public Noticed on: July 17, 1996

Dated: Nov. 5, 1996

By: Norman H. Nosenchuck, P.E.
Director
Division of Solid & Hazardous Materials

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
STATEMENT OF BASIS
FOR
CIBA SPECIALTY CHEMICALS CORPORATION AND HERCULES INCORPORATED
MAIN PLANT SITE
LOWER WARREN STREET
GLENS FALLS, NEW YORK 12801
EPA I.D. NO.: NYD002069748

Date: November 4, 1996

I. ANNOUNCEMENT OF PROPOSED CORRECTIVE MEASURES

The Statement of Basis (SB) has been developed by the New York State Department of Environmental Conservation (NYSDEC) under the authority of the Solid Waste Disposal Act, as amended, and more commonly referred to as the Resource Conservation and Recovery Act, as amended, or RCRA.

The SB describes the final corrective measure being selected for remediating the contaminated soil/waste material and groundwater identified at the Ciba/Hercules Main Plant Site (formerly known as the Ciba-Geigy/Hercules Main Plant Site) located in Glens Falls, New York (the "Facility"). This final corrective measures for the contaminated soil/waste material and groundwater at the Main Plant Site is to place a permeable cover over forty (40) acres and intercept and treat the contaminated groundwater at the downgradient boundary prior to its leaving the site. In addition, the soil/waste material within the five (5) acre RCRA Corrective Action Management Unit (CAMU), would be dewatered and stabilized as necessary to support a low permeability multi-layered cover. Institutional controls will be imposed to limit future use of the site; restrict the future movement and placement of contaminated soil/waste material and the use of contaminated groundwater; and inform potential future site owners of the residual contamination present.

For the Pretreatment Plant, the final corrective measure is to excavate soils above the target cleanup levels and redeposit the soils in the CAMU or elsewhere on the Main Plant Site. The groundwater contaminant level at the property line and immediately off-site, are just above the regulatory standards; therefore, a program will be initiated to monitor the level of contamination in the groundwater. Deed restrictions will be imposed on the use of groundwater, and if unrestricted use is not achieved for the soils, additional restrictions on soil use will be imposed. If contaminant levels in the groundwater are later found to be at unacceptable levels following contaminated soil removal, additional corrective measures will be evaluated.

For those portions of the industrial sewer which are to be decommissioned, the final corrective measure is to plug the sewer laterals and fill the manholes with sand or gravel.

An investigation is currently underway to determine the level of contamination in the bottom sediments of the adjacent surface waters due to releases from the site. If at the end of this investigation, it is determined that removal of contaminated bottom sediments is necessary, they may be deposited in the Main Plant Site CAMU after any necessary pretreatment (e.g., dewatering). If the volume of sediments to be deposited precludes placing all of them in the CAMU, priority for placement in the CAMU will be given to those sediments, if any, exhibiting a hazardous waste characteristic. If necessary, due to volume, the non-hazardous sediments may be deposited elsewhere on site under an appropriate soil cover.

The SB provides background information on the Facility, including a summary of investigative findings pertinent to the on-site soil/waste material and groundwater contamination; summarizes exposure and potential risks posed by the facility contamination; outlines the alternatives considered to remediate the contaminated soil/waste material and groundwater; and presents the technical approach and rationale for the selection of the preferred remedy.

II. Facility Background

A. Location/Hydrogeology

The Main Plant Site is located in the Town of Queensbury, just east of the City of Glens Falls, Warren County, New York. The site is situated on the northern bank of an eastwardly flowing segment of the Hudson River. The Glens Falls, Cement Co., Inc. owns the property on the western boundary of the site and the quarry on the south side of the river. It is bounded to the north by the Glens Falls Feeder Canal and Lower Warren Street (State Route 32), and to the east by the Warren County Recycling Center.

The topography generally slopes toward the Hudson River. Excavation and fill deposits associated with construction and past plant activities have modified the original topography. Most notable are the mounds created by the north and south soil/waste disposal units (i.e., waste piles) in the western portion of the site. Demolition of the plant buildings has resulted in a predominantly unvegetated site occupied largely by building foundations and intervening asphalt, gravel, and building debris.

The site is situated in an area of mixed development. Industry and commercial development (including a junkyard on the north side of Lower Warren Street directly north of the CAMU), surround the site immediately to the west, north and east. Residences are scattered among the industrial and commercial development. A significant feature to the south, across the Hudson River, is a large limestone quarry operated by the Glens Falls Cement Company.

The groundwater level contours indicate that the groundwater flows generally from north to south in the overburden and in each of three progressively deeper bedrock water-bearing zones known as Horizons A, B, and C. Groundwater in the overburden water-bearing zone flows southward and discharges to the Hudson River. Groundwater in the Horizon A bedrock water-bearing zone flows southward and generally discharges to the Hudson River. At times groundwater in this zone may flow beneath the river and discharge through seeps into the limestone quarry further south. Groundwater in the deeper bedrock water-bearing zones, Horizon B and Horizon C, flows southward and southwest respectively with the potential to discharge in the limestone quarry located on the far side of the Hudson River.

The Pretreatment Plant SWMU is part of the Main Plant Site for the purpose of RCRA corrective action. It occupies approximately four acres of the site, situated north of the Glens Falls Feeder Canal and River Street and east of Quaker Road and it is connected to the Main Plant Site by the wastewater force main and gravity sewer line.

The topography of the Pretreatment Plant SWMU is generally flat and consists of both paved and unpaved surfaces. The eastern two-thirds of the Pretreatment Plant Area is predominantly paved surfaces, and remnant foundations mark the location of several former structures. Several operating structures exist here, including a treatment building and an above-ground wastewater storage tank. The western one-third of the Pretreatment Plant Area consists of open fields with grass and other vegetation. Directly to the north and east are vegetated and marshy areas that grade away from the plant. A small stream flows near the northern boundary of the Pretreatment Plant area and into a marshy area east of the Pretreatment Plant. This marsh area drains to the Feeder Canal through an open section in the northern wall of the Feeder Canal. The Feeder Canal is situated adjacent to the Pretreatment Plant area and comprises much of its southern boundary. South of the Feeder Canal, the land surface slopes to the south-southeast towards another marsh

area and stream situated in a topographically low area. Paved roads (River Street and Quaker Road) comprise the remainder of the southern and western boundaries of the Pretreatment Plant area, respectively.

Groundwater beneath the Pretreatment Plant area flows laterally through a shallow relatively permeable fill and lacustrine sands unit. A massive clay layer underlies most of the site and this together with the underlying bedrock unit forms a lower boundary to the shallow flow zone. The bedrock is only exposed to the shallow flow zone beneath a very limited portion of the site and the main fracture zones that exist beneath the Main Plant Site are not present here. Thus the bedrock under the Pretreatment Plant is not considered a significant contaminant pathway.

Groundwater flows generally west to east across the site but exhibits local variability caused by variations in the topography of the clay surface. At times a groundwater divide develops in the central portion of the site resulting in a diversion of groundwater flow to the west and southwest in the western portion of the site. In the eastern half of the site the groundwater flows toward and discharges to the stream and marshy area that lies to the north and east. A comparison of the water levels taken from staff gauges in the stream and marsh to water levels in piezometers further north and east confirms that the stream and marsh area acts as a groundwater divide. Groundwater flow in the shallow zone beyond this feature is not anticipated. In the southern part of the site groundwater flows to the south toward the feeder canal and then southeast and under the canal where the southward sloping surface of the clay unit dips beneath the bottom of the canal.

The Pretreatment Plant is situated in an area of mixed development consisting of industrial, commercial and residential properties. The property adjacent to the northern boundary of the Pretreatment Plant area is a corridor for electrical power lines operated by the Niagara Mohawk Power Corporation. The strip of property directly east of the Pretreatment Plant is denoted in the Town of Queensbury Tax Assessment Office as being residential. However, it is not a buildable lot because it is very narrow and isolated. Immediately beyond this strip to the east is property associated with the Feeder Canal and owned by the State of New York.

B. Site History

Industrial activity at the site began in the 1800's with American Wall Paper, which when incorporated, the name changed to Imperial Wallpaper. It manufactured and sold wallpaper from purchased paper stock and pigments. Then in 1907, the company began to develop inorganic pigments and formed a separate business unit, Imperial Color Works, Inc., to expand the manufacture and sale of a wide range of colored pigments. By the early 1920's, the manufacture of organic pigments had begun. During World War II, the plant expanded operations to produce zinc chromate (an anti-corrosive coating), chromium oxide (camouflage green) and magnesium powders (for flares and tracer bullets). Also, chromite ore was processed on-site to extract the metals needed for manufacturing operations. Ore tailings were then disposed of on-site as fill material.

Hercules Incorporated (Hercules) purchased Imperial (including the site) in 1960. Ciba-Geigy Corporation (Ciba-Geigy) purchased Hercules' pigment business (including the site) in 1979. During February 1989, Ciba-Geigy stopped production at the Main Plant Site located in Glens Falls. Subsequent to the closing of the Main Plant Site operations a major interim corrective action was implemented which saw all but one building demolished and most of the contaminated building debris

disposed of in a secure landfill. Uncontaminated organic materials were disposed of in a solid waste landfill. Crushed building rubble was spread around the site. The building foundations presently remain on site.

On September 9, 1996, ownership of the Main Plant Site was transferred from Ciba-Geigy Corporation to Ciba Specialty Chemicals Corporation.

Remediation of approximately seventeen (17) acres was completed for the Eastern Portion of the Main Plant by excavating 13,000 cubic yards of soil mixed with residual chromite ore having chromium and lead concentrations in excess of 100 and 250 mg/kg. respectively, and storing it under cover on a building slab foundation elsewhere on the site. A building used for the storage of products manufactured at the facility was not demolished, but decontaminated to the New York State Health Department criteria. Since no RCRA hazardous waste was found on this portion of the site, boundaries were redrawn to remove it from the inactive site registry. During 1991 Ciba-Geigy sold these seventeen (17) acres, including the warehouse to Warren county for use as a recycling center.

From 1972 through 1973, Hercules constructed a wastewater treatment plant (now the Pretreatment Plant) to treat the wastewater generated at the main plant site prior to discharge to the Hudson River. A major portion of the Pretreatment Plant was decommissioned in 1990 in conjunction with the decommissioning and demolition of the main plant site. A scaled down version remains in operation to treat water collected in the Main Plant sewer system and effluent from the stripper located at the Building 56 slab. After treatment, the effluent is gravity fed to the effluent pump station, from where it is pumped to the City WWTP.

C. Regulatory History/Hazardous Waste Activities

During its operation by Ciba-Geigy, this Facility manufactured inorganic and organic pigments as well as pigment dispersions. The pretreatment of wastewater produced a sludge which consisted primarily of metallic hydroxides and waste pigments. The sludge is non-combustible, non-biodegradable, and cannot be recycled or reclaimed. It is a RCRA listed hazardous waste.

The open surface impoundment (north lagoon) located at the northwest end of the main plant site was used for emergency containment of waste sludge. This sludge (3-5% solids) from the wastewater treatment plant was pumped to the lagoon from the clarifiers via a pipeline, bypassing the filter press operation. The impoundment has not been used since late 1983. However, its usage after July 26, 1982 makes the unit a "RCRA Regulated Unit" subject to closure as a hazardous waste landfill and to post-closure permitting unless decontaminated at closure.

In 1984 a Federal hazardous waste permit application for the surface impoundment (north lagoon) and for a container storage area was submitted by Ciba-Geigy. Prior to permit issuance, New York State was granted authority to issue state hazardous waste operating permits (Part 373 Permits) and requested the submittal of a Part 373 permit application. After submitting this application, Ciba-Geigy decided to close the open surface impoundment and pursue a State Part 373 operating permit for the container storage area. On September 24, 1987, an operating permit was issued to Ciba-Geigy for storage of hazardous waste in containers and corrective action. The unit operated until 1989 when the waste was removed. After two cleaning operations were performed on the concrete slab, the Department accepted the certification of closure on March 31, 1992.

On September 28, 1989, the Department approved the closure plan for the north lagoon. This plan stated that the closure activities would take place when site-wide corrective measures were implemented since it was not technically feasible to close the lagoon without remediating the adjacent solid waste management units (i.e., the north and south waste piles).

On September 27, 1991, a State Part 373 post closure permit for the north lagoon was issued to Ciba-Geigy/Hercules Inc. Since at this time the State did not have authorization to administer the Hazardous and Solid Waste Amendments of 1984 (HSWA), the United States Environmental Protection Agency (USEPA) issued a HSWA Permit which was effective November 12, 1991. The combination of these permits covered the post-closure care of the north lagoon and the continuation of corrective action activities initiated under the container storage operating permit.

The corrective action requirements in the Part 373 post closure permit obligated the Permittee to perform an integrity evaluation on those portions of the industrial sewer which are used for conveyance of hazardous waste and/or liquids containing hazardous constituents. The results of this evaluation and subsequent repairs were presented in various reports. These reports detailed investigations and repairs of the industrial sewer that were acceptable to the regulatory agencies. The Permittee was allowed continued use of those portions of the industrial sewer passing the integrity evaluation.

It is the intent of the USEPA to terminate the HSWA permit upon selection of the final corrective measure(s). Implementation of the corrective measure(s) on-site will then proceed under state RCRA Corrective Action authority.

III. SWMU DESCRIPTION, HISTORY AND LEVELS OF CONTAMINATION

A. Site Characterization Overview

Based upon a review of available literature, the original December 1985 Preliminary Review divided the site into the following SWMUs: north lagoon, north waste pile, south waste pile, open pit incineration area, waste deposit areas designated as, area 1 - area 5, container storage area and stormwater impoundment basin.

As a result of the Phase 1 RCRA Facility Investigation (RFI) Report received in June 1987, it was realized that instead of discrete areas of contamination, the contamination was wide-spread and covered most of the site. Therefore, the contaminated areas were designated as follows:

1. SWMUs

   (a) Units Subject to 6NYCRR Part 373 Closure Requirements:

      (i) North lagoon (an open surface impoundment); and

      (ii) Container storage area (closed as per approved closure plan).

   (b) North and south waste piles.

   (c) Wastewater Treatment:

      (i) Storm water impoundment basin (currently in use, status to be resolved);

      (ii) Industrial sewer; and

      (iii) Pretreatment plant.

   (d) On-Site Areas:

(i) Area north of Delaware and Hudson Railroad Property; and

(ii) Area south of Delaware and Hudson Railroad Property.

2. AREAS OF CONCERN

(a) Off-site areas:

(i) Adjacent off-site surface water sediments;

(ii) Adjacent off-site land; and

(iii) Delaware and Hudson Railroad Property.

* The industrial sewer SWMU is not addressed as a discrete unit in this document. The corrective measure requirements for the industrial sewer call for the unused portion to be decommissioned. Although the facility submitted a decommissioning plan, it was felt that the decommissioning should be addressed as part of the corrective measures for the Main Plant Site. Thus, the corrective measures are addressed in the alternatives for the SWMU containing the industrial sewer.

This Statement of Basis is to document how corrective measures were chosen for the Main Plant site, (including the north lagoon area, which will be designated a RCRA Corrective Action Management Unit (CAMU), the other on-site areas located north and south of the railroad property) and the Pretreatment Plant. Therefore, the investigation of the other off-site areas are not discussed in this document. A separate Statement of Basis will be written to document the choice of corrective measures, if necessary, after completing the off-site area investigations.

B. Site Characterization By Unit

1. North Lagoon Area: RCRA Corrective Action Management Unit (CAMU)

This CAMU is approximately five acres and includes three SWMUs: the inactive open surface impoundment; the north waste pile; the south waste pile; and approximately one hundred and fifty feet of property extending eastward from the eastern edge of the impoundment and the south waste pile.

The open surface impoundment was constructed in 1972 and is lined with a 30-mil chlorinated polyethylene membrane. It covers an area of approximately 0.9 acre and is underlain by two drains constructed just above bedrock to intercept groundwater flow beneath the liner. The lagoon overflow and groundwater collected in the subdrains are conveyed by the industrial sewer system to the pretreatment plant for pretreatment and discharge to the City of Glens Falls publicly owned treatment works (POTW). The volume of hazardous waste sludge which remains in the lagoon has been estimated at 8,000 cubic yards (Malcolm Pirnie, Inc., 1987).

The lagoon is situated between two soil/waste disposal units known as the north and south waste piles. The north waste pile is bounded to the north by the feeder canal and to the south by the north lagoon. The north waste pile was last used in 1978 and may be described as a mound with a relief of approximately 20 to 30 feet above original ground surface, covering an area of approximately 1.1 acres. The volume of the north waste pile has been estimated at 31,800 cubic yards (Malcolm Pirnie, Inc., 1987).

It was previously reported (Malcolm Pirnie, Inc., 1987) that the north waste pile was created from soil, fill, and ore tailings excavated during construction of the lagoons and deposited onto the original sloping ground surface. However, recent data indicate that the waste materials may include wastewater treatment plant sludge (ECKENFELDER INC., 1991) which is a listed hazardous waste. Interim corrective measures consisting of regrading and installation of silt fences were performed in 1992 to control erosion from the north waste pile, and additional measures were implemented as described in the "Glens Falls Cement Company Maintenance Work Plan" (Hercules, Inc. 1992).

The south waste pile is bounded to the north by the north lagoon and to the south by the railroad property. Similar to the north waste pile, the south waste pile can be described as a mound with a relief of approximately 25 feet above original ground surface, covering an area of approximately 1.0 acre. Underlying the south waste pile was a lagoon originally constructed in 1971 for storage of wastewater treatment plant hazardous waste sludge. The lagoon was built with an asphalt liner, which can now be considered permeable, over a sand and gravel subgrade containing four underdrains. Bedrock lays directly beneath two-thirds of the lagoon excavation. The lagoon was used from 1972 until 1976 for storage of the listed hazardous waste sludge. The sludge was left in place and the lagoon filled over with excavated soil, miscellaneous fill, ore tailings, demolition debris, and general industrial waste. These filling activities ceased in 1987. In 1983, the underdrains were cut and capped. The volume of the south waste pile has been estimated at 31,300 cubic yards (Malcolm Pirne, Inc., 1987).

Sampling and analysis of soil/waste materials and groundwater within the CAMU and at the other on-site areas, including those north and south of the railroad property, have been conducted with the results presented in the following RFI reports: (1) Preliminary Assessment (Malcolm Pirnie, Inc., 1987); (2) the Site-Wide Soil Sampling Report (ECKENFELDER INC., 1991); (3) the Site-Wide Soil Sampling Report Addendum (ECKENFELDER INC., 1992); and (4) RFI Report for Groundwater Volume I and Volume II, 1993, including all subsequent semi-annual groundwater monitoring reports. The hazardous constituents of interest include metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and vanadium), cyanide, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs).

(a) <u>Hazardous Constituents: Soil/Waste Material</u>

Analytical data collected during remedial investigations indicate that the soil/waste material in the CAMU, including the adjacent property east of the piles, contains very high levels of contamination everywhere within the unit and it has the most frequently detected highest concentrations of hazardous constituents at the site. Add to this contamination the high residual metal contamination in the 5 to 6 feet of sludge left in the open impoundment, which was not measured, but known from experience to be enriched with heavy metals, and the CAMU becomes the most significant and focused source of hazardous constituents at the site. This significance is illustrated by the maximum and average concentrations, expressed in parts per million, of inorganic constituents detected in and around the north and south waste piles during the remedial investigation:

Inorganic Constituent	Maximum Concentration, mg/kg	Average Concentration, mg/kg
Arsenic	330.0	50.9
Barium	51,000.0	11,199.1
Cadmium	27,000.0	1,434.8
Chromium	114,000.0	20,676.6
Cyanide	5,760.0	2,110.3
Lead	199,000.0	35,022.3
Mercury	470.0	43.1
Selenium	169.0	18.8

Within this CAMU's area of investigation the south waste pile also exhibited the most frequently detected highest concentrations, expressed in parts per million, of organic hazardous constituents. Maximum total volatile organic compounds (VOCs) ranged from 2.4 to 1,073 mg/kg, with the maximum total semi-volatile organic compounds (SVOCs) ranging from 3.3 to 374.94 mg/kg. 1,2 - dichlorobenzene, not addressed as either a VOC or SVOC, had maximum concentrations ranging from 0.87 to 7.6 mg/kg.

The distribution of inorganic contamination in all three SWMUs extends from the surface down to the bottom of each unit. The trend for vertically distributed organic contamination is such that higher concentrations appear to occur more frequently at deeper depths within the south waste pile.

In addition to the contamination contributed by the three SWMUs located within the CAMU, adjacent properties extending approximately 150 feet east from the lagoon and south waste pile to the western edge of the Building 49 slab foundation, report elevated concentrations of metals and VOCs. Here total cadmium and total chromium concentrations averaged 209 mg/kg and 2,491 mg/kg respectively, with this contamination reaching down as deep as twelve feet at some locations. Also, a hot spot of VOC contamination was isolated in the vicinity of soil boring WP-3, about thirty feet west of that building slab. Similar, but much lower concentrations of VOCs were reported in soil borings SB-89 and SB-90 just south and north respectively of boring WP-3:

VOC Constituent	Maximum Concentrations, mg/kg WP-3	SB-89	SB-90
Ethylbenzene	1,500	N.D.	0.013
Toluene	19	N.D.	0.008
Xylene	3,000	2.9	0.098

The highest concentrations of VOCs were detected four to six feet below the surface at WP-3. Soil samples at SB-89 and 90 were only taken at deeper depths, i.e., eight to twelve feet. However, these contaminated deeper samples suggest VOC contamination could extend south and north of WP-3, and possibly exist at higher concentrations closer to the surface at both locations thus extending this hot spot to between those two points.

(b) Hazardous Constituents: Groundwater

Limited leachate studies on the soil/waste material demonstrate that

inorganic contamination within the CAMU, which includes the adjacent property located east of this area, exhibit a hazardous waste characteristic, (i.e., the waste exhibits a propensity to leach out inorganic constituents during precipitation events). Groundwater investigations appear to support the conclusion that the CAMU serves as a significant source of groundwater contamination at this site. Total dissolved chromium, total cyanide and total VOCs, indicator contaminants for the CAMU, have been detected at elevated concentrations expressed in parts per billion in the groundwater immediately and further downgradient of this area. Groundwater contamination by the CAMU source appears to be focused in the overburden and the adjacent underlying bedrock water-bearing zones known as Horizons A and B. Furthermore, it is probable that some of the groundwater contamination detected in wells located further downgradient, in the area south of the railroad property, has its main origins at the CAMU. Using the maximum concentration data generated during the remedial investigation, the following concentrations in parts per billion by water-bearing zone and indicator contaminants (that are representative of general contaminant distribution) demonstrate the magnitude of the groundwater contamination detected in the vicinity and downgradient of the CAMU:

Contaminant	Overburden	Horizon A	Horizon B
Dissolved Chromium	20,000 ug/l	500 ug/l	100 ug/l
Total Cyanide	50,000 ug/l	5,000 ug/l	100 ug/l
Total VOCs	10 ug/l	1,000 ug/l	10,000 ug/l

Unlike inorganic contamination, elevated VOC concentrations were not detected in the immediate vicinity of the south waste pile, with the exception of a localized hot spot at soil sampling location WP-3 (located approximately 150 feet east of the eastern edge of the north lagoon). Groundwater monitoring data suggests that the south pile contributes VOC contamination directly to the bedrock water-bearing zones. This bedrock VOC contamination could be attributed to a combination of circumstances existing at the south waste pile: i.e., (1) the VOC contamination in the waste pile seems more concentrated near its bottom and the potential exists for dense non-aqueous phase liquids (DNAPLs) to have penetrated into the bedrock and serve as sources for groundwater contamination; (2) that approximately three-quarters of the bottom rests on or very near Horizon A, the first bedrock water-bearing zone, which also was demonstrated to communicate hydraulically with the underlying bedrock zone, Horizon B; and (3) the possible diversion of most overburden groundwater to the periphery of the open impoundment and south waste pile by the open impoundment's lined northern section which was constructed down to bedrock. South of the CAMU the overburden water-bearing zone potentially receives some inorganic constituent contribution from the south waste pile.

The remedial investigation discovered a natural clay layer, of varying thickness, directly overlying bedrock under most of the site, except where excavated for such construction activities as

building of the surface impoundments. This clay layer lies below the overburden water-bearing zone and serves as an aquitard that limits vertical migration of contamination from the overburden into the bedrock aquifers except where excavated or punctured.

The very deep bedrock water-bearing zone, Horizon C, was found to be contaminated with indicator contaminants detected in the CAMU. Tests have demonstrated limited natural vertical movement between this horizon and the one above. However, it appears that contamination from the upper water-bearing zones was allowed to migrate down into Horizon C, along some of the deep bedrock production wells that were present at the site. Decommissioning and sealing of these wells appears to have effectively eliminated this migration pathway into the deeper bedrock zone.

2. Area South of Railroad Property

This SWMU encompasses an area bounded to the north by the railroad property, to the west by the Glens Falls, Cement Co. property, to the south by the Hudson River, and to the east by the Warren County Recycling Center property. It is approximately twenty (20) acres with approximately twenty to thirty percent of the property occupied by production building concrete slab foundations. There is a gentle southward slope of the area which steepens greatly along the bank of the Hudson River. The steep river bank is covered with stone in some locations to protect it from erosion. Traveling west along the river bank, the bank's slope remains steep but its height diminishes at the far western boundary of this area. Here at one time an incineration area was located and used for burning factory debris. Currently this area is covered with vegetation, including some trees located close to the embankment by the river.

East of the incineration area lays the concrete slab foundation of Building 56. Within this structure and before its demolition organic pigments were manufactured and solvents were stored in tanks located adjacent to the southern edge of the building. Presently an interim corrective measure (ICM) operates at this location. The ICM pumps ten withdrawal wells placed in the overburden water-bearing zone creating a hydraulic barrier to groundwater flowing to the Hudson River. All extracted groundwater containing residual contamination, is treated before discharge to the Glens Falls POTW. The treatment system is located on the Building 56 slab foundation. Permeability tests carried-out on the soil/waste fill prior to the ICM implementation demonstrated that the fill is highly impermeable and will not be suitable for the application of soil vapor extraction technology.

(a) Hazardous Constituents: Soil/Waste Material

Analytical data collected during remedial investigations indicate that soil/waste material in the area south of the railroad property contains high concentrations of hazardous constituents. Inorganic hazardous constituents, including high concentrations of chromium, cadmium and lead were found throughout the area and as deep as thirty feet. This inorganic contamination did not appear to exhibit any strong lateral or vertical trends, but appears to be widespread and scattered throughout the area. Overall maximum and average concentrations, expressed in parts per million for the

inorganic constituents, are as follows:

Inorganic Constituent	Maximum Concentrations, mg/kg	Average Concentrations, mg/kg
Arsenic	111.0	6.3
Barium	12,200.0	237.1
Cadmium	2,300.0	36.8
Chromium	14,800.0	1,460.9
Cyanide	72.0	10.9
Lead	65,000.0	1,160.1
Mercury	157.0	2.9
Selenium	11.8	1.7

Also, within this area investigations detected organic contamination. Over the entire area, maximum concentrations of volatile organic compounds (VOCs) ranged from 0.01 mg/kg to 1,073 mg/kg, with semi-volatile organic compound (SVOC) maximum concentrations ranging from 0.34 mg/kg to 281.2 mg/kg, and 1,2 - dichlorobenzene ranging from 0.006 to 100 mg/kg . However, an analysis by location demonstrated that the VOCs and SVOCs with elevated concentrations are focused in the vicinity of the Building 56 slab foundation and, at lesser concentrations, in the vicinity of the incineration area.

The hazardous constituent 1,2 - dichlorobenzene, which was not included as either a VOC or SVOC, had maximum concentrations ranging from 1.7 to 11 mg/kg at the Building 56 slab foundation and from 0.6 to 100 mg/kg at the incineration area. At the latter location this constituent's highest concentrations were found in the samples taken within the clay underlying the overburden water-bearing zone. It is likely that the elevated levels of contamination within the clay resulted from contamination that was carried down during the sampling event.

(b) Hazardous Constituents: Groundwater

Limited and random testing on the soil/waste material indicates that a large part of the area south of the railroad property exhibits a hazardous waste characteristic and demonstrates the potential to leach inorganic contaminants to the groundwater. Groundwater monitoring carried-out as part of the RFI for the area south of the railroad property provided the following generalized maximum concentration data for the indicator parameters:

Contaminant	Overburden	Horizon A	Horizon B
Dissolved Chromium	20,000 ug/l	3,000 ug/l	1,000 ug/l
Total Cyanide	20,000 ug/l	5,000 ug/l	1,000 ug/l
Total VOCs	20,000 ug/l	200 ug/l	10,000 ug/l

Analysis of groundwater monitoring data and corresponding soil/waste contamination profiles suggest that the incineration area and properties in the vicinity of Buildings 8, 45, and 56

slab foundations can be considered the primary contributing sources to overburden groundwater contamination in the area south of the railroad property. This becomes evident by examining chromium, cyanide, and VOC groundwater concentration contours for those locations. However, upon close examination it appears that the CAMU located to the north may also contribute to the contamination, particularly cyanide, found in the overburden groundwater at the southwestern part of the site.

Cyanide contamination in the overburden water-bearing zone in the vicinity of Building's 8 and 45 slab foundations may extend into the area north of the railroad property. Here elevated soil/waste cyanide concentrations were detected at borings RB-17 (213 mg/kg) and RB-15 (136 mg/kg). The data suggests that this overburden water-bearing zone is being contaminated by cyanide in the soil/waste material north of the railroad property, and to a lesser degree, by cyanide contamination in the vicinity of the Building's 8 and 45 slab foundations.

Organic contamination in the overburden water-bearing zone south of the railroad property appears to be primarily caused by VOCs found in soils/waste material located in the vicinity of the incineration area and Building 45 and 56 slab foundations. The highest VOC concentrations in this area were detected at the latter slab foundation. Also, recent groundwater monitoring detected the SVOC aniline as high as 1,000 parts per million south of the Building 45 slab foundation. This finding corresponds with the elevated aniline level (7.4 mg/kg) detected in soil at that location in boring IS-22.

The ICM operating behind Building 56 slab foundation appears to have effectively limited VOC migration and discharge to the Hudson River via the overburden groundwater at that location. Overburden VOC levels remain elevated and controlled within the overburden flow zone under the incineration area. This area contains soil/waste material where VOCs were most frequently detected, but only at an average concentration under one part per million. Since the CAMU to the north appears to be an unlikely source for the overburden VOC contamination, the incineration area must still remain suspect as being a primary VOC contamination source.

Groundwater data indicate that VOCs are present largely within in the Horizon B bedrock water-bearing zone at the southwestern part of the site. However, given the presence of the clay layer situated above the bedrock in this area it is unlikely that the incineration area soil/wastes are major contributors to contamination observed in this zone. The clay cap argument also may be used to presume that the CAMU serves as the source of chromium and cyanide bedrock contamination at the southwestern part of the site.

3. Area North of Railroad Property

This SWMU encompasses an area bounded to the north by the feeder canal and Lower Warren Street, to the east by the Warren County Recycling Center property, to the west by the CAMU, and to the south by the railroad property. It is approximately twenty (20) acres with at least seventy-five percent of the property occupied by production building

concrete slab foundations. There is a gentle southward slope of the property towards the railroad track embankment.

Located on one building slab foundation is approximately 13,000 cubic yards of soil contaminated with inorganic hazardous constituents (i.e., heavy metals chromium, lead and cadmium) which did not exhibit a hazardous waste characteristic. This material was excavated as part of the remediation project for the far eastern part of the site which was subsequently sold to Warren County for its recycling center.

(a) Hazardous Constituents: Soil/Waste Material

Analytical data collected during the remedial investigations indicate that soil/waste material in the area north of the railroad property contains elevated concentrations of hazardous constituents. Higher concentrations of chromium, cadmium, and lead were detected less frequently than in the other SWMU and CAMU, and the contamination was highly scattered throughout the area. Most of this contamination was located within four feet of the surface. The area did produce higher concentrations of cyanide than the area south of the railroad property at several isolated locations. Overall maximum and average concentrations, expressed in parts per million for the inorganic constituents, are as follows:

Inorganic Constituent	Maximum Concentration, mg/kg	Average Concentration, mg/kg
Arsenic	10.6	5.3
Barium	8,100.0	453.3
Cadmium	280.0	31.3
Chromium	1,740.0	21.5
Cyanide	450.0	4.8
Lead	5,000.0	52.5
Mercury	7.4	3.1
Selenium	0.3	0.3

Organic contamination was also scattered throughout the area and showed no definitive trends in either the lateral or vertical directions. Several isolated hot spots were detected, but over the entire area, maximum volatile organic compounds ranged from 0.07 to 2.43 mg/kg with semi-volatile organic compounds ranging from 0.17 to 214.97 mg/kg.

(b) Hazardous Constituents: Groundwater

Given the overall lower concentrations of total metals found in the soil/waste material of this area, the material was not expected to exhibit a propensity to leach out during precipitation events. Therefore, leachate studies were not carried-out on the soil/waste material in the area north of the railroad property. Groundwater monitoring within the overburden zone was limited to one well located approximately in the middle of the area. Relatively low levels of VOCs and heavy metals have been detected. Also, overburden groundwater monitoring wells just south of the railroad property and adjacent to this area have detected only low levels of dissolved heavy metal contamination. However, as

previously discussed this northern area SWMU does contribute significant cyanide contamination to the overburden water-bearing zone south of the railroad property.

4. Pretreatment Plant

This 4 acre SWMU is located north of the Glens Falls Feeder Canal and east of Quaker Road. It is connected to the Main Plant Site by a force main and gravity sewer line which pass underneath the Feeder Canal. A major portion of the Pretreatment Plant was decommissioned in 1990. The scaled down version currently in use, treats contaminated water collected at the Main Plant Site and effluent from the stripper located at the Building 56 slab prior to discharging to the Glens Falls WWTP.

In November 1991 an RFA was initiated at the Pretreatment Plant to characterize soil and groundwater conditions and to evaluate potential environmental impacts, if any. Based on the result of the RFA, an additional more detailed evaluation, the RFI was conducted based on a work plan approved on June 7, 1994.

(a) Hazardous Constituents: Soil/Waste Material

Analytical data collected during remedial investigations indicated that the highest concentrations of hazardous constituents in the soil are within the easternmost portion of the Pretreatment Plant. The concentrations decrease greatly towards the west, except for a small area in the central portion. The maximum concentrations were typically from zero to two feet below the surface, with contaminants down to four feet at isolated locations.

Going from the eastern portion to the west, there is a distinct break in the concentrations once a line connecting borings PT-14, PT-9 and PT-16 is reached. East of this line the inorganic constituents range up to 622 mg/kg for cadmium, 885 mg/kg for chromium, 4,570 mg/kg for lead, and 375 mg/kg for total cyanide. In boring PT-16-1 which is on the dividing line, at 0-2' below the surface, mercury was non-detect, while a duplicate sample indicated mercury at 52 mg/kg. The average level of inorganic contamination in the soils in this area is as follows: cadmium 36 mg/kg, chromium 139 mg/kg, lead 587 mg/kg, mercury 3 mg/kg and total cyanide 26 mg/kg.

The inorganic contamination in the soils to the west of the eastern portion (except for the contaminated area at boring PT-8) are above site background, but within the range of unrestricted use. It is felt that these elevated levels are due to filling low areas of the site with contaminated fill. In general cadmium is in the range of 4-5 mg/kg with its highest level being 7.9 mg/kg; chromium is generally in the range of 10-130 mg/kg, with the highest level being 197 mg/kg at boring PT-3; lead is generally in the range of 10-100 mg/kg with its highest level being 270 mg/kg at boring PT-12, all detections of mercury were below 1 mg/kg and total cyanide was not found above 110 mg/kg.

Sampling data indicates that the soil in the vicinity of boring PT-24 (0-2' below the surface) at the eastern portion, not only contains very high levels of total chromium and cadmium, but also

exceeds the limit for a characteristic waste for these constituents.

No volatile organics were detected in the Pretreatment Plant soils during the RFA. Therefore, volatile organics were not analyzed for during the RFI. Except for estimated values found below the method detection level, no semi-volatile organics were found at the eastern area. The highest level found was 21 mg/kg of dimethyl-phthalate at boring PT-19. In general, the finds of semi-volatile organics were sporadic and in the range of 1-10 mg/kg. The semi-volatile organics were found in those areas which also have the highest inorganic contamination.

(b) Hazardous Constituents: Groundwater

Initial groundwater sampling from three monitoring wells placed around the perimeter of the site indicated that the groundwater was impacted by site operations. An extensive list of parameters was sampled for, however, the only contaminant detected at concentrations exceeding the groundwater protection standards was cyanide. During the RFI, temporary groundwater sampling points were placed along the southern and western perimeters of the site. Sampling from these additional points, along with the several piezometers and monitoring wells, provided much better definition of the groundwater chemistry beneath and immediately downgradient of the site. Cyanide concentrations range from slightly over the groundwater standard of 100 parts per billion at the perimeter and immediately downgradient of the site to a range of several hundred to over 5000 parts per billion within the central portion of the Pretreatment Plant area. Concentrations vary considerably both spatially and temporally.

The results from the temporary well points along the south side of the canal support the hydrogeologic model of the site. Here groundwater above the clay was absent from the area around the pipe bridge over the canal and to the west. Concentrations of cyanide were detected in the temporary well points installed further to the east indicating that the groundwater was passing beneath the canal in this area. Here cyanide concentrations varied from well below the groundwater standard to slightly above. Along the western perimeter of the Pretreatment Plant area cyanide concentrations were detected up to and slightly exceeding the groundwater protection concentrations. The migration to this area is likely due to the complex groundwater flow patterns caused by the interaction between the undulating surface of the clay unit, the relatively thin saturated thickness above the clay and fluctuations in the groundwater elevations. Cyanide bearing groundwater that migrates off the Pretreatment Plant site to the west or southwest, via the overburden, would most likely flow toward the Main Plant Site.

IV. Exposure and Risk Summary

A. Existing Release Mechanisms and Exposure Conditions (Main Plant)

The on-site human population with the potential for exposure to site contamination is limited to maintenance personnel, normally a single

individual, and infrequent visitors. The general public is restricted from entering the site with restraints provided by perimeter fencing and gate control. As a further precaution a second fence line and locked gate restricts access to the highly contaminated land disposal units, i.e., the open surface impoundment and the north and south waste piles. Because these three solid waste management units remain uncovered they present the greatest potential threat on-site to human health and the environment.

The nature of the contamination found in the three solid waste management units and released to the underlying overburden and bedrock aquifers is summarized in Sub Section III, B.1 of this document. As a whole the three land disposal units contain very high average concentrations of inorganic hazardous constituents, including cadmium, chromium, lead, and cyanide. Both volatile and semi-volatile organic hazardous constituents were detected at significant concentrations in the south waste pile. Groundwater monitoring indicates contamination of the underlying overburden and bedrock aquifers with inorganic and organic constituents. Groundwater movement is generally to the south towards the Hudson River, with the overburden and the shallow bedrock aquifers entering the river. Groundwater flow in the deeper bedrock aquifers appears to cross under the Hudson River and discharge to a limestone rock quarry on the other side of the river.

The most plausible contaminant release mechanisms and exposure pathways placing potential human and environmental receptors at risk from the three land disposal unit's contamination include:

1. Precipitation leaching out contaminants from exposed soil/waste material, with the resulting leachate contaminating the natural groundwaters of the state, including overburden and bedrock aquifers underlying this part of the site. The groundwater in these aquifers are classified by the state as GA, with the intended future use being drinking water;

2. The contaminated groundwater pathway exposes the Hudson River and its sediments to contamination. The bedrock contaminated groundwater pathway flowing under the Hudson River has the potential to expose and further degrade a more extensive volume of the groundwater resource.

3. The potential exists for the off-site release of eroded surfacial contaminated soil/waste material by runoff during severe storm events. If left unattended such events will eventually overcome the interim measures implemented to mitigate such a release and expose wildlife occupying the wetlands located on the adjacent cement company property;

4. The release of soil/waste material through the air pathway as airborne particulate matter by strong and sustained winds during dry conditions. Such releases could expose potential human receptors, including unprotected maintenance workers on-site, at the Feeder Canal, and on cement company property by the inhalation pathway to contaminated airborne particulate matter. Exposure through the inhalation pathway would only occur when receptor presence coincides with strong wind events that create the airborne particulate matter. Although the probability of such a coincidence is very small, the potential for exposure through this pathway by potential human receptors cannot be rejected completely; and

5. The exposure of potential human receptors by direct incidental contact to contaminated soil/waste material located on-site and to that material which has migrated off-site.

Since public access to the entire site is restricted, the potential threat to human health and the environment by contaminated, exposed soil/waste material and groundwater at the remaining forty acres of the site would be through release mechanisms and exposure pathways similar to those discussed above. However, human and environmental exposure risk is reduced at some pathways because of prevailing site conditions existing at the areas located north and south of the railroad property.

Sub Section III, B.3. discusses the nature and extent of soil/waste contamination found in the area north of the railroad property. However, with more than seventy-five percent of the property north of the railroad property covered with concrete building slab foundations, and with most of the remaining properties covered with construction debris generated from post building demolition activities, releases to the groundwater by contaminated leachate would be of primary concern. Erosion of contaminated soil/waste material by storm water runoff or by wind is not very significant given the current conditions. Any exposed material eroded by storm water and carried by runoff would travel along the gentle southernly slope and deposit out at the foot of the railroad track embankment running along the entire southern perimeter of the area. Therefore, the Hudson River is not currently exposed to any contaminated soil/waste material that might transport by runoff during storm events from this area.

Should some exposed soil/waste material become airborne during dry, windy conditions as contaminated particulate material, unprotected occupational workers maintaining this site, the Feeder Canal, and working outdoors at the Warren County Recycling Plant could become potential human receptors; if present when climatic conditions cause the contamination to become airborne.

The release mechanism contributing to groundwater contamination at locations not covered by building slab foundation is leachate generated during precipitation events and percolating down to the overburden aquifer underlying this part of the site. The contaminant detected most frequently and above groundwater standards was cyanide. It appears to come from isolated and scattered hot spots located in the southern part of the area north of the railroad property. This contaminated groundwater pathway has the potential to expose the Hudson River and its sediments to the cyanide contamination.

As discussed in Sub Section III, B.2. of this document the area south of the railroad property was found to contain concentrations of inorganic and organic hazardous constituents similar to those detected north at the railroad property but at higher concentrations. At this area existing conditions are somewhat less protective than those north of the property. Here only approximately twenty to thirty percent of the area is covered by concrete building slab foundations with construction debris overlaying the exposed properties adjacent to these slabs. At the western boundary of this area exists approximately five acres, including the old incineration area. It is devoid of slab foundations, but covered with vegetation including some trees at the river's embankment. This vegetative cover helps to control erosion of surfacial soil/waste material into the Hudson River by storm water runoff and into the surrounding air on windy days. However, it does not afford protection against any direct incidental contact by potential human receptors. Moving from west to east the lack of vegetative cover and more widely spaced slab foundations leave more open area susceptible to erosion. Should severe erosion occur, the Hudson River and

its sediments would become exposed to the highly contaminated material released from the site and transported by storm water runoff.

Unprotected occupational workers maintaining the site and working outdoors at the recycling plant to the east could become potential human receptors of contaminated particulate matter that becomes airborne from this area of the site during dry, windy conditions. Exposure would only occur when worker presence coincides with climatic conditions causing the air transport of the contaminants. Also, at risk from exposure to such airborne contamination is the adjacent stretch of the Hudson River and its sediments.

By far the most severely impacted environment located south of the railroad property is the groundwater. Contaminants detected most frequently and above state groundwater quality standards include total chromium, total cyanide, total volatile organic compounds, dichlorobenzene, and aniline. The land disposal units located in the CAMU to the northwest appear to be the major contributor of bedrock and to a lesser extent overburden groundwater contamination found downgradient from those units in the area south of the railroad property. Additionally, several locations within the southern area have the potential to add their own releases to the overburden groundwater contamination. This contaminated overburden groundwater pathway can expose the Hudson River and its sediments to this contamination.

B. Existing Release Mechanisms and Exposure Conditions (Pretreatment Plant)

The Pretreatment Plant, like the Main Plant Site, restricts public access by means of a perimeter fence and locked gate. Due to the less severe soil and groundwater contamination, this SWMU presents less of a threat to human health and the environment.

The contaminant release mechanisms and exposure pathways are the same as discussed for the Main Plant Site, however the environmental receptors are different. The groundwater release pathway introduces contamination into the Feeder Canal and further downgradient. Source removal would reduce the flux into the Feeder Canal and the low level of contamination downgradient of the Pretreatment Plant is not considered a serious threat. In the event of a severe storm, eroded material could be deposited in the Feeder Canal, or on to adjacent lands.

C. Risk Summary and Management

The intent of the RCRA Corrective Action program is to reduce the risk presented by site contamination to human health and the surrounding environment. Risk reduction can be accomplished by removing the toxicity associated with the site's contamination (e.g., through technically feasible and practical treatment or removal actions) or by preventing exposure (e.g., through physical controls like containment and institutional controls such as deed restrictions). Therefore, the level of risk reduction to be achieved at any given site should address the protection of human and environmental receptors that currently exist and those that might exist in the future.

If the site or portions of the site was to be allowed unrestricted use, then all soil/waste material must be remediated to target cleanup levels, also known as decontamination cleanup standards. The term "standards" is only used for the purpose of this document. It should be interpreted as the levels in soils that either treatment or removal actions would need to achieve at this site for unrestricted use of the remediated soils. It does not imply that a state or

federal promulgated soil cleanup standard exists. The soil target cleanup levels presume establishment of residential dwellings and are protective of several pathways, including gardens growing crops whose deep roots can be subject to contaminant uptake; soil cleanup levels protective of the groundwater pathway via leachate contamination during precipitation events; direct ingestion of the soil by children; and the inhalation of soil contaminants. For the hazardous constituents existing at the site, complete decontamination would be achieved in the soils, if following remedial action the average soil hazardous constituent concentrations were at or below the following levels:

Hazardous Constituent	Soil Target Cleanup Levels
Arsenic, Total	0.4 mg/kg
Barium, Total	51.0 mg/kg
Cadmium, Total *	10.0 mg/kg
Chromium, Total *	50.0 mg/kg
Cyanide, Total	1600.0 mg/kg
Lead, Total	400.0 mg/kg
Mercury, Total	3.4 mg/kg
Selenium, Total	2.0 mg/kg
Semivolatile Organic Compounds, Total	10.0 mg/kg
Volatile Organic Compounds, Total	50.0 mg/kg

* Under review by the NYSDOH; values may be specified for trivalent and hexavalent chromium. Permittees will be notified of any changes in soil cleanup levels.

Should the final implemented remedy achieve soil target cleanup levels and allow for unrestricted usage of the property, institutional controls would still be needed to prevent human exposure to the contaminated groundwater. Such controls would remain in place until New York State's GA groundwater quality protection standards are met. Regulations stipulate that the groundwater quality standards are applicable to all non-saline groundwaters in the state, and the best usage of GA classified groundwater is potable water (i.e., drinking water). The same GA groundwater quality protection standards will serve as remediation goals for the final remedy necessary to clean up the contaminated groundwater at the site. If decontaminating the soils to target cleanup levels is not technically feasible or practical, final soil/waste remedies must be implemented to prevent direct exposure by potential human receptors; to address the management of significant releases of hazardous constituents to the groundwater underlying the site; and to mitigate any adverse impacts on the surrounding environment. Sub Section IV.A. above discussed existing potential human and environmental receptors that require protection. Should the site be considered for future industrial usage environmental receptors would not change, but potential human receptors would expand to include a larger population of occupational workers having access to the site. Both existing and future on-site workers require protection against incidental direct contact and inhalation exposure. Such protection can be afforded by properly designed, constructed, and maintained containment systems. However, institutional controls would need to be expanded

beyond those for controlling groundwater usage, to include restrictions on the future movement and placement of any residual soil/waste material remaining on site.

Containment systems may also be employed as final remedies to prevent exposure of the surrounding environment like the Hudson River, groundwater and wetlands to contaminant releases from residual soil/waste material remaining on-site. Significant soil/waste sources, such as those existing at the CAMU, will require construction of containment systems that exhibit a high degree of impermeability to precipitation in order to mitigate continuing release of contaminants to the groundwater. Off-site migration of contaminated groundwater could be curtailed by a properly designed contaminated groundwater extraction system. This system would need to be located downgradient along the site's southern perimeter to be effective in preventing the exposure of off-site receptors to the groundwater pathway contamination. Employing such a groundwater extraction system would allow for the continued collection of contaminants draining from lesser contaminated areas contained with vegetative, permeable, soil covering.

V. Corrective Measures Technologies

A. Technology Screening

A technology screening study was conducted as part of CMS. Technologies were identified which correspond to four general categories of corrective action: containment, collection/treatment, in-situ treatment, and removal/treatment/ disposal. The technologies were prescreened to eliminate those that are obviously inapplicable due to site or waste characteristics and those that are undemonstrated or unavailable. The candidate technologies were then screened further on the basis of effectiveness, implementability and cost, to select the most promising technologies for use in developing corrective measure alternatives.

The technologies retained after screening include the following:

Soils/Waste	Groundwater
Capping	Vertical cut-off walls
Soil vapor extraction	French drain
Excavation	Groundwater extraction wells
Stabilization/solidification	Groundwater sparging
Soil washing	
On-site redeposition	
Off-site landfill	

As a result of physical limitations imposed by site conditions, the following technologies have been discarded:

1. Soil Washing:

Soil washing processes are designed to reduce soil contamination through the use of particle size separation. Most organic and inorganic contaminants tend to bind (either chemically or physically) to clay and silt/soil particles. The soil washing process separates the fine clay and silt particles from the coarser sand and gravel particles, thereby separating and concentrating the contaminants into a smaller volume of soil that can be further treated and disposed. Thus, soil washing is more effective in treating soils with high sand and gravel content where a

substantial volume reduction can be achieved.

Field classification of soil/waste samples collected during the RFI indicates that the majority of contaminated soils and waste deposits at the site are comprised of silts, including waste fill material, and clay more so than sands and gravels. Grain size testing was conducted to confirm the field observations. In nine of the eleven samples, greater than 50 percent of the samples passed through the No. 200 sieve. Due to the predominance of the silts and clays, soil washing was discarded as a viable technology.

2. Off-site Landfill:

Complete excavation and placement in an off-site landfill would involve excavation of all contaminated soils/waste, sludges, and other wastes exhibiting constituent concentrations above the target cleanup levels. Complete excavation would encompass the CAMU, the areas north and south of railroad property, and the industrial sewer. The total volume of contaminated soil/waste associated with the main plant site is estimated to be 920,000 cubic yards.

Excavation and off-site landfill disposal of the estimated 920,000 cubic yards of soil/waste would require approximately 80,000 truck trips. Transport of the estimated 80,000 truckloads would require between 2,000 and 8,000 days (5.5 and 22 years, assuming 365 day operation) using a single facility. This assumes that the facility would remain in operation throughout this period and have the capacity to accept the waste.

Due to the sheer volume of contaminated soil/waste to be handled, placement in an off-site landfill has been determined impracticable. Therefore, this technology has been discarded.

3. Groundwater Sparging:

Since this technology is in-situ air stripping of volatile and semi-volatile organics from groundwater in the overburden water-bearing zone, it is highly dependent upon the pneumatic permeability of the saturated soils. For the area south of railroad property (i.e., Building 56 slab foundation) with elevated levels of organic contamination, field pneumatic permeability testing has shown that these soils are not within the range which would allow sparging. Sparging is also not technically feasible for contamination in bedrock water-bearing zones. Therefore, groundwater sparging has been discarded as an acceptable technology for its limited applicability at this site.

4. Vertical cut-off walls

Vertical cut-off walls are low permeability barriers constructed to restrict lateral groundwater flow. These walls may be constructed of various materials using techniques suited to site conditions. One of the more common types of cut-off walls is a slurry wall. A slurry wall is constructed in a bentonite slurry-filled trench which allows for excavation at depth and/or below the water table in a confined vertical walled trench. The trench is backfilled with a low permeability soil and bentonite slurry or cement-bentonite mix. This type of cut-off wall is generally used for construction in unconsolidated deposits i.e., the overburden water-bearing zone. With a significant portion of the groundwater contamination occurring in bedrock aquifers at this site, the use of cut-off walls is not considered beneficial.

5. On-Site Landfill Redisposition

This technology involves construction of an on-site landfill for the disposal of materials excavated from other areas of the site. Limits on the availability of unobstructed on-site property to accommodate such landfill construction precludes redeposition as a viable alternative.

B. Retained Corrective Measures Technologies For Soils/Waste

1. Capping: Limiting rainfall infiltration through concentrated and highly contaminated soil/waste deposits at the site by impermeable capping would reduce the leaching of hazardous constituents from these deposits. Such capping is most effective at reducing leachate generation when infiltration by rainfall (as opposed to lateral groundwater flow through the soil/waste material) is the primary factor controlling the extent of saturation within the contaminated soil/waste. In addition to controlling migration via groundwater, impermeable capping restricts direct contact with the contaminated soil/waste and prevents air-borne migration of dust by creating a barrier atop the material. The latter exposure preventions can also be achieved by permeable capping. However, the permeable cap will allow precipitation to percolate down through the porous cap and underlying soil/waste material. Leachate will be generated where the soil/waste material exhibits a propensity to transfer contamination to the percolating precipitation. Therefore, the permeable caps should be limited to areas of the site where the potential to generate a concentrated contaminated leachate is minimal or non-existent; where the soil/waste concentrations are not considered significant sources and their continued flushing by precipitation would be considered beneficial; and where a downgradient groundwater extraction and treatment system is operational to assure continued collection and treatment of any contaminated groundwater resulting from the flushing action.

   Three types of caps were evaluated for use at this site. They are the low permeability cap (sometimes called a RCRA cap), permeable cap (soil cap) and asphalt cap.

   (a) low permeability cap: consists of (in descending order) - surface/protective layer, drainage layer, two low permeability layers, gas venting layer (if needed) and a bottom/protective layer. The thickness of the layers, number of layers, materials of construction and sequence of layers is determined during final design in accordance with site specific conditions. This type of cap significantly reduces, if not eliminates, rainfall infiltration.

   (b) Permeable cap (soil): consists of top soil over a layer of subsoil.

   (c) Permeable cap (asphalt): consists of a wearing course over a binder course. Can reduce rainfall infiltration over relatively flat, unmounded surface.

2. Soil vapor extraction

   A series of vertical or horizontal pipes installed in or below unsaturated granular waste/soil contaminated with relatively high concentrations of volatile and some semi volatile organic compounds. As the air passes through the soil/waste material, the contaminants enter the air stream and are removed from the contaminated soil/waste material. The vapors removed typically require some form of emission control.

3. Excavation (Partial)

   The contaminated soil/waste material is removed using earth moving equipment. The material may then be treated and redeposited or consolidated on site, or if from off-site, at the Main Plant Site.

4. Stabilization/Solidification

This process involves mixing the soil/waste material with a binding agent such as portland cement, silicate thermoplastic or organic polymer. This is a physical process which encapsulates the grains of soils/waste thus reducing the mobility of the constituents and minimizes the potential for leaching. The volume of soil/waste is increased by the addition of the binding agent.

C. Retained Corrective Measures Technologies for Groundwater

1. French drains

This technology involves constructing a drain within an excavated trench. The trench typically includes perforated piping placed within an aggregate drain. Groundwater is intercepted in the high permeability trench, collected in sumps, and pumped to a treatment facility. This type of collection system would be limited to collecting contaminated groundwater in the overburden aquifer.

2. Groundwater extraction wells

This technology involves installation of groundwater pumping wells within a contaminant source area or migration area for extraction of contaminated groundwater. Pumping creates a local depression in the piezometric surface of the aquifer, causing groundwater to flow towards the extraction wells. The contaminated groundwater is collected for treatment and then discharged back into the environment. This form of collection would be appropriate for collecting contaminated groundwater in both the overburden and bedrock aquifers.

D. Retained Corrective Measure Technology Alternatives (Soil/Waste)

Some alternatives presented in the Corrective Measure Study were not considered for further evaluation for previously discussed reasons. Therefore, the numbering of alternatives identified herein are not consecutive, but do correspond with the alternative numbering in the study.

Due to the physical characteristics of the Main Plant Site and the Pretreatment Plant Site, and the disposal of varied wastes, the retained corrective measure technologies for soil/waste have been grouped into several alternatives for evaluation:

1. Corrective Action Management Unit (CAMU)

Alternative 2 - Capping (low permeability)
Alternative 3 - Capping (low permeability) with soil vapor extraction
Alternative 4 - Stabilization/solidification and on-site redeposition with capping (low permeability).

2. Area North of Railroad Property

Alternative 2(a)- Capping (permeable)
Alternative 3 - Stabilization/Solidification and on site redeposition with capping (permeable).

3. Area South of Railroad Property

Alternative 2(a)- Capping (permeable)
Alternative 3 - Capping (permeable) with excavation of Building 56 Area

soil/waste and its redeposition in the CAMU.

Alternative 4 - Capping (permeable) with excavated Building 56 Area soil/waste being redepositioned in the CAMU and followed by soil vapor extraction in the CAMU.

Alternative 5 - Stabilization/solidification of soil/waste on-site and its redeposition with capping (permeable).

4. Pretreatment Plant

Alternative 2(a)- Capping (permeable, soil-vegetative cover)
Alternative 2(b)- Capping (permeable, asphalt cover)
Alternative 3 - Excavation and redeposition at the Main Plant Site (with capping)
Alternative 4 - Excavation with stabilization/solidification and redeposition at the Main Plant Site.

At the time the CMS Report was written there was very little information on the groundwater at the Pretreatment Plant. Since that time, an RFI has been completed which shows cyanide contamination leaving this site via groundwater at levels slightly above standards. Therefore corrective action will not be initiated at this time. A program of groundwater monitoring will be implemented at the Pretreatment Plant site to evaluate the long term water quality trends and the effectiveness of the corrective measures.

E. Retained Corrective Measure Technology Alternatives (Groundwater)

The following groundwater retained corrective measure technology alternatives have been evaluated for the Main Plant Site:

Alternative 2 - Upgradient collection trench in overburden with a discharge to Glens Falls POTW

Alternative 3 - Downgradient collection of contaminated groundwater in bedrock Horizons A and B water-bearing zones with extraction wells, pretreatment (as necessary) on-site and discharge to Glens Falls POTW.

Alternative 4 - Downgradient collection of contaminated groundwater in overburden and bedrock Horizons A & B water-bearing zones with a combination of french drains and extraction wells, pretreatment (as necessary) on-site and discharge to Glens Falls POTW

At the Main Plant Site, the corrective measure technology alternatives for contaminated groundwater are linked with the corrective measures for the soil/waste. All of the corrective measure technology alternatives identified above for soil/waste material located in the areas north and south of the railroad property and the CAMU could employ collection of overburden and bedrock contaminated groundwater at the downgradient boundary of the site (i.e., along the edge of the property adjacent to the river). If a low permeability cap or stabilization/solidification was to be selected for covering all the areas, then the downgradient groundwater collection system for only the bedrock aquifers would be appropriate. This cap or treatment would curtail the further releases of leachate contamination from soil/waste material sources to the groundwater, but not address sources which might exist in the bedrock aquifers (i.e., dense non-aqueous phase liquid contamination that could have migrated into the bedrock from the south waste pile). Groundwater corrective measure technology alternative two (2), which considers upgradient overburden groundwater collection, incorporates low permeability caps for the areas north and south of the railroad property and the CAMU. This alternative would not address bedrock groundwater contamination from liquid solvents which may have migrated into the

bedrock.

VI. EVALUATION OF THE CORRECTIVE MEASURES ALTERNATIVES

Since the different alternatives are various combinations of basic technologies; four for soils/waste and two for groundwater, the evaluation will be an evaluation of the technologies used in the alternatives.

A. General Standards For Remedy Selection

The initial evaluation of the retained technologies is based upon how they meet the four general standards for corrective measures which are:

1. Protective of human health and the environment;

2. Attain media cleanup standards;

3. Control the sources of releases; and

4. Comply with standards for waste management.

The final corrective measures for remediating the soils, waste and groundwater at the Main Plant Site is capping with a permeable cover at all SWMUs except those located in the CAMU. The CAMU would be capped with a low permeability cap as required by Part 373 for the closure of hazardous waste landfills. Remediation of the groundwater would be by the installation of a groundwater interception system at the downgradient boundary of the property that would collect the contaminated groundwater in the overburden and bedrock Horizons A and B for pretreatment (as necessary) prior to its discharge to the Glens Falls POTW. Institutional controls will be imposed to limit future use of the site; restrict the movement of contaminated soils and use of contaminated groundwater; and inform potential future site owners of the residual contamination present in the soils and groundwater. As an added benefit, this alternative, while adequately protecting human health and the environment, will impose the least restrictions for re-development of the site.

For the Pretreatment Plant, the final corrective measure is to excavate those soils contaminated above "target cleanup levels" and redeposit them at the nearby Main Plant Site. The excavated areas would be then filled in with clean soils. The deed restrictions mentioned in the above paragraph will be placed on the use of groundwater and on the use of the site in the unlikely event that soil cannot be removed down to "target cleanup levels".

1. Protective of Human Health and the Environment

All of the retained corrective measures alternatives would provide adequate protection of human health and the environment by eliminating, reducing, or controlling exposure to contamination through treatment, engineering controls or institutional controls. The final corrective measures for the Main Plant Site will curtail migration of contaminated groundwater off-site by collecting it at the southern-most boundary for treatment prior to discharge. The permeable cap north and south of the railroad property, and the low permeability cap at the CAMU will prevent exposure associated with direct contact or particulate inhalation of the soil/waste mix underlying these protective covers. The covers will serve to prevent migration of contaminated surfacial soil/waste material to the Hudson River through runoff during storm events. Also, the CAMU once capped will be eliminated as a significant groundwater source of contamination.

Institutional controls will be implemented as part of the final corrective measures. Controls will limit the future use of the site and regulate the future movement of the contaminated soil/waste and the use of the contaminated groundwater.

For the Pretreatment Plant, the final corrective measure, removal of contaminated soils above target cleanup levels and re-deposition at the Main Plant Site) will be protective of human health and the environment. The final corrective measures at the Main Plant Site for these re-deposited soils will protect human health and prevent releases into the environment. At the Pretreatment Plant monitoring of the groundwater, along with restrictions on its use, will protect human health and the environment. If levels of groundwater contamination increase, the initiation of corrective measures will be evaluated.

2. Attainment of Media Cleanup Standards

The only retained corrective measure technologies having the potential to achieve soil/waste decontamination cleanup standards (i.e., target cleanup levels) are vapor extraction and excavation. However, vapor extraction is limited to removing only volatile organic constituents. It will not lower non-volatile contamination levels attributable to inorganic metals and certain semi-volatile organic compounds with low vapor pressures. Achieving cleanup standards for non-volatile constituents would involve excavation.

Vapor extraction technology is not practical given the heterogeneous nature of the contamination existing in areas containing volatile contaminants. Lowering the residual levels of volatile organics to their respective decontamination cleanup standards at these isolated areas (i.e., the south waste pile, incineration area, and in the vicinity of Building 56) would still leave these areas contaminated with non-volatile organic and inorganic constituents above their decontamination cleanup standards. In order to achieve full decontamination of the soil/waste mixture excavation and transport off-site would be necessary. However, such a removal action would only serve to create decontaminated islands surrounded by contamination. Creating these small "clean islands" is not cost effective nor does it offer a significant benefit. The remaining soil/waste contamination residing in the vicinity of the "clean islands" would still dictate the future use of the decontaminated areas, and would require appropriate remediation to mitigate risks from exposure.

Meeting cleanup standards in the soil/waste mixture by excavation and off-site transport either in isolated small areas of the site or in larger areas such as the areas north or south of the railroad property is considered costly and impracticable. Potential health risks from exposure to the remaining soil/waste contamination can be adequately addressed by more pragmatic remedial solutions such as the proposed corrective measures alternative. This alternative will eliminate the health risks associated with direct exposure (i.e., direct ingestion, dermal contact) and with particulate inhalation of any soil/waste contamination remaining at the site. The installation of a low permeability cap over the CAMU will serve to cut-off future releases to the groundwater from this significant source. Areas where a permeable cap will be placed can also benefit by having these areas more accessible for future redevelopment. This more porous cap placed over areas with lower residual contamination, but still having some propensity to leach will allow continued flushing of the contamination with subsequent collection by the downgradient collection systems.

There are no short-term solutions for achieving groundwater cleanup standards. No in-situ technology exists that will allow the removal of inorganic metals or chlorinated organics. However, cutting off the most significant source, i.e., the

CAMU, and allowing the contaminants to flush out from the aquifers does offer the potential for achieving groundwater cleanup standards in the future.

For the Pretreatment Plant soils, it is possible to attain media cleanup standards by excavation of those soils above the standard and re-depositing them at the Main Plant Site. Since the groundwater contamination is slightly above media standards, it is possible that, after removal of contaminated soils, the natural flushing will eventually lower contamination to groundwater cleanup standards.

3. Controlling the Sources of Releases

Vapor extraction and stabilization/solidification are treatment technologies having the potential to control sources of releases to the groundwater pathway. Application of the former technology is considered suitable for controlling releases of only volatile organic constituents. The latter technology is effective in controlling releases of inorganic constituents. However, neither technology alone can control particulate releases, runoff or surfacial soil contamination, or prevent direct exposure without the addition of an appropriate cover.

Capping is considered appropriate for controlling source releases of particulate matter through the air pathway and runoff of surfacial soil contamination. However, the low permeability cap is also effective in controlling releases of all contaminants through the groundwater pathway. This type of cap can isolate the soil/waste mixture remaining in significantly contaminated areas from precipitation, thereby precluding the generation of leachate. It is contaminated leachate migrating down to the underlying aquifers that becomes the true source for groundwater contamination.

Although the permeable cap provides adequate exposure control for direct contact, runoff contamination and releases to the air pathway, it will not be effective for controlling the generation of leachate. Its use is limited to areas where leachate generation is not expected or where contaminated groundwater plume management will be implemented and flushing residual contaminants from less significant sources is a viable alternative.

4. Compliance with Waste Management Standards

All the retained soil/waste and groundwater alternatives that generate waste streams would comply with prevailing solid waste management standards. Also, the closure of the CAMU by a low permeability cap would meet applicable closure requirements set forth in state in federal RCRA regulations for hazardous waste land disposal. Contaminated groundwater collected by extraction wells and/or french drains would be treated (as necessary) to meet appropriate discharge limitations and discharge to the Glens Falls POTW. Also, organic emissions from vapor extraction would be required to meet state air quality based emission standards.

B. Remedy Selection Decision Factors

The following five selection decision factors are used to select the proposed corrective measures alternative which will provide the greatest protection for human health and the environment with the least risk and lowest incremental cost:

1. Long-term Reliability and Effectiveness

(a) Soil/waste material: With the proper long term maintenance, capping,

vapor extraction, and solidification/stabilization will provide adequate reliability and effectiveness. Vapor extraction would involve mechanical equipment and be considered more complex and require a greater degree of maintenance. Excavation of contaminated soils at the Pretreatment Plant will eliminate any concern of long term reliability and effectiveness since all of the soils above the media cleanup standards will have been removed.

(b) Groundwater: The two primary groundwater technologies; the french drain and extraction wells, with proper maintenance will also provide adequate reliability and effectiveness. Due to its greater complexity, the extraction well system would require a greater degree of maintenance. However, this is the technology that will most likely be required to intercept the deeper bedrock aquifers since the use of french drains is limited to shallower applications.

2. Reduction of Toxicity, Mobility or Volume of Wastes

(a) Soil/waste material: The retained primary technologies; impermeable capping and stabilization/solidification can reduce the mobility of the wastes by limiting leachate generation during precipitation events. They will not reduce the toxicity or volume of the wastes like soil vapor extraction. Stabilization/ solidification of the waste, due to the addition of the stabilizing agent could increase the volume of waste up to fifty percent. The vapor extraction is limited to reducing only volatile contamination, and not the non-volatile constituents also mixed-in with the volatile soil/waste material. For the Pretreatment Plant, the excavation alternative reduces the volume of waste (contaminated soil); however, this volume is transferred to the Main Plant Site.

(b) Groundwater: The downgradient groundwater technologies will reduce the mobility of the waste in the groundwater at the Main Plant Site by preventing off-site migration. The upgradient collection system would not collect existing contaminated groundwater at the site and only reduce future mobility of contamination in the overburden.

3. Short-term Effectiveness

(a) Soil/Waste Material: The facility has estimated that to solidify/ stabilize the waste at the Main Plant Site would take forty-five months. This extended period of time is partially due to the pilot studies that would be necessary to select the proper stabilizing agents and due to the large volume of soil/waste to be processed. Soil vapor extraction system would need to operates for several years before results are achieved. The time estimated for capping is thirteen months. Due to the shorter implementation time, capping would start protecting human health and the environment approximately two and one half years sooner.

In addition, due to the in-situ nature of capping (the wastes are left in place), the risk to workers and the community are less. Since the waste are not handled, as is required during stabilization/ solidification or redeposition, there is less chance of release to the environment.

For the Pretreatment Plant, the facility estimates that each of the alternatives would take one month of field work with six months of

pre-construction activities for a total of seven months. There is less risk to the workers and community with capping. Additional risk would be incurred with excavation and re-deposition at the Main Plant Site due to the additional handling and transportation.

(b) Groundwater: The time frames for implementing the Main Plant Site groundwater technologies are almost the same; ten months for the french drain and eleven to thirteen months for the extraction wells.

4. Implementability

(a) Soil/Waste Material: Capping the site is simpler and easier to implement than stabilization/solidification or vapor extraction. For capping, all of the work would be done at the surface; there would not be the need for either laboratory or field testing to determine the effectiveness of the treatment alternatives. If problems were noted, repair of the cap could be easily accomplished. If problems developed with the stabilized soil/ waste, it would need to be reworked to achieve performance criteria.

At the Pretreatment Plant, excavation and re-deposition at the Main Plant Site is easily implementable. Standard earth moving equipment could be used to excavate and transport the contaminated soils. The depth of excavation would be shallow and would not pose a threat to the workers. The distance to transport the soil for re-deposition would be approximately one-half mile.

(b) The installation of a downgradient french drains and extraction wells is necessary to prevent continued releases from the site. The french drain is the preferred technology for the overburden aquifer since it is more reliable and easier to operate than groundwater extraction wells. Due to the depth required to intercept flow of contaminated groundwater in the deeper bedrock aquifers, it is likely that groundwater extraction wells will have to be installed. A french drain has depth limitations especially on this site due to the closeness of the Hudson River. Due to the complex nature of pumps, their associated controls and the necessity of a groundwater stripping and treatment system it is likely that in addition to daily staffing, control systems (including remote alarms) be installed to allow automatic operation and response to mechanical failure. In addition, routine mechanical repairs and purchase of water treatment chemicals would be required.

The french drain, the preferred technology for remediating the overburden aquifer, is a passive groundwater collection system, that if not operated by gravity, would only require a simple pump to transport the collected water to the existing facility pump station.

5. Costs For Retained Corrective Measure Technology Alternatives

The facility has estimated the following costs for each of the retained alternatives:

Corrective Measures Alternatives For Soil/Waste

Alternative	SWMU	Present Worth Cost
	CAMU	
2	Capping (low permeability)	$ 1,408,000
3	Capping (low permeability) with soil vapor extraction	1,719,000
4	Stabilization/solidification and on-site redeposition with low permeability cap	7,052,000
	Area North of Railroad Property	
2(a)	Capping (permeable cover)	2,742,000
3	Stabilization/solidification and on-site redeposition with a permeable cover	27,482,000
	Area South of Railroad Property	
2(a)	Capping (permeable cover)	3,151,000
3	Capping (permeable cover) with excavation of Building 56 Area soil/waste and redeposition in the CAMU	3,383,000
4	Capping (permeable cover) with soil vapor stripping of Building 56 Area, soil/waste placed in the CAMU	3,383,000
5	Stabilization/solidification and on-site redeposition with a permeable cover.	32,524,000
	Pretreatment Plant	
2(a)	Capping (permeable, soil-vegetative cover)	231,000
2(b)	Capping (permeable, asphalt cover)	249,000
3	Excavation and re-deposition at Main Plant Site (with capping)	124,000
4	Excavation with stabilization/ solidification and re-deposition at Main Plant Site	199,000 *

Corrective Measures Alternatives For Groundwater

Alternative	Description	Cost
2	Upgradient collection system	$ 9,543,400
3	Downgradient collection from bedrock, pretreatment on-site and discharge to Glens Falls Treatment Plant	14,052,000
4	Downgradient collection from overburden and bedrock aquifers, pretreatment or site discharge to Glens Falls Treatment Plant	17,141,000 to 18,105,000

* Stabilization/solidification of the Pretreatment Plant soils would only be considered if this technology was selected for the SWMUs at the Main Plant Site.

VII. Summary Determinations

In summary, a permeable cover for the areas north and south of the railroad property with a downgradient collection system collecting both overburden and bedrock contaminated groundwater is the final corrective measure. Despite its higher cost, this option was chosen because, while providing protection of human health and the environment, it also allows for simpler and less costly redevelopment of the site. Should redevelopment occur, there will be no low permeability cap complicating the installation and repair of underground utilities or the construction of new on-site structures. Institutional controls will be imposed to restrict the site usage; control future contaminated soil removal and groundwater usage; and make future owners aware of the residual contamination.

For the CAMU, the final corrective measure is capping with a low permeability cap. Since this unit is undergoing closure as a RCRA land disposal unit, certain restrictions apply to its method of closure. The low permeability cap, while providing adequate protection to human health and the environment, also satisfies the legal requirements for closure.

Capping, either low-permeability, or permeable is a less complex technology, that can be implemented in a reasonable time frame, using readily available materials. With proper maintenance, this alternative will last indefinitely. The downgradient groundwater interception system, although more complex, with the proper operation and maintenance, will provide protection as long as required.

For the Pretreatment Plant, excavation of those soils above the target cleanup levels, and re-deposition at the Main Plant Site is the final corrective measure. This re-deposited soil would be covered by the cap (either in the CAMU, or elsewhere on site) which is the final remedy for the Main Plant Site. Removal of the contaminated soils from the Pretreatment Plant and re-deposition at the Main Plant Site is the only option that will allow cleanup standards to be met, is the least costly option, is permanent, can be implemented in the same time frame as the other alternatives and uses readily available equipment.

For those portions of the industrial sewer which are to be decommissioned, the final corrective measure is to plug the sewer laterals and fill the manholes with sand or gravel. This is a straightforward technology which can be easily implemented using readily available materials and will last indefinitely.

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John P. Cahill
Commissioner

FINAL STATEMENT OF BASIS
SELECTION OF CORRECTIVE MEASURES TO ADDRESS
OFF-SITE SOIL/SEDIMENT/WASTE
at the
Ciba Specialty Chemicals Corporation and Hercules Incorporated
MAIN PLANT SITE
Lower Warren Street
Glens Falls, Warren County
New York

January 8, 1999

The New York State Department of Environmental Conservation (Department) has selected the Final Corrective Measures to address the presence of contamination at the nearby air emissions impacted properties and bottom sediment contamination in the adjacent Cement Company Pond and waste material in that section of the Hudson River adjacent and immediately downstream of the site. The detailed technical information presented in the water quality permit application was accepted as a focused Corrective Measures Study for the final corrective measures. The following final corrective measures were accepted-- Cement Company Pond: placement of clean fill over the contaminated bottom sediments and raising the pond outlet so as to maintain water depth; that section of the Hudson River adjacent to and immediately downstream of the Main Plant Site: removal of waste material in the river bed and underneath the river bank and covering the excavated areas with rip-rap; air emissions impacted properties: excavation of upper layer of contaminated soil and placement of fill material to the original grade. A public comment period was held from September 16, 1998 to October 30, 1998 on the draft Statement of Basis and the draft permit modification.

Comments were received from the facility and the adjacent Glens Falls Cement Company during the public comment period. In response to these comments, modifications were made to the draft Statement of Basis.

Ciba Specialty Chemicals Corporation and Hercules Incorporated shall implement the Final Corrective Measures pursuant to the modification made to the Article 27, Title 9; 6NYCRR Part 373: Hazardous Waste Management Permit.

Dated: Jan 8, 1999

By: Stephen Hammond
Stephen Hammond, P.E.
Director
Division of Solid & Hazardous Materials

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
FINAL STATEMENT OF BASIS
FOR
CIBA SPECIALTY CHEMICALS AND HERCULES INCORPORATED
OFF-SITE SOIL/SEDIMENT/WASTE REMEDIATION
MAIN PLANT SITE
LOWER WARREN STREET
GLENS FALLS, NEW YORK 12801
EPA I.D. NO.: NYD002069748

I. Announcement of Proposed Corrective Measures

The Statement of Basis (SB) has been developed by the New York State Department of Environmental Conservation (NYSDEC) under the authority of the Solid Waste Disposal Act, as amended, and more commonly referred to as the Resource Conservation and Recovery Act or RCRA.

This SB documents the levels, extent of contamination and selected corrective measures for the bottom sediments in the Cement Company Pond, the off-site air emissions impacted properties and the sediment/waste deposits in that section of the Hudson River adjacent to and immediately downstream of the Main Plant Site. The 6NYCRR 373 Hazardous Waste Management Permit requires a series of sequential investigations of releases to the bottom sediments in a body of water to extend downstream to where the limit of impact of releases from the Main Plant has been reached. In the Hudson River, this SB documents the investigation and remediation of only the first segment of the river. It has not been documented that the limit of impact from Main Plant Site releases has been reached; therefore as per the permit condition, the sequential investigation of releases to the bottom sediments in the river has not been concluded

For the contaminated sediment/waste remediation, the proposed final corrective measure was developed through the use of a focused Corrective Measure Study (CMS). As a result of detailed studies of sediment contamination in the pond to the west of the site (Cement Company Pond) and sediment/waste deposits in the Hudson River adjacent to and downstream of the Main Plant, the Department made a decision that remediation of the contaminated sediment/waste was necessary. For the Hudson River, the term sediment/waste is used to describe colored waste material (which in some cases may contain some coarse granular gravel type material) lying on the bed of the river and in places extending under

the river bank. Due to the swift currents and spring floods, there is essentially no fine grained sediments on that section of the river bed impacted by historic releases from the Main Plant. The waste material is either a red hard material, or a multicolored soft clay like material, both of which are easily identified by color. For the contaminated sediment/waste in the Hudson River, the facility was requested to conduct a focused CMS to determine the method of removal, restoration of excavated areas and disposal of the excavated materials. For the contaminated sediment in the Cement Company Pond, the facility was requested to propose a method of remediation. The SB describes the corrective measure being proposed for remediating the contaminated sediment/waste material in the Cement Company Pond and the Hudson River adjacent to and downstream of the Ciba/Hercules Main Plant Site located in Glens Falls, New York (the "Facility").

The proposed corrective measure for the contaminated sediment/waste material in the river is removal by mechanical means (excavation by crane with a clamshell bucket or backhoe) and disposal in the on-site Corrective Action Management Unit (CAMU). Provisions will be implemented, as necessary, to contain material suspended in the water column during excavation and prevent transport and deposition elsewhere in the water body. After excavation of the waste on and under the river bank, a protective rip-rap covering will be placed as necessary. The proposed corrective measure for the Cement Company Pond is covering the contaminated bottom sediment with gravel or other suitable material.

During past manufacturing activities, airborne particulates had been released by the facility which contaminated downwind soils with varying levels of heavy metals. A CMS was conducted to determine which properties required remediation (using DOH guidelines), evaluate the suitability of various methods of remediation and to propose a preferred corrective action for remediation. The conclusion of the CMS was that two down wind residential properties had levels of cadmium which required corrective measures and the proposed corrective measure is removal of the surficial soil and replacement with suitable fill material. Subsequent testing has determined that due to levels of cadmium in the surficial soil, corrective measures are required at a third property. The properties requiring remediation and the proposed corrective measures are acceptable to this Department and the New York State Department of Health (NYSDOH).

The SB provides background information on the Facility, including a summary of investigative findings pertinent to the contaminated materials; summarizes exposure and potential risks posed by the contaminated soil/sediment/waste and discusses the public's role in the decision process for finalizing the selected remedy.

NYSDEC welcomes public comments pertinent to finalizing the selected corrective measures. Public comments can influence NYSDEC's final selection of a corrective measure. If new substantive information and arguments are presented to NYSDEC through public comments, NYSDEC may integrate these comments and so modify the proposed final corrective measure. Therefore, the public is encouraged to review and provide comment on this SB.

II. Facility Location, Site Background and Regulatory History

The approximately 60-acre Main Plant Site is located in the Town of Queensbury, just east of the City of Glens Falls in Warren County, N.Y. The site is situated in a mixed industrial/residential area on the northern bank of an easterly flowing segment of the Hudson River. On the west, the facility is bounded by the Glens Falls Cement Company owned pond (in reality, two interconnected ponds) and a small wetland. The north boundary is the Glens Falls Feeder Canal. The eastern boundary is land formerly owned by the facility which, after remediation, was sold to Warren County.

Manufacturing activities at the site date back to 1901 and initially involved the manufacture of wallpaper. In 1907 site operations expanded to include the manufacture of inorganic pigments which eventually became the primary product line. Hercules Incorporated purchased the site in 1960 and subsequently sold it to Ciba-Geigy in 1979. Ciba-Geigy ceased production of pigments in 1989 and demolished the buildings on the site. On September 9, 1996, ownership of the Main Plant Site was transferred from Ciba-Geigy Corporation to Ciba Specialty Chemicals Corporation. Hercules and Ciba have entered into a cooperative agreement whereby Hercules is managing the corrective measures while Ciba retains ownership of the site.

On September 30, 1991 a Part 373 post-closure permit was issued to the facility for closure and post-closure care of a closing hazardous waste disposal facility. The corrective action portion of this permit required the facility to investigate the impact of past plant operations on the facility property and adjacent off-site areas including the adjacent surface waters. These same requirements have been incorporated in the post closure permit renewal which became effective on January 6, 1997. In fulfillment of this requirement, the facility has conducted investigations on the adjacent off-site lands, bottom sediments in the Cement Company Pond, Feeder Canal and the Hudson River.

III. Bottom Sediment Characterization

A Phase I RFI for the adjacent surface waters sediments was completed in 1994. The goal of this investigation was to evaluate the contribution of constituents from the site to the sediments of the adjacent surface water AOC's (Areas of Concern) and to evaluate whether additional assessments were necessary. This report concluded that there were site-related releases to the Hudson River, Feeder Canal and Cement Company Pond (and associated wetland) which required further evaluation. This evaluation was conducted in a Phase II study.

The Phase II RFI was performed to address the potential impacts from site-related constituents to aquatic biota in the Hudson River, the Glens Falls Feeder Canal and the Glens Falls Cement Company Pond. Additionally, a delineation and functional assessment of the wetland area were performed. The results of this investigation were presented in a report dated June 1997.

This report reached the following conclusions:

a) Hudson River

Limited impacts to the benthic community were found to correspond to an approximate 1,900 foot stretch of river where visible waste and/or discolored sediments were observed. The report recommended implementation of a final corrective measure which involves removal of visible waste and discolored sediment from this area based on a correlation between benthic impairment and waste deposits.

b) Glens Falls Feeder Canal

There has been no significant redeposition or resuspension of sediments and no site-related impacts to the fish population or benthic community were found. No further action was recommended for the feeder canal.

c) Cement Company Pond

The biological community has not been impaired due to site-related constituents and no further action is required.

d) The wetland (less than 0.2 acres) has limited functional value to the local ecosystem and visible waste deposits should be removed as part of the corrective measures for the Main Plant Site. (This removal has been incorporated in the approved corrective measures for the Main Plant Site.)

The Department agreed with the recommendation of no further action for the feeder canal. However, due to the level of heavy metals in the bottom sediment of the Cement Company Pond, the no further action determination was not accepted and the facility is required to remediate the contaminated bottom sediments.

The Department was not in agreement with the proposed limits of waste/discolored sediment based removal of deposits for the Hudson River. It was suspected that colored sediments extended further downstream and analytical testing of sediments had shown metal contamination at levels of concern to the Department beyond the proposed limit of removal. The Phase III sediment investigation was initiated to address these concerns.

The results of the Phase III sediment characterization were presented in the "Supplemental RFI Report, Sediments AOC, Ciba Site, Glens Falls, New York" dated May 1998. As the result of this investigation, the extent of the colored sediment/waste deposits was accurately determined. The colored waste in the river generally occurs as discrete deposits along and/or adjacent to the north bank of the river. Two types of waste occur in the study area:

1. A red, relatively hard waste occurring in layers up to a few feet thick. It often forms ledges or is present as a crust over coarse sediment or bedrock. Large fragments of the red waste have broken off from the layers and ledges and are deposited downstream with coarse grained sediment as boulder to gravel sized particles.

2. A layered, often multicolored, waste with the consistency of very soft clay. In places this waste extends up to 15-20 feet from shoreline. Some limited areas extend up to 40-50 feet from shoreline. In places, this waste material extends under the on-shore riverbank and north bank of the island adjacent to the site.

This report also documented the general lack of fine grained sediments in the river (i.e., the river bottom is composed predominantly of gravel, sand, bedrock and/or the lacustrine clay unit). The recommendation in this report to remove the colored sediment/waste deposits as documented is acceptable to the Department. However, the proposal to remove the colored waste deposits extending under the

island and shore river bank only up to the ordinary high water mark is not acceptable. It is felt, that if possible, the entire waste deposit should be removed. An investigation will be conducted to evaluate the landward extent of the waste material. If the waste extends beyond the ordinary high water mark, the entire deposit will be removed provided: (1) If on private land, the property owner's permission is secured, and (2) physical constraints such as destabilizing an adjacent slope or excessive overburden do not prevent removal.

IV. Adjacent Off-Site Land Characterization

The goal of this investigation is to evaluate if hazardous constituents from historic air emissions from the site are present in the soil of the adjacent off-site land at levels which require further action. In the Phase I investigation, a limited number of surficial soil samples were collected in a corridor extending approximately 3/4 of a mile in a direction downwind of the site. To provide background information (in areas not impacted by historic airborne releases from the site), surficial soil samples were collected in an "upwind area" located approximately 2 ½ miles from the site. This study concluded that barium, cadmium, chromium, copper, lead, strontium, mercury and cyanide were contributed to the off-site soil in the downwind sample area from site air emissions.

As a result of these findings, the facility decided to perform a risk assessment to evaluate the potential impact of these constituents. When evaluating the risk assessment report, the NYSDOH expressed a concern with regard to potential risk associated with consumption vegetables grown in a garden. This concern was based on the levels of cadmium present in the surficial samples (0 to 1 inch below grade). To address this concern, information was requested on cadmium concentrations in the root uptake zone (0 to 12 inches below grade). At this time, it was determined that cadmium was the major constituent of concern and could be used as an indicator parameter to assure that when cadmium was remediated to acceptable levels, other metals in the soil were also at acceptable levels. However, the facility implemented secondary goals to provide additional information on the root uptake potential of the cadmium and oxidation state of the chromium in order to conduct a more detailed risk assessment. A Phase II soil sampling investigation was conducted to provide this information. In general, it was found that the cadmium and chromium in the 0-1" sample were generally higher than the concentration in the 0-12" sample (which is indicative of the potential for root uptake in a garden).

The range of contamination found in the non-facility owned off site soils is as follows:

Constituent	Max. Conc.*	Min. Conc.*
Barium	173	41
Cadmium	130	0.1
Chromium	425	48
Copper	43	5.2
Lead	467	24
Strontium	112	7.9
Mercury	22	0.68
Cyanide	2	Non Detect

*Units are mg/kg (parts per million)

During the evaluation of the soil sampling results, the NYSDOH took into consideration the average level of metal contamination on the parcel, the depth in the soil column, whether the property was industrial or residential and whether there is a potential for a vegetable garden in determining whether the levels of contamination were a public health threat and therefore required remediation.

V. Hazardous Constituents in Sediment/Waste

a) Hudson River

During the initial investigations, both organic constituents (volatiles and semi-volatile organics) and inorganics (metals and cyanide) were analyzed for in the bottom sediments. In addition, testing was conducted to determine if the sediment/waste was a characteristic waste. It was later determined that heavy metals were the key contaminants and they could be

used as indicator parameters which would lessen analytical costs and allow adequate characterization of the sediment/waste.

A summary of the of the key inorganic constituents (cadmium, chromium, lead, and mercury) detected in the bottom sediments and/or waste deposits is as follows:

Constituent	Max. Conc.*	Min. Conc.*
Cadmium	250	Non Detect
Chromium(Total)	14,100	3.2
Lead	12.300	Non Detect
Mercury	31	Non Detect

*Units are mg/kg (parts per million)

In general, the highest metals concentrations were observed along the north shore of the river downstream of the site, although there were isolated exceptions to this trend at some downstream sampling points. The lowest values were observed at the reference stations upstream of the site. Low values were also observed on the south shore of the river which is apparently not influenced by releases from the site located on the north shore.

b) Cement Company Pond

The same inorganic indicators were used to evaluate the contamination in this pond. The analytical results are as follows:

Constituent	Max. Conc.*	Min. Conc.*
Cadmium	250	0.95
Chromium(Total)	6,770	20.7
Lead	11,000	17.8
Mercury	9.6	Non Detect

*Units are mg/kg (parts per million)

Going from east to west in the pond, there is a trend of decreasing metals concentrations. This would indicate that the likely source of metals contamination is the facility owned waste piles, which are located adjacent to the east side of the pond. Remediation of the waste piles has been incorporated in the approved corrective measures for the main plant site.

VI. Summary of Risks

For the Hudson River, the investigations concluded that the contamination is in the form of deposits of waste material that lie on the river bottom and in certain few locations, extends onto and under the river bank. The removal of these waste deposits, which are known to contain heavy metal contaminants and in certain locations have exhibited a hazardous waste characteristic, will remove the threat to the environment from re-suspension in the water column. This breaking down in to smaller sized particles and re-suspension in the water column would allow them to be redeposited in downstream areas, potentially impact the benthic community and accumulate in the food chain. Removal and placement in the CAMU will eliminate this threat to human health and the environment.

In the Cement Company Pond, the placement of gravel or other suitable material over the contaminated bottom sediments will isolate these sediments and prevent re-suspension in the water column. If not prevented, this re-suspension could allow contaminated sediments to reach the Hudson River and be deposited downstream and impact the benthic community. In addition, as silt accumulates over this fill material, it may provide a suitable habitat for development of a more varied benthic community. Removal of the contaminated sediments was considered, but not chosen, since after removal of the top layer of sediment, the newly exposed materials may still directly or through re-suspension provide a threat to the benthic community.

The off-site air emissions impacted soils provide a potential threat to human health through the ingestion pathway. Although other metals are present, cadmium is the constituent of concern. Ingestion would be from eating vegetables grown in a home garden where the soils have cadmium contamination. Children may also ingest the cadmium by eating soil. Both adults and children could ingest soils indirectly while eating without washing accumulated dirt from their hands. The NYSDOH has established two cleanup levels for cadmium: 10 mg/kg (ppm) where there is the potential for a vegetable garden; and 28 mg/kg (ppm) for direct ingestion.

During remediation of the contaminated sediment/waste material, measures such as silt curtains or closed buckets for removal of material will be used as necessary to prevent re-suspension of the material into the water column and transport

elsewhere. Cover material will be placed in the Cement Company Pond so as to minimize re-suspension of the bottom sediment.

VII. Summary Determination

The Department has chosen removal of designated waste deposits in the Hudson River as the preferred corrective measure. The river bottom in the study area is composed predominantly of gravel, sand, bedrock and/or lacustrine clay. There are only limited areas where the river sediments contain more than a trace amount of fine-grained (silt or finer) materials with which contaminants are typically associated. The fine-grained material occurs is a few small coves or recesses in the river banks.

Since fine-grained sediments are almost nonexistent, and contamination is concentrated in the waste deposits, removing the red hard waste deposits and the multicolored soft waste will remediate the contamination in this section of the River. This removal will eliminate releases through all pathways, thus removing any threat to human health and the environment . Excavated material will be deposited in the Corrective Action Management Unit (CAMU) to be constructed at the adjacent Main Plant Site. However portions of the excavated material demonstrated to be non-hazardous may be placed beneath the Permeable Cover at the Main Plant Site. The CAMU is designed to effectively contain the materials, prevent releases to the environment and, since the unit will be fenced, it will also prevent contact by the public.

The Cement Company Pond provides very a limited habitat. No fish or other aquatic vertebrates were observed in the pond. It is approximately 3/4 acre in area and located between two large facilities in an industrial area. The proposed corrective measure is to place up to one foot of fill material (gravel or other suitable material) over the sediments in the bottom of the pond. This measure will minimize re-suspension of sediments in the water column.

During the investigation of the off-site air emissions impacted soils, the NYSDOH determined that the levels of cadmium in the soils at three down wind residential properties were at levels that required remediation. The proposed remediation is to remove the top one foot of soil at two properties and at least the top six inches of soil at the third property and replace it with suitable clean fill material.

List of Supporting Documents

a) Sediment/Waste

Eckenfelder Inc., May 1994, "RFI Phase I Report For The Adjacent Surface Water Sediments AOC, Ciba-Geigy Site, Glens Falls, New York, Volume I"

Eckenfelder Inc., Normandeau Associates, Inc., and Applied Science Associates, Inc., Revised July 1996, "Phase II RFI Work Plan For Adjacent Surface Water Sediments AOC For The Ciba-Geigy Site, Glens Falls, New York"

Eckenfelder Inc., and Normandeau Associates Inc., June 1997, "Phase II RFI Report For Adjacent Surface Water Sediments AOC For The Ciba Site, Glens Falls, New York"

Eckenfelder, Inc., May 1998, "Supplemental RFI Report, Sediments AOC, Ciba Site, Glens Falls, New York"

(Focused CMS): Eckenfelder Inc., April 16, 1998, " Conceptual Work Plan Waste Removal Program, Hudson River Surface Water Sediments AOC, Ciba Site, Glens Falls, New York"

b) Off-Site Air Emissions Impacted Soils

Eckenfelder, Inc., October 1994, "RFI Report For The Adjacent Off-Site Land AOC, Ciba-Geigy Site, Glens Falls, New York, Volume I"

Eckenfelder, Inc., July 1996, "Phase II RFI Report, Adjacent Off-Site Land AOC, Ciba-Geigy, Glens Falls, New York"

Eckenfelder Engineering, P.C., March 1998, "Corrective Measures Study, Adjacent Off-Site Land AOC, Ciba Site, Glens Falls, New York, Volume I-Text, Appendices A and B"

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John P. Cahill
Commissioner

FINAL STATEMENT OF BASIS
SELECTION OF CORRECTIVE MEASURES TO ADDRESS
HUDSON RIVER PONDED BACKWATER AREA
CONTAMINATED SOIL/BOTTOM SEDIMENTS
at the
Ciba Specialty Chemicals Corporation and Hercules Incorporated
MAIN PLANT SITE
Lower Warren Street
Glens Falls, Warren County
New York

November 29, 2000

The New York State Department of Environmental Conservation (Department) has selected the Final Corrective Measures to address the presence of contaminated soil/bottom sediments in the Ponded Backwater Area (PBA), which is located immediately downstream of the site and adjacent to the Hudson River. The proposed final corrective measures were developed through the use of a focused Corrective Measures Study which presents a pragmatic, conceptual, corrective measures plan that includes: removal of the contaminated soil/bottom sediments by mechanical means; disposal at the Main Plant Site under a permeable cover; provisions to be implemented (as necessary) to contain the material during excavation and transportation; and backfilling and restoring the excavated areas. A public comment period was held from August 30, 2000 to October 16, 2000 on the draft Statement of Basis and the draft permit modification.

Comments were received from Brown and Caldwell (the facility's consultant). In response to these comments, revisions were made to the draft Statement of Basis.

Ciba Specialty Chemicals Corporation and Hercules Incorporated shall implement the Final Corrective Measures pursuant to the modification made to the Article 27, Title 9; 6NYCRR Part 373: Hazardous Waste Management Permit.

Dated: Nov 29, 2000

By: Stephen Hammond
Stephen Hammond, P.E.
Director
Division of Solid & Hazardous Materials

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FINAL STATEMENT OF BASIS

CIBA SPECIALTY CHEMICALS AND HERCULES INCORPORATED
HUDSON RIVER PONDED BACKWATER AREA
GLENS FALLS, NEW YORK 12801
EPA I.D. NO: NYD002069748

November 29, 2000

Announcement of Proposed Corrective Measures

This Statement of Basis (SB) has been developed by the New York State Department of Environmental Conservation (NYSDEC) under the authority of the Solid Waste Disposal Act, as amended, and more commonly referred to as the Resource Conservation and Recovery Act, or RCRA. The SB addresses the final proposed RCRA corrective measures for the Ponded Backwater Area (PBA). The PBA, impacted by past releases of hazardous constituents from the Ciba/Hercules Main Plant Site, is located immediately downstream from this site on the north side of the upper Hudson River. The SB presents a summary of pertinent information and data associated with the PBA, including:

- Background and regulatory history;
- Description of the area;
- Contamination found in the area;
- Potential environmental and human health risks posed by the soil/sediment contamination; and
- The proposed corrective measures removal action and restoration program.

The proposed final corrective measure was developed through the use of a focused Corrective Measure Study (CMS). The focused CMS presents a pragmatic, conceptual corrective measures plan, acceptable to the Department which includes:

- Removal of the contaminated soil/bottom sediments by mechanical means (i.e., excavation by earth-moving equipment);
- Disposal at the Main Plant Site under the permeable cover;
- Provisions to be implemented, as necessary, to contain the material during transportation, to prevent the release of particulates into the air and to prevent the release of material into the water column with subsequent deposition; and
- Backfilling and restoring the excavated areas.

The NYSDEC welcomes public comments pertinent to finalizing the selected corrective measures. Public comments can influence NYSDEC's final selection of corrective measures. If new substantive information and arguments are presented to NYSDEC through public comments,

NYSDEC may integrate these comments and so modify the proposed final corrective measure. Therefore, the public is encouraged to review and provide comment on this SB.

Background and Regulatory History

The approximately 60-acre Main Plant Site is located in the Town of Queensbury, just east of the City of Glens Falls in Warren County, N.Y. The site is situated in a mixed industrial/residential area on the northern bank of an easterly flowing segment of the Hudson River. On the west, the facility is bounded by the Glens Falls Lehigh Cement Company-owned pond (in reality, two interconnected ponds) and a small wetland. The north boundary is the Glens Falls Feeder Canal. The eastern boundary is land formerly owned by the facility which, after remediation, was sold to Warren County. A Pretreatment Wastewater Plant that processed contaminated wastewater generated at the Main Plant Site is located on a four-acre tract across from this site.

Manufacturing activities at the site date back to 1901 and initially involved the manufacture of wallpaper. In 1907, site operations expanded to include the manufacture of inorganic pigments, which eventually became the primary product line. Hercules Incorporated purchased the site in 1960 and subsequently sold it to Ciba-Geigy in 1979. Ciba-Geigy ceased production of pigments in 1989 and demolished the buildings on the site. On September 9, 1996, ownership of the Main Plant Site was transferred from Ciba-Geigy Corporation to Ciba Specialty Chemicals Corporation. Hercules and Ciba have entered into a cooperative agreement whereby Hercules is managing the corrective measures while Ciba retains ownership of the site.

On September 30, 1991, a Part 373 Post-Closure Permit was issued to the facility that included:

- The closure and post-closure care of a closing hazardous waste land disposal unit (i.e., a surface impoundment containing a listed hazardous waste sludge); and
- RCRA corrective action requiring the facility to investigate the impact of past releases of hazardous waste and hazardous constituents on the facility property and adjacent off-site areas.

Investigations concluded that hazardous constituents, primarily the heavy metals cadmium, chromium, and lead were released at the pretreatment plant and on the Main Plant Site. From this site, past releases of heavy metals occurred to the adjacent Hudson River, Cement Company Ponds, and other off-site areas.

On January 6, 1997, the Post-Closure Permit for the Main Plant Site was renewed and a SB was issued that selected the final corrective measures for the site and the pretreatment plant. The Permit required the facility to submit design documents for the final corrective measures and to continue investigations and studies for off-site locations impacted by the facility's past releases. Subsequently, the Department approved the design documents for the following remedies:

- An impermeable cover for the five-acre Corrective Action Management Unit (CAMU) located on the Main Plant Site containing a lagoon with listed hazardous waste sludge contaminated with heavy metals, spent solvent-contaminated soil from

the south waste pile and metal ore residue with some lagoon sludge from the north waste pile;

- A permeable soil cover for the remaining 40-acre Main Plant Site containing primarily metallic hazardous constituents from the prior on-site disposal of processed ore residue;
- The installation of an overburden and bedrock-contaminated groundwater extraction system located along most of the down gradient edge of the property and adjacent to the Hudson River; and
- The removal of soils contaminated with heavy metals from the pretreatment plant. This removal action has been partially completed.

Investigations and studies carried out pursuant to the renewed Permit showed that past releases of heavy metals from the Main Plant Site impacted the Hudson River, the PBA, the Cement Company Ponds and off-site residences downwind from the facility. On January 8, 1999, the Department issued a final SB and modified the Permit to require the final corrective measures at all locations except the PBA where additional studies would be necessary. Subsequently, the Department approved the design documents for the following final corrective measures:

- The removal of heavy metal-contaminated waste and sediment from an approximately 3,800-foot stretch of the Hudson River adjacent to and downstream from the site with on-site disposal in the CAMU;
- The in situ covering of heavy-metal contaminated sediment in the Cement Company Ponds; and
- The removal of heavy metal contaminated soils that posed a potential risk to public health at off-site residences. This removal action has been completed.

Information gathered during the additional investigations and studies conducted in the Ponded Backwater Area indicate a need to implement corrective measures to protect the fish and wildlife in this area from potential risk from surficial heavy metal contamination found in some of the surrounding soils and from the heavy metal-contaminated sediments found in the three small ponds located in this area. Based on this information, the facility submitted a focused CMS that presents a pragmatic removal and restoration remedy acceptable to the Department. The implementation of the PBA corrective measures in the year 2001 is expected to coincide with the implementation of corrective measures for the Main Plant Site, the Hudson River, and the Cement Company Ponds.

Description of The Ponded Backwater Area.

The PBA shown in Figure 1 is an approximately 13-acre, relatively flat, heavily vegetated area adjacent to the Hudson River, bounded by the banks of a former river channel. This area contains a series of three interconnected ponds, and is located immediately downstream of the site. It is believed that when a former dam was in place, this river channel was under water and a depositional area for discharges from manufacturing operations being carried out at the Main Plant Site. To the north and south, the PBA borders on vacant land containing large trees and dense vegetation. This adjacent vacant land extends from the Delaware & Hudson Railroad Corporation (DHRC) property to the north (which contains the railroad tracks) to the shore of the

Hudson River to the south. Both the vacant land and the PBA are inhabited by various species of wildlife. The majority of the PBA is owned by the Niagara Mohawk Power Corporation (NIMO). A small portion is owned by the DHRC.

Under normal river conditions, the PBA remains dry except for three interconnected ponds that remain wet throughout the summer. The PBA is subject to flooding in the spring, during conditions of high flow in the river.

Ponded Backwater Area Contamination

Several investigations were carried out in the PBA by the facility and the Department. The data collected and the conclusions drawn from these sampling events are summarized herein.

- A Phase I RCRA Facility Investigation (RFI) of adjacent surface water sediments in the Hudson River, Feeder Canal and Cement Company ponds was completed and reported in May 1994. The PBA was not sampled during the Phase I RFI.
  - Conclusions: There were site-related releases of metal contaminants to the Hudson River and Cement Company Ponds and that a Phase II RFI was necessary to assess the full extent of this contamination.
- After completing the Phase I RFI, it was determined that the PBA may have served as a depositional area for releases from the Main Plant Site and it should be included in the Phase II investigation.
- The Phase II RFI included the investigation on the bottom sediments of the three small ponds located in the PBA. The results of that investigation can be found in the Phase II RFI Report dated June 1997. In addition to the analysis for total metals, the bottom sediments underwent Toxicity Characteristic Leaching Procedure (TCLP) testing to determine if the sediment exhibited a hazardous waste characteristic. Refer to Drawing 0432-004 for sampling locations.
  - Conclusions: No sediment samples failed TCLP indicating that a hazardous waste was not present. However, based on the elevated levels of total metal contaminants detected in the bottom sediments and summarized in Table I below, the Department believed that this indicated a potential threat to the terrestrial and aquatic biota in the PBA.

TABLE I

Metal Contaminant	Maximum Concentration (mg/kg) (ppm)	Average Concentration (mg/kg) (ppm)
Cadmium, Total	260	110
Chromium, Total	1,300	715
Hexavalent Chromium	Non-Detect	Non-Detect
Lead, Total	1,100	644
Mercury, Total	3.8	2.5
Zinc, Total	280	182

Note: ppm means parts per million

- In the fall of 1997, the Department's Division of Fish and Wildlife conducted independent sampling of vegetation and leaf litter in the PBA to determine uptake of total cadmium. Nine samples were taken from three sampling locations and sent to the Hale Creek Laboratory for analysis.
  - Conclusions: The maximum concentration of total cadmium detected in leaf litter was 20.7 mg/kg (ppm) and in vegetation it was 2.96 mg/kg (ppm). The average concentration of all samples was 5.2 mg/kg (ppm). This data suggested that the surrounding soils may contain elevated levels of total cadmium and should be investigated.
- In March 1998, additional sampling and analysis to determine the areal extent of the contamination in bottom sediments and surrounding surface soils (0 to 6 inches deep) were carried out by the facility according to a Department-approved work plan. Although other heavy metals were expected to be present, the work plan only required the 25 samples be analyzed for total cadmium and a subset for all pertinent metal TCLP parameters. Total cadmium was selected as the indicator parameter since it is readily accumulated in biota and its toxic effects are evident at relatively low concentrations. Refer to drawing 0432-004 for sampling locations.
  - Conclusions: The supplemental RFI Report dated May 1998 indicated there were no TCLP failures. However, the maximum and average total cadmium concentrations reported in the surface soils were 280 mg/kg (ppm) and 55 mg/kg (ppm) respectively. Finding these elevated cadmium concentrations in the surficial soils triggered the need to investigate deeper for contamination.
- In August 1998, the Department approved a work plan requiring sampling and analysis of the soil for total cadmium, adjacent to previously taken surficial soil samples at the one-to-two feet depth, the shallower of the following: three-to-four feet below ground surface, the interval approximately one foot above the water table, the interval approximately one foot above the wood slash (debris) layer (if present), or the interval approximately one foot above hand auger or corer refusal. Refer to Drawing 0432-004 for sampling locations.

- Conclusions: The additional RFI Report dated September 1998 concluded that overall the cadmium contamination in the surrounding soils decreases with depth except for one sampling location intersecting a waste deposit in the western-most section of the PBA. However, this material will be removed as part of the previously approved River waste/sediment removal project. Therefore, not including that section of the PBA, the average and maximum total cadmium concentrations for the surrounding soils in the remainder of the PBA for various depth intervals from the surface are summarized in Table II.

TABLE II

Depth of Cadmium Contamination	Average Concentration (mg/kg) (ppm)	Maximum Concentration (mg/kg) (ppm)
0.0 to 0.5 feet	55.0	280.0
1.0 to 2.0 feet	12.0	63.0
2.0 to 3.0 feet	3.7	16.0
3.0 to 4.0 feet	2.9	8.9

Potential Environmental and Human Health Risks

Both the facility and the Department felt that a time-consuming and costly program to document the impact of site-related metals contaminants on aquatic and terrestrial biota was not necessary. Based on metals clean-up levels developed for other sites, both parties agreed that the soils/ sediments were impacted at levels which required remediation.

The PBA is a isolated, heavily vegetated, inaccessible area that is not frequented by the public, except for the occasional trespasser or fisherman who would remain on the site for only a short period of time. These conditions would limit public exposure to the soils contaminated with heavy metals. In addition, because of the current general inaccessibility and small size of the fish observed in the three small ponds, it is not believed that any significant amounts of fish are caught for human consumption.

Corrective Measures For The Ponded Backwater Area

The Department is recommending the selection of a pragmatic, presumptive remedy that affects approximately 5.4 acres of the PBA. The remedy will include:

- Removal of the heavy metal-contaminated bottom sediments in the three small ponds;
- Removal of those surrounding soils contaminated with heavy metals and considered a potential threat to the environment;
- Backfilling those areas from which contaminated soil will be excavated with clean materials; and

- Restoration of the backfilled areas with appropriate vegetation and expanding of the wetland area.

All contaminated materials excavated by heavy earth-moving equipment from the PBA will be transported by trucks over an access road which is expected to be constructed on properties owned by the DHRC and NIMO. Clearing, grubbing and excavation will begin after appropriate erosion and sediment controls are in place. Approximately 15,000 cubic yards of dewatered bottom sediments and contaminated soil will be moved to the Main Plant Site. There, the contaminated materials will be placed under a permeable soil cover which has been approved as part of the final corrective measures for that site. Refer to Drawing 18205-002 for a delineation of the sections to be excavated in the PBA.

After completing the excavation of approximately 1,000 cubic yards of bottom sediments containing heavy metals in the three small ponds, the topography will be changed by lowering surface grades and rerouting a culvert from which a steam flows into the western end of the PBA. These changes will allow for the interconnection of all three ponds and the formation of a continuous easterly flowing stream. The increased flow through the ponds and backwater area is expected to improve both the wetland habitats in and bordering the continuous water body to be formed by the corrective measures.

Based upon data developed for total cadmium, during the investigative phases of the corrective action program, three sections of the PBA were designated for soil removal by the Department. The extent and depths for soil removal in each section were determined by the Department after carefully examining soil sampling data collected during the investigations. The total volume of soil to be removed is estimated to be approximately 14,000 cubic yards. The average residual total cadmium concentration after excavating all three sections is expected to be less than five mg/kg (ppm). The removal action is expected to also significantly reduce the average residual levels of the other heavy metals present in the soils of the PBA. A summary of the planned soil excavation follows:

- In the western portion of the PBA, an area of approximately 3.4 acres will be excavated to a depth of two feet;
- In the west-central portion of the PBA, an area of approximately 0.7 acres will be subject to an excavation that will transition from two feet down to one foot; and
- In the eastern portion of the PBA, an area of approximately 1.3 acres will be excavated to a depth of one foot and backfilled with six inches of clean fill.

After excavation of the contaminated soil has been completed, the backfilling with sandy to clayey loam and grading will take place. Finished grades above the high water mark will be fertilized to promote development of vegetation. Wetland areas temporarily disturbed by remedial activities will be restored by planting wetland species using a combination of seed and plant plugs as appropriate to the location. Wetland restoration is planned to result in an increase in wetland (emergent and free water) area of approximately 15,000 square feet and will more than compensate for the 11,000 square feet to be lost along the southwestern end of the PBA as a result of a prior approved waste deposit removal action. This wetland restoration will also compensate for loss of wetlands in the western part of the Main Plant Site and on the Cement Company property from waste deposit removal or placement of the soil cover.

The physical removal of heavy metal-contaminated bottom sediment and soil, redeposition under a permeable cover at the Main Plant Site, and backfilling with clean vegetation supporting soils will significantly reduce the potential threat to the aquatic and terrestrial biota inhabiting the PBA. The Department may develop this land by putting in an access road for river access by official personnel. The New York State Department of Health has stated that the planned corrective measures will be protective of this access and the current casual recreational usage by the public. Redeposition of the excavated materials at the Main Plant Site under a two-feet thick permeable cover will minimize impact on terrestrial biota and prevent any direct human contact with the materials. Any contaminants that might leach out from the contaminated materials deposited at the Main Plant Site will be intercepted by the planned down gradient groundwater extraction system before being transported off-site.

List of Supporting Documents

Eckenfelder Inc., and Normandeau Associates Inc., June 1997, "Phase II RFI Report for Adjacent Surface Water Sediments AOC For The Ciba Site, Glens Falls, New York."

Eckenfelder, Inc., May 1998, "Supplemental RFI Report, Sediments AOC, Ciba Site, Glens Falls, New York."

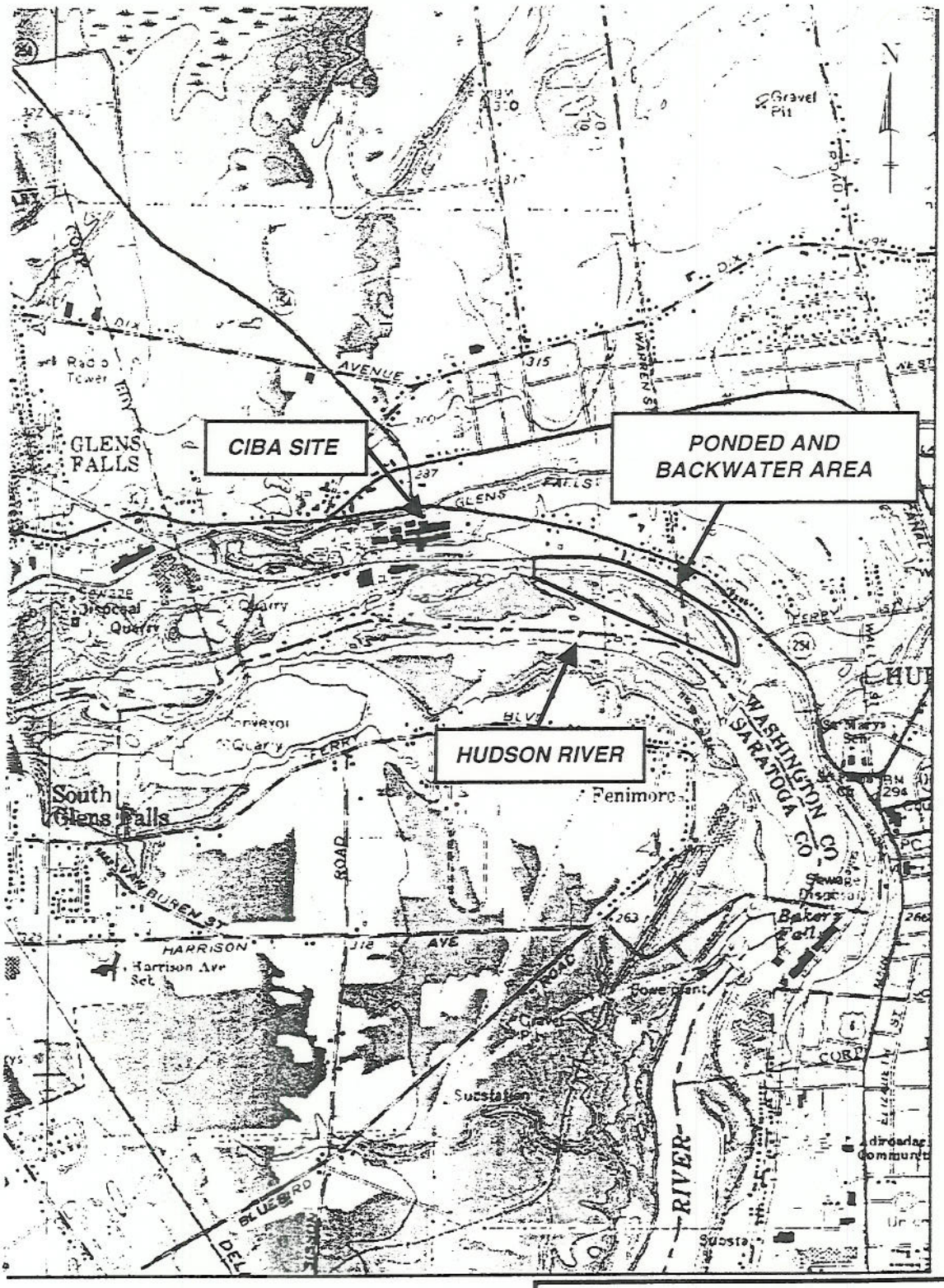
Eckenfelder, Inc., September 1998, "Additional Investigation Report, Sediments AOC, Ciba Site, Glens Falls, New York."

(Focused CMS): Eckenfelder Inc., November 1999, "Corrective Measures Work Plan, Ponded And Backwater Area, Hudson River Sub-Part, Sediments AOC, Ciba Site, Glens Falls, New York."

(Focused CMS): Eckenfelder Inc., April 16, 1998, "Conceptual Work Plan Waste Removal Program, Hudson River Surface Water Sediments AOC, Ciba Site, Glens Falls, New York."

Memorandum: Tony Gudlewski to Jack Cooper, dated November 7, 1997, "Report of Cadmium Analysis - Vegetation From Ciba-Geigy-97 Program."

Hale Creek Field Station, NYSDEC, Gloversville, New York, "Metals Analysis Report 99-14, Table 1. Cadmium, Lead And Mercury In Tissues From Program: Ciba Geigy-99; Location: Hudson River."



SOURCE: GLENS FALLS, NY (1966)
HUDSON FALLS, NY (1966)
NY 7.5' QUADRANGLES

2000 0 2000
scale feet

FIGURE 1

GENERAL LOCATION MAP
PONDED AND BACKWATER AREA

HERCULES INCORPORATED
CIBA SITE
GLENS FALLS, NEW YORK

BROWN AND CALDWELL
Mahwah, New Jersey

P:\^j\18205\topo-fig.ppt

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

STATEMENT OF BASIS

Ciba Geigy Main Plant/Pretreatment Plant
Operable Unit 04: Hudson River – South of Bakers Falls Dam
Site No. 557011
EPA ID No. NYD002069748
Queensbury, Warren County

August 2018

PREPARED BY

DIVISION OF ENVIRONMENTAL REMEDIATION

DECLARATION STATEMENT – STATEMENT OF BASIS

Ciba Geigy Main Plant/Pretreatment Plant
Operable Unit 04
Queensbury, Warren County
Site No. 557011
EPA RCRA No. NYD002069748
August 2018

Statement of Purpose and Basis

This document presents the selected remedy for Operable Unit Number: 04: Hudson River - South of Bakers Falls Dam of the Ciba Geigy Main Plant/Pretreatment Plant site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 373 (RCRA) and Part 375 (State Superfund).

The proposed remedy was made available for public comment between May 30, 2018 and July 16, 2018. On June 28, 2018, a public meeting was also held at the Queensbury Town Hall – Senior Center. Comments received from the public are addressed in the Responsiveness Summary Included in Appendix A of this final Statement of Basis. Appendix A includes additional information about public participation activities for this project.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for Operable Unit Number: 04 of the Ciba Geigy Main Plant/Pretreatment Plant site, included in Appendix B.

Description of Selected Remedy

Prior to the investigation for Operable Unit 04 (OU 04) of this site, removal activities were performed that reduced contamination within the Hudson River. The removal activities included corrective measures undertaken at the above referenced site as part of OU 02 and OU 03 and dredging activities performed by others. Additional details regarding the removal activities are discussed in Section 6.3.

Based on the implementation of the removal activities, the findings of the investigation of this site indicate that OU 04 no longer poses a threat to human health or the environment; therefore, No Further Action is the selected remedy for OU 04.

The removal activities attained the remediation objectives identified for OU 04 as identified in Section 6.5 for the protection of public health and the environment.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

August 27, 2018
Date

Michael J. Ryan, P.E., Director
Division of Environmental Remediation

RECORD OF DECISION

Ciba Geigy Main Plant/Pretreatment Plant
Operable Unit 04
Queensbury, Warren County
Site No. 557011
EPA RCRA No. NYD002069748
August 2018

SECTION 1: SUMMARY AND PURPOSE OF THE STATEMENT OF BASIS

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site resulted in threats to public health and the environment that were addressed by removal activities. The removal activities included corrective measures undertaken at the above referenced site as part of OU 02 and OU 03 and dredging activities performed by others, which are discussed in Section 6.3.

Based on the implementation of the removal activities, the findings of the investigation of this site indicate that the OU 04 no longer poses a threat to human health or the environment. The removal activities attained the remediation objectives identified for OU 04, which are presented in Section 6.5, for the protection of public health and the environment. No Further Action is the remedy selected by this Statement of Basis (SB). This SB identifies the removal activities conducted and discusses the basis for No Further Action.

The purpose of a SB is to provide the public with background information related to the investigation, and to present the selected remedy by the Department, in consultation with the NYSDOH. The SB was developed by the Department under the authority of the Solid Waste Disposal Act, as amended, and more commonly referred to as the Resource Conservation and Recovery Act (RCRA). The site is also included in the New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program), which is an enforcement program. The mission of the State Superfund Program is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment. The site is currently classified as a Class 2 site on the New York State Registry of Inactive Hazardous Waste Disposal Sites. The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Parts 373 and 375, and it will serve as the Record of Decision under the State Superfund Program.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held between May 30, 2018 and July 16, 2018, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for OU 04. Site-related reports and documents were made available for review by the public at the following document repository:

Crandall Public Library
Attn: Andrea Herman
251 Glen Street
Glens Falls, NY 12801
Phone: 518-792-6508

On June 28, 2018, a public meeting was also conducted on Queensbury Town Hall – Senior Center. At the meeting, the findings of the RCRA Facility Investigation (RFI) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal or written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the SB.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Ciba-Geigy Main Plant and Pretreatment Plant site is located in a suburban area on Lower Warren Street in Queensbury, New York and covers approximately 60 acres. The site consists of eight parcels located along Warren Street and Quaker Road. The main plant is located south of Lower Warren Street and is bisected by the Delaware and Hudson railroad tracks. The pretreatment plant is located at the northeast corner of Lower Warren Street and Quaker Road. The Hudson River borders the southern boundary of the site and a cement company borders the site to the west. Commercial and residential properties are located to the north of the site.

Site Features: Site features/structures have been removed. The majority of the site parcels including the main plant, pretreatment plant, north lot, and sliver quarry are surrounded by a fence.

Current Zoning and Land Use: The site is currently inactive and is zoned heavy industrial south of Lower Warren Street, commercial east of Quaker Road and commercial light industrial for the north lot.

Past Use of the Site: The Ciba-Geigy Main Plant site was used to manufacture color pigments, aqueous dispersions and plastic concentrates used in the manufacture of paints, printing inks, plastics, fibers and other items. The types of pigments produced include lead chromate, chromium oxide, cadmium pigments, organic blues, yellows, reds and iron blues. Manufacturing activities at the site date back to 1901. The site was previously used by American Wallpaper Company, Imperial Color Works, and Underwood Paper Mills. These three companies were consolidated into a company with various names, the last being Imperial Color Chemical & Paper Corporation. In 1960, Hercules, Inc. purchased the site and sold it to Ciba-Geigy in 1979. Ciba-Geigy ceased production of pigments in 1989 and demolished the buildings on the site. From 1901 to 1973, site operations discharged industrial water to the Hudson River. In 1973, industrial water was treated prior to discharge to the Hudson River. In 1983, industrial water was discharged to the Publicly Owned Treatment Works facility until closure of the facility. Post closure activities are being performed under RCRA permit number NYD002069748.

Operable Units: The site was divided into four operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. A summary for each operable unit (OU) is provided below.

- OU 01 pertains to on-site contamination, which is addressed by the Statement of Basis dated November 5, 1996.

- OU 02 pertains to site contamination located within the Hudson River bordering the site and on adjacent properties, which is addressed by in the Statement of Basis dated January 8, 1999.

- OU 03 pertains to site contamination located within the Ponded Backwater Area located just upstream of the Bakers Falls Dam on the Hudson River, which is addressed by the Statement of Basis dated November 29, 2000.

- OU 04 pertains to the Hudson River downstream of the Bakers Falls Dam.

Site Geology and Hydrogeology: Due to historical operations, fill deposits (up to 36 feet) are present across much of the Main Plant site. A discontinuous lacustrine sand deposit (up to 12.7 feet) consisting primarily of sand with lesser amounts of silt and gravel underlies the fill. The next deposit consists of a discontinuous lacustrine clay unit (up to 19.8 feet) that consists of silty clay that is typically layered with silt and sand. A thin discontinuous layer of glacial till (up to 4.7 feet) was encountered above the bedrock. Bedrock consisting of limestone is present beneath the overburden.

Groundwater has been encountered within four feet of ground surface. Groundwater in the

overburden and the upper bedrock zones flows south to southeast towards the Hudson River. Groundwater is influenced by the feeder canal and the groundwater extraction system.

Operable Unit (OU) Number 04 is the subject of this document.

A site location map is attached as Figure 1, which shows the four operable units.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for remediation. For OU 04, an alternative, which allows for unrestricted use was evaluated.

A comparison of the results of the investigation to unrestricted use standards, criteria, and guidance values (SCGs) for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The Potential Responsible Parties for the site, documented to date, include:

BASF Corporation	Ciba Corporation
Ashland, Incorporated	Hercules Incorporated

The facility holds a 6 NYCRR Part 373 Hazardous Waste Management Permit, which includes provisions for RCRA Corrective Action and Post-Closure Monitoring and Maintenance. The corrective action requirement makes owners and/or operators of a hazardous waste treatment, storage, and disposal facility responsible to investigate and, when appropriate, remediate releases of hazardous waste and/or constituents to the environment. The Permit (No. 5-5234-00008/00096) is issued to Ciba Corporation (acquired by BASF Corporation) and Hercules Incorporated (a wholly-owned subsidiary of Ashland, Inc.), dated March 6, 2015.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the RCRA Facility Investigation (RFI)

In 1987, investigations assessed metals, volatiles, semi-volatiles, pesticides, and polychlorinated biphenyl within Hudson River sediments located adjacent to the site. Subsequent investigations and corrective actions were performed that focused on metal contamination within the Hudson River sediments (OU 02 and OU 03). The purpose of the OU 04 RFI was to further evaluate site metals within the Hudson River resulting from previous activities at the site and potential for site metals in sediments to pose risk to human health and the environment. The field activities and

findings of the OU 04 investigation are described in the RFI Report and the Fish and Wildlife Resources Impact Analysis Report (FWRIA).

The following general activities are conducted during a RFI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected during the OU 04 RFI includes data for:

- sediment

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RFI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RFI Results

The data from OU 04 have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for corrective measures. Not all contaminants identified are contaminants of concern. The nature and extent of contamination and environmental media requiring action within OU 04 are summarized in Exhibit A. Additionally, the RFI Report contains a full discussion of the data. The contaminant(s) of concern identified for OU 04 are:

cadmium	lead
chromium	mercury

Based on the investigation results, comparison to the SCGs, and the potential public health and environmental exposure routes, certain media and areas of the site required remediation. These media were addressed by corrective measures performed in other OUs, as described in Section 6.3. More complete information can be found in the site reports.

6.2: Interim Corrective Measures

An interim corrective measure (ICM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Statement of Basis.

There were no ICMs performed for OU 04. Corrective measures have been performed for other OUs.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Remediation of Operable Units (OUs) 01, 02, and 03 were performed between 2000 and 2004 to address site contamination located at the site and in the vicinity of the site. On January 9, 2006, the Department approved the Construction Certification Report for the corrective measures completed. The primary action consisted of consolidating contaminated soils and sediments beneath either an impermeable cover or a permeable cover on the Main Plant portion of the site. A groundwater collection system was installed along the southern portion of the site to intercept contaminated groundwater in the overburden and bedrock prior to leaving the site. The primary contaminants of concern were cadmium, chromium, lead, and mercury at the Main Plant and cyanide at the Pretreatment Plant. Maintenance of the groundwater collection system and site cover is presently being performed under the post-closure permitting requirements of the RCRA permit. Due to the remaining contamination at the site, an institutional control was placed on the site in the form of a deed notice.

OU 04 pertains to the Hudson River downstream of the Bakers Falls Dam. The area covered by this OU has been significantly influenced by other discharges and actions, which could have introduced similar contamination to the river (e.g., industrial surface water discharge from the Glens Falls and Fort Edward area) or removed site related contamination (e.g., dredging activities). Navigational dredging was performed until early 1980s to maintain the waterway, which removed approximately 1.6 million cubic yards of sediments near Fort Edward. Additional navigational dredging was performed further downstream of Fort Edward. Recent Hudson River PCB dredging operations removed approximately 2.75 million cubic yards of sediments from the Hudson River. Prior to recent dredging activity, metals within sediments were evaluated by collecting 233 samples from Fort Edward to Lock 1. An assessment of this sediment data was performed which identified two locations, Griffin Island and Lock 6, for further evaluation due to elevated concentrations of cadmium, chromium, lead and mercury. The two focus areas of the Hudson River represent the segments with the greatest potential for site related contamination deposition and potential for aquatic life and human exposure. In 2015, 130 sediment samples (post-PCB

dredging) were collected, and detected cadmium (up to 40 parts per million [ppm]), chromium (up to 610 ppm), lead (up to 610 ppm), and mercury (up to 8.4 ppm). An evaluation of the sample results determined that elevated site metals were spatially limited (see Figures 2, 3, and 4) and were typically located at depth beneath the most biologically active zone. Based on these findings, impacts from site-related contamination are not anticipated to significantly impact fish and wildlife within the Hudson River. A catch and release regulation or fish advisory for site-related contamination (i.e., metals) is not necessary.

Based on the limited remaining contamination within the OU 04 sediments, the majority of site metals within the Hudson River were likely removed during excavation activities conducted by the responsible party (OU 02 and OU 03), which removed site-related metals contamination near the site, and by other parties (OU 04), where metals were co-located within the dredge areas. In summary, the data supports that remaining site-related sediment contamination is limited within the two areas investigated and the impact of that contamination is nominal.

The FWRIA for OU 04, which was performed as the basis for the RFI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

Remedial activities undertaken at the Main Plant, ponded backwater area, cement company pond and the pre-treatment plant have effectively reduced the potential for contact with site-related contaminants and measures are in place to ensure that these measures remain protective in the future. In addition, there is an "Eat None" consumption advisory for all fish obtained from north of the Bakers Falls Dam in the area of the site. Consumption of fish from south of the Bakers Falls Dam is not expected due to the "catch and release only" regulation in place. The contamination in the sediment and fish is not site-related and is from a different source.

6.5: Summary of the Remediation Objectives

The objectives for the corrective measures have been established through the remedy selection process. The goal of the corrective measures is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial objectives for OU 04 are:

Sediment

RAOs for Public Health Protection

- Prevent direct contact with contaminated sediments.
- Prevent surface water contamination which may result in fish advisories.

RAOs for Environmental Protection

- Prevent releases of contaminant(s) from sediments that would result in surface water levels in excess of ambient water quality criteria.
- Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.

SECTION 7: SUMMARY OF SELECTED CORRECTIVE MEASURE(S)

Based on the results of the investigation for the downstream area, the Department selected No Further Action as the remedy.

The corrective measures conducted for OUs 01, 02, and 03 and navigational and PCB dredging activities performed by others within OU 04 have significantly reduced site related contaminant concentrations within the Hudson River. The findings from the OU 04 RFI indicate that potential site related contamination remaining within this portion of the Hudson River is unlikely to impact fish and wildlife resources and potential for human contact since it is spatially limited, and non-contiguous due to dredging by others. Site findings also determined that site-related contamination is not present at significant concentrations to impact surface water quality or warrant a catch and release regulation/fish advisory (though a fish advisory/catch and release regulation exists already for non-site related contamination within this portion of the Hudson River). Because the areas investigated were selected due to the elevated metal concentrations located near remaining, unexcavated, fine grain sediments, they are considered to represent the areas of highest potential contamination. Based on this evaluation no further investigation or corrective measures are necessary to protect public health and/or the environment. This remedy satisfies the site remediation objectives.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the RCRA Facility Investigation (RFI) for all sediment samples collected during the OU 04 investigation. Table 1 summarizes the sediment findings from the investigation by presenting the range of contamination found at the site in the sediment and compares the data with the applicable SCGs for the site. The contaminants are known as inorganics (metals) as this was the primary contamination within the Hudson River potentially related to OU 02 and OU 03. For comparison purposes, the SCGs for potential impacts on aquatic life are provided on Table 1. Three SCGs, identified as Class A, Class B, and Class C, are provided for each metal and are summarized below.

- Class A criteria represent concentrations that pose no potential risk to aquatic life.
- Class B criteria represent concentrations that potentially may be toxic to aquatic life.
- Class C criteria represent a high potential for sediments to be toxic to aquatic life.

Sediments

Sediment samples were collected during the RFI from two focus areas within the Hudson River known as Griffin Island and Lock 6. These areas were selected due to the significant dredging performed upstream of Griffin Island and previously-available analytical results which detected elevated site contaminants (cadmium, chromium, lead, and mercury) within these segments prior to more recent dredging operations. Sample locations were focused on areas with fine grain sediment deposits (e.g., silt), where metals would also be deposited, and away from recently dredged areas that were backfilled with clean material. Based on this evaluation, 12 sample locations were identified for Griffin Island area, see Figure 2; and 22 sample locations were identified for Lock 6 area, see Figures 3 and 4. The goal at each sample location was to observe aquatic activity within the sediments and to obtain samples from four different depths (0 to 2 inches, 2 to 6 inches, 6 to 12 inches, and 12 to 24 inches) to vertically assess metal concentrations within the sediments. A total of 130 sediment samples were obtained and analyzed for metals. The results of the analyses are summarized in Table 1.

During the RFI, the biological activity within the river sediment was observed by inserting a camera into the sediments at each sample location to obtain a cross-sectional picture of the sediments and obtaining bulk sediments at 19 of the 34 sample locations to visually identify aquatic life. Visual observations during the FWRIA identified more aquatic species within Lock 6 sediments than Griffin Island sediments.

A total of 48 sediment samples were collected from Griffin Island and analyzed for metals. The sediment results from the Griffin Island focus area were primarily classified as Class A sediments. Four samples detected cadmium, chromium, lead, and/or mercury above Class A criteria. One of the four samples was characterized as Class C sediment due to elevated cadmium within the GI_06 location at the sample interval from 6 to 12 inches. Figure 2, presents the analytical results at each sample location. The Class C sediments at GI_06 are limited to this single location and are not on the surface of the sediment. Based on the metal concentrations, limited extent, and expected aquatic activity (e.g., fish, muscles, plants, etc.), site related metal contamination within the Griffin Island focus area is not significantly impacting fish and wildlife resources.

A total of 82 samples were collected from Lock 6 sediment and analyzed for metals. The sediment results from the Lock 6 focus area were primarily classified as Class A and Class B sediments. Ten sediment samples obtained from six locations were characterized as Class C sediments due to concentrations of cadmium, chromium, lead, and/or mercury. Most Class C sediments were considered to be slightly over Class B criteria except for the sample

interval from 6 to 12 inches at locations L6_07, which had the highest detections of cadmium, chromium, lead, and mercury; and L6_13. The significant concentrations of site related metals at these two locations are considered to be spatially limited and non-contiguous as they cover less than 10% of the fine grain sediments evaluated at the Lock 6 focus area. The highest concentrations of metals at most locations were detected within deeper sample intervals, with decreasing concentrations in overlying intervals. However, locations L6_03 (cadmium) and L6_13 (cadmium and chromium) still contained Class C sediments within the upper two inches of sediment. Potentially sediments located between these two locations with similar site related metals were previously removed by dredging activities. The full extent of exceedances remaining are therefore spatially limited and surrounded by clean material or non-fine grained sediments. One sample interval at L6_13 detected zinc within Class B criteria, all other detections of zinc met Class A criteria. Zinc does not appear to be a site contaminant of concern due to this one isolated Class B detection. Figures 3 and 4, present the analytical results at each location. Based on the metal concentrations, expected aquatic activity, limited spatial extent, continued sedimentation, site related metal contamination within the Lock 6 segment is not significantly impacting fish and wildlife resources.

A SCG for human contact with sediments is not available. Given that recreational users (e.g., swimmers and waders) during summer months may contact contamination within the sediments, Class C SCGs have been used for the purposes of comparison. This evaluation is conservative because ecological metal SCGs in surface water and soil tend to be lower than SCGs for public health. Seven locations detected sediments above Class C criteria (one location near Griffin Island and six locations near Lock 6). Five of the seven locations, identified as L6_03, L6_07, L6_13, L6_17, and L6_18, were collected deeper than three feet below the water surface of the Hudson River. The depth to the sediment at these locations will significantly limit public contact with the metal contamination. One sample from Griffin Island (GI_06, cadmium) and one sample from Lock 6 (L6_05, lead) were collected two feet below the water surface of the Hudson River. The metal contamination is spatially limited and is unlikely to pose a threat to public health since frequent or prolonged exposure to the sediments is not anticipated.

Table 1 - Sediment

Detected Constituents	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency Within Class
Cadmium	0.024 J to 40 J	Class A <1 Class B 1 to 5 Class C >5	76/130 45/130 9/130
Chromium	2.7 to 610 J	Class A <43 Class B 43 to 110 Class C >110	85/130 38/130 7/130
Lead	1.3 to 610	Class A <36 Class B 36 to 130 Class C >130	75/130 49/130 6/130
Mercury	Not Detected to 8.4 J	Class A <0.2 Class B 0.2 to 1 Class C >1	97/130 30/130 3/130
Zinc	15 to 170	Class A <120 Class B 120 to 460 Class C >460	20/21 1/21 0/21

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in sediment;
b - SCG: The Department's "Screening and Assessment of Contaminated Sediment."
Class A: If the concentration of a contaminant in sediment is below the Class A SCG, the contaminant can be considered to present little or no potential for risk to aquatic life.
Class B: If the concentration of a contaminant lies between the SCG for Class A and Class C, additional information is needed to determine the potential risk to aquatic life.
Class C: If the concentration of a contaminant is above Class C SCG, there is a high potential for the sediments to be toxic to aquatic life.
J: estimated value - result is less than the reporting limit, but greater than the method detection limit.

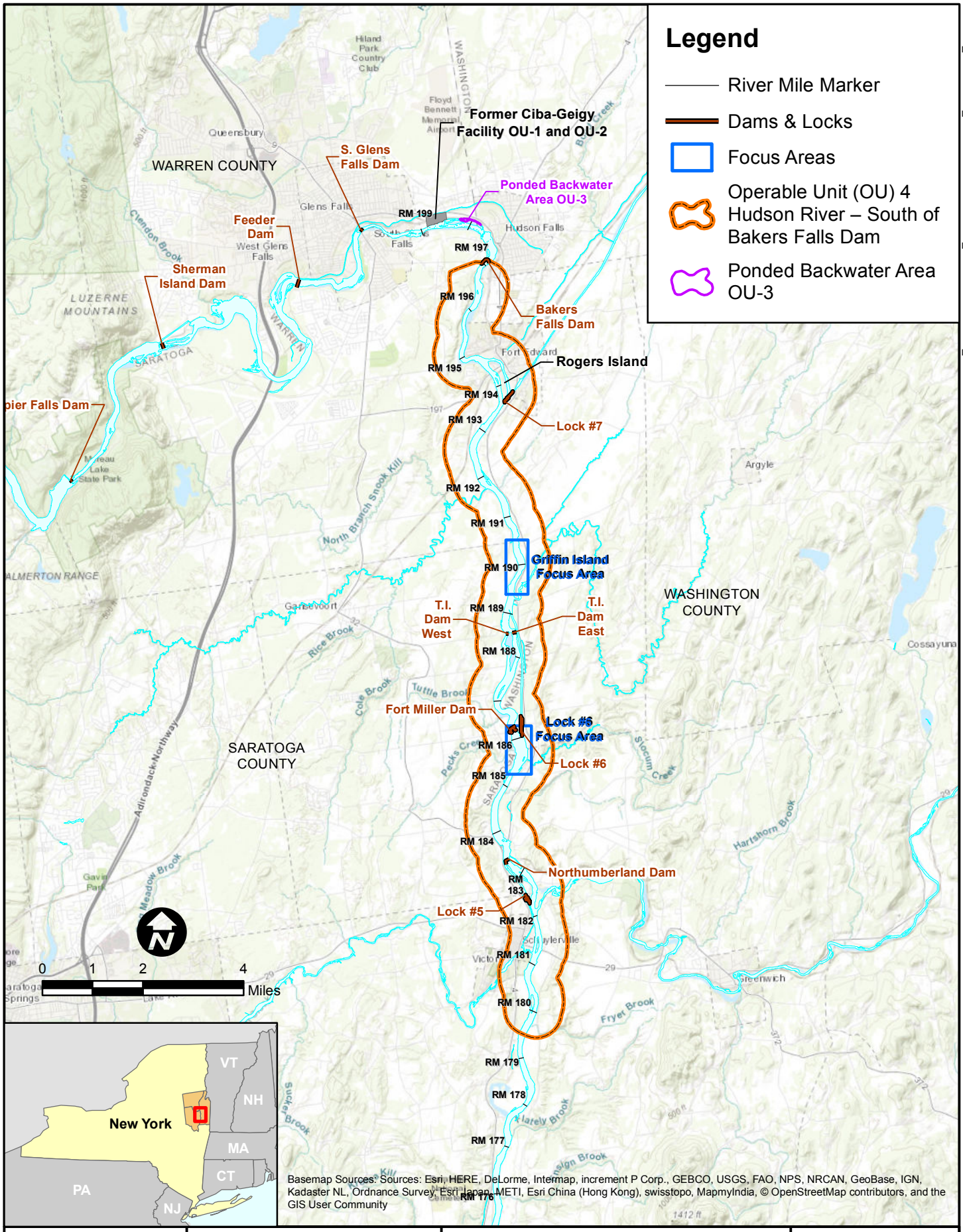
The segments evaluated as part of OU 04 RFI are located downstream of the site, but also Glens Falls and Fort Edward, which had industrial operations and municipal systems that discharged to the Hudson River. Some of the metals contamination detected could have originated from a source(s) other than the site.

Sediment contamination identified during the RFI was addressed during the actions performed for OU 02, OU 03, and navigational and PCB dredging activities performed by others. RFI findings determined that remaining metal contamination is spatially limited and non-contiguous, not significantly impacting fish and wildlife resources, not present at significant concentrations to recreational users within the Hudson River, not present at significant concentrations warranting a catch and release regulation or fish advisory, and not present at significant concentrations to impact surface water quality. Therefore, due to the inaccessibility and depth of remaining contaminated sediment, the potential for human contact with residual contamination in sediment is unlikely.

Surface Water

Investigation of OU 04 focused on two areas of the Hudson River to determine if significant contamination was present within the sediments to warrant further investigation. Surface water sampling was not required during this investigation since surface water samples collected from the areas investigated would not provide information regarding the origin of any contamination detected (e.g., Hudson River sediments or Hudson Falls/Fort Edward surface water runoff). Evaluation of sediment results determined that insufficient metals contamination remains within the sediments to warrant further investigation of surface water and the detections of higher metal concentrations (Class C sediments) were located beneath cleaner surficial sediments (Class A and B sediments) at all but one sample location (L6_13), which limits the potential for metals to mobilize into the surface water.

Surface water samples are collected adjacent to the Main Plant site (OU 01) as part of the current monitoring program. These samples have not detected chromium above surface water criteria. Sampling for cadmium, lead, and mercury is not required as part of the current monitoring program as these metals were not historically detected during previous RFI activities above surface water criteria.



Basemap Sources: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Focus Area Overview Map

FIGURE 1

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Legend

Sampling Station

- Deep Habitat Zone
- Shallow Habitat Zone
- Certification Unit Boundary

SSS Sediment Types

- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Metal	NYSDEC Freshwater SGVs (mg/kg)		
	Class A	Class B	Class C
Arsenic	< 10	**10 - 33**	**> 33**
Barium	-	**-**	**-**
Cadmium	< 1	**1 - 5**	**> 5**
Chromium	< 43	**43 - 110**	**> 110**
Lead	< 36	**36 - 130**	**> 130**
Mercury	< 0.2	**0.2 - 1**	**> 1**
Selenium	-	**-**	**-**
Silver	< 1	**1 - 2.2**	**> 2.2**
Organic Carbon-Normalized SEM-AVS	**Prediction of Toxicity (µmol/g_{oc})**		
	Non Toxic	**Uncertain Toxicity**	**Likely Toxic**
(SEM-AVS)/f_{OC}	< 130	130 - 3000	> 3000

Notes:

U, The analyte was analyzed for, but was not detected above the reported quantitation limit

UJ, The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J, The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

NS, Not sampled due to refusal and/or limited sediment recovery in core

NA, Not analyzed because analysis was not included in sampling design, as presented in the work plan

Percent Fine-Grained Sediment, Percent of sediment particles less than 63um based on the Wentworth Scale (Wentworth, 1922)

(SEM-AVS)/f_{oc}, Organic carbon normalized SEM-AVS relation; prediction of toxicity based on EPA (2002)

Shallow habitat stations classified based on observed aquatic vegetation and shallow water depths

Deep habitat stations classified based on the absence of aquatic vegetation and deeper water depths

GI_01	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.6 J	1.4 J	1.6 J	2.5 J
Barium	mg/kg	37	44	21	29
Cadmium	mg/kg	0.25 J	0.21 J	0.075 J	0.062 J
Chromium	mg/kg	19 J	22 J	7 J	6.3 J
Lead	mg/kg	13	15	6.8	5.1
Mercury	mg/kg	0.029 J	0.029 J	0.058 J	0.021 J
Selenium	mg/kg	0.2 J	0.21 J	0.13 J	0.23 J
Silver	mg/kg	0.046 J	0.05 J	0.021 J	0.023 J
Total Organic Carbon	%	0.52	0.43	0.44	0.33
Percent Fine-Grained Sediment	%	5.84	1.56	2.42	2.71
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-26.2	NS	NA	NA

GI_02	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.8 J	2.6 J	5.1 J	1.7 J
Barium	mg/kg	27	22	38	24
Cadmium	mg/kg	0.62 J	0.65 J	0.15 J	0.056 J
Chromium	mg/kg	22 J	15 J	16 J	5.2 J
Lead	mg/kg	13	9.7	21	2
Mercury	mg/kg	0.056 J	0.079	0.13 J	0.0071 UJ
Selenium	mg/kg	0.2 J	0.17 J	0.19 J	0.21 J
Silver	mg/kg	0.062 J	0.039 J	0.04 J	0.015 J
Total Organic Carbon	%	0.67	0.91	7.40	0.48
Percent Fine-Grained Sediment	%	12.54	6.71	2.64	4.67
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-394.1	-23.4	NA	NA

GI_03	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.4 J	1.9 J	1.9 J	1 J
Barium	mg/kg	36	33	28	20
Cadmium	mg/kg	0.48 J	0.14 J	0.054 J	0.051 J
Chromium	mg/kg	27 J	16 J	5.2 J	4.5 J
Lead	mg/kg	17	13	3.1	1.8
Mercury	mg/kg	0.077 J	0.029 J	0.011 J	0.0066 UJ
Selenium	mg/kg	0.23 J	0.2 J	0.2 J	0.17 J
Silver	mg/kg	0.077 J	0.039 J	0.021 J	0.013 J
Total Organic Carbon	%	0.77	0.61	0.41	0.36
Percent Fine-Grained Sediment	%	15.95	3.79	8.98	4.84

GI_04	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2	1.9	2.9	3
Barium	mg/kg	34	28	37	38
Cadmium	mg/kg	0.3 J	0.27 J	0.15 J	0.09 J
Chromium	mg/kg	17 J	13 J	11 J	6.9 J
Lead	mg/kg	12	9	10	6.7
Mercury	mg/kg	0.09 J	0.069 J	0.058 J	0.02 J
Selenium	mg/kg	0.21 J	0.23 J	0.42	0.29
Silver	mg/kg	0.053 J	0.041 J	0.046 J	0.037 J
Total Organic Carbon	%	0.85 J	0.41	0.43	0.33
Percent Fine-Grained Sediment	%	11.34	5.71	2.27	3.85

GI_05	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.3 J	1.9 J	1.7 J	2.1 J
Barium	mg/kg	31	46	63	89
Cadmium	mg/kg	0.69 J	0.36 J	0.13 J	0.2 J
Chromium	mg/kg	**43 J**	**62 J**	8 J	9.3 J
Lead	mg/kg	33	**73**	35	33
Mercury	mg/kg	**0.46 J**	0.14 J	0.08 J	0.066 J
Selenium	mg/kg	0.28 J	0.46 J	0.37 J	0.42 J
Silver	mg/kg	0.051 J	0.062 J	0.053 J	0.096 J
Total Organic Carbon	%	4.50	4.20	3.70	6.20 J
Percent Fine-Grained Sediment	%	12.30	13.66	17.24	17.55

GI_06	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.3	1.6	1.2	1.9
Barium	mg/kg	26	36	36	42
Cadmium	mg/kg	0.5 J	0.57 J	**11 J**	0.85 J
Chromium	mg/kg	20 J	24 J	**71 J**	**48 J**
Lead	mg/kg	10	19	**59**	**97**
Mercury	mg/kg	0.035 J	0.068 J	**0.26 J**	0.093 J
Selenium	mg/kg	0.24 J	0.33 J	0.31 J	0.52
Silver	mg/kg	0.054 J	0.13	0.11	0.088
Total Organic Carbon	%	1.40	1.90	1.60 J	4.80
Percent Fine-Grained Sediment	%	16.49	26.79	12.24	16.37

GI_07	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.3	1.5	1.2	2.5
Barium	mg/kg	27	40	28	59
Cadmium	mg/kg	0.43 J	0.8 J	0.31 J	0.22 J
Chromium	mg/kg	21 J	36 J	19 J	17
Lead	mg/kg	12	23	25	**57**
Mercury	mg/kg	0.059 J	0.15 J	0.055 J	0.071 J
Selenium	mg/kg	0.27 J	0.34 J	0.3 J	0.65
Silver	mg/kg	0.084	0.26	0.054 J	0.08 J
Total Organic Carbon	%	1.2	1.1	2.6	6.1
Percent Fine-Grained Sediment	%	6.47	17.66	7.82	17.49

GI_08	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.3	1.2	1.1	0.85
Barium	mg/kg	31	23	19	11
Cadmium	mg/kg	0.42 J	0.23 J	0.25 J	0.025 J
Chromium	mg/kg	13 J	12 J	8 J	2.8 J
Lead	mg/kg	13	8.6	5.9	1.3
Mercury	mg/kg	0.046 J	0.04 J	0.015 J	0.0067 UJ
Selenium	mg/kg	0.29 J	0.23 J	0.42	0.15 J
Silver	mg/kg	0.059 J	0.041 J	0.032 J	0.01 J
Total Organic Carbon	%	2.1	2.8	0.22	0.13
Percent Fine-Grained Sediment	%	9.43	15.75	3.18	45.07

GI_09	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.7	1.5	1.2	2.4
Barium	mg/kg	25	32	26	41
Cadmium	mg/kg	0.42 J	0.64 J	0.33 J	0.17 J
Chromium	mg/kg	18 J	25 J	13 J	11 J
Lead	mg/kg	14	23	12	6.2
Mercury	mg/kg	0.042 J	0.067 J	0.054 J	0.0079 J
Selenium	mg/kg	0.24 J	0.23 J	0.28 J	0.36
Silver	mg/kg	0.038 J	0.044 J	0.037 J	0.049 J
Total Organic Carbon	%	1.3	0.73	0.85	0.4
Percent Fine-Grained Sediment	%	21.76	11.17	10.16	63.59

GI_10	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1	1	1.6	1.7
Barium	mg/kg	20	20	19	17
Cadmium	mg/kg	0.17 J	0.25 J	0.13 J	0.04 J
Chromium	mg/kg	10 J	13 J	7.4 J	3.1 J
Lead	mg/kg	7.4	10	5.3	1.8
Mercury	mg/kg	0.025 J	0.06 J	0.027 J	0.0063 UJ
Selenium	mg/kg	0.17 J	0.21 J	0.19 J	0.16 J
Silver	mg/kg	0.027 J	0.03 J	0.028 J	0.013 J
Total Organic Carbon	%	0.45	0.55	0.47	0.19
Percent Fine-Grained Sediment	%	8.68	8.01	4.66	0.84

GI_11	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.2 J	1.2 J	0.99 J	1.2 J
Barium	mg/kg	27	28	22	20
Cadmium	mg/kg	0.36 J	**1.5 J**	0.086 J	0.1 J
Chromium	mg/kg	12 J	31 J	6.4 J	5.4 J
Lead	mg/kg	7.4	30	4.1	3.6
Mercury	mg/kg	0.034 J	0.1 J	0.01 J	0.022 J
Selenium	mg/kg	0.16 J	0.18 J	0.13 J	0.13 J
Silver	mg/kg	0.041 J	0.036 J	0.035 J	0.018 J
Total Organic Carbon	%	1.6	0.64	0.23	0.32
Percent Fine-Grained Sediment	%	2.19	3.41	3.11	1.76

GI_12	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.8 J	2.1 J	1.4 J	1.3 J
Barium	mg/kg	40	42	32	28
Cadmium	mg/kg	0.11 J	0.082 J	0.041 J	0.036 J
Chromium	mg/kg	8.2 J	7.9 J	4.7 J	3.8 J
Lead	mg/kg	5.6	5.1	3.6	3.8
Mercury	mg/kg	0.0084 J	0.012 J	0.015 J	0.0084 J
Selenium	mg/kg	0.27 J	0.24 J	0.17 J	0.15 J
Silver	mg/kg	0.044 J	0.04 J	0.022 J	0.019 J
Total Organic Carbon	%	0.3	2.4	0.87	0.52
Percent Fine-Grained Sediment	%	14.56	25.18	6.03	1.11
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-1.6	9.6	NA	NA

Griffin Island Rd

W River Rd

29

4

Hudson River

Griffin Island

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Feet

EHS Support consider it done

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GLENS FALLS, NEW YORK

2015 Sediment Sampling Results Griffin Island Focus Area

Figure 2

D:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20160513_FWRIA_Final\5-5_GF_Sediment_Sampling_Oct_2015_Event_GI_20160513.mxd

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Legend

Sampling Station

- Deep Habitat Zone
- Shallow Habitat Zone
- Certification Unit Boundary

SSS Sediment Types

- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Metal	NYSDEC Freshwater SGVs (mg/kg)		
	Class A	Class B	Class C
Arsenic	< 10	**10 - 33**	**> 33**
Barium	-	**-**	**-**
Cadmium	< 1	**1 - 5**	**> 5**
Chromium	< 43	**43 - 110**	**> 110**
Lead	< 36	**36 - 130**	**> 130**
Mercury	< 0.2	**0.2 - 1**	**> 1**
Selenium	-	**-**	**-**
Silver	< 1	**1 - 2.2**	**> 2.2**
Organic Carbon-Normalized SEM-AVS	**Prediction of Toxicity (µmol/g_{oc})**		
	Non Toxic	**Uncertain Toxicity**	**Likely Toxic**
(SEM-AVS)/f_{OC}	< 130	130 - 3000	> 3000

Notes:

U, The analyte was analyzed for, but was not detected above the reported quantitation limit

UJ, The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J, The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

NS, Not sampled due to refusal and/or limited sediment recovery in core

NA, Not analyzed because analysis was not included in sampling design, as presented in the work plan

Percent Fine-Grained Sediment, Percent of sediment particles less than 63um based on the Wentworth Scale (Wentworth, 1922)

(SEM-AVS)/f_{oc}, Organic carbon normalized SEM-AVS relation; prediction of toxicity based on EPA (2002)

Shallow habitat stations classified based on observed aquatic vegetation and shallow water depths

Deep habitat stations classified based on the absence of aquatic vegetation and deeper water depths

L6_01	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	3 J	3 J	3.1	2.5 J
Barium	mg/kg	97	97	99	71
Cadmium	mg/kg	**1.5 J**	**1.3 J**	**1.4**	**1.9 J**
Chromium	mg/kg	35 J	36 J	40	**56 J**
Lead	mg/kg	**46**	**46**	**47**	**53**
Mercury	mg/kg	0.18 J	0.19 J	0.18	**0.3 J**
Selenium	mg/kg	0.56 J	0.59 J	0.65	0.45 J
Silver	mg/kg	0.18 J	0.19 J	0.21 J	0.16 J
Total Organic Carbon	%	3.9	3.5	3.5	3.7
Percent Fine-Grained Sediment	%	73.88	73.46	78.35	66.24
(SEM-AVS)/f_{OC}	µmol/g_{oc}	36.2	33.3	NA	NA

L6_02	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	3.2 J	2.5 J	2.8 J	2.6
Barium	mg/kg	71	58	61	57
Cadmium	mg/kg	**1.1 J**	**1.1 J**	**1.6**	**1.9 J**
Chromium	mg/kg	33 J	33 J	**68 J**	**62 J**
Lead	mg/kg	**38**	**38**	**76**	**54**
Mercury	mg/kg	0.17 J	0.13 J	**0.25 J**	**0.34 J**
Selenium	mg/kg	0.48 J	0.38 J	0.44 J	0.38 J
Silver	mg/kg	0.16 J	0.12 J	0.16 J	0.14 J
Total Organic Carbon	%	3.2	3.1	3.9	3.8
Percent Fine-Grained Sediment	%	50.47	36.15	25.42	34.72
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-76.2	-131.3	NA	NA

L6_03	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.2 J	2.1 J	NS	NS
Barium	mg/kg	45	58	NS	NS
Cadmium	mg/kg	**7.1 J**	**6.3 J**	NS	NS
Chromium	mg/kg	36 J	**100 J**	NS	NS
Lead	mg/kg	**41**	**110**	NS	NS
Mercury	mg/kg	0.13 J	**1 J**	NS	NS
Selenium	mg/kg	0.37	0.4	NS	NS
Silver	mg/kg	0.079	0.46 J	NS	NS
Total Organic Carbon	%	1.5	3.2	NS	NS
Percent Fine-Grained Sediment	%	16.98	26.05	NS	NS
(SEM-AVS)/f_{OC}	µmol/g_{oc}	77.0	7.1	NA	NA

L6_04	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	3.2 J	2.9 J	3.4 J	1.8 J
Barium	mg/kg	69	52	83	33
Cadmium	mg/kg	**1.1 J**	0.99 J	0.41 J	0.078 J
Chromium	mg/kg	39 J	38 J	19 J	6.2 J
Lead	mg/kg	**37**	**38**	**45**	12
Mercury	mg/kg	0.13 J	0.17 J	0.19 J	0.033 J
Selenium	mg/kg	0.52 J	0.38 J	0.51 J	0.15 J
Silver	mg/kg	0.12	0.13	0.086 J	0.021 J
Total Organic Carbon	%	3.2	2.4	4.6	0.48
Percent Fine-Grained Sediment	%	51.29	32.86	24.09	26.06

L6_05	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.2 J	2.9 J	2.2 J	1.1 J
Barium	mg/kg	38	65	48	22
Cadmium	mg/kg	**1.4 J**	**3 J**	0.23 J	0.038 J
Chromium	mg/kg	**61 J**	**89 J**	15 J	4.2
Lead	mg/kg	**98**	**280**	**45**	3
Mercury	mg/kg	0.18 J	**0.33 J**	0.11 J	0.014 J
Selenium	mg/kg	0.35 J	0.64	0.41 J	0.19 J
Silver	mg/kg	0.17	0.37	0.083 J	0.016 J
Total Organic Carbon	%	3.9	7.7	5.1	0.45
Percent Fine-Grained Sediment	%	22.07	34.76	25.26	4.42

L6_07	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.4 J	1.9 J	2.4 J	2.2 J
Barium	mg/kg	57	56	130	51
Cadmium	mg/kg	**1.3 J**	**3.2 J**	**40 J**	**2.1 J**
Chromium	mg/kg	**44 J**	**60 J**	**610 J**	**380 J**
Lead	mg/kg	35	**55**	**610**	**310**
Mercury	mg/kg	0.16 J	**1.2 J**	**8.4 J**	**0.75 J**
Selenium	mg/kg	0.47 J	0.45 J	0.74	0.55 J
Silver	mg/kg	0.14	0.22	0.55	0.27
Total Organic Carbon	%	3.3	5.3	9.2	12
Percent Fine-Grained Sediment	%	40.15	25.52	50.76	19.44
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-117.0	-127.4	NA	NA

L6_06	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.9 J	2.7 J	2	2.1 J
Barium	mg/kg	42	41	54	66
Cadmium	mg/kg	0.84 J	**1.1 J**	**4.3 J**	**1.8 J**
Chromium	mg/kg	33 J	**48 J**	**52**	**59 J**
Lead	mg/kg	31	**44**	**36**	**48**
Mercury	mg/kg	0.088 J	**0.2 J**	0.14 J	**0.43 J**
Selenium	mg/kg	0.4 J	0.38 J	0.47	0.47 J
Silver	mg/kg	0.12	0.12 J	0.16	0.25
Total Organic Carbon	%	3.4	3.5	3.8	4.3
Percent Fine-Grained Sediment	%	31.91	28.29	36.41	48.51

L6_09	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2 J	1.1 J	1.7 J	1.1 J
Barium	mg/kg	29	23	25	18
Cadmium	mg/kg	0.29 J	0.11 J	0.12 J	0.055 J
Chromium	mg/kg	16 J	11 J	11 J	4.1 J
Lead	mg/kg	14	9.8	9	3.4
Mercury	mg/kg	0.055 J	0.024 J	0.017 J	0.0094 J
Selenium	mg/kg	0.22 J	0.19 J	0.19 J	0.14 J
Silver	mg/kg	0.044 J	0.028 J	0.023 J	0.015 J
Total Organic Carbon	%	4.3	0.36	0.27	0.12
Percent Fine-Grained Sediment	%	9.31	2.26	0.50	1.28

L6_10	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.2 J	2.3 J	2.3 J	1.1 J
Barium	mg/kg	52	48	44	35
Cadmium	mg/kg	**3.2 J**	**1.3 J**	**1.3 J**	**2.2 J**
Chromium	mg/kg	**70 J**	**47 J**	**53 J**	30 J
Lead	mg/kg	**66**	**44**	**38**	23
Mercury	mg/kg	**0.3 J**	0.15 J	**0.63 J**	0.11 J
Selenium	mg/kg	0.41 J	0.38 J	0.41 J	0.27 J
Silver	mg/kg	0.11	0.075 J	0.092	0.053 J
Total Organic Carbon	%	5.4	5.7	5.7	2.8
Percent Fine-Grained Sediment	%	22.33	18.40	11.25	17.24
(SEM-AVS)/f_{OC}	µmol/g_{oc}	18.7	1.2	NA	NA

L6_11	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	5.1 J	1.8 J	2.9 J	3.8 J
Barium	mg/kg	98	40	28	36
Cadmium	mg/kg	**3.7**	**1.4 J**	0.12 J	0.24 J
Chromium	mg/kg	**100 J**	41 J	16 J	23 J
Lead	mg/kg	**76**	34	16	23
Mercury	mg/kg	**0.39**	0.065 J	0.028 J	0.032 J
Selenium	mg/kg	0.85 J	0.3 J	0.21 J	0.28
Silver	mg/kg	0.26	0.12	0.024 J	0.026 J
Total Organic Carbon	%	7.6	0.88	0.3	0.4
Percent Fine-Grained Sediment	%	45.60	10.26	1.76	3.49

L6_12	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.4 J	NS	NS	NS
Barium	mg/kg	31	NS	NS	NS
Cadmium	mg/kg	0.23 J	NS	NS	NS
Chromium	mg/kg	15 J	NS	NS	NS
Lead	mg/kg	12	NS	NS	NS
Mercury	mg/kg	0.041 J	NS	NS	NS
Selenium	mg/kg	0.2 J	NS	NS	NS
Silver	mg/kg	0.023 J	NS	NS	NS
Total Organic Carbon	%	1.2 J	NS	NS	NS
Percent Fine-Grained Sediment	%	9.37	NS	NS	NS

L6_08	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	1.7 J	1.5 J	NS	NS
Barium	mg/kg	41	29	NS	NS
Cadmium	mg/kg	0.37 J	0.19 J	NS	NS
Chromium	mg/kg	23 J	17 J	NS	NS
Lead	mg/kg	18	13	NS	NS
Mercury	mg/kg	0.08 J	0.038 J	NS	NS
Selenium	mg/kg	0.29 J	0.22 J	NS	NS
Silver	mg/kg	0.064 J	0.046 J	NS	NS
Total Organic Carbon	%	4.1	2.5	NS	NS
Percent Fine-Grained Sediment	%	NS	4.98	NS	NS

Hudson River

150 75 0 150

Feet

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FORMER CIBA-GEIGY FACILITY
GLENS FALLS, NEW YORK

2015 Sediment Sampling Results
Northern Lock #6 Focus Area

Figure 3

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Legend

Sampling Station
- Deep Habitat Zone
- Shallow Habitat Zone
- Certification Unit Boundary

Bathymetry
- Index Contour (5')
- Intermediate (1') Contour

- Type I Sediment
- Type II Sediment
- Type III Sediment
- Type IV Sediment
- Type V Sediment

Metal	NYSDEC Freshwater SGVs (mg/kg)		
	Class A	Class B	Class C
Arsenic	< 10	**10 - 33**	**> 33**
Barium	-	**-**	**-**
Cadmium	< 1	**1 - 5**	**> 5**
Chromium	< 43	**43 - 110**	**> 110**
Lead	< 36	**36 - 130**	**> 130**
Mercury	< 0.2	**0.2 - 1**	**> 1**
Selenium	-	**-**	**-**
Silver	< 1	**1 - 2.2**	**> 2.2**
Organic Carbon-Normalized SEM-AVS	**Prediction of Toxicity (µmol/g_{oc})**		
	Non Toxic	**Uncertain Toxicity**	**Likely Toxic**
(SEM-AVS)/f_{OC}	< 130	130 - 3000	> 3000

Notes:
U, The analyte was analyzed for, but was not detected above the reported quantitation limit
UJ, The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
J, The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
NS, Not sampled due to refusal and/or limited sediment recovery in core
NA, Not analyzed because analysis was not included in sampling design, as presented in the work plan
Percent Fine-Grained Sediment, Percent of sediment particles less than 63um based on the Wentworth Scale (Wentworth, 1922)
(SEM-AVS)/f_{oc}, Organic carbon normalized SEM-AVS relation; prediction of toxicity based on EPA (2002)
Shallow habitat stations classified based on observed aquatic vegetation and shallow water depths
Deep habitat stations classified based on the absence of aquatic vegetation and deeper water depths

L6_13	Units	Results by Sampling Depth Interval				
		0-2"	2-6"	6-12"	12-18"	18-24"
Arsenic	mg/kg	2.3 J	2.6 J	2.7 J	4.1 J	3.8 J
Barium	mg/kg	57	57	68	60	77
Cadmium	mg/kg	**5.7 J**	**6.8 J**	**6.8 J**	0.54 J	0.12 J
Chromium	mg/kg	**170 J**	**220 J**	**400 J**	**76 J**	18 J
Lead	mg/kg	**130**	**180**	**290**	**86**	14
Mercury	mg/kg	**0.53 J**	**0.97 J**	**1.1 J**	0.15 J	0.045 J
Selenium	mg/kg	0.52	0.59	0.61	0.53	0.35
Silver	mg/kg	0.24	0.24	0.33	0.11	0.046 J
Total Organic Carbon	%	2.6	4.4	5.7	3.7 J	0.50
Percent Fine-Grained Sediment	%	41.35	49.84	51.44	27.54	NS
(SEM-AVS)/f_{OC}	µmol/g_{oc}	33.8	7.4	NA	NA	NA

L6_14	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.2 J	4.2 J	1.2 J	2.1 J
Barium	mg/kg	38	41	38	45
Cadmium	mg/kg	0.59 J	0.3 J	**1.9 J**	**2.6 J**
Chromium	mg/kg	21 J	16 J	**47 J**	**50 J**
Lead	mg/kg	16	17	**38**	**44**
Mercury	mg/kg	0.047 J	0.073 J	0.13 J	**0.33 J**
Selenium	mg/kg	0.25 J	0.35 J	0.3 J	0.32 J
Silver	mg/kg	0.068 J	0.056 J	0.18	0.13
Total Organic Carbon	%	1	0.44	1.5	1.8
Percent Fine-Grained Sediment	%	29.41	43.72	12.58	10.67

L6_15	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.2 J	2.3 J	2.2 J	1.7 J
Barium	mg/kg	49	37	40	46
Cadmium	mg/kg	**2.3 J**	0.54	**1.3 J**	**1.5 J**
Chromium	mg/kg	30 J	32	34 J	**48 J**
Lead	mg/kg	23	25	29	**42**
Mercury	mg/kg	0.098 J	0.078	0.11 J	**0.27 J**
Selenium	mg/kg	0.36 J	0.25 J	0.33 J	0.43 J
Silver	mg/kg	0.073 J	0.038 J	0.2	0.12
Total Organic Carbon	%	1.7 J	2.6	6.6	5.4
Percent Fine-Grained Sediment	%	33.87	28.03	20.79	33.84

L6_16	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.9 J	5.3 J	0.89	0.92
Barium	mg/kg	41 J	42 J	17	12
Cadmium	mg/kg	0.63 J	0.43 J	0.055 J	0.024 J
Chromium	mg/kg	**58 J**	35 J	8.4	2.7
Lead	mg/kg	**59**	**40**	6.2	1.7
Mercury	mg/kg	0.086 J	0.062 J	0.016 J	0.0069 UJ
Selenium	mg/kg	0.3 J	0.37 J	0.15 J	0.095 J
Silver	mg/kg	0.09 J	0.058 J	0.0065 J	0.0024 U
Total Organic Carbon	%	2.2	1.8	0.52	0.11 J
Percent Fine-Grained Sediment	%	13.53	11.82	4.11	1.25
(SEM-AVS)/f_{OC}	µmol/g_{oc}	18.8	71.3	NA	NA

L6_17	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.5	2.7	2.2	1.8
Barium	mg/kg	48	64	62	55
Cadmium	mg/kg	**1.6 J**	**5.8 J**	**4.4 J**	**3.4 J**
Chromium	mg/kg	**58**	**110**	**130**	**91**
Lead	mg/kg	**47**	**120**	**130**	**83**
Mercury	mg/kg	**0.25 J**	**0.34 J**	**0.34 J**	**0.51 J**
Selenium	mg/kg	0.32 J	0.51 J	0.49 J	0.38 J
Silver	mg/kg	0.086 J	0.18	0.17	0.15
Total Organic Carbon	%	5.5	8.7	15	8.4
Percent Fine-Grained Sediment	%	38.60	21.98	18.79	30.16

L6_18	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-15"
Arsenic	mg/kg	3.2	3.3	3.6	3.3
Barium	mg/kg	74	63	75	68
Cadmium	mg/kg	**1.4 J**	**1.4 J**	**12 J**	**3.8 J**
Chromium	mg/kg	23	**48**	**160**	**96**
Lead	mg/kg	20	**49**	**180**	**90**
Mercury	mg/kg	0.072 J	0.16 J	**0.72 J**	**0.39 J**
Selenium	mg/kg	0.39 J	0.38 J	0.59 J	0.47 J
Silver	mg/kg	0.074 J	0.085 J	0.25	0.16
Total Organic Carbon	%	1.9	3.2	5.6	3.8
Percent Fine-Grained Sediment	%	78.09	55.78	51.36	NS

L6_19	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.8	4.1	3.1	1.7
Barium	mg/kg	64	65	66	41
Cadmium	mg/kg	0.23	0.4 J	0.79 J	0.88 J
Chromium	mg/kg	15	22	28	23
Lead	mg/kg	12	20	26	27
Mercury	mg/kg	0.042	0.063 J	0.094 J	0.086 J
Selenium	mg/kg	0.29 J	0.32 J	0.46 J	0.29 J
Silver	mg/kg	0.043 J	0.052 J	0.12	0.089
Total Organic Carbon	%	1.9	1.7	2	1.7
Percent Fine-Grained Sediment	%	66.97	33.79	49.51	26.55

L6_20	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	2.8	2.1	1.1	1.8
Barium	mg/kg	73	56	35	43
Cadmium	mg/kg	**2.5 J**	**2.9 J**	**1.5 J**	**2.1 J**
Chromium	mg/kg	**63**	**62**	**43**	**85**
Lead	mg/kg	**57**	**53**	**40**	**110**
Mercury	mg/kg	**0.35 J**	**0.33 J**	0.19 J	**0.37 J**
Selenium	mg/kg	0.38 J	0.33 J	0.24 J	0.29 J
Silver	mg/kg	0.12	0.24	0.14	0.13
Total Organic Carbon	%	2.3	2.8	3.2	4.5
Percent Fine-Grained Sediment	%	63.11	34.87	12.46	11.40

L6_21	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	3.6	3.6	3	3
Barium	mg/kg	83	73	70	82
Cadmium	mg/kg	0.29 J	**2 J**	**2 J**	0.26 J
Chromium	mg/kg	21	**68**	**45**	17
Lead	mg/kg	16	**67**	**43**	15
Mercury	mg/kg	0.043 J	**0.32 J**	0.15 J	0.054 J
Selenium	mg/kg	0.36 J	0.39 J	0.42 J	0.47 J
Silver	mg/kg	0.051 J	0.24	0.072 J	0.056 J
Total Organic Carbon	%	1.7	3.8	2.2	2.2
Percent Fine-Grained Sediment	%	78.95	81.08	67.23	52.79

L6_22	Units	Results by Sampling Depth Interval			
		0-2"	2-6"	6-12"	12-24"
Arsenic	mg/kg	3	2.9	2.4	2.7
Barium	mg/kg	63	68	63	65
Cadmium	mg/kg	**1.4 J**	**2.1 J**	**1.7 J**	**3 J**
Chromium	mg/kg	**44**	**59**	37	**57**
Lead	mg/kg	**39**	**52**	28	**48**
Mercury	mg/kg	0.12 J	**0.2 J**	**0.21 J**	**0.23 J**
Selenium	mg/kg	0.4 J	0.42 J	0.31 J	0.43 J
Silver	mg/kg	0.095	0.12	0.11	0.17
Total Organic Carbon	%	2.1	2.5	2.1	2.6
Percent Fine-Grained Sediment	%	57.47	54.87	60.47	62.21
(SEM-AVS)/f_{OC}	µmol/g_{oc}	-136.4	-34.9	NA	NA

Fort Miller Rd
Fort Miller Road
River Rd
4
77

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FORMER CIBA-GEIGY FACILITY
GLENS FALLS, NEW YORK

2015 Sediment Sampling Results
Southern Lock #6 Focus Area

Figure 4

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APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Ciba Geigy Main Plant/Pretreatment Plant
Operable Unit No. 04: Hudson River - South of Bakers Falls Dam
RCRA & State Superfund Project
Town of Queensbury, Warren County, New York
Site No. 557011
EPA RCRA No. NYD002069748

The Draft Statement of Basis for the Ciba Geigy Main Plant/Pretreatment Plant site was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on May 30, 2018. The draft Statement of Basis outlined the proposed remedy for the contaminated sediment within Operable Unit 04 of the Ciba Geigy Main Plant site.

The release of the draft Statement of Basis was announced by sending a notice to the public via the Environmental Notice Bulletin (ENB), radio announcements on WWSC-AM 1450AM and WFFG 100.3 FM, newspaper announcements within the Post-Star and Saratogian, notification of local government leaders near the OU 04 boundary, and release of an electronic fact sheet to the contact list via listserve for Warren, Saratoga, and Washington Counties, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on June 28, 2018, which included a presentation of the RCRA facility investigation for the Ciba Geigy Main Plant/Pretreatment Plant site as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions, and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the draft Statement of Basis ended on July 16, 2018.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: Were any dredged materials deposited in the Town of Queensbury?

RESPONSE 1: Sediments dredged by others from the Hudson River downstream of the Bakers Falls Dam were not deposited in the Town of Queensbury. Sediments dredged upstream of the Bakers Falls Dam that were contaminated by site metals were dredged and placed on-site beneath a suitable cover.

COMMENT 2: What would happen to the base sediment in the event of a major flood / turbulence event?

RESPONSE 2: During a major flood event, some base sediments may be scoured by turbulent flow. If the shallow sediments that contain lower concentrations of metals were mobilized during a major flood event, new sediments are anticipated to be deposited naturally over time. Any site

related contamination within disturbed sediments would be dispersed and deposited at lower concentrations in other sediment depositional areas. Minimal dispersion of metals contamination is anticipated since one of the main factors supporting the selected remedy is the limited locations with elevated concentrations of metals detected in the sediments.

COMMENT 3: Has climate change been factored into the recommendation?

RESPONSE 3: The greatest impact climate change is anticipated to have on this site is more frequent major floods of the Hudson River. Yes, climate change was factored into the proposed recommendation since the selected remedy anticipates that the Hudson River will experience floods in the future.

COMMENT 4: Do metals continue to decrease over time?

RESPONSE 4: Metals concentrations are not anticipated to naturally decrease within the sediments.

COMMENT 5: Does Fish and Wildlife consider flood information in their data?

RESPONSE 5: The Division of Fish and Wildlife was part of the Department's review team on the site and assisted in the review of the predictions of sediment scour during flood events. An assessment of the Hudson River hydrology and geomorphology was conducted using available data to understand the transport of sediments in river environments reported in the RFI report, Appendix H. This assessment identified that erosion can occur during flood events and also identified that deposition of sediments occurs during average flow.

COMMENT 6: What is the status of the cancer study for Warren County?

RESPONSE 6: The Governor's Cancer Research Initiative, announced in October 2017, is being undertaken to examine cancer trends and the potential causes of cancer in four regions of the state including Warren County. The study will examine data to detect patterns as well as, look at factors such as occupational, socioeconomic, and environmental. The state is currently seeking input from stakeholders and community members. Please contact the Cancer Surveillance Program at (518) 473-7817 or at canmap@health.ny.gov for questions or to provide comments. Additional information can be found at https://www.health.ny.gov/diseases/cancer/cancer_research_initiative/

EHS Support submitted a letter (dated July 16, 2018) on behalf of Hercules, Inc. and Ciba Corporation which included the following comments:

COMMENT 7: Section 6.3: Summary of Environmental Assessment, paragraph 3: The total number of sediment samples identified for the 2015 investigation (n=130) included samples collected from four sampling depth intervals below the sediment-surface water interface: 0 to 2 inches, 2 to 6 inches, 6 to 12 inches, and 12 to 24 inches. The corresponding maximum

concentration listed for each primary contaminant of concern represents the maximum concentration observed in any sampling depth interval. None of the maximum concentrations were observed within the 6-inch interval below the sediment-surface water interface, where the greatest biological activity and potential for exposure was observed. The vertical distribution of maximum concentrations in subsurface sampling intervals in relation to the greatest potential for exposure in surface sampling intervals indicates limited potential for human health and ecological exposure to the maximum concentrations presented in Section 6.3.

RESPONSE 7: Agreed. The Sediments section of Exhibit A is consistent with this data, stating that "The highest concentrations of metals at most locations were detected within deeper sample intervals, with decreasing concentrations in overlying intervals" and "RFI findings determined that remaining metal contamination is spatially limited and non-contiguous, not significantly impacting fish and wildlife resources, not present at significant concentrations to recreational users within the Hudson River, not present at significant concentrations warranting a catch and release regulation or fish advisory, and not present at significant concentrations to impact surface water quality."

COMMENT 8: Section 6.4: Summary of Human Exposure Pathways, paragraph 2: The Draft Statement of Basis lists fish consumption advisories for all fish obtained from north of the Bakers Falls Dam around the Site ("Eat None") and south of the Bakers Falls Dam ("Catch and Release Fishing Only"). The Draft Statement of Basis indicates that the "contamination in the sediment and fish is not site-related and is from a different source." However, it is important to further clarify that fish consumption advisories are currently issued for reaches of the Hudson River upstream of the Site (and outside of the influence of Site-related activities): 1) Upstream of Corinth Dam (Palmer Falls Dam); and 2) Corinth Dam (Palmer Falls Dam) to South Glens Falls Dam.

RESPONSE 8: Yes, fish consumption advisories exist upstream from Corinth Dam for mercury, and Corinth Dam to South Glens Fall Dam for mercury and PCBs. These advisories are not related to site activities. Specific fish advisory information for the Hudson River can be viewed at the following
link: https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/regional/hudson_river_and_tributaries.htm

COMMENT 9: Exhibit A: Nature and Extent of Contamination, Sediments, paragraph 4: The Draft Statement of Basis states that "Potentially sediments located between these two locations [L6_03 (cadmium) and L6_13 (cadmium and chromium)] with similar site-related metals were previously removed by dredging activities." However, we are not aware of available data to support this statement in the sampling intervals where Class C sediments were identified at L6_03 and L6_13 (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches).

RESPONSE 9: Sediment samples for metals analysis were collected by GE just downstream of Lock 6. Based on the GE data, Lock 6 was identified as an area that warranted further investigation and was a focus of the RFI for OU 04. GE samples were collected from different sampling intervals than RFI OU 04 samples, but at select locations GE samples did detect site related metals (cadmium, chromium, lead, and/or mercury) at similar concentrations as nearby L6_03 and L6_13. GE samples were located within the Certification Units, identified as CU-67, CU-68, CU-

69, and CU-70, that define the horizontal extents of GE dredging and are located between L6_03 and L6_13. The sediments within the identified Certification Units were removed to a specified depth, which typically included some if not all of the GE sample interval. This supports the statement in the document regarding potential removal of site related metal contaminated sediments located between L6_03 and L6_13 by dredging activities. Exposed sediments within the Certification Units were covered by appropriate fill based on river conditions, which is protective of public health and the environment.

COMMENT 10a: Exhibit A: Nature and Extent of Contamination, Sediments, paragraph 5: In the discussion of human contact, the Draft Statement of Basis refers to the collection of samples "deeper than three feet below the surface of the Hudson River" as a factor that "…will significantly limit public contact with the metal contamination." It should be clarified that the depths referenced in this paragraph are water depths.

RESPONSE 10a: The final document will be revised to "deeper than three feet below the water surface of the Hudson River"

COMMENT 10b: Further, it is important to reiterate that elevated concentrations of metals in sediment were typically observed in subsurface sediment intervals, with decreasing concentrations in overlying intervals to the sediment-surface water interface (See Comment 1). In addition to water depths greater than three feet, the presence of surface sediment intervals with lower metal concentrations relative to subsurface sediment intervals is an additional factor that limits human contact.

RESPONSE 10b: See Response to Comment 7.

COMMENT 11: Exhibit A: Nature and Extent of Contamination, Sediments, Table 1: Table 1 in Exhibit A provides a summary of concentration ranges and exceedances of standards, criteria, and guidance values (SCGs) based on the total number of samples collected in the 2015 investigation (n=130) from four sampling depth intervals below the sediment-surface water interface: 0 to 2 inches, 2 to 6 inches, 6 to 12 inches, and 12 to 24 inches. As previously stated, elevated concentrations of metals in sediment were typically observed in subsurface sediment intervals, with decreasing concentrations in overlying intervals to the sediment-surface water interface. None of the maximum concentrations were observed within the 6-inch interval below the sediment-surface water interface, where the greatest biological activity and potential for exposure was observed. Further, sediments sampled within the 6-inch interval below the sediment-surface water interface were categorized as Class A or B at 29 of 34 sampling stations (123 of 130 samples). This point further emphasizes that the sampling depth intervals where exceedances of SCGs were observed were typically deeper than the sampling depth intervals with the greatest potential for ecological and human exposure.

RESPONSE 11: See Response to Comment 7.

APPENDIX B

Administrative Record

Administrative Record

Ciba Geigy Main Plant/Pretreatment Plant
Operable Unit No. 04: Hudson River - South of Bakers Falls Dam
RCRA & State Superfund Project
Town of Queensbury, Warren County, New York
Site No. 557011
EPA RCRA No. NYD002069748

1. *Draft Statement of Basis for the Ciba Geigy Main Plant/Pretreatment Plant site, Operable Unit* No. 4, dated May 2018, prepared by the Department.

2. Post Closure Permit, Permit No. 5-5234-00008/00096, between the Department and Ciba Corporation and Hercules Inc., effective on March 6, 2015.

3. "Fish and Wildlife Resources Impact Analysis Report Part 1: Resource Characterization Former Ciba-Geigy Site Glens Falls, New York", May 2017, prepared by EHS Support.

4. "Final Supplemental RFI for Off-site Sediments in the Hudson River Former Ciba-Geigy Site Glens Falls, New York", May 2017, prepared by EHS Support.

5. Letter dated July 16, 2018 from Gary Long and Cassie Reuter from EHS Support.

ATTACHMENT F
Environmental Easement(s) or DEC-approved Covenant
(to be replaced by updated approved document during the Permit period)

BASF

The Chemical Company

October 5, 2021

Brian Jankauskas, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau A
625 Broadway
12th Floor
Albany, NY 12233-7015

Subject: Deed Notice Correction
Former Ciba-Geigy Facility, Glens Falls, New York
EPA ID NYD002069748 / NYSDEC Site No.: 557011

Dear Mr. Jankauskas:

Per your request, this letter describes a discrepancy in the Notice of Contaminated Site for the above-referenced Site, recorded on October 15, 2008, and the activities undertaken to correct the discrepancy. The discrepancy was between the metes and bounds description for a portion of one of the three parcels subject to the 2008 Deed Notice, parcel 303.20-2-50, and the figure provided in Exhibit A to the Deed Notice. Specifically, the involved property was the area north of the "RCRA Cap" and south of Warren Street referred to as the "Sliver Quarry". The metes and bounds descriptions in the 2008 Deed Notice are correct. However, one of the property boundaries depicted in Exhibit A, which is an excerpt from the tax map acquired from Warren County's Geographic Information System (GIS), is not a surveyed boundary.

As you discussed with Bob O'Neill of Brown and Caldwell in October 2020, the above-described discrepancy became apparent during the planning of the investigation activities in the Sliver Quarry (see 'Soil Sampling Work Plan for Sliver Quarry Area' [EHS Support, November 2020]). The planned sampling locations included locations on both BASF-owned property that is subject to the Deed Notice, and locations on property to the east that is owned by the New York State Canal Corporation (NYSCC) that is not subject to the Deed Notice.

BASF revised the Deed Notice by recording a corrected figure as Exhibit A as prepared by a New York State licensed surveyor showing the proper boundary between the BASF-owned property and the NYSCC property within the Sliver Quarry. The corrected Deed Notice is attached.

BASF Corporation
100 Campus Drive
Florham Park N.J. 07932
Tel: (800) 526-1072
www.basf.com/usa

BASF

The Chemical Company

If you have any questions, please call me at 973-245-5271.

Sincerely,
BASF



Stephen Havlik
Senior Remediation Specialist

BASF Corporation
100 Campus Drive
Florham Park N.J. 07932
Tel: (800) 526-1072
www.basf.com/usa

WARREN COUNTY – STATE OF NEW YORK

PAMELA J. VOGEL, COUNTY CLERK
1340 STATE ROUTE 9,
LAKE GEORGE, NEW YORK 12845

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

BOOK/PAGE: 6368 / 220
INSTRUMENT #: 2021-4416

Receipt#: 2021536336
Clerk: LB
Rec Date: 05/18/2021 02:51:04 PM
Doc Grp: RP
Descrip: MISC RECORDINGS
Num Pgs: 36
Rec'd Frm: LAURA MCMAHON

Party1: CIBA CORPORATION
Party2: CIBA CORPORATION

Recording:

Cover Page	5.00
Recording Fee	195.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
Cross References	1.00
Total:	221.00

**** NOTICE: THIS IS NOT A BILL ****

Record and Return To:

STEVE HAVLIK
BASF CORPORATION
227 OAK RIDGE PARKWAY
TOMS RIVER NJ 08755

WARNING***
***** Information may be amended during the verification process, and may not be reflected on this cover page.**

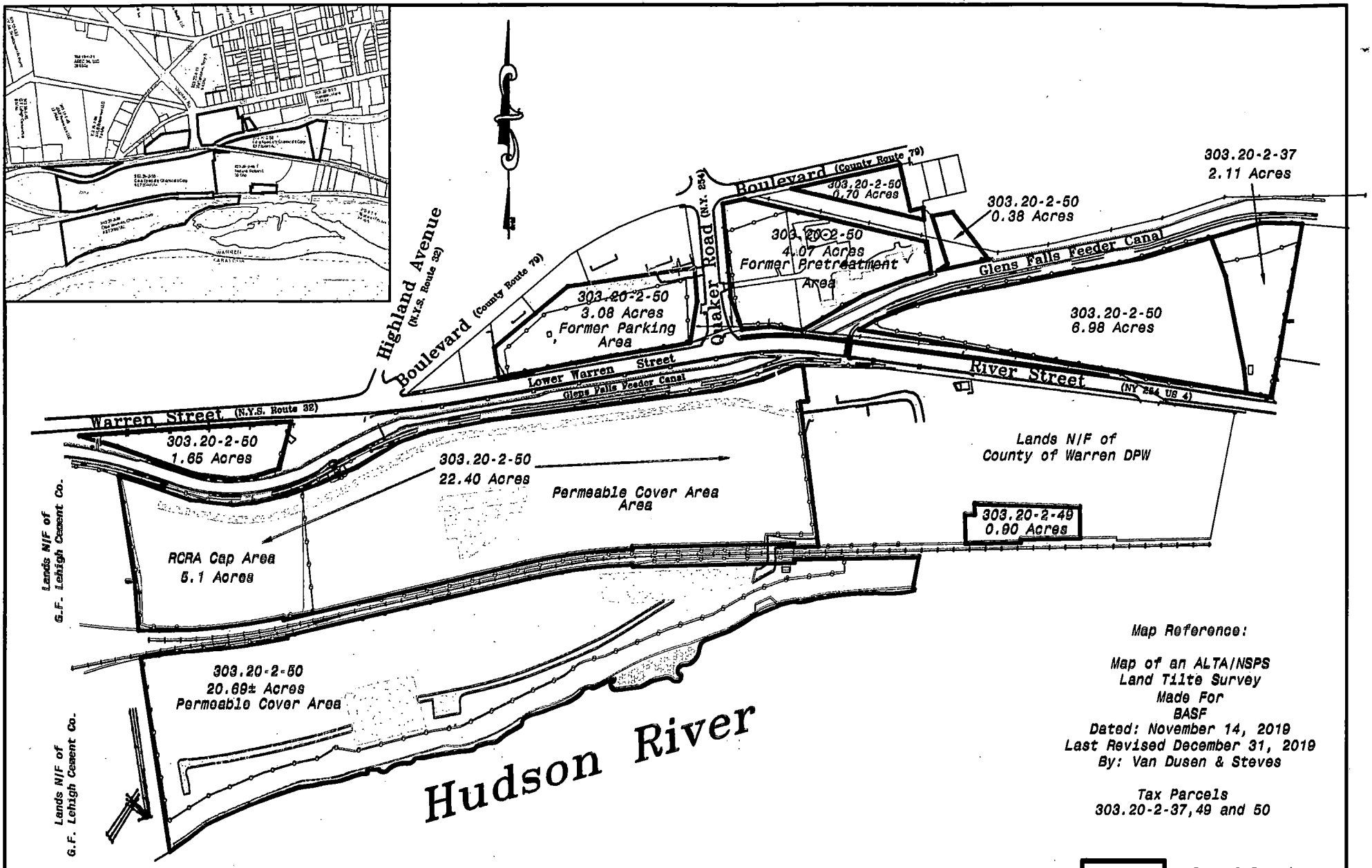
I hereby certify that the within and foregoing was recorded in the Warren County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Pamela J. Vogel
Warren County Clerk

36/35

2C

This Correction Notice of Contaminated Site is being filed to correct an error in the Notice of Contaminated Site dated October 2, 2008 and filed in the Warren County Clerk's office as Instrument No. 2008-00008674, Volume 3652, Page 7 in the book of Miscellaneous Recording. Specifically, this Corrected Notice of Contaminated Site corrects a labeling error with the survey map that was filed as Exhibit A to the original document. The corrected map, which accurately shows all areas subject to this notice, is attached hereto as Exhibit A


Highland Avenue (N.Y.S. Route 32)
Boulevard (County Route 79)
Quaker Road (N.Y. 254)
Boulevard (County Route 79)
303.20-2-50
0.70 Acres
303.20-2-37
2.11 Acres
303.20-2-50
0.38 Acres
303.20-2-50
4.07 Acres
Former Pretreatment Area
Glens Falls Feeder Canal
303.20-2-50
3.08 Acres
Former Parking Area
303.20-2-50
6.98 Acres
Lower Warren Street
Glens Falls Feeder Canal
River Street (NY 254 US 4)
Warren Street (N.Y.S. Route 32)
303.20-2-50
1.65 Acres
303.20-2-50
22.40 Acres
Permeable Cover Area
Lands N/F of County of Warren DPW
303.20-2-49
0.90 Acres
Lands N/F of G.F. Lehigh Cement Co.
RCRA Cap Area
5.1 Acres
303.20-2-50
20.69± Acres
Permeable Cover Area
Lands N/F of G.F. Lehigh Cement Co.
Hudson River
Map Reference:
Map of an ALTA/NSPS
Land Title Survey
Made For
BASF
Dated: November 14, 2019
Last Revised December 31, 2019
By: Van Dusen & Steves
Tax Parcels
303.20-2-37,49 and 50
= Parcel Boundary
Lands in
The Town of Queensbury
Warren County, New York
Scale: 1"=400'
EXHIBIT A
PARCELS SUBJECT TO NOTICE

STATE OF NEW YORK
WARREN COUNTY

I, Pamela J. Vogel, Clerk of the County of Warren of the County Court of said County and of the Supreme Court, both being courts of Record having a common seal, DO HEREBY CERTIFY that I have compared this copy with the original

DESCRIPTION: MISC RECORDINGS
DATE: 10/15/2008
BOOK/PAGE: 3652 / 7

filed, recorded, or entered in this office and that the same is a correct transcript thereof and of the whole of said original.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said County and Courts on

Date: 05/18/2021

Pamela J. Vogel
Warren County Clerk

By: Christine M Latham
Deputy



WARREN COUNTY
PAMELA J. VOGEL
COUNTY CLERK
Lake George, NY 12845

DOCUMENT# 00008674
VOLUME: 3652 PAGE: 7

Instrument Number: 2008- 00008674
As
Miscellaneous Recording

Recorded On: October 15, 2008

Parties: CIBA CORP
To
CIBA CORP

Billable Pages: 30

Recorded By: THE WEST FIRM PLLC

Num Of Pages: 31

Comment:

**** Examined and Charged as Follows: ****

Miscellaneous Recording	190.50	Cover Page	5.00
Recording Charge:	**195.50**		

RECORDED
County Clerks Office
Oct 15,2008 12:32P
Pamela J. Vogel
Warren County Clerk

**** THIS PAGE IS PART OF THE INSTRUMENT ****

I hereby certify that the within and foregoing was recorded in the Clerk's Office For: WARREN COUNTY, NY

File Information:

Document Number: 2008- 00008674
Receipt Number: 91232
Recorded Date/Time: October 15, 2008 12:32:54P
Book-Vol/Pg: Bk-RP Vl-3652 Pg-7
Cashier / Station: T Ryther / Cash Station 1

Record and Return To:

THE WEST FIRM PLLC
677 BROADWAY
8TH FLOOR
ALBANY NY 12207

MBR
30P
1c
195.50

STATE OF NEW YORK)
:ss
COUNTY OF WARREN)

NOTICE OF CONTAMINATED SITE

KNOW ALL MEN BY THESE PRESENT THAT:

Pursuant to requirements of the New York State Department of Environmental Conservation ("NYSDEC"), this Notice of Contaminated Site ("Notice") is hereby filed by Ciba Corporation ("Ciba") in the Warren County Clerk's Office in Liber of Deeds of Warren County, New York solely for the purposes described in this Notice.

This Notice pertains to those parcels of land (collectively, the "Property") lying and being in the Town of Queensbury, Warren County, New York, more particularly described in Schedule A, which is attached hereto and incorporated herein. This property is located on and around Lower Warren Street in the Town of Queensbury, Warren County and consists of the parcels identified by tax map parcel numbers: 303.20-2-37; 303.20-2-49 and 303.20-2-50. The Property is the location of a former manufacturing facility the former operation of which resulted in releases of hazardous substances into the soil and groundwater. Residual subsurface contamination remains at the Property. A survey plan is attached hereto as Exhibit A, along with a listing of the type, location and quantity of hazardous substances disposed on the Property, which is attached as Exhibit B.

Cleanup levels established for the Property in the Final Corrective Measures approved by the NYSDEC were based on current and future use of the site for industrial purposes. Without limitation of any other permissible uses, the Property is suitable for use for industrial purposes. The Final Corrective Measures require that use of the Property be restricted to industrial purposes unless and until the NYSDEC approves a petition by the Permittee to change the use of the Property.

The Final Corrective Measures approved for the Property reduce site risks to meet protection requirements for site conditions at the time of this filing. However, persons who will be accessing the Property either by conducting subsurface construction activities such as, but not limited to, the excavation of soils, installation or repair of subsurface utilities, installation of foundation piers, groundwater extraction, or through surface activities may encounter the soils, soil vapors, or groundwater which have been affected by the releases of contaminant. The groundwater at or under the Main Plant Site, indentified as "RCRA Cap" or "Permeable Cover" on Exhibit A, and the Former Pretreatment property shall not be used for any purpose, unless and until it meets state class GA groundwater quality standards. The portion of the site designated as the RCRA Cap in Exhibit A shall not be disturbed without prior approval of a workplan by the NYSDEC.

Due to the presence of contaminants in the subsurface, the Final Corrective Measures for the Property require the performance of certain post-remedial obligations, which obligations exist at the time of this filing, including continued operation and maintenance

of the groundwater pumping system; general inspection and maintenance conducted on a regular basis to evaluate the condition of site features; maintenance of a cap and permeable cover; maintenance of stormwater management systems; maintenance of access roads; and maintenance of security fences and gates. The owner of the Property at the time of any future subsurface construction activities must comply with all environmental, worker protection and other laws, rules and regulations then applicable to the Property.

Further, prior to disturbance of any soils on the former Main Plant Site, identified as "RCRA Cap" or "Permeable Cover" on Exhibit A, for construction of permanent structures, the soil vapor intrusion pathway shall be evaluated. Based on the evaluation, necessary measures may be required to address soil vapor issues, which must be reviewed and approved by both the NYSDEC and the New York State Department of Health prior to the disturbance of any soils.

The current owner of the Property and the facilities thereon is Ciba, whose address is 540 White Plains Road, Tarrytown, New York 10591. More specific information regarding the condition of the Property may be obtained from the agents or assigns of Ciba or from Hercules Incorporated, the prior owner of the Property and the entity conducting the post-remedial operations. Hercules Incorporated can be reached at 1313 N. Market Street, Wilmington, Delaware 19894.

This Notice is not a representation or warranty by the NYSDEC as to the suitability of the Property for any particular use or purpose, nor does it constitute any guarantee by the NYSDEC that additional remediation will not be required in the future. Further information concerning this matter may be found in files and reports which are kept on file by the NYSDEC for public inspection at its office located at 625 Broadway, Albany, New York 12233.

EXECUTED this 2nd day of October 2008

CIBA CORPORATION

By: _____
Name: John R. Erickson
Title: Head, Environmental, Health and Safety, NAFTA

STATE OF NEW YORK)
) ss.:
COUNTY OF WESTCHESTER)

On this 2nd day of October 2008, before me personally appeared John R. Erickson, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is ascribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual executed the foregoing instrument.

DOCUMENT# 00008674
VOLUME: 3652 PAGE: 10

Lynn Girolamo
Notary Public
My commission expires: 12-15-2009

LYNN GIROLAMO
Notary Public, State of New York
No. 01GI6000294
Qualified in Westchester County
Commission Expires Dec. 15, 2009

DOCUMENT# 00008674
VOLUME: 3652 PAGE: 11

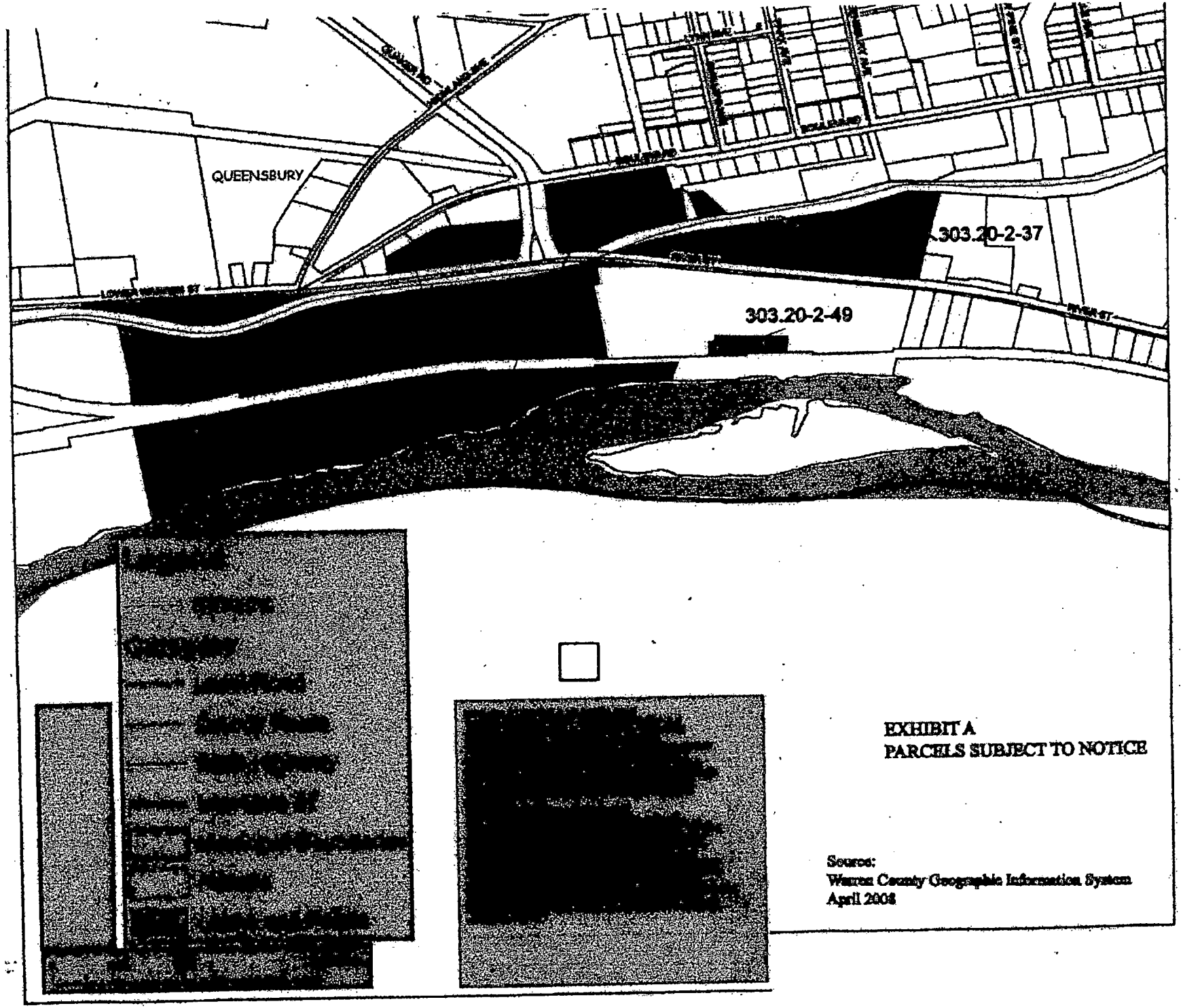


EXHIBIT A
PARCELS SUBJECT TO NOTICE

Source:
Warren County Geographic Information System
April 2008

EXHIBIT B
CONTAMINANTS ON PARCELS SUBJECT TO NOTICE

The Property was subject to extensive characterization and corrective actions under direction of the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency. Work was performed by Ciba Corporation (current Property owner) and Hercules Incorporated (former Property owner).

A full set of characterization and corrective action documents are maintained at the regulatory agencies, at the companies and, for the near term, at an on-site trailer. Taken together these documents contain what is known about the Property, or should form the basis for what should be reasonably expected to be known, and should be consulted.

RCRA CAP AREA

The RCRA cap area covers areas of the former wastewater lagoon, north waste pile and south waste pile. This was a regulated, permitted waste unit.

Analytical characterizations of the waste materials indicated the presence of heavy metals as the predominant waste constituents. Lead, chromium and cadmium were found in the highest concentrations. Organic constituents were also detected, including volatiles and semi-volatiles, where chlorobenzene, dichlorobenzene, xylene, toluene and benzene were among the constituents found. In general the organic contaminants are most concentrated in the western part of the Property. Cyanide is also found.

The waste piles and lagoon sludges were closed in place with an estimated volume of about 80,000 cubic yards. The RCRA cap area is covered with a geosynthetic cap system which cannot be disturbed. A sheet pile barrier wall was installed at the west side of the RCRA cap area.

PERMEABLE COVER AREAS

Dispersed soil and groundwater contamination was found in other areas of the Property. The contaminants are mostly heavy metals, pigments and dyes, which were the primary products used at the manufacturing facility when it was in operation. These contaminants are located site-wide, and are covered by clean soil precluding direct contact.

A groundwater extraction system was installed along the Hudson River to intercept groundwater flowing southward toward the Hudson River. Groundwater pumping is included among the ongoing operations and maintenance activities.

FORMER PARKING AREA

Near surface soil contamination exceeding levels of regulatory concern were removed from this area and were consolidated into the RCRA cap area.

FORMER PRE-TREATMENT AREA

Near surface soil contamination exceeding levels of regulatory concern were removed from this area and were consolidated into the RCRA cap area. Dissolved cyanide was and continues to be found in the groundwater in this area, in some places at levels in excess of groundwater quality standards.

GROUNDWATER MONITORING NETWORK

An extensive groundwater monitoring network was installed across the Property and is subject to continued water level measurement and water quality monitoring. Dissolved metals including chromium, lead, mercury, vanadium were found in the groundwater, and some of which continue to be found in the groundwater. More locally, dissolved volatile and semi-volatile compounds were found.

SCHEDULE A

I

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Queensbury, Warren County, New York, more particularly described as follows:

PARCEL 1: Commencing in the southerly line of the highway leading from Sandy Hill to Glens Falls, said highway being a continuation of River Street of said Sandy Hill, at a gas pipe set in the ground for a corner and running thence westerly along the said southerly line of said highway to the Blue Line of the Glens Falls Feeder; thence westerly along the said Blue Line of said Feeder to the west line of the lands formerly of Charles H. Green; thence southerly along the said west line to the Hudson River; thence easterly down said river to a point on a course south 18° 52' West from a gas pipe set in the ground; and thence North 18° 52' East through said gas pipe, and through a hickory tree six hundred and fifteen and four-tenths feet from said gas pipe to the gas pipe first mentioned; the place of beginning.

Expressly excepting therefrom all of the lands lying within the said boundaries which have been heretofore conveyed, and are now owned by the Delaware & Hudson Company, Glens Falls Branch, and used by them for railroad purposes, and also expressly excepting therefrom all the lands and river rights heretofore conveyed by Charles H. Green to A. and D. W. Sherman.

Also a strip of land thirty feet in width, and extending twelve feet and seven and three-fourths inches on the north, and seventeen feet and four and one-fourth inches on the south of a certain line described as follows: Commencing in the northerly line of the Lands of the Delaware & Hudson Company, Glens Falls Branch, at the switch point at the end of the present switch, which said point is South 1° 24' West fifty-four and seven-tenths feet from a stone monument marking the northeast corner of a piece of land conveyed by Charles H. Green to the Sandy Hill Quarry Company, January 8, 1892, and marked Monument No. 18, and extending from thence on a curve of about nine hundred and ten feet radius to a point in the north line of the above mentioned conveyed piece of land, which point is two hundred and thirty-four feet from said Monument No. 18, on a course North 78° 21' West; thence North 57° 32 1/2' West two hundred nine and sixty-five one hundredths feet to a point sixty-five and twenty-five one-hundredths feet on a course South 7° 1/2' West from a stone monument marked Monument No. 14, which said monument is two hundred and seventy-two feet on the course last named from a stone monument in the northerly line of the highway leading from Sandy Hill to Glens Falls; thence North 78° 21' West three hundred and sixty feet; thence on a curve of about seven hundred and forty feet radius to a point in the easterly line of the lands first hereinbefore described and conveyed, which point is two hundred twenty-two and five-tenths feet on a course South 18° 52' West from a gas pipe at the northeast corner of said first described lands, excepting from said strip of land such portions thereof as are owned by the Delaware & Hudson Company, Glens Falls Branch, and the Glens Falls, Sandy Hill & Fort Edward Street Railroad Company, and also excepting such portions thereof as were conveyed by Charles H. Green to the Sandy Hill Quarry Company.

PARCEL 2: Bounded on the south by the highway leading from Sandy Hill to Glens Falls called the "old road"; on the east by Green Avenue; on the north by lands formerly of J. E. DeGrush and lands formerly of Charles H. Green, and on the west by lands formerly owned by S. T. Guilford, being a corner lot about one hundred and twelve feet front on said Sandy Hill road at Green's Bridge and also same width in the rear and about one hundred and thirty-five feet or more in depth on Green Avenue (which is the street or road running northerly from said Sandy Hill road to the Boulevard) and the same depth on the westerly side, containing about one-third of an acre of land, be the same more or less.

Also all that other lot or parcel of land bounded northerly by the lands now or formerly of the Hudson Valley Railway Company; east by the lands formerly of James E. DeGrush; south by lands

of the party of the first part and by lands formerly of Frank Blonden and Eli Sabourin and Mrs. Smith, and west by lands formerly of J. E. DeCrush, being a piece of land about eighty-eight feet from north to south and about one hundred and fifty feet from east to west.

Also All that other lot or parcel of land on the southerly side of the highway leading from Green's Bridge therein to the Village of Sandy Hill, which lot is a strip of land forty-nine and one-half feet wide, extending from said highway on the north to the switch railroad track of the party of the first part on the south, a distance of about two hundred and twenty-two feet, more or less, and is bounded on the west by the first parcel described in the deed by Charles H. Green to the American Wall Paper Company dated March 18, 1901 and recorded in Book 89 of Deeds at Page 498.

PARCEL 3: Beginning at an iron pin in the west line of that section of the Boulevard Road, so called, intersection with Lower Main Street of the city of Glens Falls, New York, at the southeast corner of what was formerly the Monty lot; and at the northeast corner of the lot conveyed by James E. DeCrush, and wife, to Daniel W. Moss by deed dated May 15, 1908 and recorded in Liber 113 of Deeds at page 206; running thence south 7° 0' west along the west line of the Boulevard Road aforesaid fifty-six and eight tenths feet to an iron pin; thence North 84° 40' West one hundred thirteen and two tenths feet to an iron pin; thence North 4° 30' East fifty-four and eight tenths feet to a post in the south line of the Monty lot above referred to; thence South 85° 20' East one hundred fourteen and two tenths feet to the iron pin at the place of beginning; containing about one seventh of an acre of land, be the same more or less.

PARCEL 4: Beginning at a gas pipe stake set in the south line of the continuation westerly of River Street of the Village of Sandy Hill, New York, forty-nine and one-half feet easterly from a gas pipe stake located in the northeast corner of the lands conveyed by Charles H. Green to American Wall Paper Company by deed recorded in Book 89 of Deeds at page 498, running thence South 18° 32' West parallel to and forty-nine and one-half feet easterly from the easterly line of the said lands two hundred and eighteen feet to an iron pin set in the ground ten feet northerly from the center line of a branch railroad tract leading to the Mill of the party of the first part; running thence easterly parallel to said center line about fifty-one feet to a gas pipe set in the ground; thence North 18° 32' East parallel to and fifty feet easterly from the first line above described two hundred and twenty-five and one-half feet to an iron pin set in the south line of the said highway and thence North 71° 8' West along said south line fifty feet to the place of beginning.

PARCEL 5: Beginning on the northerly side of the road leading from Glens Falls to Hudson Falls ninety feet easterly from the easterly line of the former J. E. DeGrush's blacksmith shop lot, running from thence North 3° East and parallel with and ninety feet from said DeGrush's East line one hundred and fifty feet; thence South 88° 40' East sixty feet to an iron bolt for a corner; thence South 3° West one hundred and fifty feet to the north side of the road; thence North 88° 40' West sixty feet to the place of beginning be the same more or less.

PARCEL 6: Beginning at a point, which is the southeastern corner of Imperial Street and Lower Warren Street or the continuation westerly of River Street of the Village of Hudson Falls, (formerly Sandy Hill), and which point of beginning is one hundred and ninety-nine feet easterly, measuring on the southerly line of said Lower Warren Street from an iron pin or gas pipe stake located in the northeast corner of the lands conveyed by Charles H. Green to American Wall Paper Company by deed recorded in book 89 at page 498; running thence easterly, along the said southerly line of said street, two hundred feet, to a point eighteen feet and seven-tenths of a foot westerly, measuring on the said southerly line of said street, from an iron pin set in the ground; thence running southerly one hundred and fifty feet, on a course south 18° 52 minutes West, parallel with said easterly line of Imperial Street; thence westerly, parallel with said southerly line of said lower Warren Street, two hundred feet to the easterly line of Imperial Street; thence northerly, along said easterly line of Imperial Street, on a course North 18° 52 minutes East, one hundred and fifty feet to the place of beginning.

PARCEL 7: Beginning at a gas pipe stake set in the south line of the continuation westerly of River Street of the Village of Hudson Falls, New York, ninety-nine and one-half feet easterly from a gas pipe stake set at the northeast corner of lands conveyed by Charles H. Green to the American Wall Paper Company by deed recorded in book 89 at page 498 running thence South 18° 52' West parallel to and ninety-nine and one-half feet easterly from the southerly line of said lands two hundred and twenty-five and one-half feet to a gas pipe stake set in the ground ten feet northerly from the center line of a branch railroad track leading to the mill of the party of the first part; running thence easterly parallel to said railroad track fifty-one and fifteen one-hundredths feet to a gas pipe set in the ground, thence North 18° 52' East parallel to and fifty feet easterly from the first line above described two hundred and thirty-six and one-half feet to a gas pipe stake set in the ground in the south line of said highway; thence North 71° 8' West along said south line fifty feet to the place of beginning.

PARCEL 8: Beginning at a point on the easterly side of Imperial Street one hundred and fifty feet southerly (measuring on said easterly line of said Imperial Street, which line runs North 18° 52' East) from the southeasterly corner of Imperial Street and Lower Warren Street or the continuation westerly of River Street of the Village of Hudson Falls, which corner is forty-nine and one-half feet easterly, measuring on the southerly line of said Lower Warren Street, from an iron pin or gas pipe stake set in the ground at the south-westerly corner of said streets; running thence South 18° 52' West along the easterly line of said Imperial Street, about one hundred feet to a point in the northerly line of the right of way or branch railroad track, which point is ten feet northerly from the center line of said track; thence southerly along the said northerly line of said right of way or branch railroad track, about two hundred and ten feet to a point; North 18° 52' East one hundred and forty-six feet to a point; thence North 71° 8' West two hundred feet to the place of beginning, be the same more or less.

PARCEL 9: Commencing at a stone set in the ground at a point in the southerly line of the highway leading from Sandy Hill to Glens Falls, one Green's Bridge, so called, which said point is marked on the map attached to deed recorded in Book 65 of Deeds at page 239 as Monument 11, and running thence South 6° 45' West two hundred seventy-two and four-tenths feet to a stone set in the ground and marked as aforesaid Monument 14. Thence South 15° 37' East one hundred fifty-six and five tenths feet to a stone set in the ground and marked as aforesaid Monument 15 for a place of beginning. Thence South 78° 40' East three hundred sixty-two and five-tenths feet to a stone set in the ground and marked as aforesaid Monument 18. Thence South 11° 20' West thirty-eight feet to a stone set in the ground marked as Monument 17. Thence North 79° 41' West two hundred twenty-two and three-tenths feet on a line parallel with the center line of the Delaware and Hudson Canal Companys railroad track, as now laid and distant therefrom thirty feet to a stone set in the ground and marked as aforesaid Monument 16. Thence North 61° 51' West one hundred forty-six and eight-tenths feet to a stone set in the ground and marked as aforesaid monument 15 the place of beginning be the same more or less. The said piece of land being the same as is particularly described by a map thereof entitled map showing line of the Sandy Hill Quarry Co. railroad and boundary lines of property situated between the highway and D & H C Cos. Lands January 1892, W. Fanchar, C. E., attached to deed recorded in Book 65 of Deeds at page 239.

PARCEL II: Being a tract of land lying southerly of lower Warren Street as continued over Green's Bridge, and between that street and the Hudson River and easterly of other lands of the party of the first part, bounded and described as follows: Beginning at an iron pin driven in the ground on the southerly side of said street, one hundred feet easterly, measuring on said southerly line, from the north-easterly corner of the lands of the party of the first part (by deed recorded in Book 125 of Deeds at page 193) and running thence southerly along the easterly boundary of said lands on a course South 15° 52 minutes West to and across the right of way of the branch of the D & H Co. railroad track, running to the party of the first part's plant, to a point, which point is in the southerly line of said right of way; thence westerly along the southerly bounds of said right of way to lands conveyed to American Wall Paper Company by deed recorded in Book 89 of Deeds at page 498; thence southerly along said lands to the Hudson River, thence easterly, along the said Hudson River as it winds and turns, to the lands nor or formerly of the Union Bag and Paper Company at the mouth of a small brook; thence northerly along the said lands of the Union Bag and Paper Company just easterly of said brook, to said lower Warren Street, and thence westerly along said street to the place of beginning; excepting and reserving lots heretofore sold to George B. Moffat by deed recorded in Book 125 of Deeds at page 191; and also excepting the right of way of the main line and track of the D & H Co. railroad and also the branch right of way and track to the party of the first part's plant, as they run through said property; and also excepting whatever right, title or interest the Drake and Stratton Company may have to the use of a twenty foot strip extending from said Lower Warren Street across said property in a southerly and then easterly direction to a point near said brook marked by iron and stone monuments, as the same was described in a deed made by Charles H. Green to Belle A. Green, dated June 5, 1909 and recorded in Warren County Clerk's office, June 8, 1909, in Book 116, page 162.

Excepting and reserving therefrom also what was conveyed to the D. & H. Railroad Company in a deed made by Belle A. Green to said Company, dated February 16, 1910, and recorded in Warren County Clerk's Office, March 15, 1910, in Book No. 118 page 15; and lots conveyed to Imperial Wall Paper Company by deed from Belle A. Green to said Paper Company, dated July 29, 1912, and recorded in said clerk's office October 14, 1912, and in Book No. 124 of Deeds, at page 542; and also excepting that piece of land which was conveyed by Charles H. Green to the Sandy Hill Quarry Company by deed dated January 8, 1892 and recorded in Warren County Clerk's office March 23, 1892 in Book 65 of Deeds at page 239; and also excepting and reserving any land conveyed by Charles H. Green in his life time to the Union Bag and Paper Company.

Excepting therefrom that parcel bounded and described as follows: Beginning at a point on the southerly side of the highway leading from Glens Falls to Hudson Falls known as River Street, at the division line between the lands of the party of the first part and lands of Jules Sollohub; running thence North 60° 35' West along the southerly line of said highway 100.18' to a point; running thence South 24° 50' West 408' to the lands of the Delaware and Hudson Railroad Co. the following 3 courses and distances; South 76° 58' East, 76.85' to a point; North 13° 2' East 15' to a point; thence South 76° 58' East 28' to lands of Jules Sollohub; thence North 24° 50' East along the lands of said Jules Sollohub 378.81' to the point or place of beginning, be the said distances and diagnalong more or less.

Together with the right, title and interest of the party of the first part, if any, in and to lands lying on the hand of the aforesaid highway in front of said premises to the center line thereof.

PARCEL 14: First: Beginning on the easterly side of the former bridge which crossed the Feeder Canal next below the Lime Kilns formerly owned by the Glens Falls Lime Company, and running thence east three chains and forty-five links down to a point fifty-eight links from the southerly line of lands owned by the People of the State of New York taken for canal purposes to a fence; thence south 87° East 5 chains and 50 links along said fence to the west side of the farm formerly owned by Charles H. Green; thence South 3° West 6 chains and 5 links along the west line of the farm to a stone set in the ground; thence South 76° and 15 minutes West 10 chains to a point South 1° and 45 minutes East 1 chain and 43 links from the southeast corner of the west abutement of the railroad bridge crossing the brook running from the waste weir in said Feeder, thence South 84° West 7 chains and 16 links to a dead pine tree; thence North 3° East 4 chains and 50 links for a corner; which corner on said course is just 4 chains and 26 links distant from the north side of the top of the stone wall in the said Feeder, which wall forms one side of the towing path and one side of the water way of said Feeder; thence North 81° and 10 minutes West 7 chains and 40 links to a point for a corner, which corner is just five chains and 73 links distant from the north side of the top of said wall in said Feeder on a course North 3° East; thence North 3° East to said canal; thence down said Feeder canal to the place of beginning: Subject to the rights and title of the People of the State of New York and excepting and reserving all that part thereof sold and conveyed to the Glens Falls Railroad Company..

Second: Beginning at a stone on the west line of the former Henry Green farm, running thence South 75° 15 minutes West 10 chains to a stake across the waste weir brook; thence South

81° West 6 chains and 16 links to a white pine tree on the east line of what was known as the Haviland farm; thence South 2° West along said line to the Hudson River; thence down the river to the Henry Green line; thence northerly to the place of beginning, containing about eight acres of land, more or less. Excepting and reserving that part sold to the Glens Falls Railroad Company.

Third: Also all that other piece of parcel of land situate in the town aforesaid and bounded and described as follows: Situate upon the north side of the Glens Falls Feeder and bounded on the north by the highway leading from Sandy Hill to Glens Falls; on the east by the Basin formerly known as the Cornell Basin; on the south by the said Glens Falls Feeder; and on the west by the lands formerly of Roger P. Haviland, containing about two acres of land, be the same more or less. Excepting and reserving all rights of the State of New York therein, if any.

PARCEL 15: Beginning on the northerly side of the highway leading from Glens Falls to Sandy Hill on a line as the fence stood December 29, 1886, east of the store, and fifty feet easterly from the east line of the former J. E. DeGrush's blacksmith shop lot; running from thence North 3° East and parallel with and fifty feet from, said DeGrush's east line one hundred and fifty feet to an iron bolt for a corner; thence South 88° 40' East forty feet; thence South 3° West one hundred and fifty feet to the fence standing on the north side of the road; thence North 88° 40' West forty feet to the place of beginning, be the same more or less.

PARCEL 16: Formerly being the residence property of the late Charles H. Green, such land being bounded on the north by the center of Green Avenue or the Boulevard and having a frontage on that side of about six hundred and fifty-six feet and six inches; on the west by the center of the highway leading southerly from said Green Avenue, a continuation of the Boulevard, to Green's Bridge, and having a frontage on that side of about four hundred and twenty-five feet and six inches; on the south by the blue line of the Glens Falls Feeder Canal, with a frontage of about six hundred and forty-six feet; and on the east by a line running from the said Canal straight to said Green Avenue on a course North 3° 45' West, with a frontage of three hundred and twenty-six feet; excepting Lot. No. 5 off the northeasterly corner of said premises, which lot is fifty feet (50'0) front on Green Avenue, one hundred and thirty-two feet (132'), deep and forty-one feet and six inches (41'6") in width in the rear; and excepting whatever of the basin of said Canal which may belong to the State of New York; and also excepting a strip of land sixty-six feet in width running in a southeasterly direction across the northeasterly portion of said property which was sold and conveyed to the Adirondack Power and Light

Corp. for a pole line by deed from Belle A. Green to said corporation, dated March 8, 1923 and recorded in Warren County Clerk's Office in Book of Deeds No. 153 at page 469 and therein described as follows:

"All that certain piece of parcel of land situate in the Town of Queensbury, Warren County, New York, as shown upon he annexed blue print, entitled, in part. 'A.P. & L. Corp. BELLE GREEN PURCHASE E-1975' and bounded and described as follows: Beginning in the center of the highway known as the Boulevard road and running thence easterly along the center of said road 76.7 feet; thence South 62° 30 minutes East to the boundary line between lands of said Belle A. Green and lands of Hudson Valley Railway Company; thence along the same South 14° 20 minutes West 33.9 feet to station 50+10 in the center line of the survey of Queensbury transmission line of the party of the second part, marked by an iron pipe driven in the ground; thence continuing on the same course and along the said boundary line 33.9 feet to a point; thence North 62° 30 minutes West to the center line of said Boulevard road; thence easterly along the center of said road to the place of beginning, and containing about .86 acres of land. Subject to the right, title and interest of the public and Hudson Valley Railway Company, if any, in and to so much of said highway as is contained within the above described parcel."

PARCEL 17: Bounded north by the lands of the Delaware and Hudson Railroad Co., east by lands conveyed to Imperial Wall Paper Company by deed recorded in Book 146 of Deeds at page 471, now of the party of the first part, south by the Hudson River, and west by a line parallel to and distant five hundred one and sixty-two hundredths (501.62) feet, measured at right angles, from the westerly line of said lands of the party of the first part, more particularly described as follows: BEGINNING: at a concrete monument set in the westerly line of said lands of the party of the first part and in the southerly line of lands of the Delaware and Hudson Railroad Co., being distant thirty-three (33) feet, measured at right angles, from the center of the main line track, running thence westerly parallel to and thirty-three (33) feet distant, measured at right angles from the center of said track about 300.0 feet to a point which is distant twenty-five (25) feet, measured at right angles, from the center of the original location of the so called "Coolidge Spur"; thence westerly parallel to and twenty-five (25) feet distant, measured at right angles, from the center of said original location of the Coolidge Spur, one hundred fifty (150) feet to a point which is distant nine and fifty hundredths (9.50) feet, measured at right angles, from the center of the present location of the so called Coolidge Spur; thence westerly parallel to and nine and fifty-hundredths (9.50) feet distant, measured at right

angles, from the center of the said present location of the Coolidge Spur about fifty-two (52) feet to a concrete monument set in the ground for a corner, said concrete monument being distant five hundred one and sixty-three hundredths (501.63) feet on a course of north eighty-three (83) degrees fifty four (54) minutes twenty seven (27) seconds west from the place of beginning; running thence South 5° 41 minutes West a distance of four hundred ninety-one and fifty-hundredths (491.50) feet to a concrete monument set at the top of the bank of the Hudson River, and continuing on the last mentioned course ninety (90) feet more or less to the waters of said river; thence running easterly down and along the river's edge as the same winds and turns to the southwest corner of the lands of the party of the first part; thence running North 5° 41 minutes East along the westerly line of lands of the party of the first part ninety (90) feet more or less to a concrete monument set at the top of the bank and continuing on the last mentioned course three hundred fifty-nine and fifty-two hundredths (359.52) feet to the place of beginning. CONTAINING five and forty-three hundredths (5.43) acres of land, be the same more or less. The courses herein are referred to the Magnetic Meridian of the year 1926.

PARCEL 18: BEGINNING on the northerly side of the Glens Falls and Hudson Falls road at an iron bolt set in the ground, and running from thence North 3° East one hundred seventy-seven (177) feet and three (3) inches to an iron bolt for a corner; thence North 87° West passing another iron bolt to land owned formerly by John C. Monty; thence southerly along said Monty's land to the northerly side of said road; thence easterly along the northerly side of said road to the place of beginning, be the same more or less.

BEGINNING on the northerly side of the highway leading from Glens Falls to Hudson Falls and five (5) feet easterly from an iron bolt set in the ground in the southeasterly corner of the Blacksmith shop lot owned formerly by James DeGrush, being the lot or land last above described and running from thence North 3° east parallel with five (5) feet from the said Blacksmith shop lot and continuing in a straight line to property formerly owned by John C. Monty; thence westerly along said Monty's line to the northwesterly corner of land formerly of Green: thence southerly along said Monty's line to a line running through the barn and over an iron bolt set in the ground on the easterly side of said barn to an iron bolt set in the ground five (5) feet from the first mentioned line and being the northeasterly corner of said Blacksmith shop lot: thence South 3° West along the line of said Blacksmith shop lot one hundred seventy-seven (177) feet and three (3) inches to the northerly side of said highway and the first mentioned iron bolt; thence easterly along the northerly side of said highway five (5) feet to the place of beginning, be the same more or less.

PARCEL 19: On the south by the main highway leading from Glens Falls to Hudson Falls (being a continuation of Warren Street in Glens Falls); on the north by lands formerly of the Hudson Valley Railway Company (whereon were located said Company's railway tracks extending from Glens Falls to Hudson Falls); on the west by lands conveyed by Finch, Pruyn and Co., Inc. to Octave Lefebvre by Deed bearing date April 1, 1911, and on the east by a straight line extending from said highway to said Railway Company lands and at right angles with the north line of said highway. Said lot hereby conveyed has a frontage of seventy-five (75) feet, more or less, measuring on the north line of said highway, and has a depth of one hundred ninety-four (194) feet, more or less, measuring on the west line of the lot, and a depth of two hundred forty (240) feet, more or less, measuring on the east line of the lot.

PARCEL 20: Westerly by the lot formerly of Finch Pruyn and Co., southerly by the highway leading from Glens Falls to Sandy Hill, northerly by a fence situate about two hundred and sixty-eight feet from the fence in front and adjoining said highway and easterly by a line one hundred feet distance from the east line of said Finch, Pruyn and Co. lot. Said lot hereby conveyed being one hundred feet wide front and ninety-eight feet wide in the rear and two hundred and sixty eight feet deep.

PARCEL 21: That Tract of Land lying on the northerly side of the main highway leading from Glens Falls to Hudson Falls (being a continuation of Warren Street in Glens Falls), and bounded on the south by said highway; on the north by lands formerly owned by the Hudson Valley Railway Company; on the west by lands conveyed to Felix LaCerte by deed in Book 121 of Deeds at page 154, and on the east by a straight line extending from said highway to said Railway Company Lands, and at right angles with the north line of said highway. Said lot hereby conveyed has a frontage of eighty-two feet, measuring on the north line of said highway, and has a depth of one hundred and forty feet, measuring on the west line of the lot hereby conveyed, and a depth of one hundred and ninety-four feet, measuring on the east line of the lot hereby conveyed, being more or less.

PARCEL 23: Beginning at a post in the southwest corner of the lot which was conveyed on May 15, 1908, by James E. DeGrush and wife to Daniel H. Moos, at a distance of 112.5 feet westerly from an iron pin in the west line of the Boulevard Road; running thence North 83° 45 minutes West five (5) feet to the westerly side of a narrow lane; thence northerly along the west side of said lane twenty-five (25) feet to a post; thence North 87° West one hundred fifty (150) feet to an iron pin, which last mentioned line passes through another iron pin set in the ground near a barn; running thence North forty (40) feet to an iron stake; thence South 84° 40 minutes East one hundred fifty-one and six tenths (151.6) feet

to an iron pin in the west line of the former DeGrush lot; thence South 4° 30 minutes West along said west line fifty-eight (58) feet to the place of beginning, containing nearly one-seventh of an acre of land, be the same more or less.

PARCEL 24: Beginning at an iron pipe set in the ground on the westerly side of Green Avenue and at the southeast corner of land conveyed by Daniel W. Moon to Imperial Wall Paper Company by deed dated May 15, 1908 and recorded in Warren County Clerk's office in Book No. 113 of Deeds at page 207, and running thence southerly along the westerly line of Green Avenue sixty and five-hundredths (60.05) feet to the northeast corner of lands owned by party of the first part; thence westerly along the northerly line of land owned by party of the first part one hundred twelve and fifty-hundredths (112.50) feet to a post set in the ground on the easterly side of a narrow land; thence northerly about sixty and one-hundredths (60.01) feet to lands owned by party of the first part; thence running easterly one hundred thirteen and two-tenths (113.2) feet along the sourtherly line of lands of the party of the first part to the place of beginning.

Excepting from the above described parcels the following:

All that piece, PARCEL OR LOT OF LAND, bounded and described as follows: BEGINNING at an iron pipe driven in the ground for a marker at the southwest corner of premises conveyed by Mary Calvano to Antonetta Caccavo, by deed dated the 2nd day of February 1935, and recorded in the Warren County Clerk's office on the 6th day of February 1935, in Book 198 of Deeds at page 46, which said point is approximately forty-seven-and nine-hundredths (47.09) feet southerly from the northeasterly corner of lands formerly owned by the Standard Oil Company and now or formerly owned by Albert B. LaCarte and situated on the southerly side of the Glens Falls-Hudson Falls Highway commonly known as the Boulevard; running thence North 64° 12 minutes East and along said Caccavo's southerly line, two hundred ninety-nine and ninety hundredths (299.90) feet to an iron pipe driven in the ground for a marker; running thence South 5° 56 minutes West thirty-five hundredths (36.35) feet to an iron pipe driven in the ground for a marker; running thence South 64° 12 minutes West, two hundred ninety-nine and ninety hundredths (299.90) feet to the easterly line of premises formerly owned by the Standard Oil Company and now or formerly owned by LaCarte; running thence North 5° 56 minutes East, thirty-six and thirty-five hundredths (36.35) feet to the place of beginning.

This refers to the above described Parcel 19, Parcel 20 and Parcel 21. Being the same premises conveyed by Imperial Paper and Color Corporation to Antonetta Caccavo by deed dated February 23, 1954 and recorded February 27, 1954 in said Clerk's Office in Book 330 of Deeds at page 199.

Also excepting from the above described parcels, the lands conveyed:

(i) In deed from the Imperial Wall Paper Company to County of Warren, dated December 20, 1926, recorded December 22, 1926 in the Warren County Clerk's Office in Book No. 171 of Deeds, at page 19, which said deed conveys premises in the Town of Queensbury, County of Warren, State of New York, for the Sandy Hill-Glens Falls County Highway No. 656 and described as containing 0.367 acres more or less.

(ii). In deed from Imperial Wall Paper Company to County of Warren, dated April 25, 1931, recorded May 13, 1931 in the Warren County Clerk's office in Book No. 186 of Deeds, at page 559, which said deed conveys premises in the Town of Queensbury, County of Warren, State of New York for the reconstruction of the Sandy Hill-Glens Falls County Highway No. 656 as shown on landtaking Map No. 3 and described as containing 0.19 acres more or less.

(iii) By notice of Appropriation from the People of the State of New York to Imperial Paper and Color Corp. and others, dated August 17, 1951, recorded August 27, 1951 in the Warren County Clerk's Office in Book No. 302 of Deeds, at page 426, appropriating 0.665 acres more or less on the northerly boundary and 0.094 acres more or less on the southerly boundary of the existing Sandy Hill-Glens Falls State Highway No. 656.

(iv) (a-6) By notice of Appropriation from The People of the State of New York to Imperial Paper and Color Corp. and others, dated August 17, 1951, recorded August 27, 1951, appropriating 0.360 acres more or less on the northerly boundary of the existing Sandy Hill-Glens Falls State Highway No. 656. (Recorded in the Warren County Clerk's office in Book 302 of Deeds, at page 428).

BEING and intended to be the same premises conveyed by Imperial Color Chemical & Paper Corp. to the party of the first part by Deed dated April 1, 1960 and recorded on August 4, 1960 in the Warren County Clerk's office in Liber 396 of Deeds, page 589.

ALSO, ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Queensbury, Warren County, more particularly described as follows:

PARCEL 1: BEGINNING in the northerly bounds of River Street at the southwesterly corner of premises conveyed by Sanford and Stella Dowmont to Bray Oil Company, Inc. by deed recorded in book number 501 of deeds at page 399 in the Warren County Clerk's Office, running from thence North 65° 55 minutes West along the northerly bounds of the said River Street, 79.20 feet to a concrete monument found in the ground at the southeasterly corner of premises of Hercules Incorporated;

thence running North 7° 51 minutes East along the easterly bounds of the said lands of Hercules Incorporated, 77.04 feet to a concrete monument found in the ground; thence running North 2° 37 minutes East still along the said easterly bounds of the lands of Hercules Incorporated, 299.64 feet to an iron pipe set in the ground; thence running North 6° 23 minutes West, still along the easterly bounds of the said lands of Hercules Incorporated, 129.62 feet to a concrete monument found in the ground in the "Blue Line" on the southerly side of the Glens Falls Feeder Canal; thence running North 87° 8 minutes East along the said "Blue Line" 68.77 feet to an iron pipe set in the ground; thence running North 87° 10 minutes East, still along the said "Blue Line" 93.48 feet to an iron bolt found in the ground; thence running South 75° 37 minutes East, still along the said "Blue Line" 94.28 feet to an iron bolt found in the ground; thence running South 71° and 17 minutes East, still along the said "Blue Line" 33.40 feet to an iron pipe set in the ground at the northwesterly corner of lands of Theodore Zakrewski; thence running South 23° and 35 minutes West along the westerly bounds of the said lands of Zakrewski, 201.90 feet to a wire found in a 48 inch diameter Willow tree; thence running South 24° and 11 minutes West, still along the westerly bounds of the said lands of Zakrewski, 110.12 feet to a wire found in an 18 inch diameter Hickory tree; thence running South 22° and 52 minutes West, still along the westerly bounds of the said lands of Zakrewski and along a portion of the westerly bound of lands of the said Bray Oil Company, Inc., 118.38 feet to a wire found in a 16 inch diameter Hickory tree; thence running South 23° and 32 minutes West along the westerly bounds of the said lands of Bray Oil Company, Inc. 126.70 feet to the point and place of beginning, containing 2.111 acres of land, be the same more or less.

PARCEL 2: All that certain piece or parcel of land situate, lying and being in the Town of Queensbury, Warren County, New York, more particularly bounded and described as follows: BEGINNING at an iron pipe set in the ground in the southerly bounds of River Street at the northwesterly corner of a parcel of land conveyed by Mary Sollohub to Millicent A. Gerecki by deed dated April 16, 1968, recorded in the Book No. 493 of Deeds at page 21 in the Warren County Clerk's Office, running from thence South 24° and 33 minutes West along the westerly bounds of the said lands so conveyed to Gerecki, 377.91 feet to an iron pipe set in the ground in the northerly bounds of lands of the Delaware and Hudson Railroad; thence running North 77° and 22 minutes West along the northerly bounds of the said railroad lands, 26.00 feet to an iron pipe set in the ground; thence running South 12° and 38 minutes West, still along the bounds of the said railroad lands, 15.00 feet to an iron pipe set in the ground; thence running North 77° and 22 minutes West, still along the northerly bounds of the said railroad lands, 77.37 feet to a point for a corner; thence running North 24° and 33 minutes East along the easterly

bounds of lands of Hercules Incorporated, passing over a concrete monument found in the ground 16.02 feet from the railroad boundary line, a total distance of 408.60 feet to the southerly bounds of River Street, passing over a concrete monument found 0.50 feet southerly therefrom; thence running South 68° and 45 minutes East along the southerly bounds of River Street, 100.18 feet to the point and place of beginning containing 0.911 acre of land, be the same more or less.

Bearings given in the above descriptions refer to the magnetic meridian as of August 1969.

Excepting from Parcel 1 the Drake and Stratton Quarry mentioned in the deed from Manhattan Pulp and Paper Company to Harold D. and Viola H. Wells.

BEING and intended to be the same premises conveyed by Harold D. Wells and Viola H. Wells, his wife, to the party of the first part by deed dated November 18, 1970 and recorded on November 19, 1970 in the Warren County Clerk's Office in Liber 529 of Deeds, page 118.

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines, thereof.

As said premises are described in a Deed from HERCULES INCORPORATED to CIBA-GEIGY CORPORATION dated February 18, 1980 and recorded at the Warren County Clerk's Office on March 28, 1980 in Book 630 of Deeds at Page 391.

SCHEDULE A

II

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Queensbury, Warren County, New York, more particularly described as follows:

PARCEL 10: ALL that piece of parcel of land which was secondly described in deed From Charles H. Green to the Sandy Hill Quarry Company, dated June 25, 1889, and recorded in Warren County Clerk's office July 9, 1889, in Book No. 58 of Deeds, at page 117 as follows:

"Second: ALL that other lot or parcel of land situated as aforesaid, and bounded as follows to wit: Beginning at a point in the Blue Line of the Glens Falls Feeder of the Champlain Canal on the tow path side thereof at the intersection therewith of a line extending from a point in the top angle of the canal on said tow path side thirteen and fifteen hundredths feet easterly of the southerly abutement of the Sandy Hill Quarry Company's Railroad Bridge on a course South 24° West and running thence on said course to a stone set in the ground one hundred feet from the said top angle which said stone is marked as aforesaid Monument 5; thence South 73° 10' West one hundred twenty-three and five tenths feet to a stone set in the ground marked as aforesaid Monument 6; thence North 80° West four hundred seventy-three and five tenths feet to a stone set in the ground marked Monument 7; thence South 50° 45' West one hundred and seventy feet to a stone set in the ground marked as aforesaid Monument 9; thence South 7° 40' West two hundred and eight

feet to a stone set in the ground in the southerly line of the highway leading from Sandy Hill to Glens Falls over Green's Bridge so-called marked as aforesaid, Monument 11; thence South 6° 45' West three hundred and forty-six feet to a stone set in the ground marked as aforesaid Monument 12; thence South 25° 5' East one hundred and forty-six feet to a stone set in the gound in the northerly line of lands of the Delaware and Hudson Canal Company Glens Falls Branch; marked as aforesaid Monument 13; thence westerly along said northerly line to the easterly line of land owned or occupied by D. W. Sharman and others; thence northerly along the said easterly line to the southerly line of the said highway; thence commencing at a point in said southerly line twenty feet westerly thereon from said Monument 11 and extending from thence to a stone set in the ground marked as aforesaid Monument 10; thence one hundred and sixty-two feet on a curve of one hundred sixty-one and eight tenths feet radius to a stone set in the ground, marked as aforesaid Monument 9; thence north to the said Blue Line of said Feeder and thence easterly along said Blue Line to the place of beginning, be the same more or less."

The said two pieces of land being more particularly described by a map thereof entitled a "Map showing located line of Sandy Hill Quarry Company Railroad and boundary lines of their property May 1889," which said map is attached and hereby made a part of this deed of conveyance, excepting and reserving from the said second described lot or parcel of land, the rights of the public therein for highway purposes in so much thereof as is located between the lines of the said highway leading from Sandy Hill to Glens Falls by Green's Bridge and excepting and reserving further to the party of the first part all wood and growing timber now on the premises hereinbefore described."

Also all that certain other place of land, described in deed from said Charles H. Green to the Sandy Hill Quarry Company, dated January 8, 1892, and recorded in said clerk's office March 23, 1892, in Book No. 65 of Deeds, at page 240, as follows:

"Commencing at a stone set in the ground at a point in the southerly line of the highway leading from Sandy Hill to Glens Falls, One Green's Bridge, (so-called) which said point is marked on the map attached hereto as Monument 11 and running thence South 6° 45' West two hundred seventy-two and four tenths feet to a stone set in the ground and marked as aforesaid Monument 14 for a place of beginning, thence South 15° 37' East one hundred fifty-six and five tenths feet to a stone set in the ground and marked as aforesaid Monument 15, thence South 61° 51' East one hundred forty-six and eight tenths feet to a stone set in

the ground and marked as aforesaid Monument 16, thence South 79° 41' East two hundred twenty-two and three tenths feet to a stone set in the ground and marked as aforesaid Monument 17 said stone being thirty feet distant and in a course North 11° 20' East from the center of the Delaware and Hudson Canal Company, Railroad as now laid, thence South 11° 20' West to the lands of the Delaware and Hudson Canal Company, thence along the northerly line of the Delaware and Hudson Canal Company Railroad lands three hundred and thirty-eight feet to a stone set in the ground and marked as aforesaid Monument 13, thence North 25° 5' along the easterly side of lands heretofore conditionally conveyed by the party of the first part to the party of the second part hereto one hundred and forty-six feet to a stone set in the ground and marked as aforesaid Monument 12, thence North 0° 45' East along the easterly side of lands leased as above mentioned seventy-three and six tenths feet to a stone marked as aforesaid Monument 14 the place of beginning.

PARCEL 12: Situated easterly from Green's Bridge, so-called, between the canal and the highway leading from Hudson Falls to Glens Falls, bounded and described as follows: Beginning at an iron bolt driven in the ground, at a point in the north line of said highway, which said point is fifty-one and three tenths feet westerly from the west end of a cement guard cap at the north end of a culvert, which crosses said highway, and is twenty-nine feet southerly from the south side of the first elm tree referred to in a deed from Charles H. Green to Sanford Burt, dated May 4, 1909 and recorded in the Clerk's office of Warren County in Book 116 of Deeds, at page 48, running from thence North 8° 30' East along the east side of said elm tree and crossing a brook forty-five feet from the iron pin, the place of beginning, one hundred feet to a small tree on the east bank of said brook thence northerly along the east bank of said brook, as it winds and turns, three hundred feet, which extends across the branch brook which joins the main brook from the east; thence North 5° 4' West along a fence in a line with a large elm tree standing on the bank of the canal one hundred and nineteen feet to a pipe monument driven in said line, which said pipe is fourteen and seven-tenths feet south of the large elm tree last above mentioned; thence South 80° West along the approximate "Blue Line" on the south side of the canal one hundred ninety-two and one-half feet to a stake; thence North 88° 10' West along said "Blue Line" six hundred and sixty-two feet to a stake; thence South 85° West three hundred and seventy-five feet to the intersection of a line extending across the west end of the premises hereby conveyed; thence southerly along said west end, eighteen feet from the north-west corner post to an

iron bolt driven in the ground near a post in the north line of the aforementioned highway; thence South 70° East along the north line of said highway one thousand, three hundred and thirteen feet to the place of beginning, containing eight and twenty-three one hundredths acres of land, be the same more or less.

Also all that certain other lot of land lying southerly of the highway leading from Hudson Falls to Glens Falls, and known as Lower Warren Street, bounded as follows: northerly by the southerly line of the branch railroad tract running from the line of the Delaware and Hudson Company tract to the plant of the party of the first part, westerly by Imperial Street, southerly and easterly by other lands of the party of the first part.

PARCEL 13: Beginning on the northerly side of the highway leading from Glens Falls to Sandy Hill (now Hudson Falls) and at the southwesterly corner of the former Guilford lot at an iron bolt for a corner and running from thence North 3° East along the line of the said former Guilford lot one hundred and fifty feet to the northwesterly corner of said former Guilford lot to an iron bolt for a corner; thence North 88° 40 minutes West, forty-five feet to the east line of lands formerly of James E. DeGrush; thence South 3° West along the line of said DeGrush's land one hundred and fifty feet to an iron bolt, being the southeasterly corner of said DeGrush's lot; thence South 88° and 40 minutes East along the northerly side of said highway forty-five feet to the place of beginning.

PARCEL 22: All that piece or parcel of land described in a deed from Orville C. Smith and Daniel H. Monty to Russell A. Little, which deed bears date October 19, 1892, and recorded February 9, 1894, said piece or parcel of land being bounded and described by said deed as follows: "Being all that certain lot or parcel of land situate in the Town of Queensbury, County of Warren and State of New York, bounded on the south by the highway leading from Glens Falls to Sandy Hill, on the north by the fence, on the west by the lands sold by Orville C. Smith and wife to Edward LaRose on the east by the line one hundred feet distant from the LaRose lot, said lot to be conveyed being about one hundred feet wide in front and ninety-eight feet in rear and two hundred and sixty feet deep as the fences stood in 1894, and is part of the land formerly owned by John C. Monty, deceased."

Excepting from the above described parcels, the lands conveyed:

(1) In deed from the Imperial Wall Paper Company to County of Warren, dated December 20, 1926, recorded

December 22, 1926 in Warren County Clerk's office in Book No. 171 of Deeds, at page 19, which said deed conveys premises in the Town of Queensbury, County of Warren, State of New York, for the Sandy Hill-Glens Falls County Highway No. 656 and described as containing 0.367 acres more or less.

(ii) In deed from Imperial Wall Paper Company to County of Warren, dated April 25, 1931, recorded May 15, 1931 in the Warren County Clerk's office in Book No. 186 of Deeds, at page 559, which said deed conveys premises in the Town of Queensbury, County of Warren, State of New York for the reconstruction of the Sandy Hill-Glens Falls County Highway No. 656 as shown on landmarking Map No. 3 and described as containing 0.19 acres more or less.

(iii) By Notice of Appropriation from the People of the State of New York to Imperial Paper and Color Corp. and others, dated August 17, 1951, recorded August 27, 1951 in the Warren County Clerk's office in Book No. 302 of Deeds, at page 426, appropriating 0.665 acres more or less on the northerly boundary and 0.094 acres more or less on the southerly boundary of the existing Sandy Hill-Glens Falls State Highway No. 656.

(iv) By Notice of Appropriation from the People of the State of New York to Imperial Paper and Color Corp. and others, dated August 17, 1951, recorded August 27, 1951, appropriating 0.360 acres more or less on the northerly boundary of the existing Sandy Hill-Glens Falls State Highway No. 656. (Recorded in the Warren County Clerk's Office in Book 302 of Deeds, at page 428).

BEING and intended to be the same premises conveyed by Imperial Color Chemical & Paper Corp. to Hercules Powder Company by deed dated April 1, 1960 and recorded on April 4, 1960 in the Warren County Clerk's office in Liber 396 of Deeds, page 512.

ALSO, ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Town of Queensbury, Warren County, more particularly described as follows:

BEGINNING at a square concrete monument set in the ground as a marker at the southeast corner of a parcel of land conveyed by Green and Haviland to Samuel B. Dix by deed dated December 24, 1860 and recorded in the Warren County Clerk's office in Book No. 5 of Deeds, at page 165, which said lands are now owned by Hercules Powder Co., Inc.,

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running thence South 5° 35 minutes West along other lands of Hercules Powder Co. for a distance of 130.52 feet to the north boundary of lands of the Delaware and Hudson Railroad Company at a point 8.28 feet northerly of the center of a concrete monument marking a change in width of the said railroad property; thence turning 85° 35 minutes to the right and running northwesterly on a curve to the right, having a radius of 1877.10 feet from a tangent direction of North 88° 50 minutes West and along the north boundary of the said railroad lands for a distance of 497.28 feet; thence North 9° 44 minutes East a distance of 151.34 feet to the southwest corner of the first mentioned Dix parcel now owned by Hercules Powder Co., Inc., thence South 78° 31 minutes East along the south boundary of said parcel for a distance of 406.66 feet to the place of beginning and containing 1.70 acres more or less.

BEING and intended to be the same premises conveyed by The Finchgate Company to the party of the first part by deed dated January 15, 1968 and recorded on May 1, 1968 in the Warren County Clerk's office in Liber 507 of Deeds, page 131.

ALSO, ALL right, title and interest of the party of the first part, if any, in and to all lands and real property, easements, rights of way, water rights, riparian rights, water and land under water, strips and gores, together with the buildings and improvements thereon erected, situate lying and being in the County of Warren, State of New York.

BEING and intended to be the same premises conveyed by Imperial Color Chemical & Paper Corp. to Hercules Powder Company by deed dated April 1, 1960 and recorded on April 4, 1960 in the Warren County Clerk's Office in Liber 396 of Deeds, page 609.

ALSO, ALL of its right, title and interest in a certain easement, right and privilege set forth in a deed from O. Thompson Griffin and others to the Spring Brook Water Company dated September 29, 1934 and recorded in the Warren County Clerk's office on October 3, 1934 in Book 197 of Deeds at page 121, and also its right, title and interest in a certain easement, right and privilege set forth in a deed from Sanford C. Burt and Alice E. Burt to Spring Brook Water Company, recorded in Book 197 of Deeds at Page 120 in the Warren County Clerk's office dated September 29, 1934, as therein mentioned and described forever to lay, maintain, operate, repair, inspect, remove and from time to time replace water pipes and mains under and across the premises formerly owned by Harold B. Wells and Viola Wells, his wife, together with the right to conduct water through such pipes

or mains and through any and all replacements thereof, and the right from time to time to enter upon the said premises for the purposes of such maintenance, operation, repair, inspection, replacement and removal.

BEING and intended to be the same premises conveyed by The Village of Hudson Falls to the party of the first part by deed dated March 29, 1971 and recorded on May 5, 1971 in the Warren County Clerk's office in Liber 534 of Deeds, page 462.

ALSO, ALL OF that certain plot, piece, or parcel of land situate, lying and being in the TOWN OF QUEENSBURY, County of Warren, and State of New York, described as the former Drake and Stratton Quarry, and bounded on the North by the Glens Falls Feeder Canal property, on the West by the easterly line of a 20 foot water pipe line easement running from River Street to aforesaid canal, and on the South and southeast by the northerly line of premises conveyed by Jack Taub, as Trustee, etc., to Harold D. Wells et al, recorded in 1953 in Liber 324 of 489, of Warren County Deed Records. The parcel hereby conveyed is generally triangular in shape and has no easterly boundary.

BEING and intended to be the same premises conveyed by Harold D. Wells and Viola H. Wells, his wife, to the party of the first part by deed dated November 18, 1970 and recorded on November 19, 1970 in the Warren County Clerk's office in Liber 529 of Deeds, page 116.

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines, thereof,

As said premises are described in a Deed from HERCULES INCORPORATED to CIBA-GEIGY CORPORATION dated February 18, 1980 and recorded at the Warren County Clerk's Office on March 28, 1980 in Book 630 of Deeds at Page 408.

SCHEDULE A

III

ALSO CONVEYING all right, title and interest of CIBA-GEIGY CORPORATION, if any, to all pipelines, easements and/or rights of way for the same for the transport of waste materials to the City of Glens Falls Sewage Treatment Plant from the premises hereby conveyed.

EXCEPTING from the above described premises all that parcel of land conveyed by CIBA-GEIGY CORPORATION to the COUNTY OF WARREN by Deed dated May 16, 1991 and recorded at the Warren County Clerk's Office on May 21, 1991 in Book 823 of Deeds at Page 204.

SUBJECT TO terms, conditions and covenants contained in said Deed recorded in Book 823 Page 204 and INTENDING TO CONVEY all rights, privileges, licenses and/or easements which were reserved by or conveyed to CIBA-GEIGY CORPORATION in said Deed recorded in Book 823 Page 204.

SUBJECT TO terms and conditions of Purchase Agreement dated August 6, 1979 between HERCULES INCORPORATED and CIBA-GEIGY CORPORATION so far as now in force and effect.

DOCUMENT# 00008674
VOLUME: 3652 PAGE: 37

The preceding document (Notice of Contaminated Site executed Oct. 2, 2008) and attachments relate to and should be recorded against Liber **996, Page 206** (Deeds).

Record and Return to:
Vicki G. Schlierer
The West Firm, PLLC
677 Broadway, 8th Floor
Albany, NY 12207-2990

The preceding document (Correction Notice of Contaminated Site) and attachments relate to and should be recorded against Liber 996, Page 206 (Deeds).

Record and Return to:
Steve Havlik
BASF Corporation
227 Oak Ridge Parkway
Toms River, NJ 08755

ATTACHMENT G
Site Management Plan/Post-Closure Plan (to be replaced by updated approved document during the Permit period)

Inspection and Maintenance Plan

Former Ciba-Geigy/
Hercules Site
Glens Falls, New York

Prepared for:

HERCULES

Prepared by:

EHS Support

August 2022
(Revised January 2023)

Certification Page- Permittee, Hercules LLC

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

James Vondracek

Name/Title

1/23/2023

Date

Certification Page- Permittee, BASF Corporation

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

Stephen K Hall

Name/Title SR. REMEDIATION PROJECT MANAGER

1/30/2023

Date

Certification Page

I, Kristin A. VanLandingham, P.E., certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

Kristin A. VanLandingham, P.E.
NYS Professional Engineer License No. 089610

1-30-2023
Date



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Acronyms

AOC	Area of Concern
BCA	Brown and Caldwell Associates
CAMU	Corrective Action Management Unit
COC	constituent
EPS	effluent pumping station
gpd	gallons per day
gpm	gallons per minute
GWES	Groundwater Extraction System
HDPE	high-density polyethylene
HWM	Hazardous Waste Management
I&M	inspection and maintenance
MPS	Main Plant Site
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
P&ID	process and instrumentation diagram
PBA	Ponded and Backwater Area
POTW	publicly owned treatment works
RCRA	Resource Conservation and Recovery Act
ROP	Remedy Optimization Plan

Trademarks, trade names, company, or product names referenced herein are used for identification purposes only and are the property of their respective owners.

Emergency Contact Information

Emergency	911
State Police Department	518-745-7803
Glens Falls Hospital	518-926-1000
South Queensbury Mutual Aid / Fire	518-792-8669
Glens Falls Fire	518-761-3822
Glens Falls Ambulance Service (Empire Ambulance Service)	518-761-0465
Glens Falls Police Dept	518-761-3840
National Response Center	800-424-8802
New York State Emergency Response	518-457-7362
NYSDEC 24-hour Environmental Emergency	518-457-7362
Site Operator – Antea Group Primary: Garrett Crowe (Office) (Mobile) Backup: Katie Angel (Mobile) Backup: Chris Meyer (Office)	 914-495-9939 860-992-2636 518-859-4626 914-495-9937
Hercules LLC (Dublin, OH)	1-800-Ashland
The site Emergency Rally Point is located in the eastern parking lot by the entrance to the property.	

1 Introduction

This Inspection and Maintenance (I&M) Plan addresses the operation and maintenance (O&M) requirements of the Corrective Measures implemented for the former Ciba-Geigy/Hercules pigments manufacturing facility located at 89 Lower Warren Street in Queensbury, NY, just east of the City of Glens Falls and adjacent to the Hudson River (the Site; **Figure 1**). EHS Support LLC ("EHS Support") is submitting this report to the New York State Department of Environmental Conservation (NYSDEC) on behalf of Hercules LLC ("Hercules," a wholly-owned subsidiary of Ashland Inc.) and CIBA Corporation ("CIBA", previously acquired by BASF Corporation). Hercules and CIBA ("the Parties") are the Site permittees and share responsibility for ongoing environmental activities. The Main Plant Site (MPS) property is currently vacant. The historical manufacturing buildings were demolished. Only the concrete slabs of former Buildings 41, 45, and 56 remain on-site.

The NYSDEC-approved design for the Corrective Measures was presented in the Corrective Measures Design Report and the Drawings and Specifications, which were Attachments A and B to that report (Eckenfelder, 1999). Construction work implementing the design was presented in the Final As-Built Surveys (Thew Associates, 2003) and the Corrective Measures Implementation Construction Documentation Report (Brown and Caldwell Associates [BCA], 2004), which was approved by the NYSDEC in January 2006. The design was modified in November 2016 by suspending pumping at one of three sumps in the French drain (Sump C) and by suspending pumping at all 20 bedrock groundwater extraction wells, as detailed in the NYSDEC-approved Remedy Optimization Plan (ROP; EHS Support 2016). Pumping was restarted at one bedrock groundwater extraction well – well EW-B5 – in December 2018, as approved by the NYSDEC.

This document outlines plans for operating and maintaining the active Final Corrective Measures as designed and constructed. Major remedial components are shown on **Figure 2**, and system controls are detailed in **Appendix A**. The Final Corrective Measures at the MPS, as specified in the Statement of Basis (NYSDEC, 1996) are:

- Groundwater Extraction System (GWES) (i.e., downgradient groundwater collection system)
- Permeable cover over the areas north and south of the railroad tracks
- Low-permeability cover over the Corrective Action Management Unit (CAMU)
- Institutional controls to restrict Site usage; control future contaminated soil removal and groundwater usage; and make future owners aware of the residual contamination

Portions of the permeable cover area are being considered for development as a solar power facility by a third party through a lease agreement with BASF Corporation. If the project goes forward, construction and operation of the solar power facility will be conducted in a manner that follows the Site Management Plan/Post-Closure Plan and allows this I&M Plan to be implemented.

This I&M Plan was prepared following the original plan included in the design documents as required in Appendix II-A, Section I.B of the Hazardous Waste Management Permit (HWM Permit) # 5-5234-00008/0096, which was issued by the NYSDEC and most recently renewed on March 5, 2015 (NYSDEC, 2015). This I&M Plan supersedes the information presented in the Post-Closure Plan dated June 2014 (Hercules, 2014). As required, this I&M Plan addresses implementation and long-term maintenance of the corrective measures at the MPS, including:

1. Description of normal O&M
2. Description of potential operating problems
3. Description of alternative O&M
4. Safety and security plan
5. Description of equipment
6. Records and reporting mechanisms required

O&M of the GWES is described in **Sections 2** through **7**. General Site inspection and maintenance is described in **Section 8**. The O&M schedule and reporting are outlined in **Section 9**. Indirect discharge monitoring and staffing are outlined in **Section 10**.

The former Ciba-Geigy Corporation pigments manufacturing facility site consists of seven separate parcels of land totaling approximately ± 65 acres. The MPS area is approximately 45 acres and is bisected by a railroad track belonging to the Delaware & Hudson Railroad. The MPS area is bordered to the north by the Glens Falls Feeder Canal and to the south by the Hudson River. The MPS includes a CAMU undergoing post-closure care and several solid waste management units for which corrective measures are being maintained. The CAMU, also referred to as the Resource Conservation and Recovery Act (RCRA) Cap Area, is located in the upper area of the MPS in the northwest corner of the property (**Figure 2**). GWES operations are monitored remotely by authorized personnel via a telemetry system. As outlined in this I&M Plan, Site inspections are also performed periodically by authorized personnel who use a modular office space when on-site.

The former Ciba-Geigy Corporation pigments manufacturing facility site includes the following parcels of land in addition to the MPS: the former Storm Water Impoundment Basin, East Area, Pretreatment Plant, North Lot, and Sliver Quarry (**Figure 1**). Each of these parcels is covered by a Deed Notice, which limits the properties to industrial use. On an annual basis, the Parties will confirm that use of the parcels remains industrial and will include this confirmation in the O&M Reports that are submitted to the NYSDEC annually.

Additionally, if warranted based on changes in Site conditions, monitoring results, NYSDEC guidance, or other developments, changes in system operations and monitoring activities will be proposed to NYSDEC for approval and documented in the annual O&M Reports. If warranted, changes will also be documented in a revised version of this I&M Plan, including but not limited to changes to system operations (e.g., adding or deleting extraction wells or making changes to operation of the French drain) and changing the frequency or scope of certain measurements.

2 GWES Description

The GWES is comprised of a French drain that is designed, constructed, and operated to extract groundwater from the Overburden water-bearing zone, and an extraction well (well EW-B5) that is designed, constructed, and operated to extract groundwater from the Bedrock Horizon B water-bearing zone. The other former extraction points (Sump C in the French drain, and 19 groundwater extraction wells in Bedrock Horizons A and B) have been inactive since December 2016.

The primary constituents of concern (COCs) in groundwater for the Site are hexavalent chromium and cyanide. The GWES intercepts groundwater in the Central Area of the Site, which is the area located between the existing French drain Sumps A and B and is the area with the highest potential for flux of COCs to the Hudson River. Groundwater from the extraction system is discharged to the City of Glens Falls Publicly Owned Treatment Works (POTW). Water from the GWES is monitored and equalized at the Effluent Pumping Station. Process and instrumentation diagrams (P&IDs) are provided in **Appendix A** The current POTW discharge permit is included in **Appendix B**.

A brief description of the objectives, design, and construction of the GWES is presented below.

2.1 Groundwater Extraction Systems

Refined objectives, performance goals, and monitoring approaches for the GWES were provided in Table 1-1 of the NYSDEC-approved Revised Remedy Optimization Report (EHS Support, 2019).

2.1.1 Overburden Extraction System

The Overburden extraction system is positioned north of the Hudson River near the downgradient boundary of the MPS. The system uses a French drain to collect the groundwater. The French drain is installed at the base of the Overburden water-bearing zone. The alignment of the French drain is shown on **Figure 2**. It was also detailed in Design Drawing 60484-011 (Eckenfelder, 1999) and 'As built' Drawing CK 2509-08-00-8.0 (Thew Associates, 2003).

Water flow collected in the Overburden Extraction System under the conditions of a Permeable Cover/RCRA Cap configuration averages approximately 50,000 gallons per day (gpd), with lower rates during dry weather conditions and higher rates during high recharge periods. When active, the submersible pump in Sump A pumps at a rate of approximately 25 gallons per minute (gpm), and the submersible pump in Sump B pumps at a rate of approximately 90 gpm. The submersible pumps in the French drain sumps convey flow from the sumps to force mains. The force main that conveys water from Sump A is connected to a lift station, which then discharges water to the Effluent Pumping Station (EPS). The force main that conveys water from Sump B discharges directly to the EPS. The French drain was cut into a low-permeability clay that forms the base of the shallow groundwater system near the river. The profiles of the Central Area and Western Area of the French drain are shown on **Figure 3** and **Figure 4,** respectively. The French drain profile was also detailed on 'as built' drawing CK 2509-08-00-8.1 (Thew Associates, 2003).

2.1.2 Bedrock Extraction System

The original design of the Bedrock Extraction System included:

- Fourteen extraction wells in Horizon A, spaced about 75 feet apart, near the crest of the river bank along the southern side of the Site from approximately 60 feet east of the western property boundary to just west of the estimated position of the Horizon A subcrop (as detailed on Design Drawings 60484-013 [Eckenfelder, 1999] and 'As built' Drawing CK 2509-08-00-8.0 [Thew Associates, 2003]).
- Six extraction wells in Horizon B, spaced about 300 feet apart, along the same general alignment as Horizon A, from approximately 60 feet east of the western property boundary to just west of the estimated position of the Horizon B subcrop (as detailed on Design Drawing 60484-014 [Eckenfelder, 1999] and 'As built' Drawing CK 2509-08-00-8.0 [Thew Associates, 2003]).

Submersible pumps were installed in the extraction wells, and the extracted water was conveyed via the force main to the EPS for monitoring, equilibration, and discharge to the POTW.

As approved by the NYSDEC in November 2016 and November 2018, the only active extraction well at the Site is well EW-B5, which is located in the Central Area of the Site and screened in Horizon B. Extraction rates at well EW-B5 average approximately 300 gpd. When active, the EW-B5 pump extracts water at a rate of 10 gpm. The water pumped from well EW-B5 is conveyed through the 2-inch force main to the lift station and then is discharged from the lift station to the EPS. A P&ID detailing the configuration of EW-B5 is included in **Appendix A**.

2.1.3 Discharge Force Main

The flow from the GWES is conveyed to the EPS via force mains. Alignment of the force main is generally parallel to the French drain/sumps. The alignment and the profile of the force main are shown on Design Drawing 60484-015 (Eckenfelder, 1999) and 'As built' Drawing CK 2509-08-00-8.0 (Thew Associates, 2003). There are three force mains, as follows:

- 2-inch high-density polyethylene (HDPE) force main connected to Sump A and EW-B5 (and to former extraction wells EW-A1 through EW-A14; EW-B1 through EW-B4; and EW-B6).
- 4-inch HDPE force main connected to the 5-horsepower pump in Sump B (and to former Sump C). This was originally a 2-inch force main, but was subsequently replaced with a 4-inch force main.
- Now inactive 2-inch HDPE force main previously connected to a supplemental 1 horsepower pump in Sump B.

Currently, the discharge flow is directed as follows:

- From Sump A using a 1-horsepower, submersible electric pump (Grundfos 10S10-15) via a 2-inch force main to the lift station.
- From Sump B using a 5-horsepower, submersible electric pump (Grundfos 16E7) via a 4-inch force main to the EPS.
- From well EW-B5 using a 0.5-horsepower, submersible electric pump (Grundfos 10S05-9) via a 2-inch force main to the lift station.
- From the lift station using two 5-horsepower, vertical industrial submersible turbine pumps (Gould 5RWALC) via a 2-inch force main to the EPS.
- From the EPS using two 5-horsepower, submersible sewage pumps (Gould WS5034D3) via a 20-inch force main to the POTW. The 20-inch ductile iron force main is protected within a 24-inch insulated jacketing.

Flow diversion controls are located in the EPS. During the Corrective Measures construction activities, flow diversion controls in the EPS shunted flow during construction to a Pretreatment Plant. Water collected during construction was pre-treated before being returned to the wet well in the EPS, where monitoring and equalization occurred before discharge to the POTW. The Pretreatment Plant was disassembled when on-site construction activities were completed. Concentrations of Site-related COCs were found to meet criteria for discharge to the POTW without pretreatment. Under normal operating conditions, water from the GWES equilibrates in the wet well and is subsequently discharged to the POTW via a dedicated pipeline.

The wet well is equipped with a high-level alarm, which activates if the water level in the wet well rises to a level of possible concern. The wet well is also equipped with a high-level shut off switch capable of de-activating the extraction well and sump pumps should the water level in the wet well rise to the high-level switch. This switch is set so that the wet well will not overfill. Simultaneously, an autodialer is activated notifying the operator and backup personnel of a malfunction at the wet well. The autodialer is also activated in the event of a general power failure.

3 GWES Major Equipment

The GWES consists of various elements that, when operated together, intercept, collect, pump, and discharge groundwater from the Overburden and Bedrock (Horizon B) water-bearing zones at the downgradient facility boundary to the POTW. The major elements of the GWES are as follows:

- Overburden French drain (including 2 active sumps ['A' and 'B'] with submersible pumps and electronic liquid level operating controls)
- Bedrock extraction well (includes one active well EW-B5, equipped with a submersible, float-operated discharge pump)
- Sumps and wells are equipped with flow measuring devices (instantaneous and totalizing) and operational status monitoring devices
- Cumulative flow measuring unit (to track the combined flow from the GWES wells/sumps) at the EPS
- Flow sensors at each extraction well and sump to detect malfunctions or failure of a unit and send an electric alarm to the monitoring center in the EPS and the remote monitoring location

Plans, profiles, and details of the GWES were presented in Design Drawings 60484-011 through 60484-020 (Eckenfelder, 1999) and 'As built' Drawing CK 2509-08-00-8.0 (Thew Associates, 2013). For the active components of the GWES, these are also provided on **Figure 2** through **Figure 4** and in **Appendix A**.

The following GWES components are now inactive: Sump C and bedrock extraction wells EW-A1 through EW-A14, EW-B1 through EW-B4, and EW-B6.

The specifications for the active GWES components are summarized in **Table 3-1**. The drawings, specifications and/or vendor manuals may be referenced for additional information.

Table 3-1 GWES Specifications Summary

GWES Component	Horizon B Bedrock Extraction System (Well EW-B5)	Overburden Extraction System (French Drain)
Number of Extraction Wells	1	-
Well Diameters (inches)	8	-
Well Casing Type	Single	-
Well Depths (feet)	55	-
Number of Sumps	-	2
Sump Depths (feet)	-	28 – 32
Number of Manholes	-	5
Manhole Depths (feet)	-	15-25
Pump Horsepower (horsepower)	1/2	1 HP - Sump A; 5 HP - Sump B
Flow Rate (gpm)	10	25 - 90
French Drain Piping	-	6-inch perforated, corrugated polyethylene pipe

Depths are based on final grades for the well chambers and sump cover-doors.
Flow rate per pump is based on observed performance.
Pump Model Nos.: EW-B5 – Grundfos 10S05-9; Sump A – Grundfos 10S10-15; Sump B – Grundfos 16E7.
HP = horsepower

4 GWES Operation

This section discusses the normal operation and alternate operation for the GWES. A description of how each process should typically function is included under normal operation. Alternate operation addresses how identified unit processes may be bypassed or operated in an alternate arrangement, as applicable. **Section 3** may be referenced for specific information on system design and construction.

4.1 Groundwater Extraction Systems

4.1.1 Overburden Extraction System

Normal Operation. Overburden GWES operations consist of a French drain at the base of the Overburden water-bearing zone near the downgradient boundary of the Site, as shown in design Drawings 60484-011 through 60484-020 (Eckenfelder, 1999), 'As built' Drawing CK 2509-08-00-8.0 (Thew Associates, 2003), and on **Figure 2** through **Figure 4**. Groundwater collected by the French drain is pumped from two sumps ('A' and 'B') positioned at low elevation points along the drain. The associated pumps and controls are connected to a manifold piping system (force mains), which convey the groundwater to the EPS. The design basis is summarized in **Section 2.1.1** and described in greater detail in the Final Corrective Measures Design Report (Eckenfelder, 1999). Equipment specifications are summarized in **Table 3-1.**

Water flow in the Overburden Extraction System averages 50,000 gpd with lower flows during dry weather conditions and higher flows during high recharge periods. The French drain was constructed with sumps equipped with submersible pumps, which convey flow from the sumps to the force main. Sump A is equipped with a 1-horsepower pump that typically pumps between about 22 gpm to 27 gpm, when active. Sump B is equipped with a 5-horsepower pump, which typically pumps approximately 90 gpm, when active. Each pump typically pumps several times a day.

The flow rates from each of the sumps are electronically monitored and can be manually adjusted, as necessary, to meet the objectives of the system. Monitoring of groundwater levels is in accordance with groundwater monitoring plans approved separately by the NYSDEC.

Alternate Operation. Due to local variations in the transmissivity of the Overburden, rate of recharge, and the upgradient groundwater levels, the rate of flow to the French drain varies seasonally. Typically, flow is highest in the spring when the snowpack is melting. Flow is typically lowest in the late summer and early fall when the ground is dry and when rainfall is low. Flows also are typically lowest in the middle of winter when the ground is deeply frozen and when upgradient water levels are low. If necessary, the required flow rate can be accommodated by adjusting the valves on the discharge of the pumps to achieve the desired system objectives. The flow rate and the discharge pressure can be measured locally at each sump, except for the 5-horsepower pump in Sump B which is monitored at the EPS. The flow rates and water levels can also be monitored remotely for each sump. Different capacity pumps can be installed, if needed.

4.1.2 Bedrock Extraction System

Normal Operation. The Bedrock GWES operations consist of one groundwater extraction well (EW-B5) in Horizon B that pumps an estimated 10 gpm when active. The associated pump and controls are

connected to a manifold piping system (force main) that conveys the groundwater to the EPS. The location of well EW-B5 and the discharge force main is shown on **Figure 2**. The design basis is summarized in **Section 2.1.2** and described in greater detail in the Final Corrective Measures Design Report (Eckenfelder, 1999). Well and equipment specifications are summarized in **Table 3-1.**

The flow rate from the well is monitored electronically and can be manually adjusted, as necessary, to meet the objectives of the system. Discharge pressure at the well head is adjusted to match the pressure in the force main.

Alternate Operation. Seasonal changes in recharge effect groundwater flow rates into the well through changes in the hydraulic head. Alternate operations include varying the pumping rate from the well to achieve the required conditions. This is accomplished by adjusting the valves on the discharge of the pumps to achieve the desired flow rates. The flow rate and the discharge pressure are measured locally at the well and are monitored electronically.

In addition, equipment wear affects the output from the pumps to the force main. Manual adjustment of the flow rate is necessary when output pressure falls below the pressure in the force main. Pressures are periodically checked and re-balanced as necessary to maintain flow. Maintenance is required when the pump pressure cannot be adjusted to exceed the force main pressure.

5 GWES Operations Control

The following summarizes operator functions required to maintain GWES operations. The frequency of these functions depends on many factors, including operator experience and precipitation patterns, and is conducted on an as-needed basis. Specific operator functions are developed by the contract operations firm.

Operations personnel will be trained in accordance with applicable provisions of the General Facility Standards, Personnel Training. A health and safety plan is used for O&M activities in accordance with applicable Occupational Safety and Health Administration regulations (see **Appendix C).**

5.1 Telemetry and System Alarms

Control of all aspects of the GWES operation have been upgraded, such that the system control is performed remotely via telemetry. The telemetry system includes alarm functions to alert operators to any change in normal operating conditions, such that the system operation can either be modified remotely or if appropriate, a Site visit can be performed.

In the event of a system alarm, the telemetry system transmits an email to everyone on a preprogrammed notification list, notifying the operators that an alarm has occurred and at what time. The operators can reset alarms remotely though the system telemetry to bring the system back into operation. They are also able to control Sump A, Sump B, and extraction well EW-B5 individually by either turning them off, running them manually, or letting them run automatically.

The operators also check the telemetry data multiple times throughout the week to confirm Site conditions are within normal ranges. The telemetry provides real-time readings of the water levels and flow from Sump A, Sump B, extraction well EW-B5, and the EPS wet well that pumps to the POTW. The system also provides information on the water level and flow trend graphs from each location, how long each pump was operating, at what times it was on/off, and the total gallons pumped for the day from each location.

5.2 Inspections On-Site

Routine inspections of the GWES are performed during monthly and quarterly Site visits, and include the following:

- Visually inspect well vaults and contents (e.g., valves, piping) (monthly).
- Visually inspect French drain sumps, manholes, and piping connections (monthly).
- Check submersible pumps, piping, and level controls for proper operation and fouling (quarterly).
- Inspect and test monitoring and alarm equipment as well as flow diversion controls (e.g., force main piping and valves) (quarterly).

6 GWES Maintenance

This section describes the maintenance plan for the GWES. Maintenance of these systems is intended for personnel with the appropriate training and/or experience. Additional contractors and vendor representatives will be used, as necessary. The frequency of maintenance activities will be in accordance with equipment manufacturer recommendations and consistent with the ongoing post-construction experience at the Site. Equipment replacement will be on an as-needed basis consistent with equipment function. Spare parts are maintained on-site or nearby at the contractor's place of business. Spare parts are ordered on an as-needed basis depending on use and frequency of failures. The Site Contractor's personnel are responsible for scheduling routine and non-routine maintenance activities at the site.

6.1 Groundwater Extraction Systems

The extraction systems were designed as semi-automated systems and require minimal operator interaction. However, maintenance activities are assessed based on routine inspections and are performed as required. It is anticipated that maintenance activities may be required as indicated by operation of the following:

- Well and sump pumps
- Piping and valving
- Monitoring and alarm equipment

6.1.1 Well and Sump Pumps

Prescheduled pump maintenance is conducted in accordance with manufacturer's pump manuals and recommended maintenance intervals. The operation of the pumps is monitored. If an operation interruption is detected, an inspection needs to be conducted to assess the cause and effect repairs. A spare pump of each model type is maintained on-site (or nearby at the contractor's place of business) to minimize well downtime in the event of pump failure. Spare pumps are readily available in the marketplace for installation, if necessary.

Model numbers for each pump are documented for replacement ordering, when required. **Table 3-1** and the pump specifications assist personnel in identifying key design information on the extraction system pumps.

6.1.2 Piping and Valving

The discharge piping system delivers groundwater from the various well and sump locations to the flow diversion controls and on to the wet well in the EPS. The discharge force main and sanitary discharge lines connect in the wet well of the EPS. If a leak in the force main piping system were to occur, it would be detected as a sudden change in monitored operation in the well vaults or sumps. The operator would shut off the appropriate well or sump pump(s), investigate the leak, and make repairs as soon as feasible.

6.1.3 Instrumentation and Controls

Locally mounted pressure indicators are located in the piping system to monitor pressure drops and provide early indication of solid material buildup in the wells or lengths of the French drain or force main piping. This allows for scheduled cleaning of the pipelines or well redevelopment before flow restrictions occur. Monitoring of the system operation takes place remotely and locally at the individual wells and sumps. Local monitoring includes pressure and flow information. Remote capabilities include the ability to monitor flow data, water level data, and pump operational status, as well as the ability to control the system by being able to start, stop, and reset the pumps and system as a whole.

7 GWES Troubleshooting

This section contains troubleshooting guides for the major processes of the GWES. The guides are presented in tabular format and are intended to help diagnose the potential cause of performance-related operating problems or irregularities. Possible corrective actions to be selected are also identified. As operating experience increases, the information contained herein can be revised as appropriate to reflect current conditions. Equipment manufacturer troubleshooting manuals should be used, as necessary, to supplement this information.

The troubleshooting guide for the GWES is provided in **Table 7-1.**

The troubleshooting format is divided into four sections: Observation (the problem), Potential Cause, Sequence of Action, and Corrective Action. The Observation column contains a brief statement of the observed irregularity. The Potential Cause column identifies a possible cause to the observed problem. The listed potential causes should be initially reviewed to consider the most likely cause of a problem once it has been identified or to identify a cause not defined in the guides. Then, an appropriate Sequence of Action can be selected to determine the cause of the problem. A stepwise procedure has been presented to assess the cause of the identified problem. Each step should be pursued to completion before proceeding to the next step, until the problem has been solved and corrective measures initiated. The Corrective Action column lists possible measures to resolve the potential cause of the problem.

Appropriate personnel should be familiar with the troubleshooting guides and procedures to minimize review time and more quickly identify potential causes of problems. Malfunctions should be evaluated, logged, and discussed with appropriate personnel.

Table 7-1 GWES Troubleshooting Guide

Observation	Potential Cause	Sequence of Action	Corrective Action
1. Decrease in extraction well yield (flow rate).	A. Damaged or clogged pump.	Check maintenance records on well pump.	Repair or replace, as necessary.
	B. Clogged well screen or sediment buildup.	Check well history.	Purge sediments and/or redevelop, as necessary.
	C. Local freezing.	Conduct inspection of heat tracing, low spots in piping.	Thaw frozen areas, repair and/or replace heat tracing, as necessary.
	D. Pump mechanical wear.	Inspect pump.	Repair or replace.
	E. Reduced water levels.	Review water levels.	Maintain or adjust to desired pumping rate.
	F. No flow.	Check meter, adjust pressures, confirm pump operation.	Clean and replace flow meter, if needed.
2. Increase in extraction well yield.	A. Equipment malfunction.	Visual check of equipment.	Repair or replace equipment, as necessary.
3. Decrease in flow rate from individual French drain sump.	A. Damaged or clogged pump.	Check maintenance records on well pump.	Repair or replace, as necessary.
	B. Local freezing.	Conduct inspection of heat tracing, piping, and valving.	Thaw frozen areas, repair and/or replace heat tracing, as necessary.
	C. Pump mechanical wear.	Inspect pump.	Repair or replace.
	D. Reduced water levels.	Review water levels in sumps and manholes.	Maintain or adjust to desired pumping rate.
4. Significant decrease in EPS influent flow.	A. Electrical failure.	Investigate source.	Identify problem and correct.
	B. Leak in aboveground force main piping.	Visual inspection of piping.	1. Repair and/or correct problem. 2. Shut down GWES if necessary.
	C. Leak in below-ground force main piping.	Conduct inspection (follow enclosed space entry procedures if entering a manway).	1. Repair problem, as necessary. 2. Shutdown GWES, if necessary.

Observation	Potential Cause	Sequence of Action	Corrective Action
5. Flow meter reading when pump is off	A. Faulty flow meter	Clean flow meter, retry.	Replace flow meter, if necessary.
	B. Check valve failure	Clean check valve.	Replace check valve, if necessary.

GWES = Groundwater Extraction System

8 General Site Inspection and Maintenance

General Site inspections of the MPS will be performed on a regular basis (at least quarterly) to evaluate the condition of the Site features, and an appropriate inspection form will be completed (**Appendix D**). The scope of the inspections at the MPS will include the RCRA cap, permeable cover, stormwater management systems, access roads, and security fence and gates. Scheduled inspections will be supplemented as necessary (e.g., when severe weather or flooding occurs). Maintenance will be performed as needed based on the findings of the inspections, in addition to regularly scheduled maintenance activities. Inspection and maintenance of the GWES are addressed in **Sections 5** and **6**. The Site is manned a minimum of one day per month by an inspector who monitors the GWES and oversees general site routine/non-routine maintenance. GWES operations will also be monitored remotely by authorized personnel.

8.1 RCRA Cap and Permeable Cover

The RCRA cap and permeable cover, including the building slabs and riverbank, are inspected to check for evidence of settlement, subsidence, surface desiccation (cracks) or sloughing, erosion, or other defects (such as groundhog burrows). If minor defects or disturbances are detected, repairs will be performed by addition of material or by regrading, as appropriate. In the event that larger disturbances have occurred that significantly alter the direction of runoff flow, sufficient steps will be taken to restore the conditions to those shown on the drawings (Eckenfelder, 1999; Thew Associates, 2003), or as necessary to promote drainage and maintain the integrity of the cap/cover.

8.2 Vegetative Cover

Inspections of the grassed portions of the RCRA cap and permeable cover are performed to evaluate its condition. In the event that ground cover is observed to have become inadequate, the affected areas will be reseeded. Overgrowth of shrubs and other deep-rooted vegetation are controlled, as necessary, to preserve the continued integrity of the RCRA cap.

Routine maintenance of the vegetative cover includes mowing. Mowing will be performed during the growing season (usually 2 or 3 times), unless a lesser frequency is sufficient to control growth. Other vegetative management operations (i.e., fertilizing, liming, and reseeding) will be performed as needed. Mowing of banks and swales will be done during dry periods to minimize damage to the banks or to the top of the slope. Experience has been that mowing during wet ground conditions promotes development of erosion gullies and damage near the top of the bank. This practice was approved by NYSDEC.

8.3 Rip-rap

Rip-rap located along the riverbank and at other Site locations (e.g., as part of the surface drainage system) is inspected to confirm it is intact and undisturbed. Rip-rap will be replaced, as necessary, to preserve the integrity of the riverbank and to provide erosion protection. Should it be established that other methods of erosion control are warranted, problem areas will be corrected by adding additional erosion protection, as necessary.

8.4 Storm Water Management System

The storm water management systems are inspected to verify that swales, level spreaders, and catch basins are clear to permit unimpaired movement of surface runoff, and that structures are intact and undisturbed. Maintenance of the swales and level spreader components of the surface drainage system will be performed at least semi-annually. Swales and level spreaders will be mowed or cleaned to remove excess vegetation, sediment, and other debris that may accumulate. Obstructions found in swales, level spreaders, catch basins, or at pipe or culvert outlets will be removed. In the event that swales or level spreaders are found to be damaged or incapable of retaining internal drainage – or that pipes, culverts, catch basins, and other appurtenances are not draining properly – repairs will be made as necessary for proper operation. Manholes and catch basins will be inspected on an annual basis to evaluate any damage or existence of sediment buildup. Repairs or cleaning will be performed as necessary.

8.5 Access Roads

The access roads will consist of a gravel surface to accommodate O&M vehicles. The roadways will be inspected quarterly for damage (e.g., cracks, potholes, or worn surfaces) and will be plowed, as necessary, to facilitate operations and maintenance activities. Damage to the access roads will be repaired as soon as practical. Potential repairs include filling potholes in gravel road surfaces and regrading along edges of the roadways, as necessary.

8.6 Security Fence and Gates

The condition of the perimeter security fence at the MPS, and gates and locks, will be inspected during periodic Site visits to maintain Site security and restrict access, particularly in the RCRA cap area. Gates will remain locked to maintain access control. In addition, the RCRA cap area has its own fenced area with a locked gate that limits access to it from the rest of the Site. This area has signs posted on the perimeter of the fence for “No Trespassing” and allowing access only by authorized personnel, which is controlled by the Site contractor. The locations of Site fence lines are shown on **Figure 2**.

Repairs to fencing and gates, if needed, will be made as soon as practical. Gates and locks will be lubricated as needed, and locks will be replaced if damaged or corroded.

8.7 Well Maintenance

All monitoring wells included in the approved *Groundwater and Surface Monitoring Plan* (EHS Support, 2021) are inspected prior to sampling and gauging. The inspections are performed annually for the wells sampled and gauged annually per the approved *Groundwater and Surface Monitoring Plan*. The subset of wells that are sampled semi-annually are also inspected during those events. Prior to sampling each well is inspected visually to determine its condition and if well repairs are necessary. During the inspections, the outer portions of the well (the outer casing, well pad, lock) and the inner portions of the well that are visible (the well cap and dedicated tubing if applicable) are inspected. If any issues with the well integrity are identified, repairs will be made. The inspections also include verifying the absence of biological matter inside the well vault. Any issues with well condition would then be noted in the comment section of the gauging sheet.

Prior to sampling each well, the depth to well bottom will be measured and compared to previously measured values to check for blockage or silt build up. After each sampling event, well purging data is compiled and reviewed, and any significant changes in turbidity, static water levels, or yield are noted. If these conditions occur, the sampling team will review the information to determine if well redevelopment may be warranted, and if so, redevelopment will be performed prior to the next sampling event.

9 O&M Schedule and Reporting

This section presents a summary of the frequency of O&M activities and describes the reporting of these activities during the post-closure period. O&M activities began in 2002 at the completion of construction of the Corrective Measures.

9.1 Schedule

The frequency of O&M activities is summarized in **Table 9-1.**

Table 9-1 O&M Schedule

Activity	Frequency
Groundwater Extraction Systems O&M	
Monitoring well inspection	When sampled
Inspection of Extraction Systems components	Monthly
Extraction well redevelopment	As needed
French drain (e.g., piping, sumps, manholes) clean-out	As needed
Equipment repair/replacement	As needed
Monitoring well abandonment and installation	As needed
General Site I&M - MPS	
Inspection	Quarterly
Cap/Cover repairs or regrading	As needed
Reseeding	As needed
Rip-rap replacement	As needed
Mowing of vegetative cover	As needed, typically 2-3 times per year
Fertilizing/liming of vegetative cover	As needed
Cleaning of swales/level spreaders	Semi-annually
Inspection of manholes/catch basins and swales/level spreaders	Annually
Inspection of access roads	Quarterly
Inspection of security fence/gates	Quarterly
Access road repair	As needed
Fence/gate repair	As needed
Visual Confirmation of No Change in Use – Additional Areas	
Former Stormwater Impoundment Basin, Cement Company Pond, Hudson River AOC, Ponded and Backwater Area (PBA)	Annually

Activity	Frequency
Reporting	
O&M Reports	Annually
Emergency Incidents	Within 15 days of occurrence

9.2 Reporting

O&M records will be maintained on-site (or at a contractor's office nearby) for inspection by NYSDEC. These documents will contain the following information:

- Work completed
- Summaries of changes made
- Summaries of contacts made with representatives of the local community and public interest groups
- Summaries of problems/potential problems or emergencies encountered and actions taken to rectify
- Changes in personnel conducting or managing corrective action activities
- Projected work

The Annual O&M Report is prepared and submitted to the NYSDEC on an annual basis, in accordance with the site HWM Permit (NYSDEC, 2015).

10 Indirect Discharge Monitoring

10.1 Water Discharge

This section discusses the indirect discharge monitoring for water from the GWES force mains. Water discharged to the wet well at the EPS is equilibrated before being pumped to the City of Glens Falls POTW. After equilibration, the water is monitored for pH and flow in accordance with permit requirements. The pH meter and flow monitor are calibrated annually where they discharge to the POTW. The water quality is monitored on a quarterly basis in accordance with the permit requirements. All samples are analyzed for the constituents specified in the Industrial User Permit, last issued April 21, 2017, by a New York State Department of Health Environmental Laboratory Approval Program approved lab.

10.2 Staffing

Hercules has provided, and will continue to provide, the necessary resources to staff, operate, sample, and perform routine O&M for the GWES and other remedial components with the objective of ensuring they are operational and functional as designed and constructed. As currently configured, the system is automated so that the operator will be on-site during regular hours one day a month. The schedule for future staffing will depend on the level of effort needed to monitor and maintain the system.

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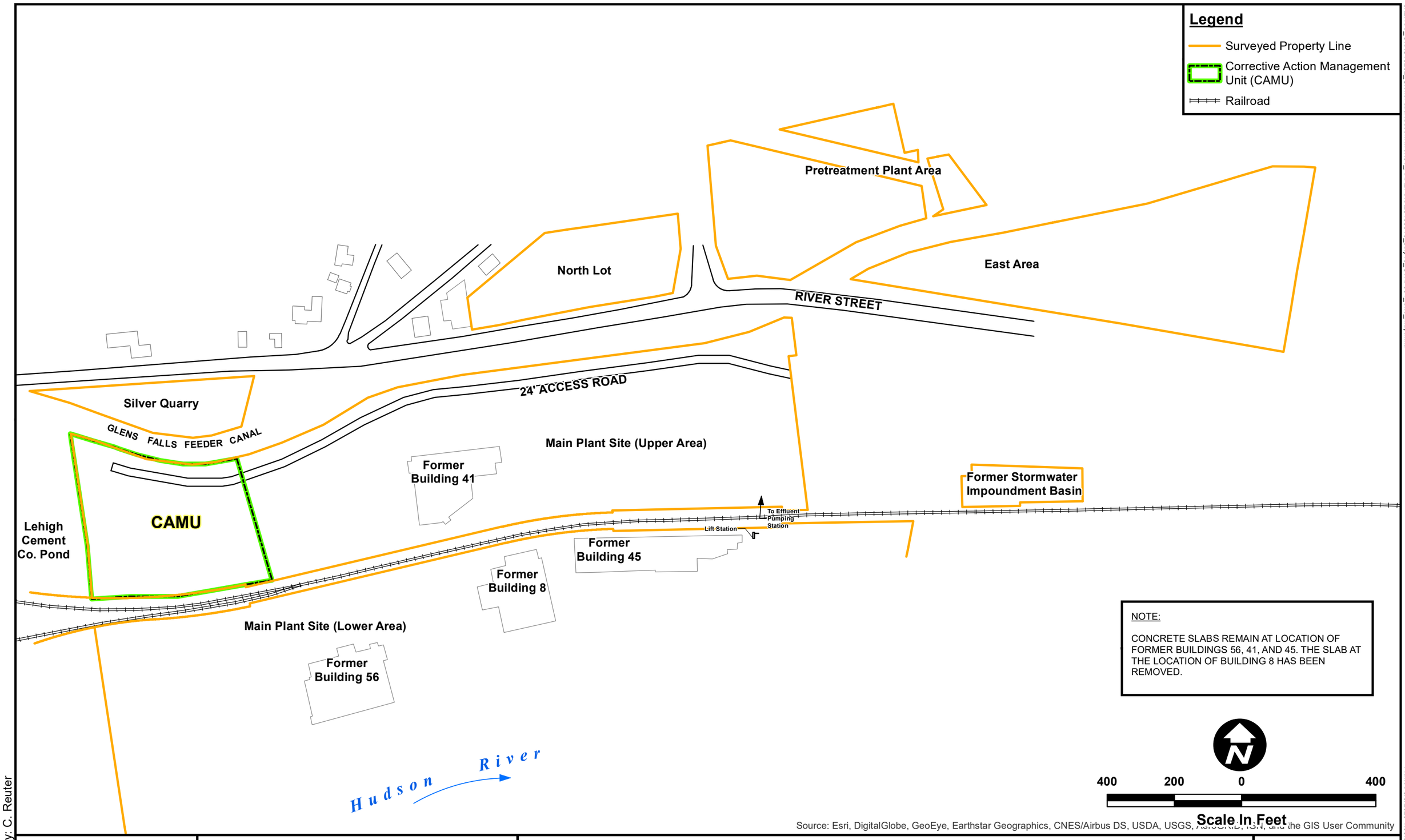
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Figures



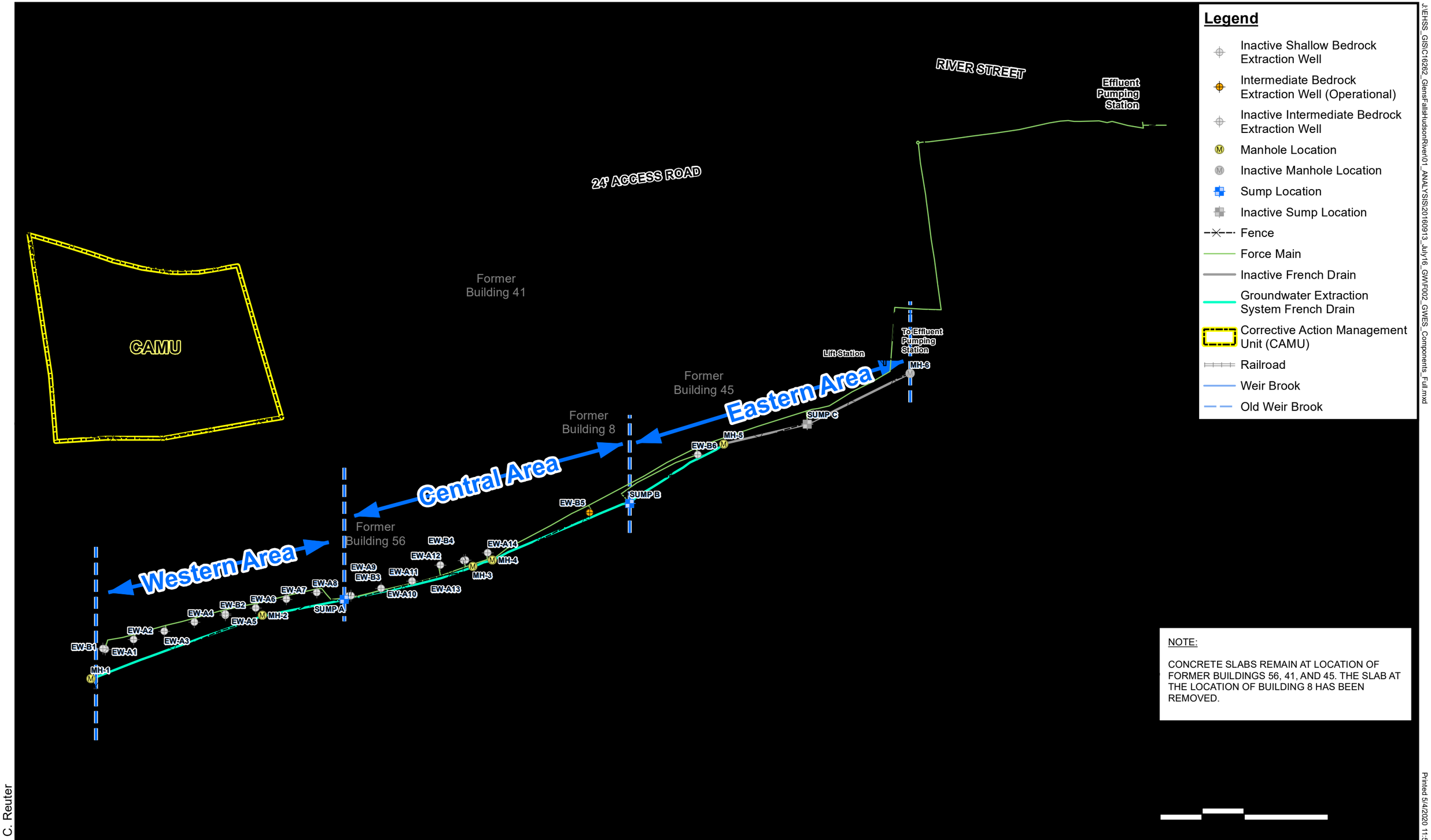
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[redacted]

FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE MAP	FIGURE 1



[redacted]

FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

SITE FEATURES AND GROUNDWATER EXTRACTION SYSTEM COMPONENTS

FIGURE 2

Reviewed By: C. Reuter

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Central Area extends from Sump A to Sump B.

Elevation in Feet, MSL

245 240 235 230 225 220 215 210 205

TB-25 Sump "A" Sta. 6+33.50 TB-26 Rim Elev. 240.00 C02 TB-27 TB-28 TB-29 TB-30 TB-31 TB-32 C03 TB-33 TB-34 TB-35 C04 **MW-OB32** TB-36 TB-37 TB-38 Manhole 3 Sta. 9+51.00 TB-39 Rim Elev. 238.80 TB-40 Manhole 4 Sta. 10+01.15 TB-41 Rim Elev. 238.80 TB-42 TB-43 TB-44 **MW-OB33** TB-45 D01 TB-46 TB-47 TB-48 TB-49 D02 TB-50 **EW-B5** TB-51 TB-52 TB-53 TB-54 TB-55 Sump "B" Sta. 13+58.20 Rim Elev. 236.50 TB-56

Final Surface Topography

Invert 210.20

Invert 210.20

Invert 228.25

Invert 228.25

Invert 215.40

Invert 215.40

48" HDPE Relocated Weir
Brook Pipe Sta. 10+38
Invert Elev. 219.20

Back Fill Stone

Clay Layer

6" Perforated HDPE

Bottom of Trench

Invert 209.20

6+00 6+50 7+00 7+50 8+00 8+50 9+00 9+50 10+00 10+50 11+00 11+50 12+00 12+50 13+00 13+50

SW-03 **SW-02**

Pumping Range - Groundwater Elevation

Location Where No Lacustrine Clay Encountered

Location Where Bottom of French Drain Trench is Above Top of Lacustrine Clay

Surface Elevation

Top of Clay Elevation

Bottom of Clay Elevation

Top of Bedrock Elevation

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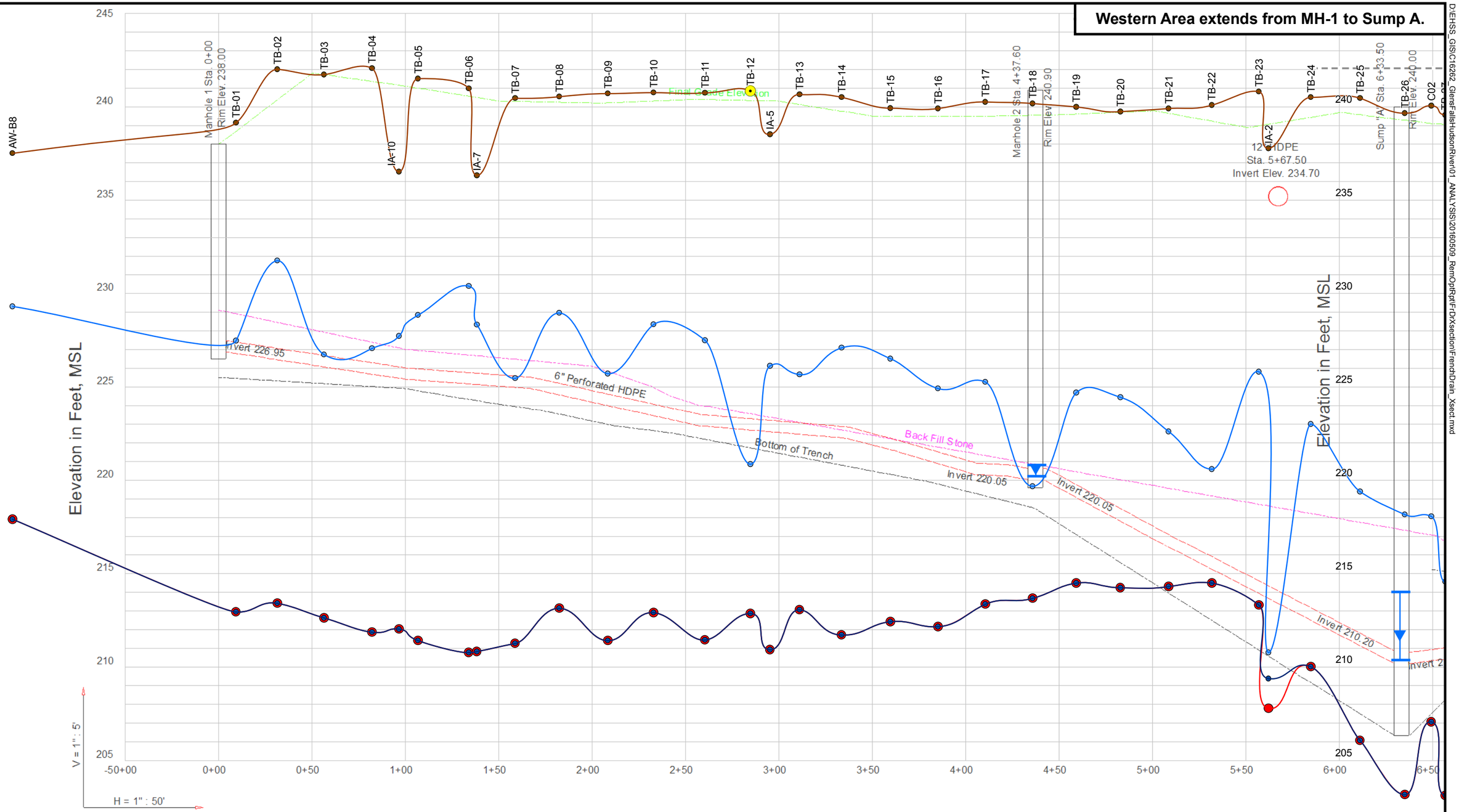
EHS Support

FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

FRENCH DRAIN CROSS SECTION - CENTRAL AREA

FIGURE 3

Western Area extends from MH-1 to Sump A.



Average Groundwater Elevation (With Range Indicator)

Location Where No Lacustrine Clay Encountered

Location Where Bottom of French Drain Trench is Above Top of Lacustrine Clay

Surface Elevation

Top of Clay Elevation

Bottom of Clay Elevation

Top of Bedrock Elevation

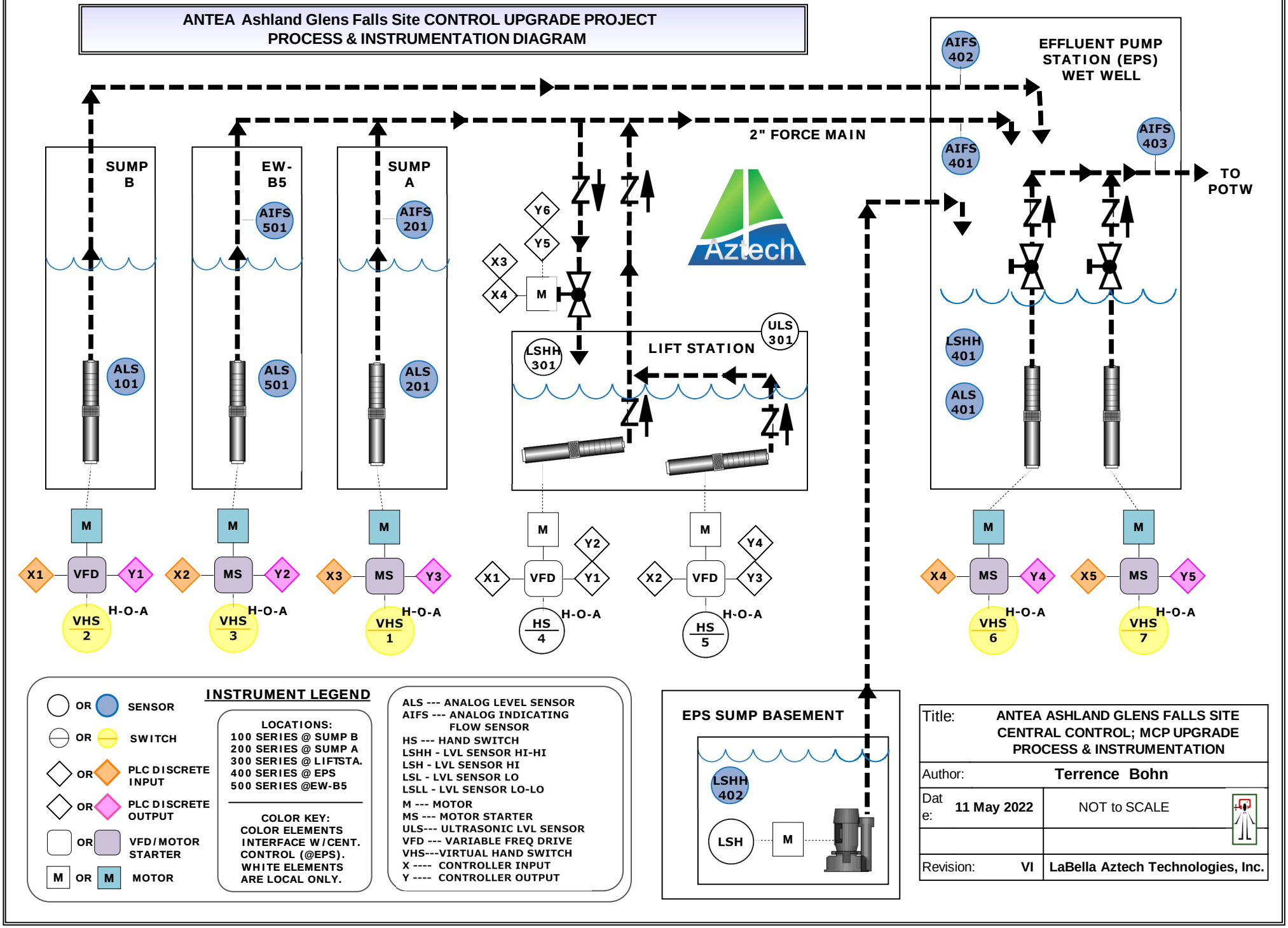
EHS Support	FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	**FRENCH DRAIN CROSS SECTION - WESTERN AREA**	**FIGURE 4**

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Appendix A GWES Piping and Instrumentation Diagrams (P&IDs)

ANTEA Ashland Glens Falls Site CONTROL UPGRADE PROJECT
PROCESS & INSTRUMENTATION DIAGRAM



INSTRUMENT LEGEND

OR SENSOR
OR SWITCH
OR PLC DISCRETE INPUT
OR PLC DISCRETE OUTPUT
OR VFD/MOTOR STARTER
M OR M MOTOR

LOCATIONS:
100 SERIES @ SUMP B
200 SERIES @ SUMP A
300 SERIES @ LIFTSTA.
400 SERIES @ EPS
500 SERIES @EW-B5

COLOR KEY:
COLOR ELEMENTS INTERFACE W/CENT. CONTROL (@EPS).
WHITE ELEMENTS ARE LOCAL ONLY.

ALS --- ANALOG LEVEL SENSOR
AIFS --- ANALOG INDICATING FLOW SENSOR
HS --- HAND SWITCH
LSHH - LVL SENSOR HI-HI
LSH - LVL SENSOR HI
LSL - LVL SENSOR LO
LSLL - LVL SENSOR LO-LO
M --- MOTOR
MS --- MOTOR STARTER
ULS--- ULTRASONIC LVL SENSOR
VFD --- VARIABLE FREQ DRIVE
VHS---VIRTUAL HAND SWITCH
X ---- CONTROLLER INPUT
Y ---- CONTROLLER OUTPUT

Title:	ANTEA ASHLAND GLENS FALLS SITE CENTRAL CONTROL; MCP UPGRADE PROCESS & INSTRUMENTATION	
Author:	Terrence Bohn	
Date:	11 May 2022	NOT to SCALE
Revision:	VI	LaBella Aztech Technologies, Inc.

ANTEA Ashland Glens Falls Site CONTROL UPGRADE PROJECT
NOTES ON CONTROL SYSTEM ARCHITECTURE

CONTROL SYSTEM HISTORY AND STRUCTURE

The former controls in underground vaults each consisted of an OPTO22 PLC (programmable logic controller) monitoring a Warrick 67 with level probes & GF Signet flow meters, and operating the vault well pump. These were designed to report via underground copper cable to a central OPTO module in the EPS. This in turn was monitored by a local PC running a Genesis 32 automation suite with dial-up modem access.

As the underground (direct buried without conduit) copper cable became increasingly unreliable due to faults, damage, age & deterioration, and the associated equipment was also degraded by power surges & lightning, data was often not moved/stored reliably & frequently was lost.

In 2012, Aztech relocated the controls for Sump B into an above-ground control panel, and added a new PLC controller and touch-screen HMI.
In 2013, Aztech installed the temporary lift station, along with a local PLC controller and touch-screen HMI.
In 2016, the system was reconfigured to recover water from Sumps A and B only, but with a new Aztech-designed control system.

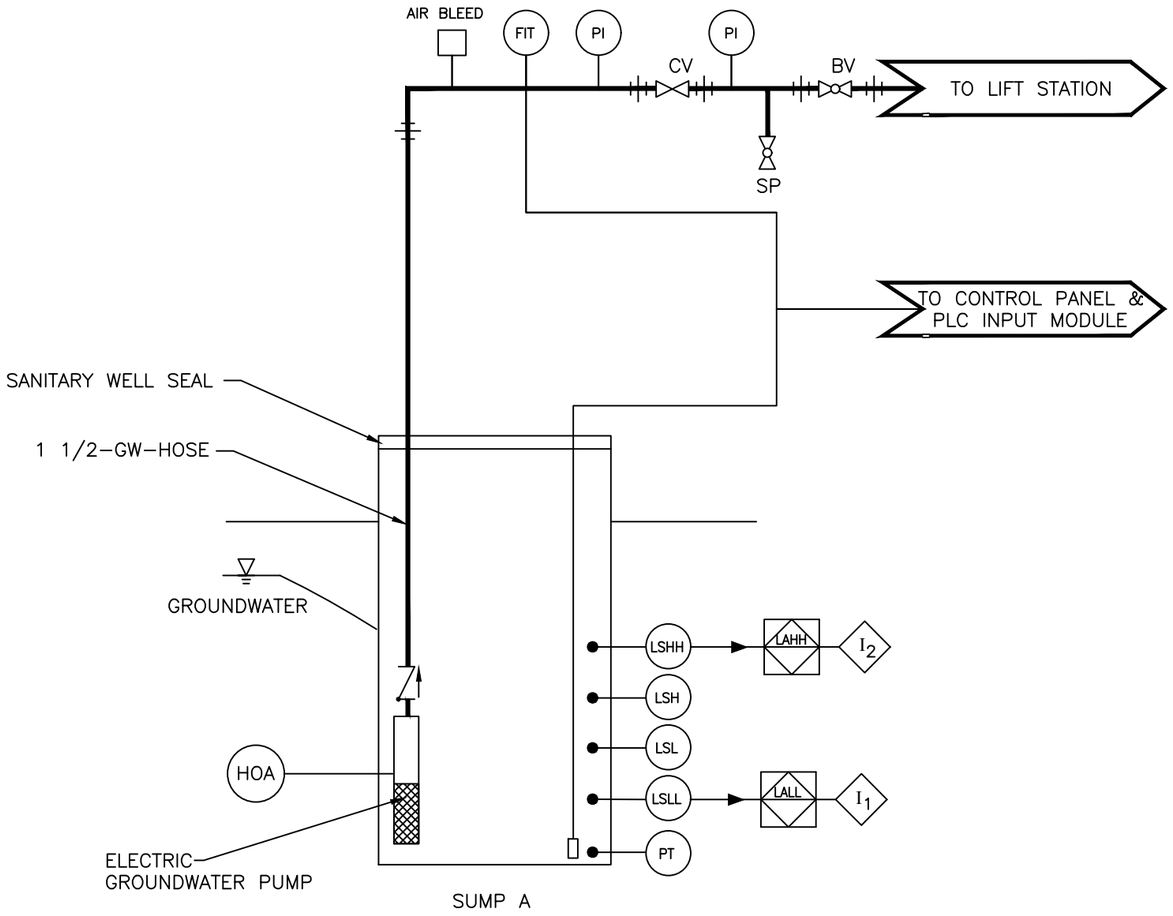
The new system changed the architecture such that PLCs located at Sump A & Sump B would now collect and relay data to a new PLC and HMI touch-screen at the EPS, using 900MHz data radios to move the data which would replace the old underground cable. All control decisions and operation for the Sumps could now be made at the EPS location or remotely.

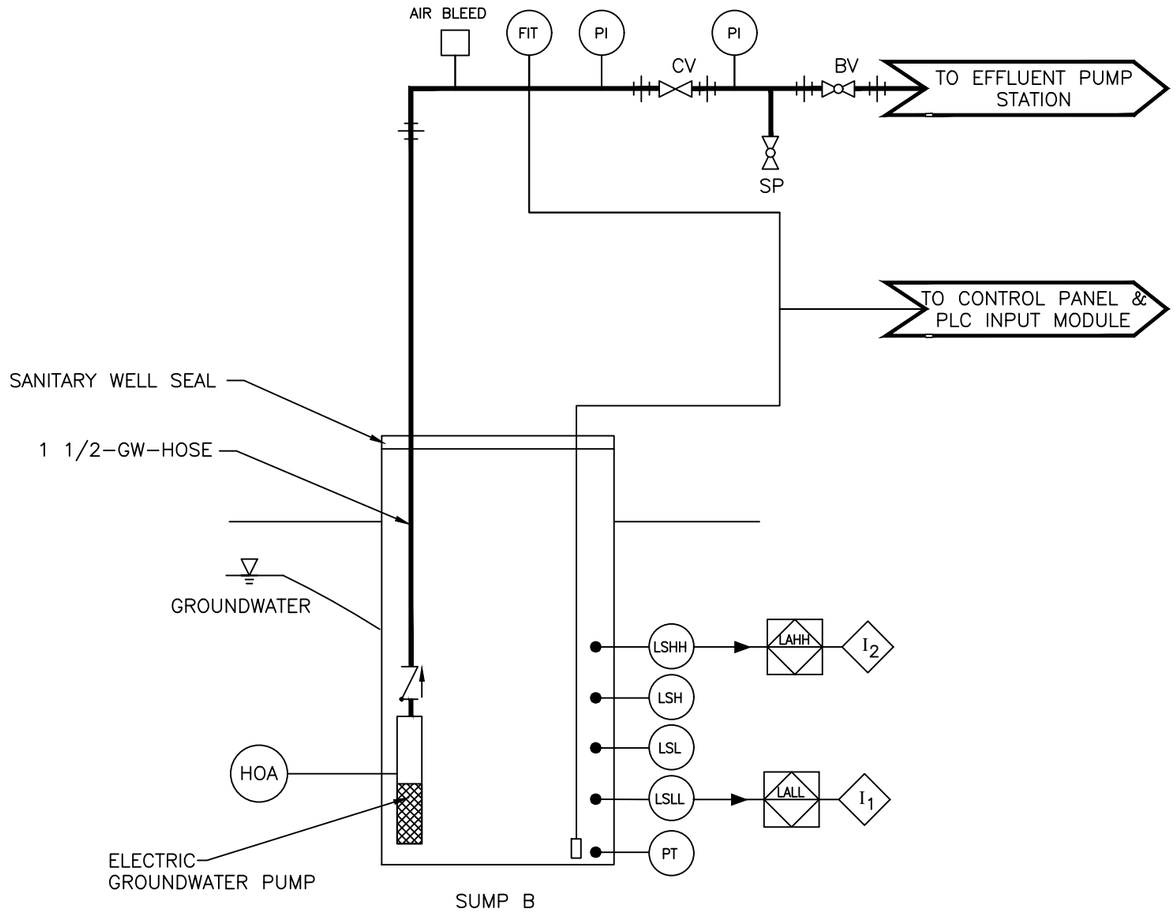
In 2018, the old EPS pump control panel was repurposed to remove local manual pump switches, alarms, and level float switches, adding an analog wetwell level sensor, and also incorporate the EPS wetwell and pumping system within the central control scheme.

In 2018, EW-B5 flow & water level probe data and pump operation were added as additional inputs/outputs to Sump B's PLC. All I/O data is relayed to the EPS, and then EW-B5 was also integrated into central control and the main HMI touch-screen.

In 2021, an analog level sensor was added to EW-B5 to replace the individual probes to allow more precise level measurement and tracking.

Title:	**ANTEA ASHLAND GLENS FALLS SITE CENTRAL CONTROL; NOTES on CONTROL SYSTEM ARCHITECTURE**	
Author:	**Terrence Bohn**	
Date:	**11 May 2022**	NOT to SCALE
Revision:		**LaBella Aztech Technologies, Inc.**





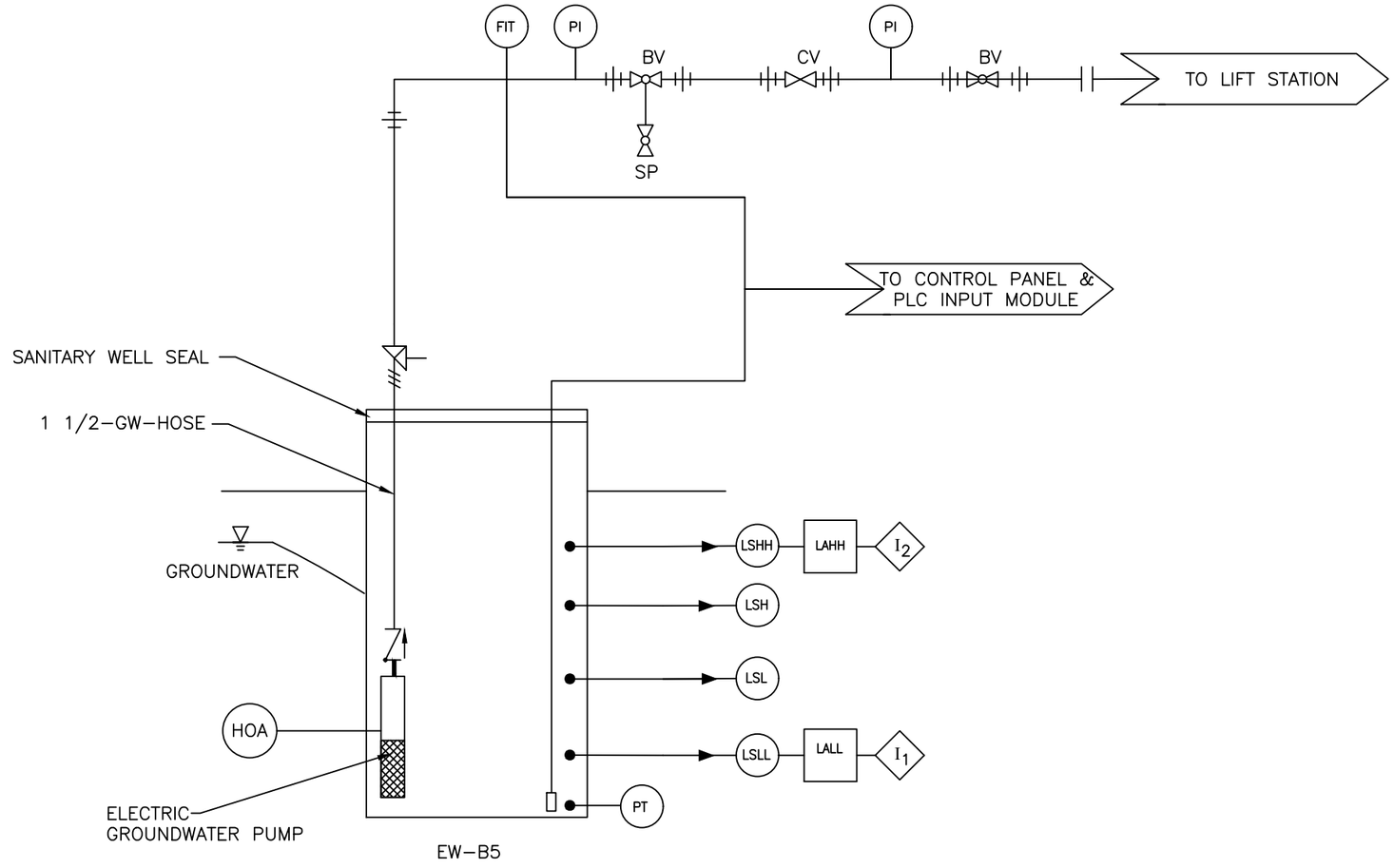
ITEM	DESCRIPTION	TYPE	FUNCTION
LSL & LSHH	LEVEL CONTROL INTERLOCK	115 VAC	PUMP CONTROL INTERLOCK/ALARM
FT/FI	FLOW TRANSMITTER	PADDLE WHEEL / 4-20 MA	WELL FLOW MEASUREMENT
AI	ANALOG INPUT	4-20 MA	FLOW MEASURE WELL LEVEL
DI	DIGITAL IMPUT	115 VAC	HI, LO, PUMP RUNNING
PUMP	PUMP / MOTOR STARTER	240 VAC	WELL PUMP
PI	PRESSURE INDICATOR	0-120 PSI	LINE PRESSURE
PT	PRESSURE TRANSMITTER	115 VAC	WELL LEVEL SENSING / ALARM

PIPING & INSTRUMENTATION DIAGRAM

FORMER CIBA-GEIGY/HERCULES SITE
QUEENSBURY, NEW YORK

PROJECT NO.	PREPARED BY	DRAWN BY	
GLENS FALLS	KA	LKO/JLH	
DATE	REVIEWED BY	FILE NAME	
5/05/2022	KA	5-2022 PID.DWG	

anteagroup



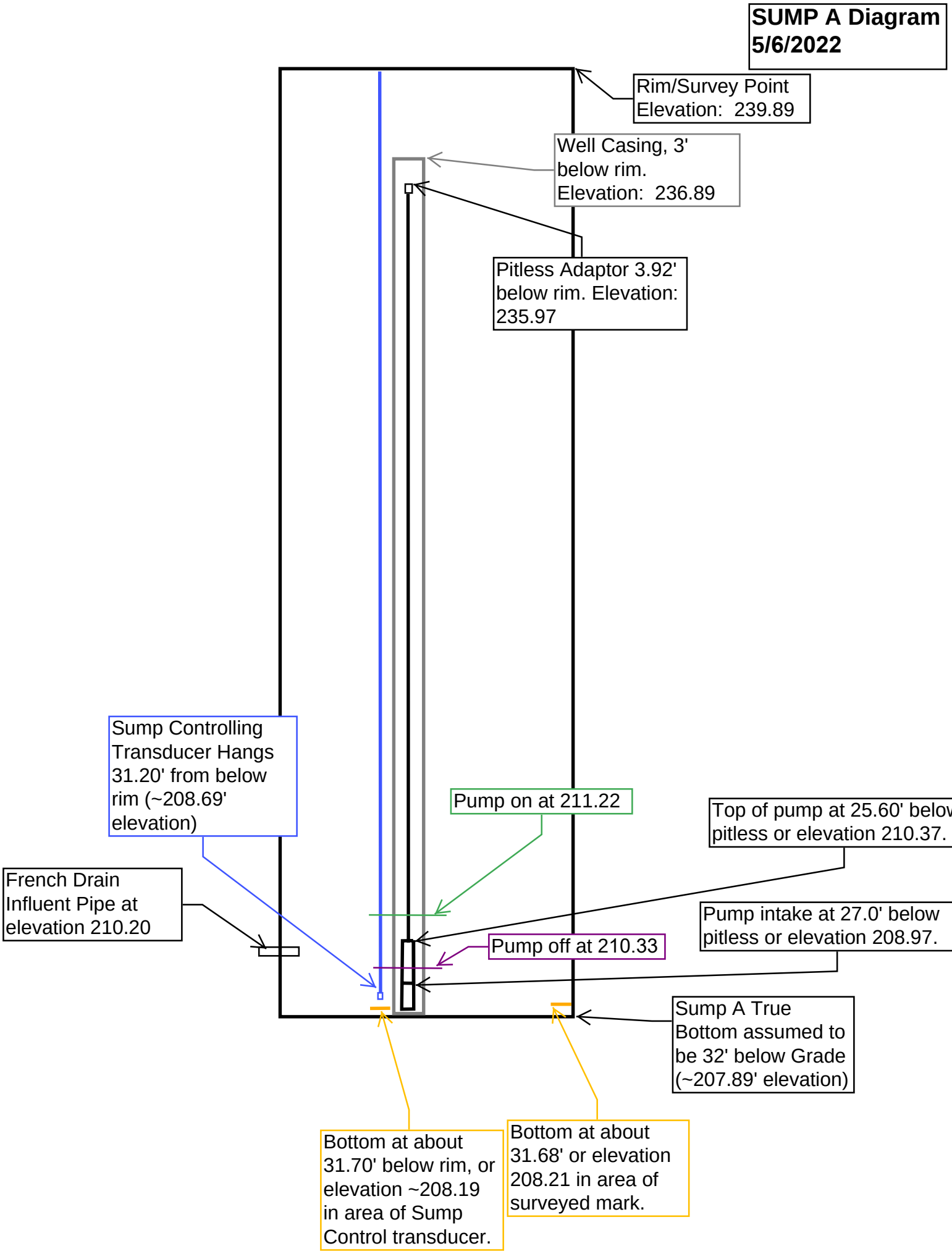
ITEM	DESCRIPTION	TYPE	FUNCTION
PT	PRESSURE TRANSDUCER	115 VAC	WELL LEVEL SENSING/ALARM
FT/FI	FLOW TRANSMITTER	PADDLE WHEEL/4-20 MA	WELL FLOW MEASUREMENT
AI	ANALOG INPUT	4-20 MA	FLOW MEASURE WELL LEVEL
DI	DIGITAL INPUT	115 VAC	HI, LO, PUMP RUNNING
PUMP	PUMP/MOTOR STARTER	240 VAC	WELL PUMP
PI	PRESSURE INDICATOR	0-120 PSI	LINE PRESSURE
LSL &LSHH	LEVEL CONTROL INTERLOCK	115 VAC	PUMP CONTROL INTERLOCK/ALARM

PIPING & INSTRUMENTATION DIAGRAM

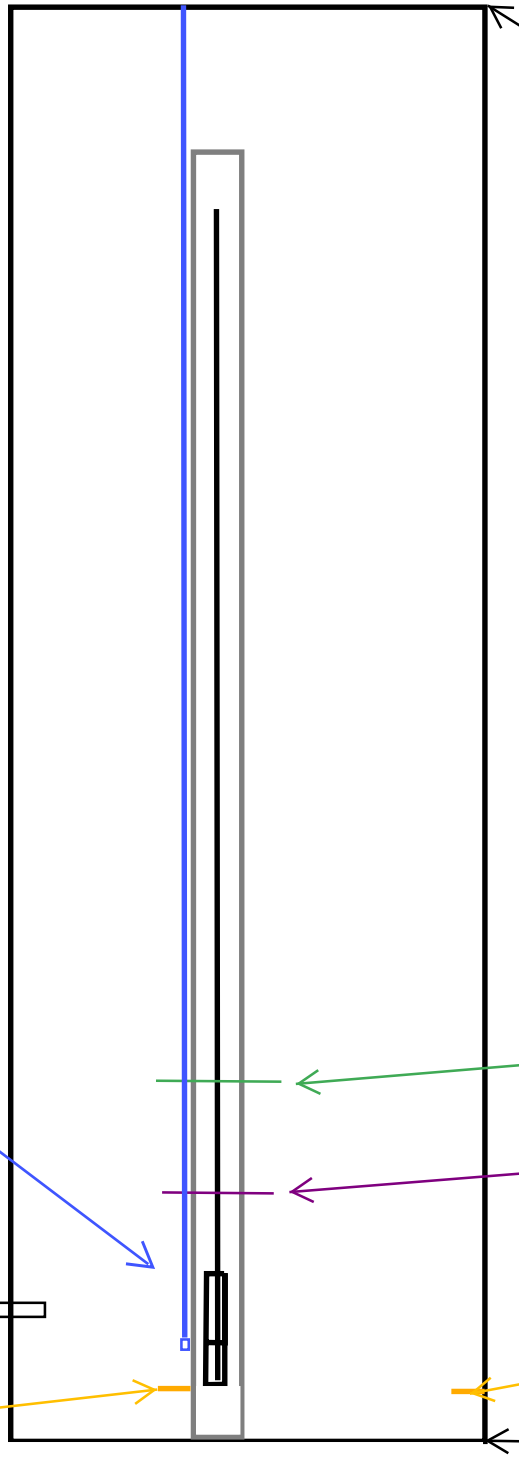
FORMER CIBA-GEIGY/HERCULES SITE
QUEENSBURY, NEW YORK

PROJECT NO.	PREPARED BY	DRAWN BY
GLENS FALLS	KA	LKO/JLH
DATE	REVIEWED BY	FILE NAME
5/05/2022	KA	EW-B5 PID.DWG

anteagroup


SUMP A Diagram
5/6/2022
Rim/Survey Point
Elevation: 239.89
Well Casing, 3'
below rim.
Elevation: 236.89
Pitless Adaptor 3.92'
below rim. Elevation:
235.97
Sump Controlling
Transducer Hangs
31.20' from below
rim (~208.69'
elevation)
Pump on at 211.22
Top of pump at 25.60' below
pitless or elevation 210.37.
French Drain
Influent Pipe at
elevation 210.20
Pump intake at 27.0' below
pitless or elevation 208.97.
Pump off at 210.33
Sump A True
Bottom assumed to
be 32' below Grade
(~207.89' elevation)
Bottom at about
31.70' below rim, or
elevation ~208.19
in area of Sump
Control transducer.
Bottom at about
31.68' or elevation
208.21 in area of
surveyed mark.

SUMP B Diagram
5/06/2022



Rim/Survey Point Elevation: 236.39

Sump Controlling Transducer Hangs 28.50' from below rim (~207.89' elevation)

Pump on at 214.00

Pump off at 211.50

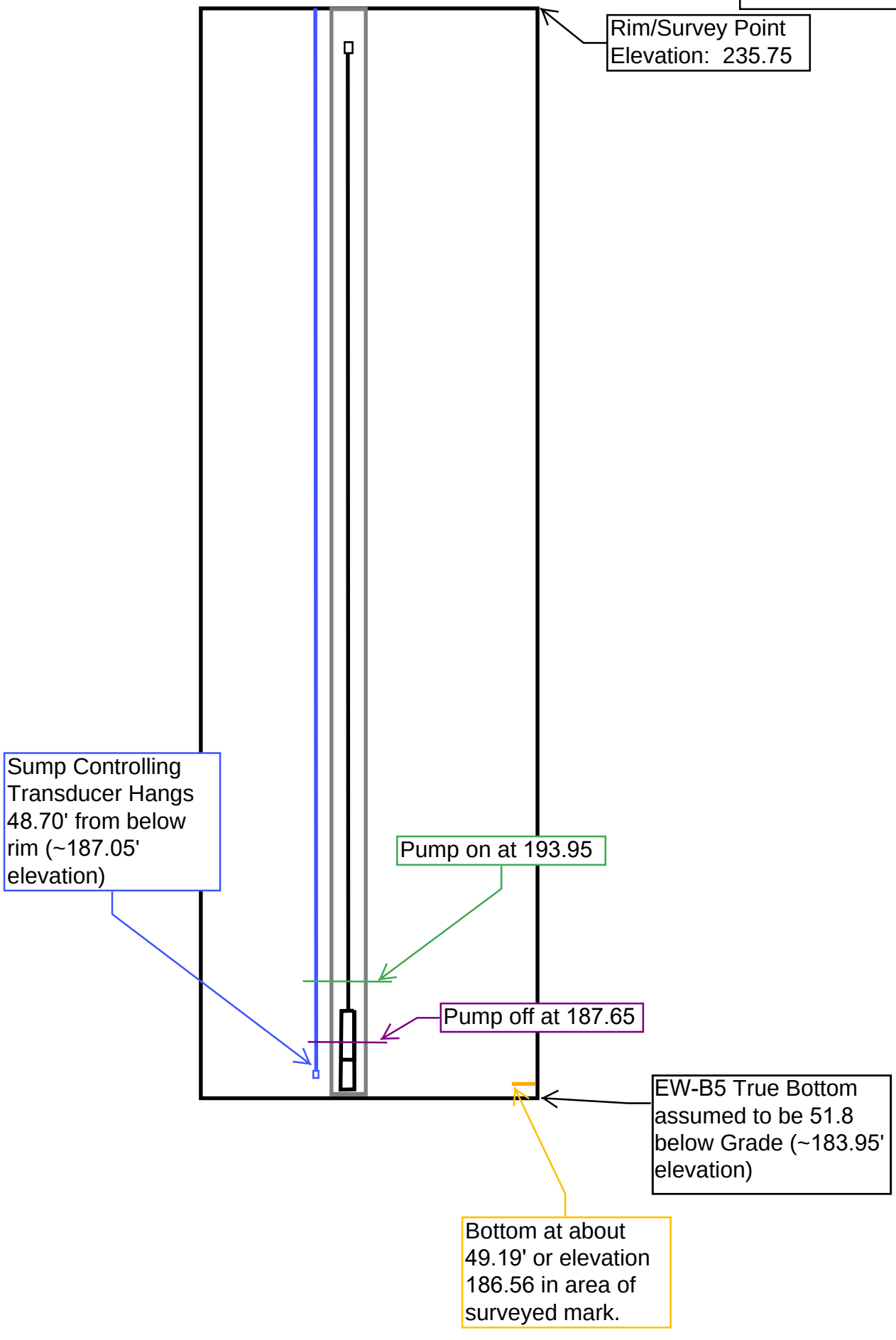
French Drain Influent Pipe at elevation 209.20

Bottom at about 28.91' or elevation 207.41 in area of survey mark.

Bottom at about 28.85' below rim, or elevation ~207.54 in area of Sump Control transducer.

Sump B True Bottom assumed to be 30' below Grade (~206.39' elevation)

EW-B5 Diagram
5/06/2022



Appendix B City of Glens Falls, Water and Sewer Board Industrial User Permit 002F - April 2022 to April 2027

City of Glens Falls Water & Sewer Board of Commissioners

2 Shermantown Road
Glens Falls, NY 12801
Telephone: (518) 761-3850
Fax: (518) 761-3862

March 15, 2022

Ashland LLC
Atrium II – North Tower – Suite 500
5475 Rings Road,
Dublin, OH 43017
Attn: James E. Vondracek

Enclosed is an updated copy of your industrial permit.

No changes were made to the permit.

Please feel free to contact me with any questions you may have on this change.

Sincerely,

Christopher S. Miller, Chief Operator,
City of Glens Falls Waste Water Treatment Plant

City of Glens Falls Water and Sewer Board of Commissioners

2 Shermantown Road
Glens Falls, NY 12801
Telephone: (518) 761-3850
Fax: (518) 761-3862

Permit No. 002G

INDUSTRIAL USER PERMIT

In accordance with the provisions of Chapter 177 of the Code of the City of Glens Falls

Hercules LLC, a wholly owned subsidiary of Ashland LLC.
5200 Blazer Parkway
Dublin, Ohio 43017

and

BASF Corporation
227 Oak Ridge Parkway
Toms River, NJ 08754-0071

Are hereby authorized to discharge industrial wastewater from the above identified facility and through the outfall identified herein into the City of Glens Falls sewer system in accordance with the conditions set forth in this permit. Compliance with this permit does not relieve the permittee of its obligation to comply with any or all applicable pretreatment regulations, standards or requirements under local, State, and Federal laws, including any such regulations, standards, requirements, or laws that may become effective during the term of this permit.

Noncompliance with any term or condition of this permit shall constitute a violation of Chapter 177 of the Code of the City of Glens Falls.

This permit shall become effective on April 24, 2022 and shall expire at midnight on April 20, 2027.
If the permittee wishes to continue to discharge after the expiration date of this permit, an application must be filed for a renewal permit in accordance with the requirements of Chapter 177 of the Code of the City of Glens Falls, a minimum of 180 days prior to the expiration date.

CITY OF GLENS FALLS

By: 

Christopher S. Miller
Pretreatment Coordinator

Issued this 15st day of March, 2022

PART 1 - EFFLUENT LIMITATIONS

A. During the period of April 24, 2017 through midnight April 20, 2022, the permittees is authorized to discharge process wastewater to the City of Glens Falls sewer system from the outfalls listed below.

Description of outfalls:

Outfall	Descriptions
001	The flow from manhole number 5 located at the Glens Falls WWTP to a dedicated conveyance channel where metering and sampling takes place prior to combining with GFWWTP primary effluent. Said discharge is conveyed by a dedicated pipeline from the permittee's effluent pumping station located on Lower Warren Street

B. During the period commencing April 24, 2022, through midnight April 20, 2027, the discharge from the process wastewater shall not exceed the following effluent limitations Effluent at this location consists of the discharge from the permittees' effluent pumping station treating groundwater from the Lower Warren Street site that was formerly used by Hercules, Inc and Ciba-Geigy Inc. for the manufacture of dyes and related chemicals.

EFFLUENT LIMITATIONS

Parameter	Instantaneous Maximum (mg/l)	Quarterly Average (mg/l unless otherwise noted)
Antimony	10	--
Ammonia	40	--
Arsenic	0 25	--
Benzene	0 1	--
Boron	5.0	--
Cadmium	0 25	--
Calcium	500	--
Chloroform	1 0	--
Chromium, total	see note below *	3.1 lb/day
Copper	1.0	--
Cyanide, total	3 0	--
Ethylbenzene	0 1	--
Iron	50	--
Lead	0.8**	--
Manganese	5.0	--
Mercury	0.025***	0.005
Methylene Chloride	1.0	--
Naphthalene	1.0	--
Nickel	2.3	--
Oil & Grease	50	--
pH	6.0-9.0 SU	--
Phenols	5.0	--
Silver	0 2	--
Toluene	0 1	--
1,1,1 - Trichloroethane	1 0	--
Xylene	0.1	--
Zinc	1.5	--
Flow (gallons per day)	350,000	175,000

*The discharge for total chromium is 3.1 lb/day and will be based on the average of chromium sampling data and the quarterly average flow. This limit is based on mass balance calculations as well as the 1999 Wastewater Headworks Analysis Report.

**0 8 mg/l Lead recommended as a local limit in the 1999 Wastewater Headworks Analysis Report.

***Variance for Mercury granted by the Water and Sewer Board at the public hearing held June 24, 1991.

C. All discharges shall comply with all other applicable laws, regulations, standards, and requirements contained in Chapter 177 of the Code of the City of Glens Falls and any applicable State and Federal pretreatment laws, regulations, standards, and requirements including any such laws, regulations, standards, or requirements that may become effective during the term of this permit.

PART 2 - MONITORING REQUIREMENTS

A. From the period beginning on the effective date of the permit until the expiration date, the permittee shall monitor outfall 001 for the following parameters, at the indicated frequency.

Sample Parameter (units)	Sample Location	Frequency	Sample Type
Flow (gpd)	See note 2	Continuous	Meter
BOD (mg/l)	See note 1,3	1/Year	Grab
TSS (mg/1)	See note 1,3	1/Year	Grab
Ammonia (mg/1)	See note 1,3	1/Year	Grab
Antimony (mg/l)	See note 1,3	1/Year	Grab
Arsenic (mg/1)	See note 1,3	1/Year	Grab
Benzene (mg/l)	See note 1,4	1/Year	Grab
Boron (mg/l)	See note 1,3	1/Year	Grab
Cadmium (mg/1)	See note 1,3	1/Year	Grab
Calcium (mg/l)	See note 1,3	1/Year	Grab
Chloroform (mg/l)	See note 1,4	1/Year	Grab
Chromium (mg/1)	See note 1,3	Quarterly	Grab
Copper (mg/1)	See note 1,3	1/Year	Grab
Cyanide (mg/1)	See note 1,3	Quarterly	Grab
Ethylbenzene (mg/l)	See note 1,4	1/Year	Grab
Iron (mg/l)	See note 1,3	1/Year	Grab
Lead (mg/1)	See note 1,3	Quarterly	Grab
Manganese (mg/l)	See note 1,3	1/Year	Grab
Mercury (mg/1)	See note 1,3	Quarterly	Grab
Methylene Chloride (mg/l)	See note 1,4	1/Year	Grab
Naphthalene	See note 1,3	1/Year	Grab
Nickel (mg/1)	See note 1,3	1/Year	Grab

Sample Parameter (units)	Sample Location	Frequency	Sample Type
Zinc (mg/l)	See note 1,3	1/Year	Grab
Trichlorophenol (mg/l)	See note 1,4	1/Year	Grab
Pentachlorophenol (mg/l)	See note 1,4	1/Year	Grab
Oil and Grease (mg/l)	See note 1,4	1/Year	Grab
Phenols, Total (mg/l)	See note 1,3	Quarterly	Grab
pH	See note 5	Continuous	Meter
Silver (mg/l)	See note 1,3	1/Year	Grab
Toluene (mg/l)	See note 1,4	1/Year	Grab
1,1,1-Trichloroethane	See note 1,4	1/Year	Grab
Xylene (mg/l)	See note 1,4	1/Year	Grab

Notes

1 Composite sampler is located at the Southern end of the Preliminary Treatment Building at the WWTP

2 Daily flows are to be recorded from the permittee's flow meter at the Southern end of the Preliminary Treatment Building at the WWTP

3 Composite samples shall be taken at the frequency specified above and tested by a State certified laboratory. Permittee's samples shall be 24 hour time composites except as noted above.;

4. Grab samples shall be taken from the effluent wet well at the Southern end of the Preliminary Treatment Building at the WWTP at the frequency specified above and tested by a State certified laboratory

5. pH shall be monitored at the Southern end of the Preliminary Treatment Building at the WWTP.

B. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 CFR Part 136 and amendments thereto unless specified otherwise in the monitoring conditions of this permit

PART 3 - REPORTING REQUIREMENTS

A Monitoring Reports

Monitoring results obtained shall be summarized and reported on an Industrial User Monitoring Report Form once per quarter. The reports are due on the 28th day of the following month. The report shall indicate the nature and concentration of all pollutants in the effluent for which sampling and analyses were performed including measured maximum and average daily flows.

B If the permittee monitors any pollutant more frequently than required by this permit, using test procedures prescribed in 40 CFR Part 136 or amendments thereto, or otherwise approved by EPA or as specified in this permit, the results of such monitoring shall be included in any calculations of actual daily maximum or monthly average pollutant discharge and results shall be reported in the monthly report submitted to the City of Glens Falls. Such increased monitoring frequency shall also be indicated in the monthly report.

C. Automatic Resampling

If the results of the permittee's wastewater analysis indicate that a violation of this permit has occurred, the permittee must:

1. Inform the City of Glens Falls of the violation within 24 hours; and

2 Repeat the sampling and pollutant analysis and submit, in writing, the results of this second analysis within 30 days of the first violation

D Accidental Discharge Report

1 The permittee shall notify the City of Glens Falls immediately upon the occurrence of an accidental discharge of substances prohibited by Chapter 177 of the Code of the City of Glens Falls or any slug loads or spills that may enter the public sewer. The City of Glens Falls should be notified by telephone at (518) 761-3850 The notification shall include location of discharge, date and time thereof, type of waste, including concentration and volume, and corrective actions taken. The permittee's notification of accidental releases in accordance with this section does not relieve it of other reporting requirements that arise under local, State, or Federal laws.

Within five days following an accidental discharge, the permittee shall submit to the City of Glens Falls a detailed written report The report shall specify.

a Description and cause of the upset, slug load or accidental discharge, the cause thereof, and the impact on the permittee's compliance status. The description should also include location of discharge, type, concentration and volume of waste.

b Duration of noncompliance, including exact dates and times of noncompliance and, if the noncompliance is continuing, the time by which compliance is reasonably expected to occur

c. All steps taken or to be taken to reduce, eliminate, and/or prevent recurrence of such an upset, slug load, accidental discharge, or other conditions of noncompliance.

E All reports required by this permit shall be submitted to the City of Glens Falls at the following address:

City of Glens Falls
Attn · Pretreatment Coordinator
2 Shermantown Rd.
Glens Falls, NY 12801

PART 4 - SPECIAL CONDITIONS

SECTION 1 - ADDITIONAL/SPECIAL MONITORING REQUIREMENTS

A No Special Monitoring Requirements are applicable at this time

SECTION 2 - REOPENER CLAUSE

A This permit may be reopened and modified to incorporate any new or revised requirements contained in a National Categorical Pretreatment Standard

B. This permit may be reopened and modified to incorporate any new or revised requirements resulting from the City of Glens Falls' reevaluation of its local limits.

C. This permit may be reopened and modified to incorporate any new or revised requirements developed by the City of Glens Falls as are necessary to ensure POTW compliance with any and all regulatory standards.

PART 5 - STANDARD CONDITIONS

SECTION A. GENERAL CONDITIONS AND DEFINITIONS

1 Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

2. Duty to comply

The permittee must comply with all conditions of this permit Failure to comply with the requirements of this permit may be grounds for administrative action, or enforcement proceedings including civil or criminal penalties, injunctive relief, and summary abatements

3 Duty to mitigate

The permittee shall take all reasonable steps to minimize or correct any adverse impact to the public treatment plant or the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4 Permit Modification

This permit may be modified for good causes including, but not limited to, the following:

a. To incorporate any new or revised Federal, State, or local pretreatment standards or requirements.

b. Material or substantial alterations or additions to the discharger's operation processes, or discharge volume or character which were not considered in drafting the effective permit.

c A change in any condition in either the industrial user or the POTW that requires either a temporary or permanent reduction or elimination of the authorized discharge.

d Information indicating that the permitted discharge poses a threat to the Control Authority's collection and treatment systems, POTW personnel or the receiving waters.

e. Violation of any terms or conditions of the permit

f. Misrepresentation or failure to disclose fully all relevant facts in the permit application or in any required reporting.

g Revision of or a grant of variance from such categorical standards pursuant to 40 CFR 403.13.

h To correct typographical or other errors in the permit.

i To reflect transfer of the facility ownership and/or operation to a new/operator

j Upon request of the permittee, provided such request does not create a violation of any applicable requirements, standards, laws, or rules and regulations.

The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

5. Permit Termination

This permit may be terminated for the following reasons:

a. Falsifying self-monitoring reports

b. Tampering with monitoring equipment

c Refusing to allow timely access to the facility premises and records

d. Failure to meet effluent limitations

e. Failure to pay fines

f. Failure to pay sewer charges

g. Failure to meet compliance schedules

6 Permit Appeals

The permittee may petition to appeal the terms of this permit within thirty (30) days of the notice

The petition must be in writing; failure to submit a petition for review shall be deemed to be a waiver of the appeal In its petition, the permittee must indicate the permit provisions objected to, the reasons for this objection, and the alternative condition, if any, it seeks to be placed in the permit

7 Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any violation of Federal, State, or local laws or regulations

8 Limitation on Permit Transfer

Permits may be reassigned or transferred to a new owner and/or operator with prior approval of the City of Glens Falls·

a The permittee must give at least thirty (30) days advance notice to the City of Glens Falls

b. The notice must include a written certification by the new owner which.

(i) States that the new owner has no immediate intent to change the facility's operations and processes

(ii) Identifies the specific date on which the transfer is to occur

(iii) Acknowledges full responsibility for complying with the existing permit

9 Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit an application for a new permit at least 180 days before the expiration date of this permit.

10 Continuation of Expired Permits

An expired permit will continue to be effective and enforceable until the permit is reissued if:

a) The permittee has submitted a complete permit application at least 180 days prior to the expiration date of the user's existing permit

b) The failure to reissue the permit, prior to expiration of the previous permit, is not due to any act or failure to act on the part of the permittee.

11 Dilution

The permittee shall not increase the use of potable or process water or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit.

12. Definitions

a) Daily Maximum – The maximum allowable discharge of pollutant during a calendar day Where daily maximum limitations are expressed in units of mass, the daily discharge is the total mass discharged over the course of the day. Where daily maximum limitations are expressed in terms of a concentration, the daily discharge is the arithmetic average measurement of the pollutant concentration derived from all measurements taken that day

b) Composite Sample – A sample that is collected over time, formed either by continuous sampling or by mixing discrete samples The sample may be composited either as a time composite sample composed of discrete sample aliquots collected in one container at constant time intervals providing representative samples irrespective of stream flow, or as a flow proportional composite sample: collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increases while maintaining a constant time interval between the aliquots.

c) Grab Sample – An individual sample collected in less than 15 minutes, without regard for flow or time.

d) Instantaneous Maximum Concentration – The maximum concentration allowed in any single grab sample.

e) Cooling Water –

(1) Uncontaminated: Water used for cooling purposes only which has no direct contact with any raw material, intermediate, or final product and which does not contain a level of contaminants detectably higher than that of the intake water

(2) Contaminated: Water used for cooling purposes only which may become contaminated either through the use of water treatment chemicals used for corrosion inhibitors or biocides, or by direct contact with process materials and/or wastewater.

f) Monthly Average – The arithmetic mean of the values for effluent samples collected during a calendar month.

g) Weekly Average – The arithmetic mean of the values for effluent samples collected over a period of seven consecutive days.

h) Bi-Weekly – Once every other week.

i) Bi- Monthly – Once every other month

j) Quarterly – The arithmetic mean of the values for effluent samples collected during a calendar quarter

k) Upset – Means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee, excluding such factors as operational error, improperly designed or inadequate treatment facilities, or improper operation and maintenance or lack thereof

l) Bypass – Means the intentional diversion of wastes from any portion of a treatment facility

13. General Prohibitive Standards

The permittee shall comply with all the general prohibitive discharge standards in Chapter 177 of the Code of the City of Glens Falls. No user shall contribute or cause to be contributed, directly or indirectly, any pollutant, wastewater, or other material which will inhibit or interfere with the operation or performance of the POTW or the use or disposal of the sludge generated by the POTW or pass through the POTW without adequate treatment in violation of any applicable federal, state, or local environmental regulation into the receiving waters of the Hudson River or into the sludge by-product of the POTW. These general prohibitions apply to all such users of a POTW, whether or not the user is subject to National Categorical Pretreatment Standards or any other national, state, or local pretreatment standards or requirements Namely, the industrial user shall not discharge wastewater to the sewer system:

a) Containing any liquid, solid, or gas which, by reason of its nature or quantity, is sufficient, either alone or by interaction with other substances, to cause fire or explosion or be injurious in any way to the POTW or to the operation of the POTW. At no time shall two successive readings on an explosion-hazard meter at the point of discharge in the system or at any point in the system, be more than 5% nor any single reading over 10% of the lower explosive limits (LEL) of the meter. Materials prohibited under this subsection include but are not limited to substance(s) which the Board, the DEC or the EPA has notified a user poses a fire or explosion hazard to the POTW;

b) Containing solid or viscous substances which may cause obstruction to the flow in a sewer or other interference with the operation of the wastewater treatment facilities, such as but not limited to grease, oil or fat in concentrations exceeding 100 parts per million by weight, garbage with particles greater than ½ inch in any dimension, animal guts or tissues, paunch manure, bones, hair, hides or fleshings, entrails, whole blood, feathers, ashes, cinders, sand, spent lime, stone or marble dust, metal, glass, straw, shavings, grass clippings, rags, spent grains, spent hops, wastepaper, wood, plastics, gas, tar, asphalt residues, residues from refining or processing of fuel or lubricating oil, mud or glass grindings or polishing wastes,

c) Having a pH less than six point zero (6.0) or higher than nine point zero (9 0) or having any other corrosive property capable of causing damage or hazard to structures, equipment or personnel of the POTW;

d) Containing any toxic pollutants in sufficient quantity, either singly or by interaction with other pollutants, so as to potentially inhibit or interfere with the operation or performance of the POTW, constitute a hazard to humans or animals, create a toxic effect in the receiving waters of the POTW or exceed a limitation set forth in a National Categorical Pretreatment Standard A "toxic pollutant" shall include but not be limited to any pollutant identified pursuant to Section 307 (a) of the Federal Act.

e) Containing any wastes which either singly or by interaction with other wastes, are sufficient to create a public nuisance or hazard to life or are sufficient to prevent entry into the sewer for its maintenance and repair.

f) Containing any substance which may cause the POTW's effluent or any other product of the POTW, such as residues, sludges or scums, to be unsuitable for reclamation and reuse or to interfere with the reclamation process. In no case shall a substance discharged to the POTW cause the POTW to be in noncompliance with the sludge use or disposal criteria, guidelines or regulations developed under Section 405 of the Act, any criteria, guidelines or regulations affecting sludge use or disposal developed pursuant to the Solid Waste Disposal Act, the Clean Air Act or the Toxic Substances Control Act; or state criteria applicable to the sludge management method being used.

g) Containing any substance which may cause the POTW to violate its State Pollution Discharge Pollution Discharge Elimination System Permit or receiving water quality standard

h) Containing any objectionable color not removed in the treatment process, such as but not limited to dye wastes and vegetable tanning solutions.

i) Having a temperature which may inhibit biological activity in the POTW treatment plant resulting in interference, but in no case wastewater with a temperature at the introduction into the POTW which exceeds forty degrees centigrade (40 degrees C.) [one hundred four degrees Fahrenheit (104 degrees F)]

j) Containing any pollutants, including oxygen-demanding pollutants (BOD, etc.), released at a flow rate and/or pollutant concentration which will cause interference to the POTW In no case shall a slug load have a flow rate or contain concentrations or qualities of pollutants that exceed, for any time period longer than fifteen (15) minutes, more than five (5) times the average twenty-four hour concentration quantities or flow during normal operation

k) Containing any radioactive waste or isotopes of such half-life or concentration as may exceed limits established by the Board in compliance with applicable state or federal regulations or limits set forth in any applicable federal, state, or local pollutant discharge regulation

l) Containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant.

m) Containing any substance which exceeds a national categorical pretreatment standard promulgated by the EPA or any other applicable federal, state or local pollutant discharge regulation

n) Containing any medical or infectious wastes,

o) Containing any gasoline, benzene, naptha, fuel oil or other flammable or explosive liquids, solids or gases, and in no case pollutants with a closed cup flashpoint of less than one hundred forty (140) degrees Fahrenheit (60 degrees C), or pollutants which cause an exceedance of 10 percent of the Lower Explosive Limit (LEL) at any point within the POTW

14 Compliance with Applicable Pretreatment Standards and Requirements

Compliance with this permit does not relieve the permittee from its obligations regarding compliance with any and all applicable local, State and Federal pretreatment standards and requirements including any such standards or requirements that may become effective during the term of this permit.

SECTION B OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes but is not limited to. effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

Upon reduction of efficiency of operation, or loss or failure of all or part of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control its production or discharges (or both) until operation of the treatment facility is restored or an alternative method of treatment is provided This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3 Bypass of Treatment Facilities

a) Bypass is prohibited unless it is unavoidable to prevent loss of life, personal injury, or severe property damage or no feasible alternatives exist.

b) The permittee may allow bypass to occur which does not cause effluent limitations to be exceeded, but only if it is also for essential maintenance to assure efficient operation

c) Notification of bypass·

(1) Anticipated bypass If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, at least ten days before the date of the bypass, to the City of Glens Falls

(2) Unanticipated bypass The permittee shall immediately notify the City of Glens Falls and submit a written notice to the POTW within 5 days This report shall specify·

(i) A description of the bypass, and its cause, including its duration;

(ii) Whether the bypass has been corrected, and

(iii) The steps being taken or to be taken to reduce, eliminate and prevent a reoccurrence of the bypass

4. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in accordance with section 405 of the Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act or in accordance with the latest appropriate State and/or Federal requirements.

SECTION C. MONITORING AND RECORDS

1 Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water or substance. All equipment used for sampling and analysis must be routinely calibrated, inspected and maintained to ensure their accuracy Monitoring points shall not be changed without notification to and the approval of the City of Glens Falls.

2. Flow Measurements

If flow measurement is required by this permit, the appropriate flow measurement devices and methods consistent with approved scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Analytical Methods to Demonstrate Continued Compliance

All sampling and analysis required by this permit shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto, otherwise approved by EPA, or as specified in this permit.

4. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures identified in Section C.3, the results of this monitoring shall be included in the permittee's self-monitoring reports.

5 Inspection and Entry

The permittee shall allow the City of Glens Falls, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit,

b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit,

c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit;

d) Sample or monitor, for the purposes of assuring permit compliance, any substances or parameters at any location, and

e) Inspect any production, manufacturing, fabricating, or storage are where pollutants, regulated under the permit, could originate, be stored, or be discharged to the sewer system

6 Retention of Records

a) The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurements, report or application

This period may be extended by request of the City of Glens Falls at any time

b) All records that pertain to matters that are the subject of special orders or any other enforcement or litigation activities brought by the City of Glens Falls shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

7 Record Contents

Records of sampling and analyses shall include·

a) The date, exact place, time, and methods of sampling or measurements, and sample preservation techniques or procedures,

b) Who performed the sampling or measurements;

c) The date(s) analyses were performed,

d) Who performed the analyses;

e) The analytical techniques or methods used; and

f) The results of such analyses

8 Falsifying Information

Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, is a crime and may result in the imposition of criminal sanctions and/or civil penalties.

SECTION D. ADDITIONAL REPORTING REQUIRMENTS

1. Planned Changes

The permittee shall give notice to the City of Glens Falls 90 days prior to any facility expansion, production increase, or process modifications which results in new or substantially increased discharges or a change in the nature of the discharge.

2 Anticipated Noncompliance

The permittee shall give advance notice to the City of Glens Falls of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements

3. Automatic Resampling

If the results of the permittee's wastewater analysis indicates a violation has occurred, the permittee must notify the City of Glens Falls within 24 hours of becoming aware of the violation and repeat the sampling and pollutant analysis and submit, in writing, the results of this repeat analysis within 30 days after becoming aware of the violation.

4 Duty to Provide Information

The permittee shall furnish to the City of Glens Falls within 10 days any information which the City of Glens Falls may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also, upon request, furnish to the City of Glens Falls within 10 days copies of any records required to be kept by this permit

5. Signatory Requirements

All applications, reports, or information submitted to the City of Glens Falls must contain the following certification statement and be signed as required in Sections (a), (b), (c) or (d) below.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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."

a) By a responsible corporate officer, if the Industrial User submitting the reports is a corporation For the purpose of this paragraph, a responsible corporate officer means

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or;

(ii) the manager of one or more manufacturing, production, or operation facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b) By a general partner or proprietor if the Industrial User submitting the reports is a partnership or sole proprietorship respectively

c) The principal executive officer or director having responsibility for the overall operation of the discharging facility if the Industrial User submitting the reports is a Federal, State, or local governmental entity, or their agents.

d) By a duly authorized representative of the individual designated in paragraph (a), (b), or (c),

(i) the authorization is made in writing by the individual described in paragraph (a), (b), or (c);

(ii) the authorization specifies either an individual or a position having responsibility for the overall operation of the facility from which the Industrial Discharge originates, such as the position of plant manager, operator of a well, or a well field superintendent, or a position of equivalent responsibility, or having overall responsibility for environmental matters for the company; and

(iii) the written authorization is submitted to the City

e) If an authorization under paragraph (d) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for the environmental matters for the company, a new authorization satisfying the requirements of paragraph (d) of this section must be submitted to the City of Glens Falls prior to or together with any reports to be signed by an authorized representative

6. Operating Upsets

Any permittee that experiences an upset in operations that places the permittee in a temporary state of noncompliance with the provision of either this permit or with any section of Chapter 177 of the Code of the City of Glens Falls, shall inform the City of Glens Falls within 24 hours of becoming aware of the upset at (518) 761-3850

A written follow-up report of the upset shall be filed by the permittee with the City of Glens Falls within five days. The report shall specify:

a) Description of the upset, the cause(s) thereof and the upset's impact on the permittee's compliance status,

b) Duration of noncompliance, including exact dates and times of noncompliance, and if not corrected, the anticipated time the noncompliance is expected to continue; and

c) All steps taken or to be taken to reduce, eliminate and prevent recurrence of such an upset

The report must also demonstrate that the treatment facility was being operating in an appropriate manner.

A documented and verified operating upset shall be an affirmative defense to any enforcement action brought

against the permittee for violations attributable to the upset event.

7. Annual Publication

A list of all industrial users which were subject to enforcement proceedings during the twelve (12) previous months shall be annually published by the City of Glens Falls in the largest daily newspaper within its service area. Accordingly, the permittee is apprised that noncompliance with this permit may lead to an enforcement action and may result in publication of its name in an appropriate newspaper in accordance with this section

8 Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil and/or criminal penalties for noncompliance under Chapter 177 of the Code of the City of Glens Falls or State or Federal laws or regulations

9. Penalties for Violations of Permit Conditions

The City of Glens Falls provides that any person who violates a permit condition is subject to administrative penalties of up to $5000 per violation per day and civil penalties of up to $5000 per violation per day. Any person who willfully or negligently violates permit conditions is subject to criminal penalties of $5000 per violation per day, or imprisonment for six months, or both. The permittee may also be subject to sanctions under State and/or Federal law

10 Recovery of Costs Incurred

In addition to civil and criminal liability, the permittee violating any of the provisions of this permit or Chapter 177 of the Code of the City of Glens Falls or causing damage to or otherwise inhibiting the City of Glens Falls wastewater disposal system shall be liable to the City of Glens Falls for any expense, loss, or damage caused by such violation or discharge. The City of Glens Falls shall bill the permittee for the costs incurred by the City of Glens Falls for any cleaning, repair, or replacement work caused by the violation or discharge Refusal to pay the assessed costs shall constitute a separate violation of Chapter 177 of the Code of the City of Glens Falls.

Appendix C Site Safety and Health Plan

Health, Safety, Security & Environment

Ashland – Glens Falls, New York

Site Health and Safety Plan

Project Number:	GFALLS2020
Project Name:	Former CIBA/Hercules Plant
Address:	89 Lower Warren Street
City, State	Queensbury, New York

Prepared By:	Antea Group
Address:	500 Summit Lake Drive, Suite 150
City, State, Zip:	Valhalla, NY, 10595

Telephone:	800.477.7411		

Updated: April 1, 2020

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FIGURES

Route to Hospital Map
Site Map

SITE HEALTH AND SAFETY PLAN

Antea Group believes that all work-related injuries and illnesses are preventable and has a goal of zero work related injuries and illnesses for its worksites. This plan outlines the processes and procedures Antea Group will employ to achieve this goal.

- The Project Manager or Site Safety Officer (SSO) will hold daily on-site safety meetings ***prior to the start of field work*** to review site safety concerns, procedures, review key elements of the Site Health and Safety Plan (HASP) and Job Safety Analyses (JSAs) with all members of the field crew, including Antea Group employees and subcontractors. Other site safety meetings will be held as needed. Subcontractor personnel must participate in safety discussions as requested by Antea Group. See Antea Group's tailgate meeting checklist and guidance document for details (Appendix A).
- All field team members who may be exposed to site impacts during the course of their work, shall have completed OSHA 40-hour HAZWOPER and annual refresher training (29 CFR 1910.120). ***Documentation of training shall be readily available***.
- Each Antea Group team member must review, sign and date the HASP and the Antea Group Acknowledgement Agreement at the end of this document. Each subcontractor employee and visitor must review the HASP and sign, date, and describe their affiliation on the Subcontractor Acknowledgement Agreement at the end of this document.
- The signed HASP is kept in the field and readily available for duration of field work and returned to the project file upon completion of field activities.
- The HASP shall be revised or rewritten if site activities are changed significantly, if areas of differing hazards are involved, or as information about contaminants and hazards changes. Changing conditions may justify either increasing or decreasing HASP restrictions or action levels, depending upon the additional information generated.
- **STOP WORK AUTHORITY—ALL WORKERS HAVE THE AUTHORITY AND RESPONSIBILITY TO STOP ANY WORK, OR REFUSE TO DO WORK, THAT THEY FEEL IS UNSAFE.**

1.0 GENERAL INFORMATION

ANTEA GROUP PROJECT NUMBER:	**GFALLS2020**		
Client:	Ashland LLC.	Site Owner:	BASF
Site Name:	Former CIBA/Hercules	Client Claim/PO Number:	N/A
Site Address:	89 Lower Warren Street, Queensbury, New York 120804		
Project Manager:	Cody Hume		

Place date(s) in appropriate box(es) for current phase(s) of site activities.

Site Activities	Soil Borings	Monitoring Well Installation	Tank Removal	Soil Excavation	Recovery Well Installation	Pilot Tests	Treatment System Construction	Ground Water Sampling	Groundwater Extraction System Operation	O&M
Site Assessment										
Remedial Investigation										
Site Remediation Activities			2012 (AST)					2010-2016: Bi-Annually. 2017 – Indefinite: Quarterly	2004 - Indefinite	2004 - Indefinite

2.0 EMERGENCY CONTINGENCY PLAN

2.1 Local Emergency Telephone Numbers

Can 911 be used at this site? Yes [X] No [ ] If yes, be certain it is activated and enhanced.

Since cellular telephones may not reach a local 911 operator, also supply the following information. (Provide area code)

Ambulance	518-743-9884	Fire Department	518-761-3822
Hospital Emergency Room	518-926-1000	Police Department	518-761-3840
Poison Control Center	800-222-1222	HazMat Response Unit	518-761-3822
(List utility companies as appropriate)	National Grid: 800-642-4272	Verizon FiOS: 877-417-7607	
	Water & Sewer: 518-761-3857		

2.2 Hospital Routes

INCLUDES A MAP WITH HIGHLIGHTED EMERGENCY HOSPITAL ROUTE(S) at the end of the HASP.

Emergency Hospital* Name: Glens Falls Hospital Phone number: 518-926-1000

Hospital Address: 100 Park Street, Glens Falls, New York 12801

Hospital Directions: Head west on Lower Warren Street toward the Feeder Canal trails. Follow Lower Warren Street as it becomes Warren Street/Rt-32. Enter roundabout and take 4th exit onto Glen St/US-9/Rt-32. Turn right onto Park Street.

* **Hospital should be notified immediately if an injury occurs which requires medical attention.**

Estimated driving distance: 2.35 Miles Estimated driving time: 6 Minutes

Does hospital accept chemically contaminated patients? Yes [X] No [ ]

2.3 Evacuation Routes

Identify prevailing wind direction, if known. Evacuation route and meeting location must be upwind or crosswind):
Wind varies throughout the year.

PRIMARY EVACUATION ROUTE AND MEETING LOCATION: **Exit trailer/building/fenced in locations and head out towards Lower Warren Street. Will meet by DPW plow near entrance at Lower Warren Street.**

SECONDARY EVACUATION ROUTE AND MEETING LOCATION: **N/A – Only one exit.**

2.4 Emergency Contacts

PHONE NUMBERS (provide area codes)			
	Name or Description	**Work**	**24-hr. Emergency**
Consultant			
Project Manager:	Cody Hume	914-495-9932	914-610-1396
Site Contacts:	Garrett Crowe	914-495-9939	860-992-2636
	Katelyn Foster	914-495-9941	386-984-6782
Hub Manager:	Aaron Lapine	914-495-9934	949-244-4951
Corporate HSSE :	Darius Szewczak	(800) 477-7411	(800) 651-3117
Antea Group Operator	Corporate Office	(800) 477-7411	(800) 651-3117
Consultant PM\UM to call			
Ashland Contact:	James E. Vondracek	908-243-3548	

Regulatory Agency			
NYS Dept. of Env. Cons. (DEC)	Region 5 – Warrensburg Office	518-623-1200	Spill Resp.: 518-457-7362
	DEC Site Contact: Brian Jankauskas, P.E.	518-402-9620	
US EPA, Region 2, RCRA	Andy Park	212-637-4184	

2.5 Reporting Procedures and First Aid

Call emergency services (911) ASAP if situation is an emergency, i.e. workers or the public are in immediate peril.

Report all accidents, injuries, and illnesses IMMEDIATELY to the Antea Group PM, Office Leader or Antea Group HSSE. **Antea Group is a member of WorkCare, a 24-hour occupational medical management service. If an employee is injured or becomes ill, immediately contact WorkCare to assist in the medical evaluation and management of the employee.**
(888) 449-7787

Report all NEAR MISSES as soon as reasonably possible (no later than 24 hrs after the event). Use Antea Group's online reporting system to submit your near miss. If necessary, use the attached reporting form to capture facts and details immediately while in the field. See Appendix B for reporting form.

2.5.1 First Aid Equipment

- Standard first aid kit/CPR mask
- Portable eye wash

2.5.2 First Aid Procedures

(if an emergency, call 911) (all Antea Group employees onsite must have up-to-date first aid/CPR training).

Ingestion:	Follow instructions from Poison Control Center or the MSDS, contact Antea Group Corporate HSSE to engage Antea Group's medical case management service as necessary.
Inhalation:	Move victim to fresh air. Contact Antea Group Corporate HSSE to engage Antea Group's medical case management service as necessary.
Dermal Exposure:	Remove contaminated clothing. Wash thoroughly with soap and water. Contact Antea Group Corporate HSSE to engage Antea Group's medical case management service as necessary.

A first aid kit and portable eyewash is provided in each employee's field bag and is available on-site. If a worker suffers a chemical splash in the eye, flush the eye for 15 minutes and arrange for off-site medical treatment immediately. Workers will also be instructed to thoroughly wash with soap and water any unprotected skin that comes in direct contact with contaminated soil or water. Contact Antea Group Corporate HSSE to engage Antea Group's medical case management service as necessary.

Trained workers who choose to provide CPR or First Aid must use Universal Precautions to control possible exposure to blood borne and infectious agents. CPR kits are available in employee field bags.

2.5.3 Site Emergencies

In the event of a fire or explosion, or other imminently dangerous situation (e.g. rupturing a natural gas line), evacuate the site immediately and call the appropriate emergency phone numbers listed in Section 2.1. Call the Antea Group PM or Office Leader and inform him/her of the situation as soon as possible.

2.6 SITE RESOURCES

If no, identify closest available resource with directions.

Water supply available on site: Yes [X] No [ ] Bathrooms available on site: Yes [X] No [ ]

Telephone available on site:	Yes	X	No		Electricity available on site:	Yes	X	No	
Other resources available on site:	Yes	X	No		If "yes", identify:	Site job trailer for storage/shelter.			

2.7 Project HSSE Team

Team Members (list)	
Project Manager:	Chris Meyer
Antea Group on-site Personnel: (On-site personnel Are responsible for Antea Group site health and safety.)	Bryan Reles, Katie Angel, Meagan McNaney
Antea Group Site Safety Officer:	Bryan Reles, Katie Angel

PROJECT TEAM OSHA TRAINING RECORDS
(DOCUMENTATION MUST BE AVAILABLE FROM ANTEA GROUP AND APPROPRIATE CONTRACTORS UPON REQUEST)

Name	40 Hr Training Date	8-Hr Refresher Date	Site Supervisor Training Date
Bryan Reles	**2/12/2007**	**12/20/2016**	**12/3/2007**
Katie Angel	**1/16/2014**	**12/9/2016**	**1/30/2014**
Meaghan McNaney	**8/22/2014**	**1/3/2017**	**8/29/2014**

All workers who have to potential to be exposed to site impacts must have up-to-date HAZWOPER training. In addition, Antea Group employees must, at a minimum, have defensive driver training, first aid/CPR and medical monitoring. See subcontractor Section 12 for minimum required subcontractor training.

2.8 Perimeter Establishment

Map/Sketch attached:	**Yes**	**X**	**No**		**Site secured:**	**Yes**	**X**	**No**	
Perimeter identified:	**Yes**	**X**	**No**		**Zone(s) of Contamination identified:**	**Yes**	**X**	**No**	

2.9 Work Zones

As deemed necessary based on work activities, an exclusion zone will be identified for each site or site activity. The exclusion zone will be clearly marked with yellow **CAUTION** tape, barricades and\or cones (recommended cone height – 42 inches), as needed. A contamination reduction zone and support zone will be established for any site with site contaminant levels that pose a health threat to site workers or the public. No person will be allowed in the exclusion zone or contamination reduction zone without approval from the Antea Group Site Safety Officer.

2.10 Site Security

Site security must be determined on a site-specific basis. The need for additional personnel, on-site security guards, fencing, etc. should be discussed with the client site manager, or other members of management. Equipment stored overnight will be locked and secured to prevent vandalism and protect the public. A description of the additional safety requirements should be listed below:

LIST SITE SECURITY MEASURES: ALL SECTIONS OF SITE ARE FENCED AND SHOULD BE CHAINED/LOCKED AT END OF THE THE WORK DAY. ALL DOORS TO BUILDINGS SHOULD BE CHECKED TO MAKE SURE LOCKS ARE IN PLACE.

When work scheduling requires that an excavation be left open overnight, security fencing will be erected to restrict access to the site or work zones described in Section 2.9.

2.11 Site Map

Attach a site map to the "Figures" section at the end of the Site Health and Safety Plan. The Site Map can also to be used to outline Traffic Control (see Section 10).

3.0 SITE CHARACTERIZATION

A. Summary of Previous Site Investigation(s): Series of historical investigations between early 1980s and 2000. Final Corrective Measures put into place in 2001. Ground water extraction system installed in 2000-2001, brought into operation soon after. Groundwater sampling conducted routinely (Changed from Bi-annually to quarterly in 2017), and reported annually.

B. Source of Previous Site Investigation Information: Historic site documents.

C. General Facility Description:

Gasoline Service Station [ ] Refinery [ ] Bulk Terminal [ ] Other: Former Chemical Production Facility

Description: Active [ ] Years has the site been operating: [ ] Closed/Abandoned [X]

Current property use (operations on-site, products, raw materials used, etc.): No current uses. Only site activities are site monitoring and remediation/extraction system maintenance.

Was the site previously used for industrial purposes: Yes [X] No [ ]

Describe previous site uses: Production of dyes, wallpaper, and chemicals.

Surface cover on-site includes:

[X]	Soil/bare ground	[ ]	Clay caps	[ ]	Plastic cover		
[X]	Grass	[X]	Paving/asphalt	[X]	Water bodies		
[X]	Woods	[ ]	Swamp	[X]	Brush/scrub		
[X]	Buildings	[X]	Unpaved roads	[X]	Other	Soil Cap	

Approximate site surface area: ____ sq. ft. or 65 acres

Percentage of surface area: Concete Pad/unpaved road 15 % bare soil ____ %

vegetated 85 % under water ____ %

Potential for dust generation on-site: High [ ] Medium [X] Low [ ]

Any site access restrictions: Yes [ ] No [X] Please list:

Fenced/locked [X] Posting (signs) [X] Security guards [ ]

Evidence of public access to the site? Yes [ ] No [X]

If "yes," describe:

D. Regulatory Contacts

Are regulatory agencies involved with the site (Y/N)? Federal? [X] State? [X] Local? [ ]

Name	Agency	Phone (incl. area code)
Brian Jankauskas, P.E.	NYSDEC, Region 5	(518)-402-9620
Andy Park	USEPA, Region 2, RCRA	(212)-637-4184
		( )

		( )

4.0 WASTE CHARACTERIZATION

4.1 Waste/Contaminant Type(s)

Characteristic(s):										
	X	Liquid	X	Soil	X	Solid		Sludge		Gas
		Corrosive		Ignitable		Radioactive		Explosive		Flammable
	X	Volatile	X	Toxic		Reactive		Unknown		Other

4.2 Major Spills/Releases

Type	Date	Chemical	Quantity	Impacted Media*

(*air, surface water, soil, or ground water)

Free Product: Yes [ ] No [X] Dissolved: Yes [ ] No [X]

Have removal actions occurred? Yes [ ] No [X]

If "yes," describe: _____

Is there evidence that contaminants present could cause vapor problems in structures on-site?

Yes [ ] No [X] If "yes," is building mechanically ventilated? Yes [ ] No [ ]

Exhaust Ventilation: _____ General Building Ventilation: _____

4.3 Chemicals/Waste Stored On-site (including petroleum products)

		How Many?	Size?	Chemical?
	Drums			
	Tanks			
	Vats			
	Surface impoundments			
	Pits/landfills			
	Other			

Identify all chemical products Antea Group will use or store on site:

Alconox, Muriatic Acid, Bleach, ZEP Citrus Degreaser, WD-40, Pine Sol, PVC Glue/Primer, utility marking paints, gasoline, rodent poison

Material Safety Data Sheets (MSDS) are **required** for site chemicals.
Please indicate where MSDS can be found for this site:

[ ] MSDS Log/Binder (In Field)

[X] Attached (Additional Info. Optional)

5.0 REMEDIATION SYSTEM INFORMATION

Is there a remediation system onsite? Yes [X] No [ ]

Describe: Extraction system currently consists of pumping from one extraction well in bedrock and two sumps which are part of the french drain on site. Water is pumped from the well/sumps located adjacent to the Hudson River up to Effluent pump house (Northeast corner of the property by Lower Warrant St.), where the water is then pumped to the local POTW.

List the Remediation System hazards identified at this site:

[ ]	Inadequate Ventilation	[ ]	Unguarded Equipment	[X]	Slip, trip, fall or overhead hazards
[ ]	Noise Exposures	[ ]	Confined Space	[ ]	Security Issues
[X]	Energized Equipment requiring lockout/tagout	[ ]	Temperature Extremes	[ ]	List Other:

If building ventilation system is not adequate, identify manual ventilation procedure:

Identify PPE/procedures required to mitigate the remaining system hazards identified above: Lockout/ Tag out procedures for anything involving electrical components of the system, situational awareness around vaults due to depth of vaults.

Have sound level surveys been conducted on site? Yes [ ] No [X]

If "Yes," record range of survey results and approximate distance from source. Note: hearing protection must be worn if noise levels prevent normal conversation at a distance of three feet, or anytime noise levels are measured to be over 85 dB.

dBA	Source	Distance from Source	Date

Check all energy sources on the remediation site:

[X]	Electrical	[X]	Mechanical	[ ]	Other (describe)
[ ]	Thermal	[ ]	Hydraulic		
[X]	Chemical	[ ]	Pneumatic		

Are written Lockout/Tagout procedures required? Yes [X] No [ ] Where are they located? In each of the vaults.

Remediation Systems in Shutdown Mode (See Antea Group's Lockout/tagout practice for details)

Remediation systems that are shut down for **service or maintenance** reasons for extended periods of time, will be locked and tagged in accordance with the requirements of 29 CFR 1910.147, OSHA's Lockout/tagout standard, outlined in Antea Group's Lockout/Tagout written practice.

Remediation systems shut down for business reasons **other than equipment service or maintenance** (i.e. outside the scope of 29 CFR 1910.147), and which will be left in that condition at least until the next visit by a Antea Group employee, will be secured in accordance with the following procedure.

a) The system will be locked, using a standard Antea Group padlock, so that the power cannot be turned on, and a yellow "caution" tag will be applied. The tag must include the following information:

1) Caution
2) Do not operate
3) Do not remove the tag unless authorized
4) Name of person applying the tag
5) Date tag applied
6) Reason why equipment is shut down

b) Systems shutdown and locked for other business reasons can only be unlocked and have the tag removed with the approval of the Antea Group Project Manager for the site or the Office Leader for that region. However, unlike systems locked and tagged under 29 CFR 1910.147:

- The person applying or removing the lock and tag does not have to be an authorized LOTO trained employee under 29 CFR 1910.147.
- The person removing the lock and tag does not have to be the same person who applied the devices.

6.0 HAZARD EVALUATION

Identify all chemicals that are present or are suspected of being present on site and list their maximum concentrations in soil/water. Attach MSDS for each chemical of concern in **Appendix C**.

Chemical Name	TLV/*PEL*	**Maximum Concentration in Soil	*Maximum Concentration in Water	Health Hazards/ Comments
Primary				
Chromium	***TLV:*** *0.5 mg/m3 TWA* ***PEL:*** *1 mg/m3 TWA*	Current concen. unknown	60 mg/L	irritation eyes, skin; lung fibrosis (histologic)
Cyanide	***TLV****: 4.7 ppm, 5 mg/m3 Ceiling; Skin (as both Cyanide salts and Hydrogen Cyanide)* ***PEL:*** *5 mg/m3 TWA; Skin*	Current concen. unknown	7.3 mg/L	Irritation-Eyes, Skin, Nose, Throat; Acute Toxicity
Vanadium	***TLV:*** *0.05 mg/m3 TWA* ***PEL:*** *0.5 mg/m3 Ceiling*	Current concen. unknown	1.5 mg/L	Irritation-Eye, Nose, Throat, Skin, Acute and chronic bronchial damage
Secondary				
Metals/Inorganics:				
Aluminum	**PEL:** 15 mg/m3 TWA	Current concen. unknown	30 mg/L	Irritation eyes, skin, respiratory system
Ammonia	**TLV:** 25 ppm (17 mg/m3) TWA Or 35 ppm	Current concen. unknown	8.2 mg/L	irritation eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation

	(24 mg/m3) STEL **PEL:** TWA 50 ppm (35 mg/m^3)				
Antimony	**Both:** 0.5 mg/m3 TWA	Current concen. unknown	0.053J	mg/L	irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly
Arsenic	**PEL:** 0.01 mg/m3 TWA **TLV**: 0.01 mg/m3	Current concen. unknown	0.018 J	mg/L	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]
Barium	**Both**: 0.5 mg/m3 TWA	Current concen. unknown	1.2	mg/L	Irritation of eyes, skin, upper respiratory system; skin burns (by hydroxide, carbonate); gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia. INGES ACUTE: Abdominal cramps, profuse watery diarrhea; vomiting; severe muscle weakness; cardiac arrhythmia; unconsciousness; respiratory arrest.
Beryllium Beryllium (continued)	**TLV:** 0.00005 mg/m3 TWA (inhalable particulate matter) **PEL:** 0.002 mg/m3 TWA 0.005 mg/m3 Ceiling 0.025 mg/m3 Peak (30 minutes)	Current concen. unknown	0.0027J	mg/L	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]
Cadmium	**TLV:** 0.01 mg/m3 TWA (total particulate) 0.002 mg/m3 TWA (respirable particulate fraction) **PEL:** 5 µg/m3 TWA 2.5 µg/m3 Action Level	Current concen. unknown	0.055	mg/L	pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Chloride	N/A	Current concen. unknown	430	mg/L	*Note*No MSDS for Chloride
Cobalt	**TLV:** 0.02 mg/m3 TWA **PEL:** 0.1 mg/m3 TWA	Current concen. unknown	0.062	mg/L	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma
Hex. Chromium	**TLV:** (as insoluble) 0.01 mg/m3 TWA (Water Soluble) 0.05 mg/m3 TWA **PEL:** 5 µg/m3 TWA	Current concen. unknown	53	mg/L	Lung cancer, nasal septum ulcerations and perforations, skin ulcerations, and allergic and irritant contact dermatitis. *Note* No MSDS for Hexavalent Chromium
Copper	**Both**: 1 mg/m3 TWA	Current concen. unknown	0.270	mg/L	Irritation-Eye, Nose, Throat, Skin; Cumulative Lung Damage
Flouride	N/A	Current concen. unknown	6.1	mg/L	*Note* No MSDS for Flouride
Iron	**(Both as iron oxide) TLV:** 5 mg/m3 TWA **PEL:** 10 mg/m3 TWA	Current concen. unknown	120	mg/L	Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)
Lead	**TLV:** 0.05 mg/m3 TWA **PEL:** 0.05 mg/m3	Current concen. unknown	1.4	mg/L	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis

	TWA 0.03 mg/m3 Action Level				wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension
Magnesium	No PEL for Magnesium. As magnesium oxide: **TLV:** 10 mg/m3 TWA **PEL:** 15 mg/m3 TWA	Current concen. unknown	65	mg/L	Irritation of eyes, mucous membranes; cough; headache, dullness, weakness; elevated body temperature, metal fume fever; eye redness, pain; INGES. ACUTE: Abdominal pain, diarrhea
Manganese	**TLV:** 0.02 mg/m3 (respirable fraction) TWA 0.1 mg/m3 (inhalable fraction) TWA **PEL**: 5 mg/m3 Ceiling	Current concen. unknown	16	mg/L	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage
Mercury	**TLV:** 0.025 mg/m3 **PEL:** 1 mg/10m3 Ceiling	Current concen. unknown	0.0088	mg/L	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria; erethism (a central nervous system disorder characterized by irritability, weakness, sensitivity to stimulation, shyness, depression, insomnia, and eventually memory loss and tremors.)
Methyl Mercury	**TLV:** 0.01 mg/m3 TWA, 0.03 mg/m3 STEL **PEL:** 0.01 mg/m3 TWA, 0.04 mg/m3 CEILING	Current concen. unknown	2	ng/L	Toxic if inhaled. May cause respiratory tract irritation. May be fatal if absorbed through skin. May cause Skin irritation. May cause eye irritation. May be fatal if swallowed.
Nickel	**TLV:** Elemental: 1.5 mg/m3 TWA, Insoluble compounds: 0.2 mg/m3 TWA, Nickel subsulfide: 0.1 mg/m3 TWA **PEL:** 1 mg/m3 TWA	Current concen. unknown	0.037 J	mg/L	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
Nitrate	N/A	Current concen. unknown	6	mg/L	*Note* No MSDS for Nitrate
Nitrite	N/A	Current concen. unknown	0.16	mg/L	*Note* No MSDS for Nitrite
Ortho-phosphate	N/A	Current concen. unknown	4.5	mg/L	*Note* No MSDS for Orthophosphate
Phosphorus	N/A	Current concen. unknown	4.7	mg/L	*Note* No MSDS for Phosphorus
Potassium	N/A	Current concen. unknown	980	mg/L	Very hazardous in case of skin contant, eye contact, ingestion, or inhalation. Severe over exposure can produce lung damage, choking, unconsciousness or death.
Selenium	**Both:** 0.2 mg/m3 TWS	Current concen. unknown	0.012 J	mg/L	irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns
Sodium	N/A	Current concen. unknown	3,600	mg/L	Very hazardous in case of skin contact and eye contact.
Strontium	N/A	Current concen. unknown	6.8	mg/L	*Note* No MSDS for Strontium
Sulfate	N/A	Current concen. unknown	750	mg/L	*Note* No MSDS for Sulfate
Thallium	**Both:** 0.1 mg/m3 TWA	Current concen. unknown	0.025 J	mg/L	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary

					edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs
Thiocyanate	N/A	Current concen. unknown	1.4	mg/L	*Note* No MSDS for Thiocyanate
Zinc	N/A	Current concen. unknown	0.890	mg/L	Slightly hazardous in case of skin contact, eye contact, ingestion, and inhalation.
VOCs					
Acetone	**TLV:** 500 ppm (1,188 mg/m3) TWA 750 ppm (1,782 mg/m3) STEL **PEL:** 1,000 ppm (2,400 mg/m3) TWA	Current concen. unknown	59	µg/L	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis
Benzene Benzene (Continued)	**TLV:** 0.5 ppm (1.6 mg/m3) TWA 2.5 ppm (8 mg/m3) STEL **PEL:** 1 ppm TWA 5 ppm STEL	Current concen. unknown	1.6	µg/L	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Chlorobenzene	**TLV**: 10 ppm, 46 mg/m3 TWA **PEL:** 75 ppm, 350 mg/m3 TWA	Current concen. unknown	86	µg/L	Skin, eye, nose irritation, headache; nausea; drowsiness, incoordination, unconsciousness; CHRONIC EXPOSURE: Numbness, cyanosis, hyperesthesia (increased sensation), muscle spasms; anemia. In animals: liver, lung, kidney damage, bone marrow suppression. INGES. ACUTE: Abdominal pain
Chloroform	**TLV:** 10 ppm, 49mg/m3 TWA **PEL:** 50 ppm, 240 mg/m3 Ceiling	Current concen. unknown	8.7	µg/L	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]
cis-1,2-dichloroethene	***Both:*** *200 ppm TWA, 790 mg/m³*	Current concen. unknown	81	µg/L	Respiratory tract irritation, skin irritation, eye irritation, central nervous system depression.
1,1-Dichloroethene	N/A	Current concen. unknown	0.24	µg/L	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
1,2-Dichlorobenzene	**PEL:** C 50 ppm (300 mg/m3)	Current concen. unknown	750	µg/L	irritation eyes, nose; liver, kidney damage; skin blisters
1,3-Dichlorobenzene	N/A	Current concen. unknown	1.6	µg/L	Irritation-Eye, Nose, Throat, Skin; Liver damage
1,4-Dichlorobenzene	**PEL:** 75 ppm TWA, 450 mg/m³	Current concen. unknown	71	µg/L	Irritant (skin, eye, nose)
Methyl Ethyl Ketone (a.k.a. 2-Butanone)	**TLV**: 200 ppm (590 mg/m3) TWA 300 ppm (885 mg/m3) STEL **PEL:** 200 ppm (590 mg/m3) TWA	Current concen. unknown	6.2	µg/L	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis
Tetrachloroethene	**TLV:** 25 ppm (170 mg/m3) TWA 100 ppm (685 mg/m3) STEL **PEL:** 100 ppm TWA 200 ppm Ceiling	Current concen. unknown	0.25	µg/L	irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

	300 ppm (peak) for a single time period up to 5 minutes for any 3 hours			
Toluene	**TLV:** 20 ppm (75 mg/m3) TWA **PEL:** 200 ppm TWA 300 ppm Ceiling 500 ppm Peak (10 minutes)	Current concen. unknown	1.0 µg/L	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
trans-1,2-dichloroethene	*N/A*	Current concen. unknown	20 µg/L	N/A
Trichloroethene Trichloroethene (continued)	**TLV:** 10 ppm TWA; 25 ppm STEL **PEL:** 100 ppm TWA; Also, exposures shall not exceed 200 ppm (ceiling) with the following exception: exposures may exceed 200 ppm, but not more than 300 ppm (peak), for a single time period up to 5 minutes in any 2 hours.	Current concen. unknown	19 µg/L	irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Vinyl chloride	**TLV:** 1 ppm TWA **PEL:** 1 ppm TWA; 0.5 ppm Action Level	Current concen. unknown	2.4 µg/L	Carcinogen: lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities;

(*P*) = results pending; (NA) = not analyzed; (NE) = not established
**Most recent (2013) results for each constituent for each well.*
*** Excludes soil results that have been verified by more recent borings to be unrepresentative of soil conditions*

Potential Hazards (check boxes that apply to the site):

	corroded containers		open lagoons		underground tanks		air stack emissions
X	overhead electric lines		visible leachate		surface tanks		visible on-site releases
	visible soil contamination		odors		observed tanks		visible off-site releases
	observed free product	X	dust	X	confined spaces		visible on-site erosion
X	underground utilities		open pits		excess debris	X	on-site surface water contamination
	building contamination		no hazards		high traffic issues	X	off-site surface water contamination

List Other Biological-ticks and spiders onsite, sac spiders have been found onsite and are moderately poisonous to humans

Wild parsnip has been found onsite, a rash can develop when skin contacts the leaves or plant sap in the presence of sunlight

7.0 PERSONAL PROTECTION & MONITORING EQUIPMENT GUIDELINES

7.1 Personal Protection

Level of Protection: B [ ] C [ ] D [X] List any modifications: Long sleeves shirts and gloves

1. **All personnel working on Antea Group sites must wear: long pants, sleeved shirt (short sleeves are acceptable), hard hat, high visibility traffic safety vests, safety glasses and safety shoes. When working on the hillside long sleeves and gloves should be worn to prevent skin contact with wild parsnip. Personnel may need to wear additional or more protective eye, ear and hand PPE appropriate for their work tasks.**

2. Nitrile gloves and tyvek/saranex suit should be worn if contact with contaminated water or soil is likely.

3. Hearing protection must be worn if noise levels prevent normal conversation at a distance of three feet, or anytime noise levels are measured to be over 85 dB.

4. No smoking, eating, or drinking is allowed in the exclusion or contamination reduction zones. Smoking is only allowed in areas pre-approved by the Antea Group PM and client.

5. No Antea Group personnel shall conduct a permit required confined space entry. In addition, no personnel shall approach any excavation area where there is danger of a wall collapse.

6. Respiratory protection is dependent on conditions listed below Section 7.2. No site specific respiratory protection required onsite. Minimum Level C respiratory protection for most Antea Group release sites consists of a half-face air purifying respirator with combination P100 filters with organic vapor (minimum).

7.2 Surveillance Equipment and Materials

1. Calibration: A qualified individual will calibrate before and after field activities the photo ionization detector (PID) or flame ionization detector (FID).

2. Frequency: The worker breathing zone will be initially monitored every hour (at a minimum) and recorded in Appendix F. If previous site monitoring data indicates that there are exposures are below action level, monitoring frequency may be reduced, as long as site conditions have not changed and site activities will not create new exposures. Periodic monitoring can be stopped when site monitoring data indicates that breathing zone shows no hazardous conditions or air contaminants. However, if monitoring is stopped, data to support this decision must be available onsite for review. (Table for recording data is provided in Appendix F.)

   In addition to periodic site monitoring, breathing zone monitoring should always be conducted and documented (in Appendix F) during tasks that may result in continuing or new exposures, such as active drilling, probing, or excavating. If there are more stringent state or federal regulatory requirements for site monitoring, those requirements must be followed.

3. Instrumentation

Instrument	Breathing Zone Reading	PPE Upgrade or Other Actions To Be Taken
Photo ionization detector (PID) or Flame ionization detector (FID)	Total Org.Vapors	**Level D.** Work may continue.
	Bkgrd - 2 ppm	**Level D.** Collect benzene detector tubes (unless there is previous site data to show that benzene at these PID levels is below 0.5 ppm)
	2 - 100 ppm	**Level C.** Air-purifying respirator with organic vapor canisters required if levels continue for **two hours or more** in the breathing zone. Workers can choose to don respirators at lower levels if nuisance odors are a concern. Collect benzene detector tubes.
	100 - 300 ppm	**Level C if levels continue for 15 minutes in the breathing zone**. If levels continue beyond 15 minutes **STOP WORK**. Contact Corporate HSSE.
	300- 500 ppm	**STOP WORK, leave immediate area--** Contact Corporate HSSE
	>500 ppm	
Explosion Meter	< 10% of LEL	**Work may continue. Evaluate inhalation potential.**
	10 - 20% of LEL	**Work may continue. Eliminate all ignition sources, Reduce the concentration &increase monitoring** frequency, consider use of ventilation.
	> 20% of LEL	**Work must stop until LEL is Below 10%!**
Oxygen Meter	< 19.5% O_2	**Leave area.** Re-enter only with SCBA.
	19.5% to 23.5% O_2	**Work may continue.** Investigate causes of changes above/below 21%.
	>23.5% O_2	**Work must stop.** Ventilate before returning and retest atmosphere. O_2-rich atmospheres pose explosion hazards.
Sound Level Meter	< 85 dBA	Suggest wearing hearing protection when it is necessary to raise voice to be heard at distance of 3 feet.
	85 - 90 dBA	**Hearing protection required.** Install warning signs for fixed noise sources.
	> 90 dBA	**Hearing protection required.** Employer must have Hearing Conservation Program.

8.0 SAFETY STANDARD OPERATING PROCEDURES (ALSO SEE APPENDIX D FOR SITE SAFETY CHECKLIST)

8.1 Chemical Hazards

A photo ionization detector (PID) or flame ionization detector (FID) will be used to measure the relative concentration of hydrocarbon vapors. Monitoring for exposure to benzene vapors may be done using activated charcoal tubes and vacuum pumps, vapor badges, or benzene colorimetric tubes in the breathing zone when working with heavily contaminated soil or water. Action limits for use of respiratory protective equipment are outlined in Section 7.2 above. All respiratory protection equipment shall be NIOSH/MSHA-approved and use shall conform to OSHA 29 CFR 1910.134. Antea Group's written Respiratory Protection Program detailing selection, use, cleaning, storage, medical monitoring, training and fit testing of respiratory protective equipment is available to all employees via Antea Group's intranet.

In addition to being inhalation hazards, hydrocarbon compounds can also be absorbed through the skin. Skin contact with liquid hydrocarbons or fuel hydrocarbon-bearing soil should be prevented. In situations where sampling would result in direct skin contact with hydrocarbon liquids, saturated soil or contaminated equipment, nitrile gloves will be worn.

Drilling or digging may also liberate pockets of hydrogen sulfide (H_2S). While the characteristic "rotten egg" odor of H_2S is detectable at levels as low as 0.0005 ppm, prolonged detection is unreliable due to its olfactory fatigue properties. In open air on a typical petroleum remediation site, risk from exposure to H_2S is minimal. However, should H_2S be encountered or expected, workers shall be instructed to stop drilling/digging and move to an upwind location until the vapors have dissipated, as measured by H_2S colorimetric detector tubes or other direct-reading instruments. The bore hole or excavation will be immediately backfilled.

When working in areas that are not open air and/or have to potential to accumulate gases or vapors, a combination explosimeter/oxygen (O_2) meter will be available on-site to monitor the levels of flammable gases, such as petroleum vapors and methane. An explosimeter should be used by a subcontractor to verify that the atmosphere inside an underground storage tank has been inerted prior to allowing the tank to be moved from its location.

8.2 Physical Hazards

1. Mechanical hazards: Ensure that mechanical equipment is properly guarded and overhead hazards are removed or secured to prevent being struck or entrapped by moving parts or heavy equipment or falling objects.

   Maintain a safe distance from heavy equipment and moving machinery parts.

   Tools and equipment used on site shall be in proper working condition. Workers using tools and equipment must be properly trained in their use.

   Antea Group has adopted a practice to eliminate the wide-spread use of fixed open-bladed knives (FOBKs), such as pocket or utility knives. FOBKs are not allowed on Antea Group field sites without prior approval by the Antea Group PM. Safer alternatives such as safety knives, shears, etc. should be used in place of FOBKs. See Antea Group's FOBK practice for more details.

2. Electrical hazards: Be aware of underground and overhead utilities. For protective measures against underground electrical cables see Section 8.3 Underground Utilities.

   For overhead power lines, OSHA requires a minimum distance of 10 feet from overhead lines transmitting up to 50kVs and an additional 4" of distance for every 10kV after 50kV, from any unguarded, energized overhead line. For example: 15 feet from lines transmitting up to 200kVs and 25 feet from 350kV lines. However, because power lines, rig masts and other elevated objects can move due to wind or other forces, **it is Antea Group's policy is to maintain at least 20 feet clearance from any lines, or an additional 5 feet from any OSHA minimum distance that exceeds 20 feet.** If it is critical to work within 20 feet of a line, or at OSHA minimum distance, efforts should be made to have the lines covered ("shrouded") or shut off and locked out by the local power company. If neither can be accomplished, contact Antea Group Corporate HSSE.

   Generators, powered hand tools and extension cords used on Antea Group sites must be grounded. Extension cords must be inspected at the start of each work day to ensure that they are not damaged. Frayed or otherwise damaged extension cords shall not be used onsite, and must be taken out of service unless they can be properly repaired.

   Heavy equipment, including drilling rigs and vacuum trucks, must be grounded when the potential for static electricity build up and its uncontrolled release exists. Confirm with the equipment operator that equipment is grounded as needed. All equipment will be properly locked/tagged out when required by the Energy Lockout/Tagout Program and Safe Electrical Work Policy and Procedure for Antea Group Project Work. Do not stand in water when operating electrical equipment.

3. Open excavations: Open excavations deeper than 6 feet that are not clearly visible to site workers and the public must have fall protection measures in place, such as barricades and warning signs. When scheduling or work conditions necessitate leaving excavations open overnight, security fencing will be erected to restrict access to the site or work zones described in Section 2.9

   Excavations must be properly constructed and maintained as per Section 8.12 of this HASP.

4. Hazardous plants or animals: Poisonous plants, and stinging, biting or other dangerous animals can be encountered on field sites. Identify workers with any allergies. Do not touch any plants that you cannot identify. Clear brush from well locations and other work areas. If necessary, arrange for vegetation removal by a landscaping company. Do not approach or provoke any animals, including spiders or insects. If a worker is bitten or stung by insect or spider, provide first aid and monitor the worker for a reaction. If an insect, or spider bite is suspected to be serious, or a worker is bitten by snake or other animal, seek medical attention immediately. If the bite is not an emergency, call WorkCare (800) 455-6155 for medical assistance.

5. Slip, trip fall hazards: will be minimized by maintaining good housekeeping practices at all times. Keep the work area free of debris, unused tools, extra supplies, or any other objects that could interfere with walking and working surfaces.

8.3 Underground Utilities

A minimum of 72 working hours prior to excavating, Underground Service Alert or the state equivalent:

Name DIGSAFE Phone 811 / 1-800-962-7962

will be contacted and informed of the scheduled field activities. The underground service locator company will identify which underground utilities (e.g. electrical, gas, sewer, water, telephone, cable TV) are present and will notify their respective owners. The utilities will be located by their owners. **Prior to drilling or direct push, air excavate (120% the width of the hole) and to a depth of at least 5 feet will be performed at all times** to ensure no utilities, lines or tanks are in the way. See Excavation Section 8.12. **Look for overhead utilities** as well.

Utility service locator company has been notified? **If applicable attach contact sheet to back of document.**	Date(s) _____ _____	Confirmation #, if applicable: _____ _____

If you are planning to drill the same location as a previously installed point and the diameter of the new boring/well is larger, you must manually clear the borehole.

8.4 Work Limitations (time of day, weather, heat/cold stress)

In the event of severe weather, such as high winds, heavy rain or snow, tornadoes, electrical storms, or extreme temperatures, the SSO and PM shall determine whether work can continue without compromising site worker health and safety.

In high ambient temperatures (especially with high humidity), ***follow heat-stress precautions***. Drink plenty of cool water and/or electrolyte-replacement beverages (e.g., Gatorade). Take frequent breaks out of direct sunlight removing protective clothing. Provide shade to workers if necessary. Increase number of breaks if pulse does not return to normal resting pulse during breaks. Alter schedules so work is conducted during early morning or evening. Work shall progress only under conditions of adequate lighting.

Symptoms of heat exhaustion and heat stress include:

- Profuse sweating **or** complete cessation of sweating;
- Changes in skin color;
- Increased respiration;
- Vision problems, confusion;
- Body temperatures in excess of 100°F; and
- Increased heart rate.

Any member of the work team who exhibits these symptoms should immediately be removed from the area and observed while resting in a shaded area after removal of impervious or restrictive clothing and after consumption of cool water or electrolyte fluid. If symptoms persist, immediate medical attention shall be sought.

In cold temperatures, especially when combined with high wind, follow hypothermia precautions:

- Drink warm liquids and take frequent work breaks in a wind-sheltered area. Monitor co-workers for signs of shivering, lack of coordination, or confusion. Remove workers exhibiting these signs from the work area to a heated warming shelter.
- Dress in removable layers of insulated clothing to prevent sweating and use protective waterproof gear;
- Frostbite (superficial or deep tissue) can occur on any exposed skin at temperatures of 30.2°F or colder.
- If available clothing does not give adequate protection to prevent hypothermia or frostbite (which can occur on any exposed skin), work should be modified or suspended until adequate clothing is available or until conditions improve.

If extreme cold conditions are encountered (e.g. < 10° F), discuss proper clothing requirements and a warming break schedule with the Project Manager. Consider rescheduling the work if possible.

8.5 Fire and Explosion Hazards

Each site will be inspected for fire and explosion hazards during a pre-work site walk-through.

During the course of underground storage tank removal, drilling, or remediation of petroleum impacted soil or ground water, the potential for fire and explosion of flammable vapors exists. Extreme caution should be taken to monitor for the presence of flammable vapors or conditions that could create flammable conditions. Explosimeters are available for this monitoring and

action levels are defined in Section 7.2. Fire extinguishers must be available on all sites with the potential for flammable vapors or electrical fires (i.e., systems, control panels). Use of fire extinguishers by employees trained in their use is limited to employee rescue or extinguishing relatively small, controllable fires. Antea Group does not expect or require its employees to fight fires.

In the event of a fire or explosion, the following action plan should be followed:

Shut down equipment and shut off all supply lines immediately if this can be done safely. (Notify the site operator to shut down operations if necessary.)

Evacuate the immediate area. At this point you may not know if a soil vapor fire has started or if a supply line, natural gas line, etc. has been hit. Tank, supply line, or remediation system fires are extremely hazardous and precautions must be taken to evacuate the area immediately.

Call 911 to notify the fire department. Antea Group employees are not trained fire brigades. Every fire should be treated as an emergency. Even if site personnel extinguish the fire, professional fire departments should evaluate the situation to ensure that the danger is over and that a fire will not reoccur.

Evaluate the situation to identify the source of the flammable vapors and to assess the danger to employees, the public and property. From a safe distance, try to determine if the fire is due to a ruptured supply line, ignited soil vapors or methane, or is electrical. This information should be communicated to the fire department. Small fires from known sources (i.e., engine fires, electrical panel fires, etc.) may be extinguished if the employee can do it without high risk. A soil vapor fire may eventually burn itself out. Soil stockpiles must be placed away from nearby structures and property lines. Extinguishing fires in fuel vapor-laden soils with clean soil may be possible. **Employees or subcontractors shall not enter an excavation to attempt to extinguish a fire.**

Fire, Explosion and Vacuum Truck Operations—vacuum truck operators must ensure that the truck and hoses are properly bonded and grounded prior to initiating vacuum operations and that vacuum truck hoses are properly tested for continuity each work shift.

Vacuum truck operators must ensure that the materials to be collected are compatible with residual materials that may already be in the truck or the truck must be washed prior to use. Hydrocarbons and other vapors created by the vacuum pump exhaust shall be vented away from the work area and away from areas where people are present.

8.6 Noise/Hearing Protection

Workers shall be instructed in the recognition of noise hazards and shall be provided, and trained in the use of, hearing protective devices. Monitoring should be performed for on-site noise sources that are suspected to be above 85 dB. Record sound readings in Appendix G. If monitoring has not been performed for suspected noise sources, hearing protection must be worn. As a general rule, hearing protection should be worn when working around heavy equipment, particularly drill rigs, or when background noise is such that a worker has to raise their voice to be heard at a distance of 3 feet.

8.7 Levels of Protection

Work on petroleum remediation sites must be performed, at a minimum, in the following Level D protection:

- hard hat (a Antea Group requirement, unless wearing the hard hat creates additional safety risks and there are no overhead hazards present),
- steel-toed (safety-toed) work shoes/boots, meeting ANSI/ASTM standards
- sleeved shirt (short sleeve minimum) and long pants, or cotton coveralls
- eye protection- safety glasses (ANSI Z87), goggles or face shield as required
- high visibility safety vest (ANSI Class II preferred)
- gloves- sampling (nitrile) or work (leather, synthetic leather, Kevlar, etc. depending on work tasks), and
- hearing protection, as needed.

If monitoring equipment or site conditions indicate the need to upgrade the level of protection to Level C at a petroleum release site, air-purifying respirators with organic vapor canisters (at a minimum) will be donned, Tyvek coveralls with hoods, chemical resistant inner and outer gloves, and disposable boot covers will be donned as necessary. Contact Corporate HSSE regarding dermal protection.

At no time will an Antea Group employee conduct work on any site requiring Level A protection. On work sites requiring Level B protection, workers will be provided with additional training and equipment. Corporate HSSE must review and approve the work plan for Level B work before the work can be performed.

8.8 Decontamination Procedure

Level: B. [ ] C. [ ] D. [X]

Contamination may result from walking through contaminated soils or liquids, splashing liquids during sampling, use of or contact with contaminated equipment, or contact with air contaminants. Field team workers will be instructed to observe the following precautions to assure contaminants will not remain in contact with their skin.

- Tools, equipment and personnel will be decontaminated using procedure appropriate for level of personal protection worn.

- All contaminated, disposable clothing will be properly bagged for disposal and left on site. All personnel will be instructed to wash hands, face, neck and forearms at the end of the work shift and to shower at the end of the workday.

- No eating or drinking will be permitted in the vicinity of heavy equipment and/or drilling and excavating activities. Smoking is only permitted in pre-designated area when approved by Antea Group and the client.

Special decontamination requirements: _____

8.9 Confined Spaces

If entry into a confined space is necessary, a trained Antea Group subcontractor shall be used and a Confined Space Entry Permit must be completed and authorized, and confined space entry procedures followed. Detailed information on Antea Group's Confined Space Entry procedures can be found in the Antea Group Health & Safety Manual. Contact Corporate HSSE before any permit required confined space entry.

Does this site have any permit-required confined spaces?	Yes	[X]	No	[ ]
Does someone need to enter the permit-required confined space as part of the work?	Yes	[ ]	No	[X]

If "yes," the Antea Group project team must confirm the subcontractor's permit required confined space program and employee training have been reviewed as part of the Antea Group pre-qualification process.

8.10 Investigation – Derived Material Disposal

Soil cuttings and well development or sampling water shall be placed in 55-gallon drums on-site, unless on-site disposal is allowed under both regulatory and client requirements. Drums must be in sound condition (new or reconditioned drums) with lid that seals and can be tightened in place. Disposal methods of drummed soil and water will be determined based on laboratory analytical data.

Drums stored on site until disposal shall be labeled, sealed, and if possible, placed on an impermeable surface in a secure location prior to Antea Group's field team leaving the site. At a minimum, non-hazardous waste containers must be marked with a description of the material, and emergency contact information (company name and phone number). Hazardous waste must be marked and labeled so that the container complies with applicable DOT or RCRA requirements. Drums must be removed within 90 days of waste generation.

8.11 Excavations

All soil excavation and utility trenching is to be undertaken in strict conformance with all applicable local, state, and federal regulations. Subcontractors performing excavations on-site must have a competent person in charge of the excavation, who performs daily inspections of the excavation. Entry into excavated areas or trenches is allowed only when:

1. Shoring, sloping and spoil pile placement is in conformance with 29 CFR 1926 Subpart P, and
2. Personal protection and monitoring, as detailed in this Site Health and Safety Plan, have been implemented, and there is no hazardous atmosphere or other unsafe condition in the excavation.

9.0 Drilling and Excavating Health and Safety Guidance Procedures

9.1 Preparation

Prior to conducting any subsurface work, a markout must ALWAYS be called in (approximately three working days before field work is scheduled - depending on the area). In some areas, not all markouts are performed by the "Call Before You Dig System," thus contacting the appropriate utility companies and assuring their markouts must be tracked by Antea Group or the subcontractor responsible for the markouts. Private utility mark-outs should also be arranged when site work and conditions warrant it.

- Always search the file and request the client search files for an as-built of the station/facility.

9.2 When on Site

- Subcontractors are required to perform an on-site inspection of their heavy machinery each day prior to the start of fieldwork. The Antea Group Site Safety Officer (SSO) will observe the inspection. Any safety concerns identified by the subcontractor must be addressed prior to the use of the equipment. During the inspection, the subcontractor must verify that all rig/vehicle kill switches are working properly. Antea Group employees on-site must be informed of the location of the kill switches and how to operate them.

- As part of your on-site health and safety meeting, walk the site with the field team to identify any additional site hazards and determine possible boring locations (make sure the locations shown on the work plan/site plan are in areas free of utilities/subsurface structures). Make sure all utilities have been marked out properly. It is Antea Group's responsibility to ensure all boring or excavation locations are clear of utilities prior to drilling. Often "as-builts" are incorrect or not available.

- Attempt to determine how all utilities are running. For the most part, utilities can run anywhere and can bend and twist in any direction but, there are a few basic things to keep in mind. Usually water and sewer lines will run to a bathroom. Electrical lines will run in between on-site lights, the kiosk, service station and car wash buildings. Storm water drains usually tie into one another and you can get a general idea of how they run by looking into them and seeing what direction the line is going. Obviously any cut outs in the asphalt should be avoided, especially if observed around the USTs (often, leak detection is an afterthought and is added following the completion of the service station rebuild and its location is obvious due to a continuous cut out in the asphalt around the tank field).

- ALWAYS AIR EXCAVATE (120% the width of the proposed hole) TO A DEPTH ONE FOOT BELOW THE ESTIMATED DEPTH OF UTILITIES AND AT LEAST FIVE FEET bgs. If you are drilling in the same location as a previously installed point and the diameter of the new boring/well is larger, you must manually clear the borehole. In addition, if you didn't advance the "old" boring yourself, you can't assume that it is a safe drilling location. Refusal may have been encountered in the "old" location. If refusal is encountered prior to five feet, move to a new location. If you make three attempts without success, call the project manager to discuss alternatives. If you can't reach the PM contact your Office Leader for further instruction.

- If you encounter pea-gravel while excavating STOP. Call the Antea Group PM for further instruction. Utilities or USTs may be present.

- If you hit/damage any utility/subsurface feature IMMEDIATELY contact the office for further instruction. If you can't reach the PM contact your Office Leader for further instruction. Also contact your HSSE Advisor.

9.3 Drilling Activities

- Drilling operations shall at all times be under the immediate supervision of a contractor's representative who has authority to modify the work methods as necessary to ensure safety.
- Contractors shall ensure properly designed cribbing (i.e., wooden mats) is always carried with mobile drill rig to work site.
- Where practical, drilling should always take place on "level" surfaces. If the proposed site is not level, consideration should be given to selecting another suitable site that is level, or to leveling the site by re-grading.
- Drilling locations must be clear of underground and overhead hazards as discussed in this HASP.
- Additionally, the guidance provided in the Environmental Remediation Drilling Safety Guidelines (ERDSG) industry document **should** be followed.

10.0 TRAFFIC CONROL AND ON-SITE VEHICLES/MOBILE EQUIPMENT

Petroleum site work frequently necessitates working in parking lots, streets or other areas with vehicular traffic. In such instances, the work team will be wearing high visibility traffic safety vests (ANSI Class II minimum recommended) and will use a combination of traffic cones (recommended height - 42-inches) and barricades as necessary to prevent contact between workers, pedestrians and motor vehicles. Proper placement of large contractor vehicles such as field trucks and drill rigs to add a layer of protection should be considered.

Check for specific DOT requirements when working in or near a road or road right-of-way. In such cases, traffic control set up will need to be subcontracted to a traffic control subcontractor.

The PM shall develop a **Site Specific Traffic Control Plan** for high traffic sites, or other high-risk locations. The plan (map) should include known site traffic patterns and the control equipment set up used to divert or restrict traffic and to define site work (exclusion) zones. **Include Traffic Control Plan in the "Figures" section at the end of the HASP.**

Onsite Vehicles:

- Enter and exit through the gates or pathway provided and designated for this use.
- Vehicles will not be driven over unprotected hoses or exposed piping.
- Vehicles may be left running **only** when operating auxiliary equipment or lights, and then only when driver can ensure the vehicle is secure with the transmission in park or neutral, the parking brake set and the wheels chocked.

Earth Moving Activities:
All mobile earth-moving equipment on-site must comply with 29 CFR 1926.602 for back-up alarms or signal persons.

Dig and Haul Projects:
Dump trucks should only dump the load on **level** ground so the hazard of "tip-over" is avoided. If absolutely necessary, the dump truck can dump into the slope (i.e., back of truck facing directly uphill).

Any truck that has a raised bed dumping feature (i.e., dump-truck) must always lower bed before driving forward to leave the immediate work area. This is due to two hazards:

- *Tip-over* due to change in gravity of raised bed and
- *Hitting overhead obstacles* (like power lines or canopies).

11.0 JOURNEY MANAGEMENT PLAN

Provide directions for the preferred route from Antea Group's office to the field site, with the preferred/safest exit and entry points to the site. Also, provide any specific information of problem traffic areas that should be avoided when traveling in the area of the site. Information can be provided via maps, written instruction or both, as appropriate and available. Use the "Figures" section at the end of the HASP. (Information regarding onsite traffic flow and mobile equipment is provided in Antea Group's Traffic Control Plan in Section 10.)

Additional Comments:

- Seatbelts must be worn by all occupants in traveling vehicles
- Including the requirements for drivers to have all appropriate licenses, and to have received defensive driver training within the last two years.

11.1 Lone or Isolated Worker

Workers should not be put into a situation where they are left alone or isolated with no means of quickly summoning help should he/she become incapacitated due to injury or vehicle accident.

- A positive means of communication, i.e. a device such as a walkie-talkie, vehicle radio or cell phone, should be provided to all field personnel.
- Lone employees should check in with their supervisor or their field office at the start of the day, mid-day, and a final status report call at the end of the day (so others know where the worker is and that he/she is safe).
- In high hazard/crime affected areas, operations teams should consider assigning two workers or hiring a security guard during site work. If the area appears too dangerous, work should be postponed until an appropriate security plan can be developed.

12.0 SUBCONTRACTOR TRAINING AND SAFETY DOCUMENTS

All subcontractors must meet OSHA training requirements for the work they will perform while onsite. Subcontractor workers that have the potential to be exposed to site impacts must have initial HAZWOPER training and up-to-date annual 8-hr refresher training. In addition, subcontractors driving on Antea Group business must have completed a defensive driver training class within the last two years.

Subcontractors shall be responsible for the development and implementation of their own HASP and/or JSAs to cover duties and hazards specific to that subcontractor's area of expertise or on-site functions. Subcontractors are given the opportunity to review Antea Group's HASP, and must sign the document, prior to the start of on-site work. Subcontractors are required to provide job safety analyses (JSAs) or written safety standard operating procedures, for the primary tasks they perform on-site. Contractors are required to review these safety documents with the work team during the appropriate on-site safety meetings (tailgate, etc). Any discrepancies or conflicting safety requirements between Antea Group and subcontractor HASPs shall be addressed prior to the start of field work.

All subcontractor employees must attend and participate in all on-site safety meetings as required by Antea Group. All on-site subcontractor workers must be able to effectively communicate with all field workers in English. If not, a translator/mentor must be assigned to those employees that cannot communicate in English to assure that all employees understand the safety information communicated on-site.

Any hazardous work situations, unsafe acts and conditions, near misses, or other safety incidents must be reported to the Antea Group Site Safety Officer immediately so that corrective measures may be taken, and the information can be reported to Antea Group management in a timely manner.

13.0 BEHAVIORAL SAFETY OBSERVATIONS

Behavior Based Safety is an established method of using reinforcement to change unsafe individual behaviors. The process starts with a behavioral hazard analysis to identify "at-risk" behaviors. These can be determined by using near miss/incident reviews, JSAs, audits, etc. Using the inventory of at-risk behaviors, a checklist is then developed to assist in the observation of work behavior. Observers record safe and at-risk behaviors and provide feedback to workers about their performance. The feedback reinforces the necessity for safe behaviors. Observation data also is used to identify barriers to safe behavior. Removing these barriers lowers the workers' exposure to at-risk conditions and makes it easier for employees to work safely. Antea Group has developed a behavior based safety observation (BBSO) checklist from an analysis of its near miss/incident data, JSAs and auditing data.

The checklist is attached as Appendix H. Field teams should perform one BBSO per field event. BBSOs can be performed on Antea Group employees or subcontractors.

14.0 ACKNOWLEDGMENT AGREEMENT

14.1 Antea Group Employee

SITE HEALTH AND SAFETY PLAN REVIEW RECORD

I acknowledge that I have read and understood the contents of this Site Health and Safety Plan and I agree to abide by all provisions as set forth. I have also checked in with the site client contact to alert them of our presence and for any daily safety issues. Please note: "no implements are to be brought on a Antea Group site, or while performing Antea Group business that are, or are intended to be used, as weapons (such as: guns, knives, etc.)". Firearms are expressly prohibited. By signing below you are certifying, that this policy is upheld. Antea Group retains the option to audit your personnel and equipment to assure your compliance.

NAME	SIGNATURE	CELL PHONE	DATE

NAME	SIGNATURE	CELL PHONE	DATE

14.2 Subcontractor & Visitor

SITE HEALTH AND SAFETY PLAN REVIEW RECORD

I have been given the opportunity to review the Health and Safety Plan for this site and have been briefed on its contents and on the nature of the contaminants and the level and degree of exposure likely as a result of participation in this project. I agree to conform to all the requirements of this plan. (This HASP does not replace the requirement or liability for your company to have it's own safety program and HASP.) I also acknowledge that this plan is specific for this Antea Group site and may not address unforeseen hazards not included in the Site Health and Safety Plan or your specific contracted task. Please note: "no implements are to be brought on a Antea Group site, or while performing Antea Group business that are, or are intended to be used, as weapons (such as: guns, knives, etc.)". Firearms are expressly prohibited.

By signing below I am certifying that this policy is upheld. Antea Group retains the option to audit your personnel and equipment to assure your compliance.

ALL WORKERS HAVE THE AUTHORITY TO STOP, AND/OR REFUSE TO PERFORM, ANY UNSAFE WORK.

NAME & AFFILIATION	SIGNATURE	CELL PHONE	DATE

NAME & AFFILIATION	SIGNATURE	CELL PHONE	DATE

APPENDIX A
DAILY TAILGATE MEETING OUTLINE/CHECKLIST

DAILY TAILGATE MEETING OUTLINE/CHECKLIST

SITE INFORMATION	
Date:	
Site Name:	
Site Location:	
Project / Site Number:	
Name of Antea Group Employee Leading Meeting	
Title of Antea Group Employee Leading Meeting:	

	YES	NO
Are all field team members in attendance for the tailgate meeting?		
Are there potential language barriers or concerns?		
Is safety information provided in language(s) that all workers understand? (If no an interpreter is required.)		
Identified worker with the least years of experience. Name: Company:		
How many years (or months) experience for worker? # of yrs / months:		
How many workers have less than 1 year experience?		
Is each one assigned an on-site mentor?		

TAILGATE DISCUSSIONS POINTS ***(see next page for additional guidelines)***	**COVERED** YES	NO
INTRODUCTION- site background, field team introductions, training documentation review		
SITE HAZARDS- perform site walk-thru with team, locate utility markings, work locations, ID any site hazards		
Locate site/facility Emergency Stop switches		
EMERGENCY ACTION PLAN - emergency #s, evacuation signal & routes (walk them), 1st aid kits, training, etc		
WORK HAZARDS- scope-of-work, etc		
Antea Group discuss safety of Antea Group tasks to be performed- review JSAs		
Contractor(s) discusses safety of contractor work tasks to be performed- review JSAs		
List JSAs reviewed		
Heavy machinery inspection, kill switches located and tested		
Hand tools, power tools and other equipment inspected ***INSPECT portable fire extinguishers onsite***		
On-site impacts, other chemical on-site- monitoring procedures, PPE upgrade and action levels		
ONSITE VEHICLE MOVEMENT AND SPOTTER REQUIREMENTS - discuss movement of work vehicles and spotter procedures		
HIGHLIGHT SPECIFIC WORK CONCERNS- e.g. excavation, drilling, utilities, power lines, traffic, weather, etc.		
PPE REVIEW - review standard PPE, upgrades needed		
Gloves available on site match the glove type(s) listed in the JSAs for today's work? *NOTE: Any gloves not listed in JSA cannot be used onsite without management approval and field editing of onsite JSA*		
ANTEA GROUP OR CLIENT SPECIFIC SAFETY PROTOCOLS_- FOBK practice, utility clearance requirements, etc.		
REQUIRED PERMITS. LIST:		
PROACTIVE SAFETY ACTIONS - report all near misses, stop work authority, STOP WORK as needed,		
FEEDBACK - Worker questions, comments, concerns		
Have all worker signed the site health and safety plan?		

DAILY TAILGATE MEETING OUTLINE/CHECKLIST

TAILGATE MEETING ATTENDANCE *(use additional sheets if required)*		
Worker Name	**Company Name**	**Signature**

AFTERNOON TAILGATE MEETING		YES	NO
Afternoon Tailgate held?			
List Topics:			
Name & Title or worker leading afternoon tailgate meeting:			

DAILY TAILGATE MEETING OUTLINE/CHECKLIST

DAILY TAILGATE MEETINGS

Daily tailgate meetings shall be held at the start of each work day, shift or task change.

The daily tailgate meetings shall review the planned work activities for the day, discuss and resolve the risks and mitigations, discuss any Health, Safety, Security and Environment (HSSE) concerns and raise the HSSE consciousness of each worker before they start work.

These meetings shall include, but are not limited to:

- A review of relevant Health and Safety Plan (HASP) elements to be performed at an appropriate frequency. A review shall be done whenever the HASP is updated and should also be done regularly to remind workforce of relevant elements.
- A Hazard Communication (HAZCOM) review.
- Address the risks of any issues arising from the site walk and the location of on-site equipment and materials.
- Complete the tailgate safety meeting forms.
- A review of applicable permit/s.
- A review of the right and obligation to 'Stop Work.'
- Complete and review *Job Safety Analyses* (JSAs) for the tasks to be completed. The focus should be on how to complete activities on a given site during that work day and activity. The JSA discussion should include identification of 'Stop Work' triggers.
- Implement the controls set forth in the HASP and JSAs. Verify that all parties on site have a complete understanding of the work plan and controls that are in place.
- In addition, allocate resources and complete permits.

PARTICIPATION AND PREPARATION

Effective daily tailgate meetings require participation. Team members should recognize the connection between the meetings and their personal safety.

Involvement of all team members is a critical factor for a successful meeting.

The conductor of the daily tailgate meeting shall prepare by achieving a thorough understanding of: JSAs, HASP, the scope of work, the subcontractors on site, and client requirements.

Additionally, the conductor of the meeting should have the required checklists available to verify that he or she covers all applicable and necessary topics.

TAILGATE MEETING LOCATIONS

When selecting the location of the meetings, the following shall be considered:

- Safety of personnel.
- Background noise.
- Uncomfortable or cramped locations.
- Weather and environment.

APPENDIX B
I-3 FIRST REPORT FIELD FORM

I-3 – FIRST REPORT FIELD FORM

All injuries/illnesses to Antea Group employees, contractor employees, and contractor or subcontractor employees require immediate notification to your Manager, and Darius Szewczak or Tara Duffy

GENERAL INFORMATION	
Antea Group Employee Name Reporting:	
Date of Incident:	
City/State of Antea Group Office:	
Site Project/ID Number:	
Site Location (Street, City, State):	
Antea Group Project Manager Name:	
Subcontractor Name (if applicable):	
Incident Location (Street, City, State):	
Short Description of Incident:	

CONDITIONS					
Weather:		Temperature:		Lighting:	

WHEN DID INCIDENT OCCUR						
	Month	Day	Year	Time (hrs)	(min)	AM/PM
Occurred						
Reported						

DETAILS		
Witness Name (s)	Employee/Contractor/Other	Phone #

Equipment Involved:	
Incident Type:	

Environmental Release Info	Product / Material	Amount	Unit

Full Description of Incident:	
Immediate Actions Taken:	

Reported by:	
Date:	

APPENDIX C
CLASS III HASP
HAZARDOUS PROPERTY INFORMATION
(including MSDS)

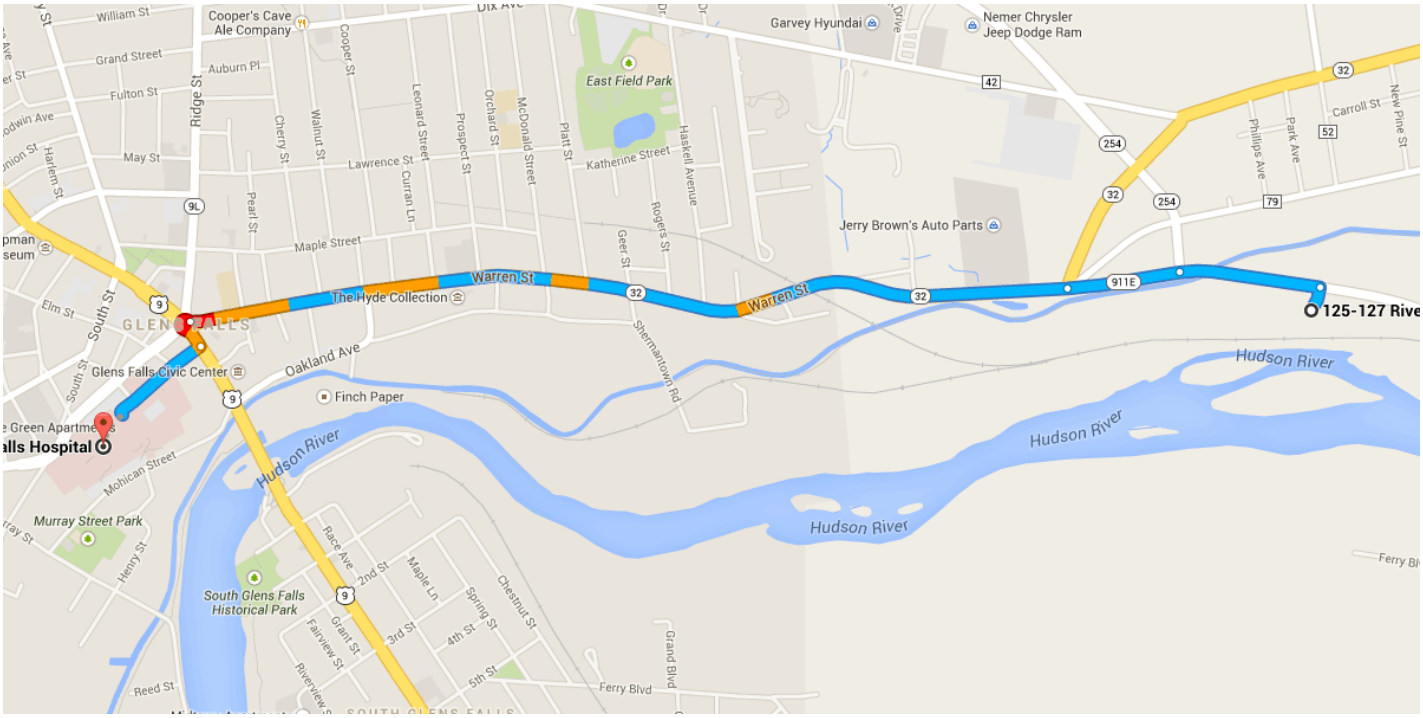
FIGURES

ROUTE TO HOSPITAL MAP
AND
SITE MAPS

Google

Drive 2.4 miles, 7 min

Directions from **125-127 River St** to **Glens Falls Hospital**



125-127 River St

Queensbury, NY 12804

1. Head **northeast** toward **NY-254 E**

240 ft

2. Turn **left** onto **NY-254 W**

0.3 mi

3. Continue onto **NY-911E**

0.2 mi

4. Continue onto **NY-32 S/Warren St**

1.6 mi

5. At **Centennial Cir**, take the **4th** exit onto **Glen St**

420 ft

6. Turn **right** onto **Park St**

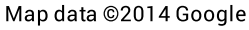
Destination will be on the right

0.2 mi

Glens Falls Hospital

100 Park St, Glens Falls, NY 12801

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.



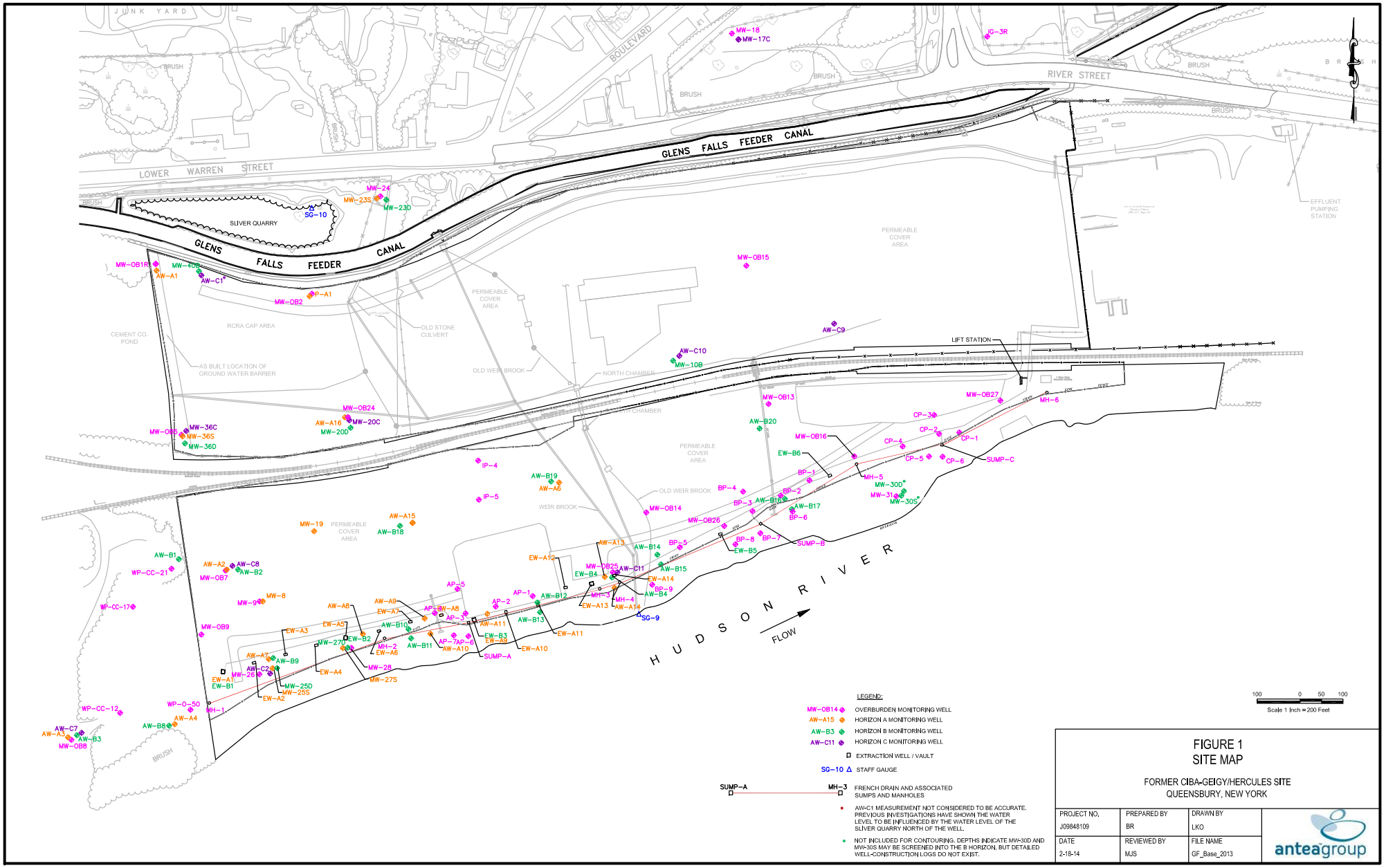


FIGURE 1
SITE MAP

FORMER CIBA-GEIGY/HERCULES SITE
QUEENSBURY, NEW YORK

PROJECT NO.	PREPARED BY	DRAWN BY
J09848109	BR	LKO
DATE	REVIEWED BY	FILE NAME
2-18-14	MJS	GF_Base_2013

anteagroup

Appendix D Site Inspection Forms

Monthly, Quarterly, and Annual Site Inspection Form

Initial Issue Date: 11/3/2016
Revision Date: 7/18/2022
Revised By: KA

FORMER HERCULES/CIBA-GEIGY GWES DATA & SITE CONDITION INSPECTION SHEET

Client: Ashland, Inc.

Site Location: 89 Lower Warren Street, Queensbury, NY

Date of visit: _____

Time of visit: _____

O&M Tech(s): _____

Event Type (circle): **Monthly** **Quarterly** **Annual**

Monthly Inspection Activities

Groundwater Extraction System O&M

WELL ID	COMPUTER			Totalizer	WELL/SUMP HEAD					System vs. Actual GW Elevation	±0.10 ft? (yes/no)	Time	Enclosure Locked/Well Sealed?	
	Well Setpoint/ Interval	Reported GW Elevation	GPM		GPM	PSI 1	DTW	Survey Measure Point	GW Elevation					
SUMP A	210.23-211.22							239.89					Yes	No
SUMP B	211.50-214.00					--		236.39					Yes	No
EW-B5	187.65-193.95							235.75					Yes	No
EPS WET WELL	--	--		Net: Gross:	--	--	--	--		--	--		Yes	No

	Arrival		Departure	
All Gates and buildings secured and locked? (if no and there is evidence of trespassing, notify PM)	Yes	No	Yes	No
Any holes or breaks in the perimeter fence line?	Yes	No	Yes	No
Is dumpster secured and locked? (if no and there is evidence of trespassing, notify PM)	Yes	No	Yes	No
All access roads clear and in good condition? (if no, state details in notes section)	Yes	No	Yes	No
Site utilities operational? (if no, state details in notes section)	Yes	No	Yes	No
Any system alarms active? (if yes, state details in notes section)	Yes	No	Yes	No
Any housekeeping issues? (if yes, state details in notes section)	Yes	No	Yes	No
Are all Fire Extinguishers present and in good condition? (if no, state details in the notes section)	Yes	No	Yes	No

Data Management	Completed		
Download backup telemetry files in EPS	Yes	No	N/A
Record pH and flow readings at POTW	Yes	No	

Quarterly Inspection Activities

RCRA Cap and Permeable Cover Inspection	Permeable Cover		RCRA Cap	
Any settlement, subsidence, surface cracking, or erosion in the cap/cover? (if yes, state details in the notes section)	Yes	No	Yes	No
Any biological intrusion or erosion in the cap/cover? i.e. burrowing gophers, beavers, fallen trees, etc. (if yes, state details in the notes section)	Yes	No	Yes	No
Any ponded water on top of cap/cover? (if yes, state details in notes section)	Yes	No	Yes	No
Any settlement, subsidence, surface cracking, or erosion in or around the building slabs? (if yes, state details in the notes section)	Yes	No	N/A	
Any settlement, subsidence, surface cracking, or erosion along the Hudson River Bank? (if yes, state details in the notes section)	Yes	No		
Is the rip-rap along the Hudson Riverbank in good condition? (if no, state details in notes section)	Yes	No		
Any settlement, subsidence, structure cracking, or erosion in or around the outfall structures along Hudson River? (if yes, state details in notes section)	Yes	No		

Comments	
Site vegetation conditions? (do we need to call for any vegetation removal?)	
Cement company pond conditions? (Is the pond level encroaching upon the RCRA cap? / Is there any discoloration?)	
Force main conditions? (Surrounding vegetation blocking view? / Is there damage to outer insulation?)	
Any other visible site erosion? (if yes, state details)	

Data Management	Completed		
Photographs of RCRA cap, cement company pond, and force main collected?	Yes	No	If no, state details in notes section

Other Actions	Date	Initials
Collect quarterly discharge samples from POTW and submit for analysis		
Quarterly protective safety device (PSD) Inspections (Separate Form)		

Annual Inspection Activities

Action	Date		Initials
Any evidence of ongoing active disturbances or change of use in Former Stormwater Impoundment Basin, Cement Company Pond, Hudson River AOC, Ponded and Backwater Area (PBA)? (if yes, state details in notes section)	Yes	No	
Are the HWM Permit and POTW Permit available in the site trailer, and in good condition? (if no, state details in the notes section)	Yes	No	
Confirm that manholes, catch basins, swales, and level spreaders appear clear of accumulated debris			

Notes:
Survey elevation of Sump A: 239.89
Survey elevation of Sump B: 236.39
Survey elevation of EW-B5: 235.75
If System v. Actual GW Elevation >0.10 ft, call PM prior to leaving site.

Force Main Inspection Forms

POTW Force Main Inspection Form - Checklist
Former Ciba-Geigy Facility, Glens Falls, NY

Date of Inspection: _____

Weather: _____

Note: Use the checklist below to look for signs of damage to the force main. Use second page to indicate if there is a corresponding issue at each section of the force main. Document if significant trees, tree branches, or brush are over the force main and need to be cleared.

Evidence of Moisture:
Any evidence of leaks at seams, valves?
Any evidence of past leaks?
Any vibration or evidence of movement?
Any mold or moisture damage?
Any areas with scale, pits, or rust?
Any significant corrosion of flange bolts?
Any corrosion at supports?

Jacketing:
Any damage to jacketing exposing insulation?
Any missing jacketing?
Any significant dents indicating potential damage to protected pipe?

Insulation:
Any physical damage of jacketing?
Any deterioration / damage of weather seals
Any bulging or wet insulation?
Any discoloration indicating leakage?
Any missing insulation?

Notes:

Inpector's Signature: _____

Inspector's Name (print): _____

POTW Force Main Inspection Form - Checklist
Former Ciba-Geigy Facility, Glens Falls, NY

Area	Force Main Section	Evidence of Moisture	Jacketing Damage	Insulation Damage	Trees/Brush	Notes
Weir Brook Sluice Area	WB0 to WB1					
	WB1 to WB2					
Area between Trailer and Pump House	0 to 1					
	1 to 2					
	2 to 3					
	4 to 5					
	6 to 7					
	7 to 8					
	8 to 9					
	9 to 10					
	10 to 11					
	11 to 12					
	12 to 13					
	13 to 14					
	14 to 15					
	15 to 16					
	16 to 17					
	17 to 18					
	18 to 19					
	19 to 20					
	20 to 21					
	21 to 22					
	22 to 23					
	23 to 24					
	24 to 25					
	25 to 26					
	26 to 27					
	27 to 28					
	28 to 29					
	29 to 30					



EHS Support

FORMER CIBA-GEIGY / HERCULES SITE
GLENS FALLS, NY

FORCE MAIN INSPECTION SITE MAP

FIGURE 1

Reviewed By: C. Reuter

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Printed 1/13/2023 4:53:43 PM by ChelbiSaranecki

Quarterly Protective Safety Device (PSD) Inspection Forms

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

MAIN PANEL EMERGENCY STOP

Quarterly Inspection

Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect for external damage, cracking, deformation & discoloration**		
2	**Inspect for external corrosion**		
3	**Inspect signage/placards for damage, cracking, deformation or discoloration**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	
Quarterly Inspection	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

MAIN PANEL EMERGENCY STOP

Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Press e-stop button inward**		
3	**Verify response / complete data recording**		
4	**Pull button outward (reset)**		
5	**Complete recording of data**		

DATA TO BE RECORDED	*RESULTS*	
Initial integrity	Good	Other:
Initial position	Inward	Outward
Equipment shutdown	Yes	No
Alarm notification	Yes	No
Position after reset	Inward	Outward
System restarted	Yes	No
System downtime due to testing	System Off:	
	System On:	
	Toal Downtime:	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

MAIN PANEL EMERGENCY STOP

Repair

STEP	PROCEDURE	DATE	INITIALS
1	Shutdown system utilizing shutdown procedures		
2	Remainder of procedures to be completed by licensed and qualified electrician		
3	LOTO power supply to switch and inspect possible damaged components		

DATA TO BE RECORDED	RESULTS
Emergency Stop repair date	
Emergency Stop repair effort/parts list	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

MAIN PANEL EMERGENCY STOP

Replacement

STEP	PROCEDURE	DATE	INITIALS
1	Shutdown system utilizing shutdown procedures		
2	Remainder of procedures to be completed by licensed and qualified electrician		
3	Apply LOTO to power supply to switch and replace component		
4	*Remove LOTO and test switch to ensure proper operation*		

DATA TO BE RECORDED	RESULTS
Verify in-kind replacement	
Emergency stop button replacement date	
Emergency stop button serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-A
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-A
Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change high high level setpoint to below water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-A
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in sump**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-A
Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**LOTO power to Sump A following LOTO procedures**		
2	**Remove transducer from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace transducer with new unit and reconnect to electrical panel**		
5	**Test electrical functionality of transducer and reinstall into well**		
6	**Follow functionality test procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B
Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change high high level setpoint to below water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in sump**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B
Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**LOTO power to Sump A following LOTO procedures**		
2	**Remove transducer from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace transducer with new unit and reconnect to electrical panel**		
5	**Test electrical functionality of transducer and reinstall into well**		
6	**Follow functionality test procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B5
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B5

Annual Inspection

Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change high high level setpoint to below water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B5
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in extraction well**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

High High Water Level - LT-B5 Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**LOTO power to EW-B5 following LOTO procedures**		
2	**Remove transducer from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace transducer with new unit and reconnect to electrical panel**		
5	**Test electrical functionality of transducer and reinstall into well**		
6	**Follow functionality test procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

ORS Interface Probe - LSHH-EPS
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect exterior protective float assembly screen for damage, cracking, deformation, and discoloration.**		
2	**Inspect floats, stems, clips for corrosion and scaling with attention to free movement of wetted parts (e.g., float bulb)**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

ORS Interface Probe - LSHH-EPS
Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" switch setpoint (depth, orientation)**		
3	**Begin to remove float assembly**		
4	**Note deactivation of dewatering pump**		
5	**Verify system shutdown on main control panel**		
6	**Verify signal/alarm status is received at control panel**		
7	**Verify notification system activates**		
8	**Return float to Record "as left" setpoint**		
9	**Using main control panel touch screen, acknowledge alarms and reset.**		
10	**Verify alarm condition is no longer present**		
11	**Restart dewatering pumps following start up procedure**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	Alarm Active Alarm Inactive
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	Alarm Active Alarm Inactive
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

ORS Interface Probe - LSHH-EPS Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove ORS interface probe from well and inspect for abnormalities**		
3	**Test float assembly to ensure proper operation**		
4	**Repair connections/floats and test electrical functionality of switch**		

TO BE RECORDED	*RESULTS*
Switch rebuild-repair date	
Switch rebuild or repair effort/parts list	
Summary of rebuild-repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

ORS Interface Probe - LSHH-EPS Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove ORS interface probe from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace ORS interface probe with new unit and connect to electrical panel**		
5	**Test electrical functionality of probe and reinstall into well**		
6	**Restart dewatering pumps following start up procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Level switch replacement date	
Level switch serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-A
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-A
Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change low low level setpoint to above water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-A
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in sump**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY
Low Low Water Level - LT-A
Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**LOTO power to Sump A following LOTO procedures**		
2	**Remove transducer from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace transducer with new unit and reconnect to electrical panel**		
5	**Test electrical functionality of transducer and reinstall into well**		
6	**Follow functionality test procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B
Annual Inspection
Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change low low level setpoint to above water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in sump**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY
Low Low Water Level - LT-B
Replacement

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**LOTO power to Sump A following LOTO procedures**		
2	**Remove transducer from well**		
3	**Remove electrical connection from electrical panel**		
4	**Replace transducer with new unit and reconnect to electrical panel**		
5	**Test electrical functionality of transducer and reinstall into well**		
6	**Follow functionality test procedure**		

TO BE RECORDED	*RESULTS*
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B5
Quarterly Inspection
Time Directed

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Inspect transducer exterior and wires for damage, cracking, deformation, and discoloration.**		
2	**Inspect transducer exterior and wires for corrosion and scaling**		

DATA TO BE RECORDED	*RESULTS*
Condition Assessment	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B5

Annual Inspection

Failure Finding

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Record "initial" system operational data**		
2	**Verify/record "as found" setpoint**		
3	**Change low low level setpoint to above water level**		
4	**Verify system shutdown**		
5	**Verify signal/alarm status is received at control panel**		
6	**Verify notification system activates**		
7	**Return setpoint to initial value**		
8	**Verify alarm condition is no longer present**		

TO BE RECORDED	*RESULTS*
As-found switch setpoint	
System shutdown	Yes No
Signal/alarm received at control panel	Yes No
Notification to technician	Yes No
As-left setpoint	
Signal/alarm reset	Yes No
Alarm condition no longer present	Yes No

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B5
Repair

STEP	*PROCEDURE*	*DATE*	*INITIALS*
1	**Shutdown system utilizing shutdown procedures**		
2	**Remove level transducer from well and inspect for abnormalities**		
3	**Repair connections/floats and test electrical functionality of transducer**		
4	**Measure wire to appropriate length**		
5	**Replace transducer in extraction well**		
6	**Gauge well to verify accurate data transmission**		

TO BE RECORDED	*RESULTS*
Transducer repair date	
Transducer repair effort/parts list	
Summary of repair task	

ADDITIONAL COMMENTS

Former Hercules/Ciba-Geigy Facility
Glens Falls New York
Groundwater Extraction System

89 Lower Warren Street
Queensbury, NY

Low Low Water Level - LT-B5 Replacement

STEP	PROCEDURE	DATE	INITIALS
1	LOTO power to EW-B5 following LOTO procedures		
2	Remove transducer from well		
3	Remove electrical connection from electrical panel		
4	Replace transducer with new unit and reconnect to electrical panel		
5	Test electrical functionality of transducer and reinstall into well		
6	Follow functionality test procedure		

TO BE RECORDED	RESULTS
Verify in-kind replacement	
Transducer replacement date	
Transducer serial number, model number & type	

ADDITIONAL COMMENTS

Health and Safety Plan

Former Ciba Geigy Facility
Glens Falls, NY

Prepared for:

Hercules LLC

Prepared by:

EHS Support

June 2026

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Appendix B Job Safety Analysis Worksheet
Appendix C Daily Tailgate Safety Meeting Form
Appendix D Air Monitoring Log

Health and Safety Plan Approval

This Health and Safety Plan (HASP) was prepared for employees performing work that poses physical and/or chemical exposure risks to EHS Support LLC ("EHS Support") employees and EHS Support subcontractors. It was prepared based on the best available information regarding the hazards known or suspected to be present on the project Site. While it is not possible to identify, evaluate, and protect against all possible hazards in advance of the Site visit, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury. This HASP will be updated as necessary to include new project activities, risks, or changes in organizational structure.

By signing below, I acknowledge that I have reviewed and hereby approve this HASP. This HASP has been written for the exclusive use of EHS Support's employees and direct contractors. The plan is written for specified Site conditions, dates, and personnel, and must be amended if these conditions change. This HASP is only valid for one year after approval.

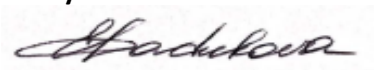
Written by:



6/11/2026

Gregg Hicks Date
EHS Director of Internal H&S

Approved by:



6/11/2026

Elena Dadukova Date
EHS Support Project Manager

HASP Compliance Form

I, the undersigned, have been provided with a copy of this Site-specific project HASP for the Hercules LLC, Glens Falls facility. I have read the HASP, attended a project safety orientation session conducted by EHS Support, and have had the opportunity to ask questions about health and safety issues relating to this project. I understand that it is my responsibility to abide by this Plan, and that physical injury, damage, and other harm to myself or others could result from my failure to do so.

Name (print)	Company	Signature	Date

HASP Revisions

HASP Section	Updated By	Site Safety Officer Initials	Date	Comment(s)
All	GWH	ED	11/06/2023	Updated scope, field staff, hazards
All	GWH	ED	11/04/2024	Updated scope, field staff, hazards
All	GWH	ED	06/06/2026	Updated scope, field staff, hazards

Acronyms

°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists
AED	automatic external defibrillator
ANSI	American National Standards Institute
APR	air-purifying respirator
C	ceiling exposure limit
Ca	potential occupational carcinogen
CFR	Code of Federal Regulations
COC	constituent of concern
CPR	cardiopulmonary resuscitation
dB	decibels
eV	electron volt
FID	flame ionization detector
GI	gastrointestinal
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation derived waste
IDLH	immediately dangerous to life and health
IP	ionization potential
JSA	Job Safety Analysis
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
mph	miles per hour
mrem/hr	milliroentgen equivalent in man per hour
NIOSH	National Institute for Occupational Safety and Health
OBZ	Operator's Breathing Zone
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PSA	Project Safety Analysis
REL	recommended exposure limit
SCBA	self-contained breathing apparatus

SPCC	Spill Prevention, Control, and Countermeasure
SSO	Site Safety Officer
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
VOC	volatile organic compound

Trademarks, trade names, company, or product names referenced herein are used for identification purposes only and are the property of their respective owners.

1 Introduction

This Health and Safety Plan (HASP) summarizes health and safety hazard information for EHS Support LLC ("EHS Support") field activities related to work conducted at the former Hercules/Ciba Geigy facility at 89 Lower Warren Street in Queensbury, New York. The EHS Support HASP delineates procedures that will allow personnel to identify and predict hazards, work safely, and respond quickly and appropriately to Site emergencies. All Site work will be conducted in accordance with the following:

- EHS Support standard operating procedures
- Occupational Safety and Health Administration (OSHA) regulations in the Code of Federal Regulations (CFR), Title 29 Parts 1904, 1910, and 1926 as applicable
- Any applicable state safety regulations

Organizational Structure	
EHS Support has established a chain of command with lines of authority, responsibility, and communication for this project. The Project Manager (PM) has the responsibility and authority to direct all Site operations and is ultimately responsible for the overall management of the project. The field work covered by this HASP will be overseen or managed by a Field Team Leader who is responsible for the proper implementation and execution of the comprehensive work plan. Each field project will have a Site Safety Officer (SSO) who has the responsibility and authority to implement the HASP and verify compliance with the plan. Other personnel needed to conduct the proposed work will be assigned.	
PM	Is responsible for appropriately staffing the project to safely and effectively implement the work plan. They will also ensure that company funds are available for the Field Team Leader to provide appropriate personal protective equipment (PPE) and monitoring equipment.
Field Team Leader	Is responsible for the safe and proper implementation of the work plan. They will have the authority to expend company resources to ensure that PPE and other safety equipment are available and in good working order. They will communicate with the PM regarding implementation of the work plan.
SSO	Is responsible for the implementation of this HASP. They will communicate any issues arising from changing Site conditions, upgrades in PPE, decontamination procedures, and needs for monitoring equipment with the Site PM or Field Team Leader. The SSO will ensure that other workers assigned to the project are following the HASP.
Field Team Members (EHS Support Personnel, Contractors, and Subcontractors)	The field team members are responsible for complying with the HASP, notifying the SSO of hazardous or potentially hazardous conditions, and carrying out assigned tasks during field operations.
Site Visitors and State/Federal Agency Representatives	Any visitor to the project site is responsible for complying with all aspects of this HASP.
Note: It is expected that other employees assigned to the project will follow the HASP and report all potential safety concerns to the SSO.	

A Project Safety Analysis (PSA, included as **Appendix A**) must be completed prior to any field mobilization to identify hazards and assess risk associated with the scoped tasks. This analysis should be completed with feedback from the field team, client, subcontractors, and other key stakeholders.

1.1 Emergency Services

EHS Support field staff have first aid/CPR/AED training, and each project site will have a first aid kit immediately available to all work areas on-site. Injuries requiring more than first aid where the injured employee is alert and ambulatory should be treated at an occupational health clinic unless the injury is one where there is a concern regarding moving the employee. Significant injuries and any injury causing the loss of consciousness should be treated at the nearest hospital, and the employee should be transported via an emergency medical service provider. At no time shall an injured employee drive themselves for treatment.

In the event of an incident follow the EHS Support Emergency Action Plan, which includes the following sequence of events:

Assess the situation and workplace conditions, and ensure the area is safe to enter and ensure injured workers get immediate medical treatment if necessary.

For a serious injury or incident (incident requiring immediate medical treatment or hazardous material spill), call 911 or facility specific emergency number for necessary emergency response personnel.

Notify the immediate supervisor and the H&S Service Line Leader immediately or once it is safe to do so in the following manner. Proceed to the next contact if the H&S leader is not available until you reach someone via phone.

Gregg Hicks – 606.922.5585

Ryan Harding – 978.505.5762

Mark Smith – 850.544.9219

If a non-life-threatening injury / incident:

If you do not live in Ohio or Washington, and you are not a QHS employee, call TruePeo at 1-888-834-5240, available 24/7.

Ohio residents should call the Ohio Bureau of Workers' Compensation at 1-800-644-6292.

Washington residents should call the Washington State Department of Labor & Industries at 1-877-561-3453.

QHS employees, regardless of state of residence, should call The Hartford at 1-800-327-3636.

Ensure you follow the appropriate Emergency Action Plan

Project Personnel and Emergency Contact Information

Emergency Phone Numbers		
Emergency (fire, police, ambulance)		911
Emergency Facility Specific		
Glens Falls Hospital	100 Park Street Glens Falls, NY 12801	(518) 926-1000
Center for Occupational Health	102 Park Street B2 Glens Falls, NY 12801	(518) 926-2140 Monday-Thursday, 6:30 a.m. - 5:00 p.m. Friday, 6:30 a.m. - 4:00 p.m.
Site/Client Contacts		
Client PM or Contact	James Vondracek	614-323-5448
Site Contact	Elena Dadukova	302-440-4401
Client or Site H&S Contact	James Vondracek	614-323-5448
EHS Support Contacts		
Project Manager	Elena Dadukova	302-440-4401
Task/Field Lead	Cal Figliozzi	401-374-2566
Site Safety Officer	Cal Figliozzi	401-374-2566
Project Health and Safety	Gregg Hicks	606-922-5585
Field Team Members	Cal Figliozzi	401-374-2566
	Jack Horvath	412-742-6762
H&S Service Line Lead	Gregg Hicks	606-922-5585
Human Resources	Lateefah Allen	609-442-0341
Contractors		
Maviro	Elijah Neumann	518-929-4201
CONTRACTOR COMPANY	INSERT NAME	INSERT PHONE
CONTRACTOR COMPANY	INSERT NAME	INSERT PHONE
CONTRACTOR COMPANY	INSERT NAME	INSERT PHONE
CONTRACTOR COMPANY	INSERT NAME	INSERT PHONE
CONTRACTOR COMPANY	INSERT NAME	INSERT PHONE
Subcontractors		
Utility Locator Company	INSERT NAME	INSERT PHONE

Emergency Phone Numbers		
State/Federal Agency		
NYSDEC	Kevin Chazhikattu	518-408-2529
Incident Notification Process		
Dial 911/Facility or Site Emergency Number as applicable		
Facility contacts (if applicable)		
Contact EHS Support PM	Elena Dadukova	
Contact H&S Service Line Lead	Gregg Hicks	
Contact Client PM	James Vondracek	
Client incident reporting number	1-800-ASHLAND	
Other Emergency Information		
Location of assembly areas	Site trailer	
Location of storm shelter	Site trailer	
Nearest First Aid Kit/AED (on-site, provided by EHS - Support personnel, or distance to nearest)	Site trailer / Employee vehicle	
Nearest Eyewash/Shower (on-site, provided by EHS - Support personnel, or distance to nearest)	Site trailer	

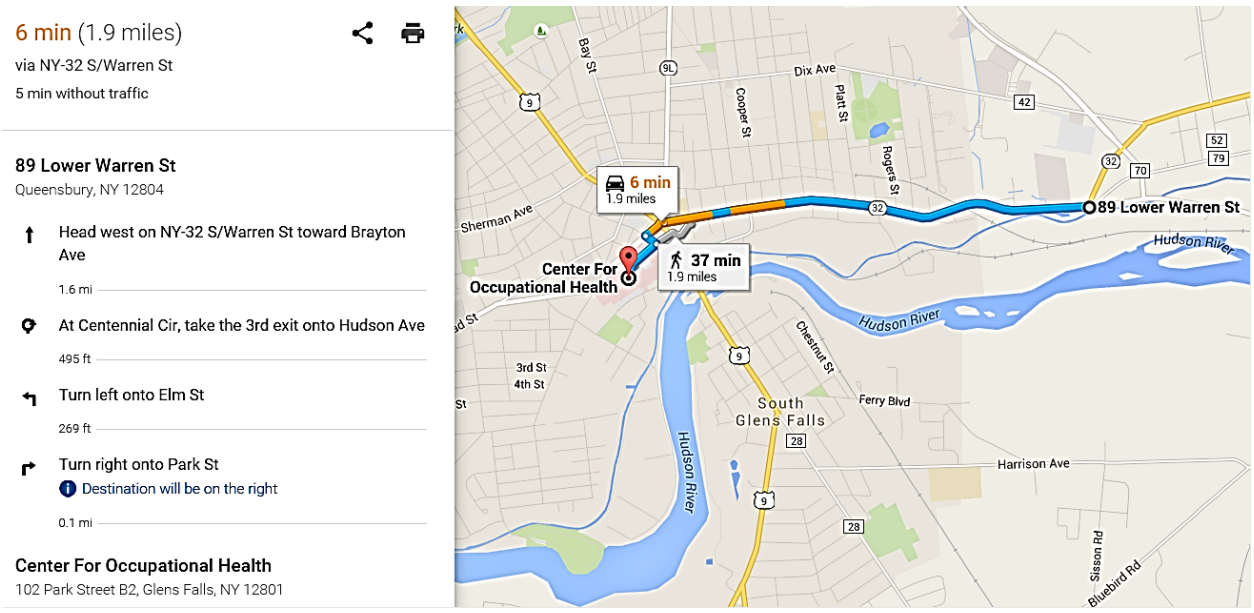


Figure 1-1 Occupational Clinic Map and Directions

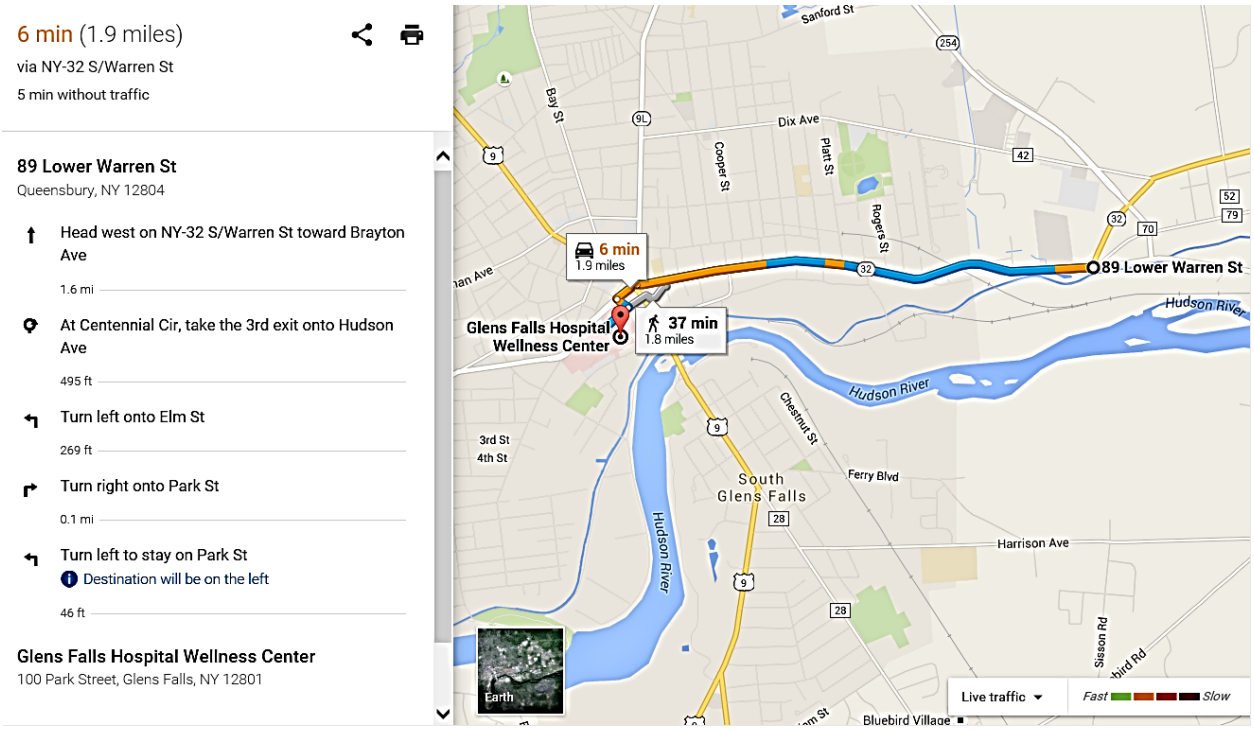


Figure 1-2 Hospital Map and Directions

2 Scope of Work

Project/Task Number	LLC.16262.2026	**HASP Preparation Date**	June 2026
Activity Duration (days/weeks/months)	Ongoing	**Anticipated Start Date of Current Work**	Ongoing
State of the Site/Facility	Inactive	**Site Access**	Road / Vehicle

Site Topography	Flat to sloping

Normal Shift Work	Yes
Lone Working	☐ Yes ☒ No If Yes: Check in person:
	Check in frequency:
Traffic	Light
Major Tasks *A Project Safety Analysis (PSA, **Appendix A**) must be completed prior to mobilization to identify specific hazards and assess risk. The Job Safety Analysis (JSA, **Appendix B**) Form must be completed for each task. This form includes the task, hazard controls, and personal protective equipment (PPE) used for each task.*	Please Describe Major Tasks (are included below): • Routine site inspections, site walks. • Routine groundwater gauging, sampling, and well redevelopment, if needed. • Routine surface water sampling from shore. • Construction oversight o Oversee force main repair to aluminum jacketing and insulation replacement • Soil sampling using drill rig and hand auger. • Sediment and surface water sampling inundated area within Sliver Quarry area. •
Equipment Needed	Dump trucks, excavators, hand tools, PPE, skid steer, drums, drill rig, hand auger, bottleware, sampling equipment, personal floatation devices (PFDs)

A morning meeting (often referred to as a “tailgate” or “toolbox” meeting) must be held daily prior to commencement of any field tasks. A tailgate template is included as **Appendix C**. This meeting should include all field personnel and subcontractors performing work. Discussion topics should include scoped daily tasks, hazards and risk assessment as described in corresponding JSA documents, and lessons learned.

See **Figure 2-1** for the Site location map, **Figure 2-2** for the Site plan, and **Figure 2-3** for an Aerial View of the Site.

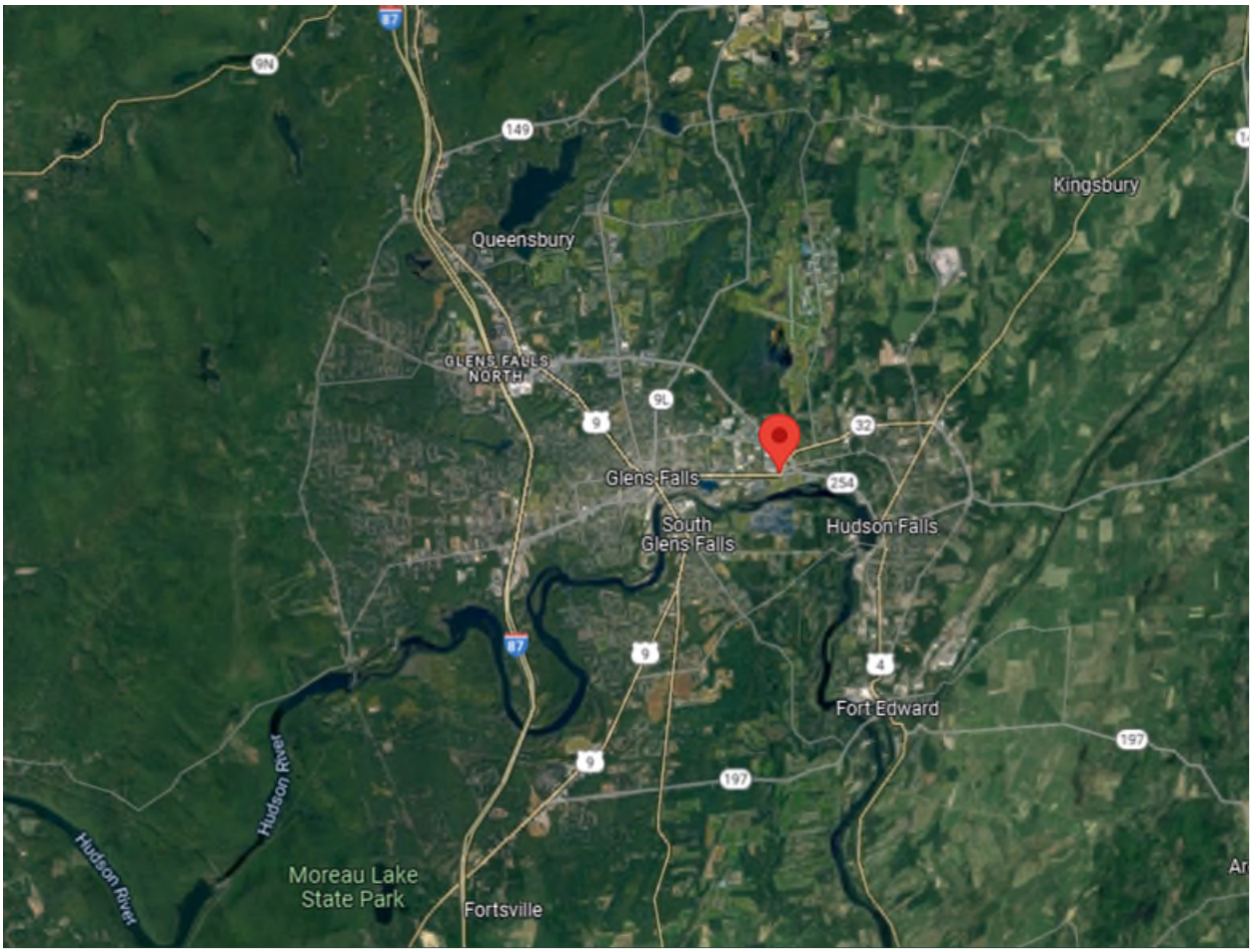


Figure 2-1 Site Location Map

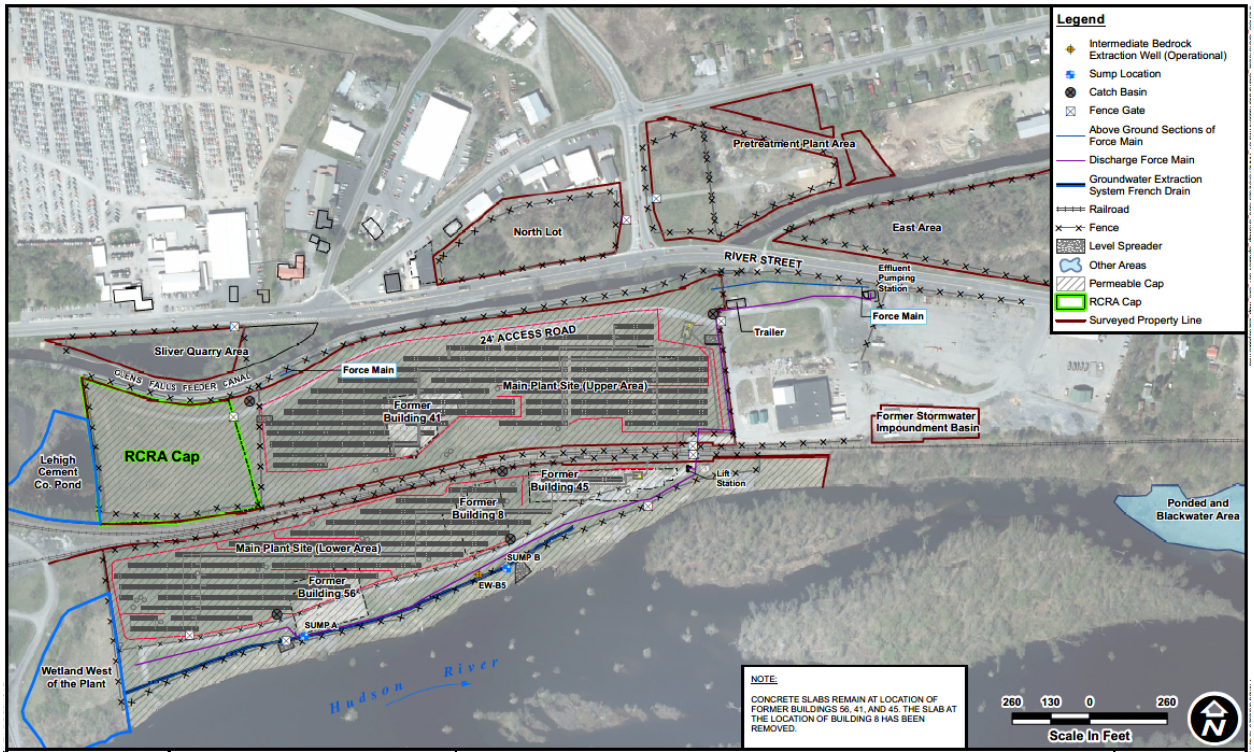


Figure 2-2 Site Plan



Figure 2-3 Site Ariel View Photograph

3 Task/Operation Preliminary Health and Safety Hazard Assessment

Physical Hazards	Working around heavy machinery during this task oversight. Slips, trips & falls, work near water. Striking above ground hazards such as the solar panels onsite.
Biological Hazards	Bees, snakes, spiders, ticks, poison ivy.
Environmental Hazards and Site-Specific Conditions	Above ground utilities, cold stress, heat stress, and thunderstorms.
Environmental Release/Spill Containment	EHS Support does not respond to major spills. Personnel will have equipment and/or absorbents on hand to clean minor spills related to the materials being handled for the work scope. For major spills, contact the appropriate agency. In the event of a spill or leak: 1. **Evacuate** (injured parties and all non-essential personnel). 2. **Stop, Coordinate and Eliminate** (stop source of incident (e.g. spill), coordinate shut down of equipment, and eliminate sources of ignition and sparks for flammables or incompatibles that could catch fire, explode, or vigorously react. Wear appropriate PPE). 3. **Notify** (call 911 for the appropriate response agency). 4. **Secure** the area. 5. **Treat** (provide immediate treatment to injured and affected personnel). 6. **Identify** material (if unknown) and identify PPE, hazard and response procedures using SDSs). 7. **Contain/Isolate** (contain released material/incident using emergency response equipment and/or set up perimeter to isolate area). 8. **Meet** the spill response crew and advise them of the spill location and the material spilled. 9. **Document** spill/environmental issue electronically via form located in the Issues section of Air Table. **10. Investigate and remediate**
Chemical Hazards	Dusts

3.1 Site-Specific Chemical Exposure Limits

Site-Specific Chemical Exposure Limits										
Chemical Name	**OSHA PEL**		**ACGIH TLV**		**IDLH**	**Potential Exposure Routes**				**Exposure Symptoms**
	TWA	**STEL**	**TWA**	**STEL**		**Inhalation**	**Absorption**	**Ingestion**	**Injection**	
Cadmium	0.005 mg/m^3	NA	0.01 mg/m^3; 0.002 mg/m^3 Respirable Fraction	NA	9 mg/m^3	X		X		Respiratory system, kidneys, prostate, blood
Chromium	1 mg/m3	NA	0.5 mg/m^3	NA	250 mg/m^3	X		X		Eyes, skin, respiratory system
Hexavalent Chromium	0.005 mg/m^3	NA	0.05 mg/m^3	NA	NA	X		X		Cancer (lung, nasopharynx, oropharynx, nasal passages)
Lead	0.05 mg/m^3	NA	0.05 mg/m^3	NA	100 mg/m^3	X		X		Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
Mercury	0.1 mg/m^3	NA	0.1 mg/m^3 Skin for aryl compounds; 0.025 mg/m^3 Skin for elemental and inorganic compounds	NA	10 mg/m^3	X		X		Eyes, skin, respiratory system, central nervous system, kidneys
Chlorobenzene	75 ppm	NA	10 ppm	NA	1000 ppm	X		X		Eyes, skin, respiratory system, central nervous system, liver
Dichlorobenzenes	75 ppm	NA	10 ppm	NA	150 ppm	X		X		Liver, respiratory system, eyes, kidneys, skin
Vanadium	NA	NA	NA	NA	35 mg/m^3	X		X		Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)

4 Employee Training Requirements

Training Type	Applies To:				
	Does Not Apply	All Personnel	EHS Support Employees	Contractor Site Personnel	Personnel Entering the Exclusion Zone
40-hour HAZWOPER training with a current 8-hour refresher certificate	☐	☒	☐	☐	☐
8-hour HAZWOPER supervisor training	☐	☐	☒	☐	☐
Contractor site-specific training	☒	☐	☐	☐	☐
Daily Tailgate Safety Meetings	☐	☒	☐	☐	☐
Fire Watch	☒	☐	☐	☐	☐
First Aid/CPR/AED training for remote Sites	☐	☐	☒	☐	☐
Initial training for Site workers and supervisors	☒	☐	☐	☐	☐
Pre-mobilization PSA and project kick off meeting	☐	☒	☐	☐	☐
Railroad Safety Training	☒	☐	☐	☐	☐
TWIC	☒	☐	☐	☐	☐
Other (specify)					
Click or tap here to enter text.		☐	☐	☐	☐
Click or tap here to enter text.		☐	☐	☐	☐
Click or tap here to enter text.		☐	☐	☐	☐

5 Employee Medical Qualifications

Type	Applies To:			
	Does Not Apply	All Personnel	EHS Support Employees	Contractor Site Personnel
Annual physical	☐	☐	☒	☐
Client/Site drug and/or alcohol testing	☒	☐	☐	☐
Respirator fit test and medical evaluation	☒	☐	☐	☐
Other (specify)				
Click or tap here to enter text.		☐	☐	☐
Click or tap here to enter text.		☐	☐	☐
Click or tap here to enter text.		☐	☐	☐

6 Hazard Controls

6.1 Engineering and Administrative Controls

EHS Support will implement engineering and administrative controls to prohibit access to hazardous areas, warn of physical hazards and/or otherwise minimize the likelihood of worker injury or exposure. Specific engineering and administrative controls for each EHS Support activity are listed in the Job Safety Analysis in **Appendix B**.

6.2 Potential Routes of Exposure

6.2.1 Inhalation

Constituents in dust may become airborne while performing sampling. Action levels and responses have been established for these compounds to prevent inhalation of constituents in dust. Air monitoring will be performed if deemed necessary, and a stop-work will be given if air concentrations exceed set maximum levels.

6.2.2 Ingestion

Personnel may by exposed to accidental ingestion of contaminants by hand-to-mouth contact after coming into contact with contaminated materials. Ingestion of contaminants will be controlled during work activities by prohibiting eating, drinking, or smoking within potentially contaminated areas and by requiring all field personnel to decontaminate themselves upon leaving the Site. All field personnel will be required to wash hands and face prior to any hand to face activities, except in a heat stress emergency situation where water or other immediate medical attention is immediately needed.

6.2.3 Skin and Eye Contact with Contaminants

Skin and eye contact with some of the contaminants at the Site may cause eye, skin, throat, central nervous system, and/or mucous membrane irritation. Most of the contaminants can be absorbed into the bloodstream through the skin or eyes. Any part of the body that comes into direct contact with contaminants will be washed with soap and rinsed immediately. All field personnel will report any skin or eye contact to the EHS Support SSO. If the EHS Support SSO is also the field manager, the SSO shall document any potential exposures and discuss necessary actions, if any, with the PM. Appropriate medical treatment will be obtained, and steps will be taken to eliminate similar exposures.

6.3 Physical Hazards

Physical hazards can include traffic, slips, trips, falls, lifting hazards and ergonomics, hand safety/sharp objects, severe weather, underground utilities, falling branches, working over water, and driving/vehicle safety. Site-specific physical hazards are detailed, evaluated, controlled (where possible) in appropriate JSAs. The completed JSAs are in **Appendix B**.

6.3.1 Tips to Keep Safe and Warm While Working the Winter Season

Dressing in layers is the primary defense to combat the cold. Hats, gloves, and insulated boots aid in retaining body heat and keeping away moisture. Employees should have a warm and dry break area stocked with water and food and remain hydrated. Warm, sweet liquids are best, as long as they do not contain any alcohol or caffeine.

Schedule work during the warmest part of the day and avoid working when tired. A lack of energy can lessen the body's ability to keep muscles warm.

Lastly, the field team should review medications prior to working in cold environments. Some prescription or over-the-counter medications can increase the risks associated with cold working environments. The field crew should be trained to recognize the most common signs and symptoms of illnesses like hypothermia and frostbite, as well as how to effectively respond to them. See **Section 5.3.16** for more information on cold stress and how to identify cold related illnesses.

Each JSA will identify and evaluate these potential exposure hazards.

6.3.2 Heat Stress

Heat stroke is the most serious form of heat-related illness; it happens when the body becomes unable to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include confusion, loss of consciousness, and seizures. Heat stroke is a medical emergency that may result in death. Call 911 immediately.

Heat exhaustion is the body's response to loss of water and salt from heavy sweating. Signs include headache, nausea, dizziness, weakness, irritability, thirst, and heavy sweating.

Heat cramps are caused by the loss of body salts and fluid during sweating. Low salt levels in muscles cause painful cramps. Tired muscles—those used for performing the work—are usually the ones most affected by cramps. Cramps may occur during or after working hours.

Heat rash, also known as prickly heat, is a skin irritation caused by sweat that does not evaporate from the skin. Heat rash is the most common problem in hot work environments.

Table 6-1 lists heat-related symptoms and the first aid measures to take if a worker shows signs of a heat-related illness.

Table 6-1 Heat-Related Symptoms and First Aid

Illness	Symptoms	First Aid*
Heat stroke	• Confusion • Fainting • Seizures • Excessive sweating or red, hot, dry skin • Very high body temperature	• Call 911. • While waiting for help: • Place worker in shady, cool area. • Loosen clothing and remove outer clothing. • Fan air on worker; place cold packs in armpits. • Wet worker with cool water; apply ice packs, cool compresses, or ice if available. • Provide fluids (preferably water) as soon as possible. • Stay with worker until help arrives.
Heat exhaustion	• Cool, moist skin • Heavy sweating • Headache • Nausea or vomiting • Dizziness • Lightheadedness • Weakness • Thirst • Irritability • Fast heartbeat	• Have worker sit or lie down in a cool, shady area. • Give worker plenty of water or other cool beverages to drink. • Cool worker with cold compresses/ice packs. • Take worker to clinic or emergency room for medical evaluation/treatment if signs or symptoms worsen or do not improve within 60 minutes. • Worker should not return to work that day.
Heat cramps	• Muscle spasms • Pain • Usually occurs in abdomen, arms, or legs	• Have worker rest in shady, cool area. • Worker should drink water or other cool beverages. • Wait a few hours before allowing worker to return to strenuous work. • Have worker seek medical attention if cramps do not go away.
Heat rash	• Clusters of red bumps on skin • Often appears on neck, upper chest, folds of skin	• Try to work in a cooler, less humid environment when possible. • Keep the affected area dry.

* Remember, if you are not a medical professional, use this information as only a guide to help workers in need.

6.3.3 Cold Stress

When the body is unable to warm itself, cold-related stress may result. This may include tissue damage and possibly death. Four factors contribute to cold stress: cold air temperatures, high velocity air movement, dampness of the air, and contact with cold water or surfaces. A cold environment forces the body to work harder to maintain its temperature. Cold air, water, and snow all draw heat from the body. Wind chill is the combination of air temperature and wind speed. For example, when the air temperature is 40° F, and the wind speed is 35 mph, your exposed skin receives conditions equivalent to the air temperature being 11° F. While it is obvious that below freezing conditions combined with inadequate clothing could bring about cold stress, it is also important to understand that it can also be brought about by temperatures in the 50s coupled with some rain and wind.

Hypothermia occurs when body heat is lost faster than it can be replaced. When the core body temperature drops below the normal 98.6° F to around 95° F, the onset of symptoms normally begins.

Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. While frostbite usually occurs when the temperatures are 30° F or lower, wind chill factors can allow frostbite to occur in above freezing temperatures.

Trench Foot or immersion foot is caused by having feet immersed in cold water at temperatures above freezing for long periods of time. It is similar to frostbite but considered less severe.

Table 6-2 lists cold-related symptoms and first aid measures to take if a worker shows signs of a cold-related illness.

Table 6-2 Cold-Related Symptoms and First Aid

Illness	Symptoms	First Aid*
Hypothermia	• Shivering to generate heat • Stomping of feet to generate heat • Loss of coordination • Slurred speech • Fumble with items in hands • Pale and cold skin • As body temperature falls, symptoms will worsen and shivering will stop • Inability to work or stand • Body temp reaches 85°, hypothermia will develop and worker may lose consciousness • At 78° and below, possible death	**Mild Hypothermia** • Move to warm area and stay active. • Remove wet clothes and replace with dry clothes or blankets, cover the head. • To increase metabolism and assist in raising internal core temperature, drink a warm (not hot) sugary drink. Avoid drinks with caffeine. **More Severe Hypothermia** • Do all the above and call 911. • Cover all extremities completely, place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest, and groin. Arms and legs should be warmed last. **Severe Hypothermia** • Treat the worker very gently and do not apply external heat to re-warm. • Hospital treatment is required.

Illness	Symptoms	First Aid*
Frostbite (typically the feet and hands)	• Cold • Tingling • Stinging or aching followed by numbness • Skin color turns red, then purple, then white, and is cold to the touch • Possible blisters in severe cases	• Do not rub the area to warm it. • Wrap the area in a soft cloth, move the worker to a warm area, and contact medical personnel. • Do not leave the worker alone. If help is delayed, immerse in warm water (maximum 105° F) - not hot water. • Do not pour water on affected part. If there is a chance that the affected part will get cold again, do not warm. Warming and re-cooling will cause severe tissue damage.
Trench foot	• Tingling • Itching • Burning sensation • Blisters	• Soak feet in warm water, then wrap with dry cloth bandages. • Drink a warm, sugary drink.

* Remember, if you are not a medical professional, use this information only as a guide to help workers in need.

Protective clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. However, wool, silk, and most synthetics retain their insulation even when wet. The following are recommendations for working in cold environments:

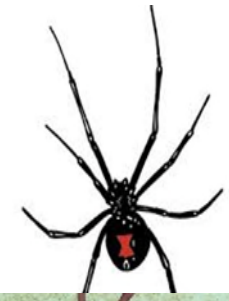
- Wear at least three layers of clothing. An inner layer of wool, silk, or synthetic to wick moisture away from the body. A middle layer of wool or synthetic to provide insulation even when wet. An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood. Up to 40 percent of body heat can be lost when the head is left exposed.
- Wear insulated boots or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- With the exception of the wicking layer, do not wear tight clothing. Loose clothing allows better ventilation of heat away from the body.

Do not underestimate the wetting effects of perspiration. Oftentimes wicking and venting of the body's sweat and heat are more important than protecting from rain or snow.

6.4 Biological Hazard

Biological Hazards include the potential for blood borne pathogens, poisonous plants, snakes, spiders, insects, mosquitoes, ticks, animal droppings, small biting animals and wildlife, and domestic pets. Site-specific biological hazards will be detailed, evaluated, controlled (where possible) in the JSA. Completed JSAs are located in **Appendix B**.

6.4.1 Mosquitoes



quito

Mosquitoes are a common insect found in the United States. Due to the recent outbreaks of the West Nile virus, it is important to be educated on the prevention of mosquito bites. To avoid insect bites, apply insect repellent containing 20-50 percent DEET (N, N-diethyl-meta-toluamide) to exposed skin and clothing when outdoors. Wear long-sleeved clothes and long pants during peak mosquito feeding hours (dusk until dawn). In addition, eliminating standing water sources around the jobSite will prevent mosquitoes from nesting.



6.4.2 Spiders

Poisonous spiders native to the United States are the black widow and the brown recluse. The bite of the black widow and other widow spiders usually feels like a pinprick. The initial pain disappears rapidly, leaving local swelling and two tiny red marks. Muscular cramps in the shoulder, thigh, and back usually begin within 15 minutes to three hours. In severe cases, pain spreads to the abdomen, the blood pressure rises, and there is nausea, sweating, and difficulty in breathing. The black widow appears shiny and hairless to the naked eye. The body ranges from a deep glossy black to an occasional dark brown to a reddish brown. The underside of the abdomen has a distinct red or orange hourglass shape. In immature spiders, the color can vary and the hourglass may be white or missing. Common places where widow spiders may be found are in firewood piles, under boards and furniture, inside boxes, sheds, barns, well houses, and behind and under debris. If a black widow bite is suspected, contact emergency medical services immediately.

Brown recluse spiders are timid, rarely bite unless provoked, and seek shelter in secluded areas. They are brown, tan, or orange-yellow in color and have a body length of ½ inch, not including their legs. They are distinguished by a fiddle-shaped marking situated near their eyes or on other upper body areas.

Brown recluse spider bites are usually unnoticed until hours later when the symptoms become obvious. A blister encircled in red is the first symptom to appear. More severe symptoms (including nausea, fever, convulsions, and weakness) occur within a day. While brown recluse spider venom is rarely fatal, when left untreated the blister can evolve into severe tissue damage called necrosis, as well as nerve damage. Also, because the venom causes red blood cells to be destroyed, or hemolyis, other peripheral symptoms can occur, such as a form of anemia. Thus, medical attention is highly recommended.

6.4.3 Ticks

Ticks find their way to their human hosts when humans walk through woods or brush and come in contact with the low vegetation where the ticks reside. The ticks will then make their way to warm, dark places on the body, which means they are most commonly found under the arms, in the groin area or on the inner legs. Ticks are extremely effective carriers of diseases and when they bite, they attach very firmly and can feed for quite a long period of time. This means that anyone who is bitten by a tick is at an increased risk for certain infections that are carried by ticks. Ticks are most active during the summer months, but tick bites can occur all year long.

Most individuals may not even realize that they have in fact been bitten, as the bite does not evoke any kind of pain. Later however, the area may take on a red appearance. It may also itch uncontrollably, and the person may experience a burning sensation. Some specific types of ticks may cause a throbbing pain in the infected area.

Treat protective clothing with products containing permethrin that kill ticks. Permethrin can be used to treat boots, clothing, and gear and should remain protective through several washings.

Wear a light-colored long sleeve shirt to protect the arms, minimize the potential for a tick to enter the sleeve and provide contrast for easier identification of a tick. Wear pant legs tucked in socks or tape bottoms of pant legs to boot.

Use of a repellent containing 20 percent or more DEET (N, N-diethyl-m-toluamide) offers protection for up to several hours. Always follow product instructions, avoiding the hands, eyes, and mouth.

Upon completing work, one should inspect clothing and self for ticks prior to returning to vehicle or moving indoors. If a tick is found, remove immediately.

Ticks typically remain attached to your body after they bite you. After a period of several days or weeks of drawing blood from your body, an engorged tick can detach itself and fall off. If a tick is found, remove immediately. In about 60 to 70 percent of cases, a rash may develop at the Site of the tick bite. This rash is most often circular with a clear edge (bullseye shaped), but oblong and other shaped rashes may occur. If a bullseye or rash occurs, seek medical attention.

6.4.4 Venomous Snakes



Copperhead

Venomous snakes found in the United States include rattlesnakes, copperheads, cottonmouths/water moccasins, and coral snakes. Take the following steps to prevent a snakebite:

- Do not try to handle any snake.
- Use caution when walking in or near tall grass and piles of leaves or climbing on rocks or piles of wood where a snake may be hiding.
- Wear boots and long pants when working outdoors.
- Wear leather gloves when handling brush and debris.
- Be aware that snakes tend to be active at night and in warm weather.



Deer Tick – <u>not to scale</u>

6.4.5 Poison Ivy

Poison ivy has groups of three leaves. The three leaves of poison ivy are arranged so that there is one terminal leaf and a pair of leaves further down the stem. The pair of leaves is exactly oppoSite each other, with leaves originating from the same point. In addition, the leaves in this pair butt right into the stem, unlike the terminal leaf, which has its own little stem extension. Three-leaved plants where all three leaves have their own little stem extension are not poison ivy. Poison ivy can have all kinds of leaf

shapes with fine teeth. Poison ivy can have tiny little teeth, but they are never regular, and they appear around the entire leaf.

Wear long sleeves, long pants, and socks when walking in areas where these plants may grow. Skin products such as Ivy Block lotion can be applied beforehand to reduce the risk of a rash.

6.4.6 Blood Borne Pathogens

The majority of the occupational tasks on-Site will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any blood borne pathogen for employees' on-Site will be following an injury. When administering first aid care, there are potential hazards associated with blood borne pathogens that cause diseases such as Human Immunodeficiency Virus, Hepatitis B, Hepatitis A, Hepatitis C, or the Herpes Simplex Virus. An employee who has not received the appropriate certification should never execute first aid and/or CPR.

In order to minimize any potential pathogen exposure, all employees should use hand washing facilities on a regular basis. The decontamination area will provide an adequate supply of water, soap, and single-use towels for hand washing. Additionally, the following universal precautions should be followed to prevent further potential risk:

- Direct skin or mucous membrane contact with blood should be avoided.
- Open skin cuts or sores should be covered to prevent contamination from infectious agents.
- Body parts should be washed immediately after contact with blood or body fluids that might contain blood, even when gloves or other barriers have been used.
- Gloves and disposable materials used to clean spilled blood shall be properly disposed of in an approved hazardous waste container and labeled with hazardous waste contents.
- First aid responders shall wear latex or thin mil nitrile gloves when performing any procedure that has a risk of contact with blood or bodily fluids.
- Safety glasses will be worn to protect the eyes from splashing or aerosolization of bodily fluids.
- A CPR mask will be worn when performing CPR to avoid mouth-to-mouth contact.
- Work gloves will be worn to minimize the risk of injury to hands and fingers when working on all equipment with sharp or rough edges.
- Never pick up broken glass or possible contaminated material with unprotected hands.

6.5 Severe Weather Hazards

Severe weather hazards that may be encountered during Site activities include the potential for thunderstorms and tornadoes. Site-specific general hazards will be detailed, evaluated, and controlled (where possible) in the JSA. Completed JSAs are located in **Appendix B**.

6.5.1 Thunderstorms

Preparation for the threat of a thunderstorm will begin with monitoring weather notifications starting at least one day prior to commencement of Site activities. Communication of inclement weather shall be ongoing to determine if water access shall be delayed. A weather radio and/or real-time weather radar data will be available on board to obtain current information about potential changes in weather. When lightning is seen or thunder is heard, the personnel will stop work activities and immediately return to

shore and take shelter at shore facilities, temporary offices or other approved structure or vehicle. Site personnel may return to field activities following 30 minutes with no lightning strikes or thunderclaps.

6.5.2 Lightning

When lightning strikes, it will most often strike the highest object in the immediate area. Discontinue activities when there is lightning or even when weather conditions look threatening. The first lightning strike can be a mile or more in front of an approaching thunderstorm cloud.

6.5.3 Tornadoes

Preparation for the threat of tornadoes will begin with the identification of a safe shelter in the event of the issuance of a tornado warning. Structures on Site may not provide adequate protection from tornado winds and flying debris; off-Site facilities will have to be identified. When a warning is issued, personnel will move to the pre-identified shelter. Do not take shelter in automobiles or under overpasses. If shelter cannot be reached in a timely fashion, take cover in a ditch or other low-lying area. Weather alerts will be monitored from the National Weather Service or similar new and weather agency. All Site personnel will be notified of the issuance of watches and warnings.

There are two levels of detection when it comes to tornadoes. A tornado watch means that the conditions are right for a tornado and a tornado warning means a tornado has been sighted in the area.

Upon arriving on Site, a designated tornado shelter will be established, and Site personnel will go through the evacuation procedure prior to beginning work on-Site. In the event a tornado watch is issued, a weather radio or other approved device/method must be monitored, and weather conditions on-Site must be watched closely for severe weather changes. In the event a tornado warning is issued, personnel on-Site must seek cover in the designated tornado shelter.

6.6 Personal Protective Equipment

Equipment	Required	Not Applicable	Comments
Steel Toe Boots/Shoes	X		
Chemical Boots		X	
Coveralls or Long Sleeve Shirt & Pants	X		
Safety Vest	X		
Hearing Protection	X		When around noisy equipment and operators use per their company policy.
Hard Hat	X		
Safety Glasses with Side Shields	X		
Safety Goggles		X	
Face Shield		X	
Cotton or Leather Work Gloves	X		

Equipment	Required	Not Applicable	Comments
Chemical Resistant Gloves (Nitrile)	X		If contacting impacted materials
Rain Gear	X		If needed
Half- or Full-Face Respirator (Specify Cartridges)		X	
Personal Flotation Device	X		When working near / over water
Chaps	X		When needed for surface water and sediment sampling
Other Required PPE			
All work is anticipated to be completed in Level D or modified Level D. ***NOTE: If Site conditions suggest another level than Level D or Modified Level D for EHS Support personnel, and they are not currently trained for the necessary level with the appropriate equipment, stop and do not perform this work.***			

7 Air Monitoring

Periodic air monitoring is not currently planned as part of this project. If warranted based on site conditions, air monitoring shall be conducted using OSHA/NIOSH protocol. Air samples, including blanks, shall be submitted to an accredited laboratory for sample analysis.

Monitoring – Direct-Reading Instrumentation							
Task/ Operation	**Substance(s)/ Hazard(s)**	**Monitoring Location**	**Direct Reading Instrument and Response Factor**	**Frequency of Monitoring**	**Action Level**	**Required Action**	**PPE Required**
	Combustible gases and vapors Explosive atmosphere		Combustible Gas Indicator (CGI)		< 10% LEL	Continue investigation.	
					10% to 25% LEL	Continue on-site monitoring with extreme caution as higher levels are encountered.	
					> 25% LEL	Explosion hazard. Withdraw from area immediately.	
	Many organic gases and vapors		Flame Ionization Detector (FID) with Gas (also chromatography option)		Depends on chemical	Consult standard reference manuals for air concentration/ toxicity data. Action level depends on PEL/REL/TLV.	

8 Traffic Control

Traffic Control Site work in areas with vehicular traffic. In such instances, the work team will be wearing high visibility traffic safety vests (ANSI Class II minimum recommended) and will use a combination of traffic cones and barricades as necessary to prevent contact between workers, pedestrians and motor vehicles.

Traffic control subcontracted to a traffic control subcontractor may be required in the instances where work is located within high traffic areas or in high-risk locations. Check for specific DOT requirements when working in or near a road or road right-of-way.

A Site-Specific Traffic Control Plan has been developed for the work conducted in the Sliver Quarry area. The plan includes known site traffic patterns and the control equipment set up used to divert or restrict traffic and to define site work zones. Traffic Control JSA is included in **Appendix B**.

9 Site Control, Decontamination, and Emergency Contingency Plan

Is the Site securely fenced?	Yes / No	RCRA cap and permeable cover fenced. Site trailer is in area that is not fenced.
If no, how will the site prevent access by unauthorized persons?	N/A	
Coordination with Owners or Operators	EHS Support must receive permission to access private property from landowners and site operators.	
Personnel and PPE Decontamination	• Deposit disposable PPE in a waste container • Wash hands and face whenever leaving the Site and before eating, drinking, smoking, or using restroom facilities	
Equipment Decontamination	Refer to the following SOPs for specific decontamination requirements and procedures: • SOP 9 – Field Decontamination • SOP 10 – Decontamination of Heavy Equipment	
Medical Emergencies	Field personnel may administer first aid on a voluntary basis if they are trained to do so. Remember to follow "universal precautions" if blood or bodily fluids are present (i.e., assume all blood and bodily fluids are contaminated and avoid contact with these fluids). Use nitrile or latex gloves when performing first aid. Contact the EHS Support H&S Program Manager if you are exposed to another individual's blood or bodily fluids. For serious injuries or illnesses, transport the victim to the hospital via ambulance by calling 911. If exposure to hazardous substances is suspected, or if any symptoms of exposure are experienced, leave the contaminated area. If a dermal or ocular exposure is suspected, wash the affected area with plenty of water for a minimum of 15 minutes. If symptoms are serious in nature, seek medical assistance immediately. In the event of any work-related injury or illness, contact the EHS Support PM and an EHS Support Safety Specialist by phone. All accidents and injuries will be reported using the electronic New Injury Report form located in the Issues section of MyMomentum.	

Appendix A PSA Checklist

Site Personnel Information

Item	Yes	No	N/A	PSA Discussion Topics	Comments
Do the personnel serving in the field have adequate safety expertise, training, and experience to serve in their respective project roles: • Transportation Workers Identification Credential (TWIC) • First Aid/CPR • Hot Work • Confined Spaces • Fire Watch • Other:	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐		Click or tap here to enter text.
Are there any Short Service Employees Working on the Field Team? (EHS Support or subcontractors)	☐	☐	☐	Who is serving as the field mentor for those individuals?	Click or tap here to enter text.
				How will the short service worker be identified? (e.g., color of hard hat, sticker etc.)	Click or tap here to enter text.
Are there subcontractors working on this project?	☐	☐	☐	A subcontractor representative must participate in the PSA call	Click or tap here to enter text.
				Proper subcontractor documents in the file and have been vetted by the H&S team	Click or tap here to enter text.
				Are the subcontractors required to be HAZWOPER trained under 29 CFR 1910.120(a)? Do we have verification of training?	Click or tap here to enter text.
Are EHS Support employees supervising subcontractors?	☐	☐	☐	Do they have the 8-hour Supervisor training in accordance with 1910.120(e)(4) and (e)(8)?	Click or tap here to enter text.

Documentation Checklist

Item	Yes	No	N/A	PSA Discussion Topics	Comments
Is the HASP current for the scope of work? Provide date and title of HASP in the Comments.	☐	☐	☐		Click or tap here to enter text.
Has a copy of the current HASP been made available to the PSA call attendees and have the attendees reviewed?	☐	☐	☐		Click or tap here to enter text.
Is there a written scope of work for the project? Provide date and title of the document in the Comments.	☐	☐	☐		Click or tap here to enter text.

Task Specific Physical Hazards

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
After hours/night work	☐	☐	☐	Is there adequate supplemental or task lighting?	☐	☐	☐	Click or tap here to enter text.
				How is the site secured during off-shifts?	☐	☐	☐	Click or tap here to enter text.
				Is there a buddy system in place?	☐	☐	☐	Click or tap here to enter text.
				Is there a plan for fatigue management?	☐	☐	☐	Click or tap here to enter text.
Audit Due Diligence in Operational Areas of Facility	☐	☐	☐	Will employees have an escort through the facility?	☐	☐	☐	Click or tap here to enter text.
				Will the site provide site-specific visitor/contractor training?	☐	☐	☐	Click or tap here to enter text.
				Has the PM or field team been made aware of site-specific PPE?	☐	☐	☐	Click or tap here to enter text.
				Have high hazard/off limit areas of the facility been discussed with the client?	☐	☐	☐	Click or tap here to enter text.
				Does the facility have specific emergency action protocols?	☐	☐	☐	Click or tap here to enter text.
Concrete or Asphalt Cutting or Coring	☐	☐	☐	How will dust be mitigated? (i.e. wet process)	☐	☐	☐	Click or tap here to enter text.
				High noise exposures during this process will need either distance or hearing protection	☐	☐	☐	Click or tap here to enter text.
Drilling	☐	☐	☐	How will personnel be protected from rotating equipment/moving parts?	☐	☐	☐	Click or tap here to enter text.
				Will there be any suspended loads?	☐	☐	☐	Click or tap here to enter text.
				What requirements will there be for spotters?	☐	☐	☐	Click or tap here to enter text.
				Has adequate clearing and leveling been conducted to accommodate drill rigs and supplies to provide a safe work area?	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Ground crew working in the vicinity of heavy equipment will be minimized to prevent struck by and caught between accident types.	☐	☐	☐	Click or tap here to enter text.
				The following policies will be discussed with the operators: • Keep hands on machine controls and will not engage in distractions (texting, cell phones, radios) while equipment is moving and/or movement is not locked out • Seat belts will be worn while operating equipment.	☐	☐	☐	Click or tap here to enter text.
				Crew will wear traffic vests (Type II, white or yellow) when not wearing overprotective coveralls (i.e. Tyvek).	☐	☐	☐	Click or tap here to enter text.
Driving	☐	☐	☐	Will transportation involve personal, rental, or company vehicle? If "yes," include in the Comments if the car is a personal car, rental car, or a company car.	☐	☐	☐	Click or tap here to enter text.
				Is the vehicle appropriate for the project scope?	☐	☐	☐	Click or tap here to enter text.
				Are drivers familiar with vehicle to be used (e.g., brakes, mirrors, lights, small vs large or SUV)?	☐	☐	☐	Click or tap here to enter text.
				Will work and travel exceed 12 hours?	☐	☐	☐	Click or tap here to enter text.
				Will travel to site exceed 200 miles? *If yes, is there a journey management plan?*	☐	☐	☐	Click or tap here to enter text.
				Are directions to the site available?	☐	☐	☐	Click or tap here to enter text.
Electrical	☐	☐	☐	Ensure all electric services are installed by a licensed electrician.	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Extension cords will be used in a manner that they are protected from damage and inspected prior to use to check for damage (i.e. cuts, breaks, splices, or missing prongs).	☐	☐	☐	Click or tap here to enter text.
				If equipment needs maintenance, how will energy control and isolation be completed?	☐	☐	☐	Click or tap here to enter text.
Excavations and Trenches	☐	☐	☐	Who is the competent person?	☐	☐	☐	Click or tap here to enter text.
				How will the excavation be sloped/shored/barricaded?	☐	☐	☐	Click or tap here to enter text.
Groundwater Sampling	☐	☐	☐	Traffic (flow and congestion)?	☐	☐	☐	Click or tap here to enter text.
				Pinch points when opening well heads	☐	☐	☐	Click or tap here to enter text.
				How will ergonomic concerns (i.e., lifting, repetitive motion, materials handling, awkward postures) be mitigated?	☐	☐	☐	Click or tap here to enter text.
				What hand protection will be used to protect against COC exposures?	☐	☐	☐	Click or tap here to enter text.
Heavy Equipment Use	☐	☐	☐	Traffic (flow and congestion)?	☐	☐	☐	Click or tap here to enter text.
				What are requirements for spotters?	☐	☐	☐	Click or tap here to enter text.
				How will daily equipment inspections be documented?	☐	☐	☐	Click or tap here to enter text.
Hot Work	☐	☐	☐	Verify with designated client representative that the planned hot work operations conform to the client's hot work procedures and permit requirements	☐	☐	☐	Click or tap here to enter text.
				How will atmospheric testing be completed?	☐	☐	☐	Click or tap here to enter text.
				Do you have a fire watch with an appropriate fire extinguisher?	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Are there any known flammable or combustible materials in the hot work areas?	☐	☐	☐	Click or tap here to enter text.
Industrial Waste Characterization	☐	☐	☐	What tools will be used to collect soil samples?	☐	☐	☐	Click or tap here to enter text.
				How will potential exposures to vapors and chemicals be mitigated?	☐	☐	☐	Click or tap here to enter text.
Land Based Ecological Surveys	☐	☐	☐	Will work be done near water or sloped ground?	☐	☐	☐	Click or tap here to enter text.
				How are task locations accessed?	☐	☐	☐	Click or tap here to enter text.
Off-site Transportation of Waste	☐	☐	☐	How are moving vehicles/traffic flow managed?	☐	☐	☐	Click or tap here to enter text.
Overwater sediment and surface water sampling	☐	☐	☐	Does the site have a float plan?	☐	☐	☐	Click or tap here to enter text.
				Be aware of the water conditions in the fieldwork area. Know where currents, rapids, and obstructions exist and the locations of shallow and deep spots.	☐	☐	☐	Click or tap here to enter text.
				How will weather conditions be monitored?	☐	☐	☐	Click or tap here to enter text.
				How will the vessel be accessed?	☐	☐	☐	Click or tap here to enter text.
				How will the vessel be secured when not in use?	☐	☐	☐	Click or tap here to enter text.
				Have the proper authorities been notified and permits been approved for work on this waterway?	☐	☐	☐	Click or tap here to enter text.
				Do passengers have appropriate training and PPE?	☐	☐	☐	Click or tap here to enter text.
Pressure washing	☐	☐	☐	Minimum wand length is 48”	☐	☐	☐	Click or tap here to enter text.
				All personnel using pressure washing equipment shall be trained in the proper use and inspection of the equipment	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Do personnel need special PPE to complete pressure washing (i.e. Tyvek suits or face shields)?	☐	☐	☐	Click or tap here to enter text.
Remedial Excavation Works	☐	☐	☐	Who is the competent person?	☐	☐	☐	Click or tap here to enter text.
				How will the excavation be sloped/shored/barricaded?	☐	☐	☐	Click or tap here to enter text.
				Will persons need to enter the excavation?	☐	☐	☐	Click or tap here to enter text.
Remedial Piping Installation	☐	☐	☐	Do any permits need to be obtained prior to starting work? (i.e. hot work)	☐	☐	☐	Click or tap here to enter text.
				Will rigging be used to suspend loads during placement?	☐	☐	☐	Click or tap here to enter text.
				How will pipes be placed? (i.e. manually or use of mechanical placement)	☐	☐	☐	Click or tap here to enter text.
Site Visit/Site Inspection	☐	☐	☐	Will employees have an escort through the facility?	☐	☐	☐	Click or tap here to enter text.
				Will the site provide site-specific visitor/contractor training?	☐	☐	☐	Click or tap here to enter text.
				Has the PM or field team been made aware of site-specific PPE?	☐	☐	☐	Click or tap here to enter text.
				Have high hazard/off limit areas of the facility been discussed with the client?	☐	☐	☐	Click or tap here to enter text.
Surface and Sediment Sampling (manual - maximum waist deep)	☐	☐	☐	What PPE needs to be utilized to enter the water? (i.e. waders, PFD)	☐	☐	☐	Click or tap here to enter text.
				How deep is the water expected to be and how swift the current?	☐	☐	☐	Click or tap here to enter text.
				Do field workers need a special permit to access water?	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Where/how will the task locations be accessed (i.e. kayak, riverbank, dock) and how is the terrain at the access point (i.e. sloped, rocky, swampy)?	☐	☐	☐	Click or tap here to enter text.
Waste soil/cutting management from drilling	☐	☐	☐	Determine fill capacity based on materials and weather conditions. • The maximum weight a 55-gallon drum can weight by regulation is 400 KG or 832 pounds if the drums weight more than 800lbs the waste contractor could refuse to pick up the drums. If working in cold weather conditions (i.e., temperatures below freezing), space should be left in water based IDW drums to allow for expansion.	☐	☐	☐	Click or tap here to enter text.
				Does the waste removal contractor have proper mechanical means to move full drums? (i.e. forklift with drum grappler)	☐	☐	☐	Click or tap here to enter text.
				Has a staging area been decided? • Ensure space is left in between the drums for easy removal and inspection • Segregate waste types.	☐	☐	☐	Click or tap here to enter text.
Well Installation	☐	☐	☐	Traffic (flow and congestion)?	☐	☐	☐	Click or tap here to enter text.
				What are requirements for spotters?	☐	☐	☐	Click or tap here to enter text.
				How will daily equipment inspections be documented?	☐	☐	☐	Click or tap here to enter text.
Well Surveying	☐	☐	☐	Traffic (flow and congestion)?	☐	☐	☐	Click or tap here to enter text.
				Pinch points when opening well heads	☐	☐	☐	Click or tap here to enter text.

Activity	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				How will ergonomic concerns (i.e., lifting, repetitive motion, materials handling, awkward postures) be mitigated?	☐	☐	☐	Click or tap here to enter text.
				What hand protection will be used to protect against COC exposures?	☐	☐	☐	Click or tap here to enter text.

Site Conditions Assessment

Site Condition	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
Heavy Wooded Site Area/High areas of vegetation where ecology present	☐	☐	☐	Does vegetation need to be cleared? If so, what tools will be used?	☐	☐	☐	Click or tap here to enter text.
High activity site with heavy equipment	☐	☐	☐	Will spotters be used?	☐	☐	☐	Click or tap here to enter text.
				How will ground crew communicate with operators?	☐	☐	☐	Click or tap here to enter text.
				If traffic is continually flowing (i.e. trucks continually entering/exiting the site) has a traffic flow plan been developed?	☐	☐	☐	Click or tap here to enter text.
Potential for unexploded ordinance	☐	☐	☐	Are explosion hazards throughout the site, or only in exclusion zone?	☐	☐	☐	Click or tap here to enter text.
				Smoking, open flames, and spark generating equipment will only be allowed in designated areas. Have those areas been defined?	☐	☐	☐	Click or tap here to enter text.
Activity in Private Homes or Third-Party Premises	☐	☐	☐	Have access permits been obtained?	☐	☐	☐	Click or tap here to enter text.
Remote Site with limited services	☐	☐	☐	Are field members CPR/AED/First Aid trained and comfortable providing care if needed?	☐	☐	☐	Click or tap here to enter text.
				Who on the field team will provide a first aid kit and eye wash?	☐	☐	☐	Click or tap here to enter text.
Absence of Cell Phone Reception	☐	☐	☐	How will team members communicate?	☐	☐	☐	Click or tap here to enter text.
				How will emergency response be contacted in the event of an emergency?	☐	☐	☐	Click or tap here to enter text.
Poor access requiring 4WD	☐	☐	☐	Do we have the appropriate rental vehicles?	☐	☐	☐	Click or tap here to enter text.
				Are we using ATVs?	☐	☐	☐	Click or tap here to enter text.

<table>
<tr><th>Site Condition</th><th>Yes</th><th>No</th><th>N/A</th><th>PSA Discussion Topics</th><th>Yes</th><th>No</th><th>N/A</th><th>Comments</th></tr>
<tr><td rowspan="4">High crime/area subject to civil disobedience</td><td rowspan="4">☐</td><td rowspan="4">☐</td><td rowspan="4">☐</td><td>Are there any site-specific/special clearance requirements for site access (e.g., government installation, site security notification)?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>If “yes,” were arrangements made to comply with the requirements?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>Is pre-site visit drug testing required?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>Is local Area Safety Council Training required?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td rowspan="5">Overhead Utilities</td><td rowspan="5">☐</td><td rowspan="5">☐</td><td rowspan="5">☐</td><td>Has an avoidance plan been prepared?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>Have project overhead utility hazards been identified?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>Will ground crew member been assigned as a spotter to any piece of heavy equipment that is working close enough to an overhead line so that a part of the machine does not infringe on the safe distance?</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>On the first day, team members must designate power line crossing points and post signs stating DANGER OVERHEAD POWER LINES.</td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
<tr><td>Safe distances from overhead power lines must be maintained (see table below)
<table>
<tr><th>System Voltage (kilovolts)</th><th>Minimum Distance Required Clearance (feet)</th></tr>
<tr><td>0 -50</td><td>10</td></tr>
<tr><td>51 – 100</td><td>12</td></tr>
<tr><td>101 – 200</td><td>15</td></tr>
<tr><td>201 – 300</td><td>20</td></tr>
<tr><td>301 – 500</td><td>25</td></tr>
</table></td><td>☐</td><td>☐</td><td>☐</td><td>Click or tap here to enter text.</td></tr>
</table>

Site Condition	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				501 – 750: 35 751 – 1000: 45				
Underground Utilities	☐	☐	☐	How will underground utility clearance be conducted?	☐	☐	☐	Click or tap here to enter text.
				Has a public one-call been requested?	☐	☐	☐	Click or tap here to enter text.
				Private utility mark out be used?	☐	☐	☐	Click or tap here to enter text.
				Is there a minimum clearance of 5 feet from the edge of utility markings and proposed drilling locations?	☐	☐	☐	Click or tap here to enter text.
				Will the upper 4 feet of all intrusive work be manually cleared by hand augering/probing, air jet, or other similar method?	☐	☐	☐	Click or tap here to enter text.
				If intrusive work must be conducted within the required 5-foot minimum clearance, has the specific work been reviewed by an EHS Support H&S Specialist and the PM?	☐	☐	☐	Click or tap here to enter text.
Local Hunting Season	☐	☐	☐	Are there nearby woods where hunters could be?	☐	☐	☐	Click or tap here to enter text.
				What specific colors/highly visible clothing should be worn?	☐	☐	☐	Click or tap here to enter text.
				How will crew members make themselves “known” in the area? (i.e. making noise or using 4-ways on equipment)	☐	☐	☐	Click or tap here to enter text.
				Do we need to adjust working times to accommodate for typical hunting times (i.e. dawn and dusk)?	☐	☐	☐	Click or tap here to enter text.
Biological Hazards	☐	☐	☐	Alligators	☐	☐	☐	Click or tap here to enter text.
				Bears	☐	☐	☐	Click or tap here to enter text.

Site Condition	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
				Bees	☐	☐	☐	Click or tap here to enter text.
				Fire Ants	☐	☐	☐	Click or tap here to enter text.
				Poison Ivy	☐	☐	☐	Click or tap here to enter text.
				Poison Sumac	☐	☐	☐	Click or tap here to enter text.
				Snakes	☐	☐	☐	Click or tap here to enter text.
				Spiders	☐	☐	☐	Click or tap here to enter text.
				Ticks	☐	☐	☐	Click or tap here to enter text.
				Wasps	☐	☐	☐	Click or tap here to enter text.
				Other:	☐	☐	☐	Click or tap here to enter text.
Potential for Thunderstorms	☐	☐	☐	Is there a designated area where will the field team can take temporary shelter when lightning is seen, or thunder is heard?	☐	☐	☐	Click or tap here to enter text.
				30 minutes must pass since the last detected lightning strike or thunderclap, how will the team keep track?	☐	☐	☐	Click or tap here to enter text.
Potential for Tornadoes	☐	☐	☐	How will the field team track severe weather alerts for tornado warnings and watches?	☐	☐	☐	Click or tap here to enter text.
				Does the site have a site-specific evacuation and muster point? If not, the field team should define one upon arriving to the site.	☐	☐	☐	Click or tap here to enter text.
Potentials for Hurricanes	☐	☐	☐	Has the weather been checked prior to mobilization for potential hurricanes?	☐	☐	☐	Click or tap here to enter text.
Potential for snow/ice	☐	☐	☐	Is snow and ice in the forecast?	☐	☐	☐	Click or tap here to enter text.
				How will snow and ice be removed from access areas (i.e. walkways and roads) on the site?	☐	☐	☐	Click or tap here to enter text.

Site Condition	Yes	No	N/A	PSA Discussion Topics	Yes	No	N/A	Comments
Other Site-Specific Hazards	☐	☐	☐	Discuss any other site-specific hazards known to the site or encountered during other mobilization efforts.	☐	☐	☐	Click or tap here to enter text.

Site Required Personal Protective Equipment (PPE)

Equipment	Required	Not Applicable	Comments
Steel Toe Boots/Shoes			
Chemical Boots			
Coveralls or Long Sleeve Shirt & Pants			
Safety Vest			
Hearing Protection			
Hard Hat			
Safety Glasses with Side Shields			
Safety Goggles			
Face Shield			
Cotton or Leather Work Gloves			
Chemical Resistant Gloves (Nitrile)			
Rain Gear			
Half- or Full-Face Respirator (Specify Cartridges)			
Personal Flotation Device			
Chaps			
Other Required PPE			
All work is anticipated to be completed in Level D or modified Level D. ***NOTE: If Site conditions suggest another level than Level D or Modified Level D for EHS Support personnel, and they are not currently trained for necessary level with the appropriate equipment, stop and do not perform this work.***			

Appendix B Job Safety Analysis Worksheet

Issue Date	Oct. 12, 2017
Revision No.	003
Revision Date	Aug. 24, 2020

Job Safety Analysis (JSA)

Using the information accumulated regarding the potential hazards posed to EHS Support employees from your site-specific health and safety plan (HASP), an evaluation of the hazards must be conducted. The evaluation will be done as a JSA. A JSA is a method by which assigned jobs are reviewed to determine how to control hazards posed during the assigned tasks. The hierarchy of hazard control is as follows:

- Elimination – completely remove the hazard from the work environment.
- Substitution – substitute tools or chemicals to reduce the hazard.
- Engineering controls – install barriers or use mechanical means to reduce the hazard (e.g., ventilation).
- Administrative controls – change schedules, employee rotation, signage, and training to reduce exposure.
- Work practice controls – change the way tasks are conducted to reduce exposure.
- Personal Protective Equipment (PPE) – assign PPE when controls do not abate the hazard.

A JSA worksheet will be completed for each job that will be performed by EHS Support employees. The JSA is an important accident prevention tool that works by finding hazards and eliminating or controlling them before they have a chance to become accidents. The JSA can be used for job clarification and hazard awareness, as a guide in new employee training, for retraining existing employees, as a refresher on jobs which run infrequently, as an accident investigation tool, and for informing employees of specific job hazards and protective measures. JSAs should be completed by keeping in mind the potential risks of the separate tasks that comprise the job, as well as past injury/illness history of the task(s). Each job is broken into tasks that are listed on the worksheet. The hazards are then ranked using a calculation that accounts for the potential severity and the potential likelihood of the identified hazards. Before completing the JSA form, consider the following:

- The purpose of the job – what has to be done and who has to do it?
- The activities involved – how is it done, when is it done, and where is it done?

Employees assigned to perform the jobs being evaluated should be involved in the completion of the JSA form. The process for completing a JSA should include an observation and/or experience with how an EHS Support employee conducts the task/job and an operational review of the task/job.

Prior to conducting tasks that require the use of physical labor or mechanical equipment, the hazards of these tasks and mitigation measures to be used must be reviewed. If at any time tasks have not been addressed in the HASP, the Project Manager (PM) or Site Safety Officer (SSO) must review the hazards associated with that task. The time involved and level of crew involvement should be appropriate to the tasks being performed. This discussion of additional hazards should be documented in some manner (e.g., JSA, field book, Daily Tailgate Safety Meeting form). A daily Site safety briefing is required to discuss and document the tasks to be conducted that day, specific hazards associated with the tasks, and any lessons learned from the previous day. The meetings are to be held prior to the commencement of any tasks. The Daily Tailgate Safety Meeting form is in Error! Reference source not found. of the HASP or located on MyMomentum.info.

Client: **Project:** **Location:**	**JSA Title:**	**Page** **of**	☐ New ☐ Revised

Work Activity Description:	**Project / Field Team Members:**	**JSA Author(S):**	**Date:**
		Reviewed By:	**Date:**
		Approved By:	**Date:**

Risk Assessment Matrix		**Likelihood Ratings**					
Consequences Ratings		**A**	**B**	**C**	**D**	**E**	**F**
People	**Property**	**1** Very remote (1 in 1,000,000)	**2** Remote (1 in 100,000)	**3** Possible (1 in 10,000)	**4** Probable (1 in 1,000)	**5** Likely (1 in 100)	**6** Almost certain (1 in 10)
1 = No Injury / Illness	1 = No damage	**1 - Low**	**2- Low**	**3- Low**	**4- Low**	**5- Low**	**6- Low**
2 = Injury / Illness — first aid only	2 = Slight damage	**2- Low**	**4- Low**	**6- Low**	**8- Low**	**10- Medium**	**12- Medium**
3 = Injury / Illness — medical treatment	3 = Minor damage	**3- Low**	**6- Low**	**9- Medium**	**12- Medium**	**15- Medium**	**18- High**
4 = Disabling injury (restricted work or days away from work)	4 = Local damage	**4- Low**	**8- Low**	**12- Medium**	**16- Medium**	**20- High**	**24- High**
5 = Long-term disability or major disabling injury	5 = Major damage	**5- Low**	**10- Medium**	**15- Medium**	**20- High**	**25- High**	**30- High**
6 = Fatality	6 = Catastrophic damage	**6- Low**	**12- Medium**	**18- High**	**24- High**	**30- High**	**36- High**

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☐ Safety Vest	☐ Goggles	☐ Respirator (provide type)	☐ Nitrile Gloves
☐ Hard Hat	☐ Face Shield	☐ Protective Outerwear	☐ Leather or Work Gloves
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Chemical Protective Outerwear	☐ Other:
☐ Safety Glasses	☐ Safety Boots / Shoes	☐ Fire Extinguisher	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score**	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score**
Example: Access monitoring wells	• Pinch points from opening well • Metal plate covers/caps • Insects (bees, wasps etc.) • Poisonous spiders • Slips/Trips/Falls • Contaminated water / vapors	6 - Low	• Wear proper gloves to access and use tools to remove metal plate covers if necessary. • Be aware of insects and spiders in well annulus. • Watch where you are walking, avoid uneven surfaces. • Wear safety glasses, proper gloves (Nitrile). Allow well to vent long enough for vapors to dissipate.	3 - Low

Instructions for Completing the Job Safety Analysis Form

Complete a Job Safety Analysis (JSA) for all tasks being conducted on-site that may pose a hazard to EHS Support employees. Assigned jobs should be reviewed to determine how to control or minimize the hazards, as well as protect employees from these hazards. Each job is broken into tasks; the tasks are listed in order and an associated hazard ranking is calculated for each. This JSA worksheet was developed to aid in the review of jobs/tasks. The JSA is an important accident prevention tool that works by finding hazards and eliminating them before they become accidents. The JSA can be used for job clarification and hazard awareness, as a guide in new employee training, for retraining existing employees, as a refresher on jobs which run infrequently, as an accident investigation tool, and for informing employees of specific job hazards and protective measures.

Keep in mind the potential risks of the separate tasks that comprise the job, as well as the past injury/illness history of the task(s) when completing the JSA. Consider the following when completing the JSA:

- The purpose of the job — What must be done? Who will do it?
- The activities involved — How is it done? When is it done? Where is it done?

Employees assigned to perform the jobs being evaluated should be involved in the completion of the JSA form. The process for completing a JSA must include the following: a visual observation of (or experience with) how an EHS Support employee conducts the task/job and an operational review of the job/task. ALL JSAs SHOULD BE REVIEWED AT LEAST ANNUALLY OR AFTER AN INCIDENT/ACCIDENT AND REVISED AS NECESSARY. When applicable, this worksheet should be included in the site-specific health and safety plans (HASPs).

The following provides column-by-column instructions for completing the JSA form.

Column-by-Column Instructions

Job Steps

Examine a specific job/task by breaking it down into a list of steps (tasks) to discover the potential hazards employees may encounter.

Each job/task or operation will consist of a set of steps. For example, the job might be to collect a soil sample using a trowel. To determine where a step begins or ends, look for a change of activity as in a change in direction, movement, or tools. In the example, preparing the sampling equipment is one step. The next step might be to walk to the sample location (a change in activity). The following step may be clearing the area where the sample will be collected. Filling a sample container would be another step and so on.

Be sure to list all the steps needed to perform the job. It is OK if you break the job down into many small tasks rather than group too many of them together. Some steps may not be performed each time, for example, clearing a sample location. Not all sample collection areas will require clearing. However, if that step is generally part of the job, it should be listed.

Potential Hazards

A hazard is a potential physical, chemical, or environmental danger. The purpose of the JSA is to identify as many hazards as can be predicted. Consider the entire universe of the task when identifying hazards. Ask the five “Ws" and one "H" questions, who, what, when, where, why, and how. For example: who is conducting the step; what tools, equipment, and chemicals are used to complete the step; when is the task/step being conducted (e.g., time of day/year, light/dark conditions, cold/hot conditions); where is the task being conducted; why is the task being conducted (e.g., contamination); how will the step be conducted (e.g., what position will your body be in for the task — crouching, bending, standing, sitting).

To identify hazards, ask yourself these questions about each step of the task:

- Is there the chance the employee may strike against, be struck by, or otherwise making injurious contact with an object or a vehicle?
- Can an employee be caught in, by, or between objects?
- Is there potential for slipping, tripping, or falling?
- Could an employee suffer strains from pushing, pulling, lifting, bending, or twisting?
- What equipment will the employee use during the task?
- Is the environment hazardous to safety and/or health (e.g., over exposure to heat/cold, bees, snakes, ticks, spiders, fire ants, poison ivy/oak, heat, gases, mists, fumes)?
- Are there contaminants of concern present? Can the employee's activity cause a potential exposure to those contaminants?
- What is someone else doing that could negatively impact me/others or the project?

Close observation and knowledge of the job is important. Examine each step carefully to find and identify hazards: include the actions, conditions, and possibilities that could lead to an accident. Compiling an accurate and complete list of potential hazards will allow you to develop the recommended safety procedures needed to prevent accidents.

Baseline Risk Score & Post Prevention Risk Score

The Baseline Risk Score is an assessment of the risk level in the task prior to performing and acting on the findings of the JSA. The Post Prevention Risk Score provides an assessment of the risk level in the task after implementing the control and protection measures assigned by the JSA. The risk score is calculated by multiplying the Severity of the injury/illness by the Likelihood of the injury/illness occurring. Use the following matrix to determine the risk score:

Risk Assessment Matrix		Likelihood Ratings					
Consequences Ratings		A	B	C	D	E	F
People	Property	1 Very remote (1 in 1,000,000)	2 Remote (1 in 100,000)	3 Possible (1 in 10,000)	4 Probable (1 in 1000)	5 Likely (1 in 100)	6 Almost certain (1 in 10)
1 = No Injury / Illness	1 = No damage	1 - Low	2- Low	3- Low	4- Low	5- Low	6- Low
2 = Injury / Illness — first aid only	2 = Slight damage	2- Low	4- Low	6- Low	8- Low	10- Medium	12- Medium
3 = Injury / Illness — medical treatment	3 = Minor damage	3- Low	6- Low	9- Medium	12- Medium	15- Medium	18- High
4 = Disabling injury (restricted work or days away from work)	4 = Local damage	4- Low	8- Low	12- Medium	16- Medium	20- High	24- High
5 = Long-term disability or major disabling injury	5 = Major damage	5- Low	10- Medium	15- Medium	20- High	25- High	30- High
6 = Fatality	6 = Catastrophic damage	6- Low	12- Medium	18- High	24- High	30- High	36- High

To determine the risk level, complete the following:

1. Calculate the Baseline Risk score and enter it in the appropriate column on the JSA form. The baseline risk scores are used to determine the urgency of action or implementation of hazard controls (see the risk scores below).
2. Assign controls/protections for the identified hazards greater than a Baseline Prevention Risk Score of 4.
3. Re-calculate the score accounting for the changes the controls/protections will make — this new score is the Post Prevention Risk score.
4. Enter the Post Prevention Risk score in the appropriate column on the JSA form.

Using the risk scores below, determine the action to take based on the Post Prevention Risk score. (Note: If the Post Prevention Risk Score remains greater or equal to 9, the job should be suspended until controls/protections are implemented to lower the risk score.)

The risk scores are:

- 1 to 6 (Acceptable Risk) — No additional action needed.
- 5 to 8 (Low) — Review the operation/activity and take any steps necessary to reduce and control the risks.
- 9 to 16 (Medium) — Inform Site Safety Officer and seek further advice before proceeding any further with the operation/activity.
- 17 or Greater (High) — STOP the activity immediately. Review with Site Safety Officer and Project Manager and reduce the risks identified. Contact a member of the H&S Team if further guidance is needed.

Hazard Controls / Protection Measures

Using the first three columns of the JSA form as a guide, decide what actions or procedures are necessary to eliminate or minimize the hazards that could lead to an accident, injury, or occupational illness. Keep in mind the Occupational Safety and Health Administration (OSHA) requirement to control hazards before assigning personal protective equipment.

To begin minimizing/eliminating hazards, implement the following in order they are presented below:

1. Engineering controls to remove or abate the hazard
2. Administrative controls to protect from the hazard
3. Work practice controls (e.g., provide job instruction training)
4. Personal protective equipment
5. Good housekeeping
6. Good ergonomics (positioning the person in relation to the machine or other elements in such a way as to improve safety)

Once actions and/or procedures have been defined, enter them in the “Hazard Controls / Protection Measures” column on the form. Keep in mind the following:

1. List all appropriate safe operating procedures. Begin with an action word. Say exactly what needs to be done to correct the hazard, such as "lift using your leg muscles." Avoid general statements such as "be careful," "watch out," or “work safely.”
2. List the required PPE necessary to perform each step of the job if controls cannot completely abate the hazard.
3. Give a recommended action or procedure for each hazard. Serious hazards should be corrected immediately.

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Soil boring and sampling	**Page** 1 **of 2**	☐ New ☒ Revised

Work Activity Description: Clear underground and overhead utilities Equipment set up Conduct boring activity (drill rig, hand auger) Collection of soil sample Site clean up	**Project / Field Team Members:**	**JSA Author(S):** Mark Smith — **Date:** 7/20/2017 **Reviewed By:** — **Date:** **Approved By:** Shannon Barr — **Date:** 2/8/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☐ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☒ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Unloading equipment and tools	Muscle strain Pinch points	12	• Use proper lifting techniques • Use buddy system for lifting • Keep hands and finger clear of pinch points and wear appropriate gloves	6
Retrieve soil sample	Pinch points, insect/snake hazard at ground level	12	• Be aware of sampling area and surrounding ground surface for insect, snakes, and other bio hazards. Wait for them to leave before proceeding with work. • Wear correct gloves while collecting the soil sample (leather for using tools, nitrile for direct grab/spoon).	

			• Use sample collection tools properly.	
Collect soil samples in laboratory bottleware	Exposure to vapors and chemicals	12	• Wear proper PPE (Nitrile gloves, safety glasses) • Properly label samples and preserve properly	8
Site clean up	Slips, trips, falls Muscle strain	6	• Proper PPE (gloves, eye protection) • Ensure area is policed (free of trash, tools, etc.) • Properly dispose of all trash	3

EHS Support

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	July 22, 2020

Job Safety Analysis (JSA)

Client: SBA Shipyard **Project:** May 2021 Field Sampling **Location:** Jennings, LA	**JSA Title: Soil and** Sediment Sampling	**Page** 1 **of** 6	☐ New ☒ Revised

Work Activity Description: Soil Sampling and Sediment sampling over water	**Project / Field Team Members:** Andrew Miano Mark Smith Brett Selensky - BESI (Benchmark Ecological Services)	**JSA Author(S):** Andrew Miano	**Date:** 04/19/2021
		Reviewed By:	**Date:**
		Approved By:	**Date:**

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☒ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☒ Other: PFD
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Sediment Sampling	Contact with chemicals during sampling	20	Wear gloves, long sleeved clothes, safety glasses	15
	Pinch points with hand tools	6	Be aware of pinch points	4
	Struck By/Against Heavy Equipment	30	Use reflective warning vests worn when exposed to vehicular traffic.	12
			Avoid equipment swing areas.	
			Make eye contact with operators before approaching equipment.	

			Understand and review hand signals.	
	Slips, Trips, Falls	30	Clear, walkways of equipment, tools, and debris.	12
			Mark, identify, or barricade other obstructions.	
	Handling Heavy Objects	15	Observe proper lifting techniques.	6
			Obey lifting limits.	
			Utilize team lifting practices for large loads over 50 pounds	
	Sharp Objects	12	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects.	4
			Maintain all hand and power tools in a safe condition.	
			Keep guards in place during use.	
	Insect/Snake Bites	9	Review injury potential and types of snakes with workers.	6
			Avoid insect nests areas, likely habitats of snakes.	
			Emphasize the Buddy System where such injury potential exists.	
			Use insect repellent, wear appropriate garments to protect against sting/bite injuries.	
	High Noise Levels	30	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period).	10
Vessel Use	Slip/Trip/Fall	30	Work Areas and means of access shall be maintained safe and orderly.	12
			Even terrain will be utilized as loading/unloading areas.	
			Tripping and poor footing hazards will be repaired as they are discovered or clearly identified.	

	Vehicular Traffic/Problems	30	Spotters will be used when backing up trucks and moving equipment.	12
	Falling Overboard	30	Non-slip surfaces will be provided on all working decks, stair treads, & ladders.	12
			All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards.	
			Maximum weight capacity for watercraft will not be exceeded.	
			Vessel must have a means for either radio and/or cell phone communication.	
			If man overboard occurs stop forward motion of vessel, toss ring or PFD to man in water, come about and retrieve man. Contact emergency personnel as soon as possible if warranted.	
	Watercraft Operation	6	Only those personnel who have successfully completed a boating safety course will operate watercraft.	2
			Locations of rocks, ledges and manmade surface obstructions will be noted within the work area. These will be given a wide berth.	
			All watercraft must have required Coast Guard approved lighting, signaling & safety devices.	
Vessel Operations Underway & Docking	Drowning	30	Have USCG Approved personal flotation devices available for all workers when on or near the water.	12
			Have onboard a floating ring buoy or other throwable device with at least 90 feet of line.	
	Electrical Shock	30	Use double insulated or properly grounded electric power-operated tools.	12
			Maintain tools in a safe condition.	
			Use or employ ground-fault circuit interrupters.	

			Use qualified personnel to hook up electrical circuits.	
			Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation.	
			Cover or elevate electric wire or flexible cord passing through work areas to protect from damage.	
			Keep all plugs and receptacles out of water.	
			Use approved waterproof, weatherproof type if exposure to moisture is likely.	
			Inspect all electrical power circuits prior to commencing work.	
	Caught In/Between Moving Parts	30	Use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects.	12
			Maintain all equipment in a safe condition.	
			Keep all guards in place during use.	
			De-energize and locked-out machinery before maintenance or service.	
	Struck by, Against Protruding Objects, Boats/Wakes, Operating Equipment	30	Avoid moving equipment and equipment swing areas.	12
			Make eye contact with operators before approaching equipment.	
			Restrict entry to the work area to authorized personnel.	
			Understand and review posted hand signals	
	Inhalation and Contact with Potentially Hazardous Substances	15	Use the appropriate skin, eye and respiratory protection based on the exposure hazards present	10
	Overflow/Spills of fuel in or onto boat or water	15	Ensure that fueling is done from approved, vented containers.	10
			Use approved safety containers.	

			Workers will be aware capacity of fuel tank/container.	
			Have spill containing/absorbing items available.	
			Follow operations manual maintenance and inspection procedures for each piece of equipment used on site.	
	Explosion	30	Ensure that all fuel is in approved safety containers.	12
			No smoking or open flame within 50 feet.	
			Equipment/Motors that use flammable fuel shall be shut down during fueling, servicing, or maintenance.	
	Spill on clothing	16	Workers should be aware of capacity of fuel tank.	8
			Wear gloves while fueling.	
			Change clothing if saturated with fuel.	
	Fire extinguishers	1	Ensure that boat has an approved fire extinguisher on board.	1
			The fire extinguishers must be inspected and approved at specific intervals.	
Sample Shipment	Exertion Contact with chemicals	4	Use proper lifting procedures (bend at knees, straight back) when lifting heavy objects such as ice chests. Wear gloves when handling coolers	2

1 References

Risk Score = Likelihood x Severity

Severity of Injury/Illness	Likelihood of Injury/Illness
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

To determine the risk level, complete the following:

1. Calculate the Baseline Risk score and enter it in the appropriate column on the JSA form. The baseline risk scores are used to determine the urgency of action or implementation of hazard controls (see the risk scores below).
2. Assign controls/protections for the identified hazards greater than a Baseline Prevention Risk Score of 4.
3. Re-calculate the score accounting for the changes the controls/protections will make — this new score is the Post Prevention Risk score.
4. Enter the Post Prevention Risk score in the appropriate column on the JSA form.

Using the risk scores below, determine the action to take based on the Post Prevention Risk score. (Note: If the Post Prevention Risk Score remains greater or equal to 9, the job should be suspended until controls/protections are implemented to lower the risk score.)

EHS Support

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: Ashland/Hercules **Project:** Glens Falls Site **Location:** Glens Falls, NY	**JSA Title:** Traffic Control	**Page** 1 **of** 2	☐ New ☒ Revised

Work Activity Description: Traffic control and flagging	**Project / Field Team Members:** Kyle Shugerts	**JSA Author(S):** Gregg Hicks	**Date:** 11/03/2023
		Reviewed By:	**Date:**
		Approved By: Gregg Hicks	**Date:** 11/03/2023

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☐ Gloves (Chemical / Leather)
☐ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☐ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Inspection of work zone, set up of controlled access points for work vehicles as well as traffic control patterns using barricades, cones, or barrels	Stuck by traffic Falling debris Back muscle strain	18	• Be cautious of environmental surroundings such as rockslides, construction, and traffic. • Be familiar of the task and road layout. The road should be well lit without glare. • Wear appropriate PPE. • Utilize appropriate bending and lifting techniques when transporting heavy or large equipment.	6

			• Cones and flaggers should be strategically placed; a flagger should be placed on either side of 2-laned roads, each facing the oncoming traffic. • Where there is dim lighting, use spotters.	
Set up warning signs for divers of upcoming obstacles when dealing with construction	Stuck by traffic Falling debris Back muscle strain	18	• Road signs should be used to warn drivers of upcoming obstacles. • Use proper lifting techniques upon setting up signs. The signs should give drivers enough warning 4-8 times in distance (feet) as the speed limit.	6
Flagging	Stuck by traffic Falling debris	18	• Stand on the shoulder adjacent to the controlled road, or a lane should be closed for a flagging position. • Be cautious of surroundings, face oncoming traffic, and wear appropriate PPE. • The flagger should be clearly visible to all drivers, and needs to be isolated, not located within a group of people which could cause confusion upon drivers. • The flagger should be placed well in advance to the construction or warning site and should make eye contact with each driver to confirm awareness.	6
Flagging on-site	Struck by traffic Unseen by traffic	18	• Only approach a vehicle or piece of equipment when the driver has made a complete stop, be cautious of surroundings, and wear proper PPE. • Back away from the vehicle when the driver is ready to back up.	6

Appendix C Daily Tailgate Safety Meeting Form

Issue Date	Jan. 2, 2013
Revision No.	005
Revision Date	January 2021

Daily Tailgate Safety Form

General Information			
Project Name/Location: Click or tap here to enter text.		**Name(s) of Person(s) Conducting Meeting:** Click or tap here to enter text.	
Date: Click or tap to enter a date.	**Time:** Click or tap here to enter text.	**Weather:** Click or tap here to enter text.	
Lone Worker			
☐ No **If no, continue to rest of form*	☐ Yes ***If yes, complete check-in person and daily tasks/hazards section below*	**Check-In Person:** Click or tap here to enter text.	**Check-In Frequency:** Click or tap here to enter text. *(i.e. arrival, lunch, and de-mob; or every 2 hours)*
Subcontractor(s):			

Day 1/Project Restart topics to cover:

Who is: ☐ PM(s) ☐ SSO ☐ Client ☐ Client PM ☐Subs ☐ Contact for Emergency

Chain of command for communicating hazards, incidents, stop work, etc.?

Location of: ☐ 1st Aid Kits ☐ Fire Extinguishers ☐ SDSs ☐ JSAs ☐ Emergency Contacts ☐ Hospital/Clinic

☐ What is different on the site from what was covered during the PSA call?

☐ What are we doing today that is not captured on the JSAs?

☐ What are obvious unique risks identified?

☐ Other EHS Support, Client, Sub or Other Party activities that may pose a hazard to today's activities?

☐ Complete all pre-use inspections (i.e., heavy equipment, power/hand tools, fall protection, electrical) and turn in to Project Manager at the end of the field event

**Regroup during/after lunch to discuss morning activities and plan for afternoon activities.*

Discuss the following – review of previous day's outcomes (Check if YES):

☐ Incidents? ☐ Lessons Learned? ☐ Any Stop Work Interventions? ☐ Corrective Actions Worked?

☐ Issues with Equipment? ☐ Issues with PPE? ☐ Audits/Inspections Performed? ☐ Communication Changes?

☐ Topics from Corp H&S or Client to Cover? ☐ Any work deviate from plan? – Notify PM & client

☐ Other: Click or tap here to enter text.

Notes: Click or tap here to enter text.

**All incidents and audits shall be uploaded to MyMomentum.*

Prework authorization – check activities to be conducted that require permit issuance or completion of a checklist, or similar, before work begins:

☐ Not Applicable ☐ Access Permits ☐ Confined Space ☐ Energy Isolation (LOTO) ☐ Hot Work ☐ Steam ☐ Live Electrical

☐ Buried or Overhead Utilities ☐ Excavation/Trenching ☐ Mechanical Lifting Ops ☐ Pressure System ☐ Working at Height

☐ Float Plan ☐ Other: Click or tap here to enter text.

Permit Name/Numbers and Notes: Click or tap here to enter text.

Today's Task(s)	
1. Click or tap here to enter text.	2. Click or tap here to enter text.
3. Click or tap here to enter text.	4. Click or tap here to enter text.
5. Click or tap here to enter text.	6. Click or tap here to enter text.

Potential Hazards Associated – Review the known risks from the JSA Hazard Rating (left column) and determine if risk level has changed (check risk level of Low (L), Medium (M), High (H) - refer to Risk Assessment Matrix on JSA Form). If the risk has increased to HIGH, the JSA shall be updated and new controls implemented.

Previous Hazard Rating – Tasks with	L	M	H	Tailgate Hazard Rating	L	M	H
☐ Mechanical (i.e., augers, moving parts)	☐	☐	☐	☐ Mechanical (i.e., augers, moving parts)	☐	☐	☐
☐ Pressure (i.e., gas cylinders, wells)	☐	☐	☐	☐ Pressure (i.e., gas cylinders, wells)	☐	☐	☐
☐ Electrical (i.e., utilities, equip. repair/shut down)	☐	☐	☐	☐ Electrical (i.e., utilities, equip. repair/shut down)	☐	☐	☐
☐ Radiation (i.e., alpha, sun, laser)	☐	☐	☐	☐ Radiation (i.e., alpha, sun, laser)	☐	☐	☐
☐ Security (i.e., lighting, equipment, check-ins)	☐	☐	☐	☐ Security (i.e., lighting, equipment, check-ins)	☐	☐	☐
☐ Gravity (i.e., ladder, scaffold, trips)	☐	☐	☐	☐ Gravity (i.e., ladder, scaffold, trips)	☐	☐	☐
☐ Chemical (i.e., fuel, acid, waste)	☐	☐	☐	☐ Chemical (i.e., fuel, acid, waste)	☐	☐	☐
☐ Motion (i.e., traffic, moving water)	☐	☐	☐	☐ Motion (i.e., traffic, moving water)	☐	☐	☐
☐ Driving (i.e., boat, ATV, skid steer)	☐	☐	☐	☐ Driving (i.e., boat, ATV, skid steer)	☐	☐	☐
☐ Sound (i.e., machinery, generators)	☐	☐	☐	☐ Sound (i.e., machinery, generators)	☐	☐	☐
☐ Environment (i.e., heat, cold, rain)	☐	☐	☐	☐ Environment (i.e., heat, cold, rain)	☐	☐	☐
☐ Biological (i.e., ticks, snakes, poison ivy)	☐	☐	☐	☐ Biological (i.e., ticks, snakes, poison ivy	☐	☐	☐
☐ Personal (i.e., alone, night, not fit for duty)	☐	☐	☐	☐ Personal (i.e., alone, night, not fit for duty)	☐	☐	☐
☐ Other: Click or tap here to enter text.	☐	☐	☐	☐ Other: Click or tap here to enter text.	☐	☐	☐
Proposed Corrective Actions	**Yes**	**No**	**N/A**	**Proposed Corrective Actions**	**Yes**	**No**	**N/A**
Protective Clothing/Equipment Required	☐	☐	☐	Work Permit Required	☐	☐	☐
Delineate Work Areas to Protect Workers and/or Public	☐	☐	☐	Other:	☐	☐	☐
Comments: Click or tap here to enter text.							

Attendees
Site Workers (including EHS Support Contractors and Subcontractors) by signing here, you are stating the following: • You have been involved in the Daily Tailgate Safety Meeting, the review of the JSAs, and understand the hazards and control measures associated with each task you are about to perform. • You are aware of your authority and obligation to 'Stop Work' **Fit for duty:** • You are physically and mentally fit for duty. • You are not under the influence of any type of medication, drugs, or alcohol that could negatively affect your ability to work safely. • You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or fatigue issue you may have to the EHS Support SSO. • You leave the site uninjured unless you have otherwise notified the EHS Support SSO.
EHS Support Site Safety Officer: _____ _____ Name Signature

Site Personnel Name and Affiliation	Signature	Site Personnel Name and Affiliation	Signature
Click or tap here to enter text.		Click or tap here to enter text.	
Click or tap here to enter text.		Click or tap here to enter text.	
Click or tap here to enter text.		Click or tap here to enter text.	

Site Visitors – Not involved in work activities				
Name (print)	**Company Name**	**Arrival Time**	**Depart Time**	**Signature** *(I have been informed of today's activities and site safety parameters)*
Click or tap here to enter text.	Click or tap here to enter text.			
Click or tap here to enter text.	Click or tap here to enter text.			
Click or tap here to enter text.	Click or tap here to enter text.			

Post Daily Activities Review – To be completed once activities for day have concluded and BEFORE leaving the Site		
Were there any incidents or near misses?	☐ Yes* ☐ No	If yes, details: Click or tap here to enter text.
Where there any 'Stop Work' interventions?	☐ Yes ☐ No	If yes, details: Click or tap here to enter text.
Where there any areas for improvement noted?	☐ Yes ☐ No	If yes, details: Click or tap here to enter text.
Was the site audited by EHS Support, client, or regulatory representative?	☐ Yes* ☐ No	If yes, details: Click or tap here to enter text.
The job site is being left in a safe condition and there were no reports of injury or first aid.	☐ Yes ☐ No	
EHS Support SSO Signature: _____		

** If response is YES, entry into MyMomentum is required.*

Please upload into SharePoint under your project in a folder titled Daily Tailgate Safety Forms.

Appendix D Air Monitoring Log

Issue Date	Aug. 16, 2013
Revision No.	002
Revision Date	Jan. 8, 2019

Air Monitoring Log

Project Information			
Company Name:	**Address:**	**Telephone:**	**Date:**
Project Name:	**Client:**	**Site Location:**	**Operation Monitored:**
Instrument:	**Model:**	**Serial No.:**	
Calibration Date:	**Probe:**	**Settings:**	
Temp/Rel. Hum:	**Wind:**	**Indoor:**	**Outdoor:**
Interference:		**Operator Name:**	

Air Monitoring Log							
Sample No.	***Time***	***LEL***	***O_2***	***H_2S***	***CO***	***Location***	***Comments***

Ammonia

STEL: 35 ppm 15 minute(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 17.04 g/mole

Molecular formula : H3-N

Boiling/condensation point : -33.3°C (-27.9°F)

Melting/freezing point : -77.8°C (-108°F)

Critical temperature : 132.4°C (270.3°F)

Vapor density : 0.6 (Air = 1)

Specific Volume (ft^3/lb) : 22.7273

Gas Density (lb/ft^3) : 0.044

Physical/chemical properties comments : SPECIFIC GRAVITY (AIR=1): @ 70°F (21.1°C) = 0.59
PH: Approx. 11.6 for 1 N Sol'n. in water

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
Ammonia, anhydrous	LC50 Inhalation Vapor	Rat	18600 mg/m3	5 minutes
	LC50 Inhalation Vapor	Rat	7040 mg/m3	30 minutes
	LC50 Inhalation Gas.	Rat	17401 ppm	15 minutes
	LC50 Inhalation Gas.	Rat	9500 ppm	1 hours
	LC50 Inhalation Gas.	Rat	2000 ppm	4 hours

IDLH : 300 ppm

Chronic effects on humans : May cause damage to the following organs: lungs, upper respiratory tract, skin, eyes.

Other toxic effects on humans : Hazardous by the following route of exposure: of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure

Ammonia				
Ammonia, anhydrous	-	Acute LC50 0.88 mg/L Fresh water	Fish - Orangethroat darter - Etheostoma spectabile	96 hours
	-	Acute LC50 0.74 mg/L Fresh water	Fish - Orangethroat darter - Etheostoma spectabile	96 hours
	-	Acute LC50 1 to 1.5 ppm Fresh water	Fish - Fathead minnow - Pimephales promelas - LARVAE - 90 days	96 hours
	-	Acute LC50 0.53 ppm Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 0.5 to 1 ppm Fresh water	Fish - Fathead minnow - Pimephales promelas - LARVAE - 14 days	96 hours
	-	Acute LC50 31260 ug/L Marine water	Crustaceans - Redtail prawn - Penaeus penicillatus - 3.58 to 4.75 cm - 0.4 to 0.69 g	48 hours
	-	Acute LC50 25400 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 22790 to 32200 ug/L Marine water	Crustaceans - Kuruma shrimp - Penaeus japonicus - Post-larvae	48 hours
	-	Acute LC50 16010 to 21460 ug/L Marine water	Crustaceans - Kuruma shrimp - Penaeus japonicus - Mysis	48 hours
	-	Acute LC50 14860 to 19140 ug/L Marine water	Crustaceans - Redtail prawn - Penaeus penicillatus - Zoea	48 hours
	-	Acute LC50 14530 to 20600 ug/L Marine water	Crustaceans - San paulo shrimp - Penaeus paulensis - Zoea	48 hours
	-	Acute LC50 11310 to 15480 ug/L Marine water	Crustaceans - Kuruma shrimp - Penaeus japonicus - Zoea	48 hours
	-	Acute LC50 8590 to 9640 ug/L Marine water	Crustaceans - San paulo shrimp - Penaeus paulensis - Post-larvae	48 hours
	-	Acute LC50 5210 to 6040 ug/L Marine water	Crustaceans - Redtail prawn - Penaeus	48 hours

		penicillatus - Zoea	
-	Acute LC50 4980 to 9070 ug/L Marine water	Crustaceans - Kuruma shrimp - Penaeus japonicus - Nauplii	48 hours
-	Acute LC50 4180 to 6030 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <24 hours	48 hours
-	Acute LC50 4130 to 5100 ug/L Fresh water	Daphnia - Water flea - Daphnia pulex - <24 hours	48 hours
-	Acute LC50 2710 to 3670 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia reticulata - <4 hours	48 hours
-	Acute LC50 2500 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus aquaticus - 8 to 10 mm	48 hours
-	Acute LC50 660 ug/L Fresh water	Fish - common carp - Cyprinus carpio	96 hours
-	Acute LC50 450 to 470 ug/L Fresh water	Fish - Chinook salmon - Oncorhynchus tshawytscha - Underyearling - 1 to 7 g	96 hours
-	Acute LC50 440 ug/L Fresh water	Fish - common carp - Cyprinus carpio	96 hours
-	Acute LC50 380 ug/L Fresh water	Fish - Silver carp - Hypophthalmichthys molitrix - Fingerling	96 hours
-	Acute LC50 300 ug/L Fresh water	Fish - Carp - Hypophthalmichthys nobilis	96 hours

Products of degradation : Products of degradation: nitrogen oxides (NO, NO_2 etc.).

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1005	AMMONIA, ANHYDROUS	2.2	Not applicable (gas).		**Reportable quantity** 100 lbs. (45.4 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 13,T50
TDG Classification	UN1005	AMMONIA, ANHYDROUS; OR ANHYDROUS AMMONIA	2.3	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions**
Mexico Classification	UN1005	AMMONIA, ANHYDROUS	2.2	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations :

TSCA 8(a) IUR: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: Ammonia, anhydrous
SARA 302/304 emergency planning and notification: Ammonia, anhydrous
SARA 302/304/311/312 hazardous chemicals: Ammonia, anhydrous
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Ammonia, anhydrous: Sudden release of pressure, Immediate (acute) health hazard

Clean Water Act (CWA) 311: Ammonia, anhydrous

Clean Air Act (CAA) 112 accidental release prevention - Toxic Substances: Ammonia

Clean Air Act (CAA) 112 regulated toxic substances: Ammonia, anhydrous

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Ammonia	7664-41-7	100
Supplier notification :	Ammonia	7664-41-7	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations :

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) :

Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

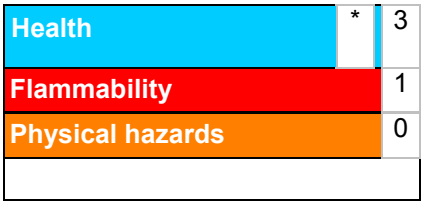
United States

Label requirements : CAUSES SEVERE RESPIRATORY TRACT, EYE AND SKIN BURNS.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

Hazardous Material Information System (U.S.A.) :



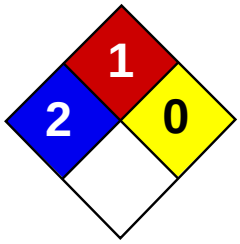
National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.







Material Safety Data Sheet
Antimony MSDS

Section 1: Chemical Product and Company Identification

Product Name: Antimony

Catalog Codes: SLA1453, SLA4462

CAS#: 7440-36-0

RTECS: CC4025000

TSCA: TSCA 8(b) inventory: Antimony

CI#: Not available.

Synonym: Stibium

Chemical Name: Not available.

Chemical Formula: Sb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Antimony	7440-36-0	100

Toxicological Data on Ingredients: Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 121.75 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 1635°C (2975°F)

Melting Point: 630°C (1166°F)

Critical Temperature: Not available.

Specific Gravity: 6.691 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 7000 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Antimony powder UNNA: UN2871 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

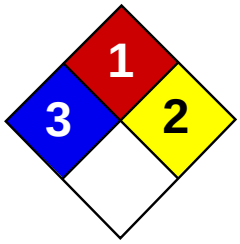
Other Special Considerations: Not available.

Created: 10/11/2005 11:19 AM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

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Barium

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer/Supplier:

ESPI Metals

1050 Benson Way, Ashland, OR 97520

Toll Free (800) 638-2581 * Fax (541) 488-8313

E-Mail: sales@espimetals.com

Product Name: Barium

Formula: Ba

CAS Number: 7440-39-3

II. HAZARDOUS INGREDIENTS

Hazardous Component: Barium

Percent (%): 0-100

OSHA/PEL: 0.5 mg/m^3

ACGIH/TLV: 0.5 mg/m^3

HMIS Ratings:

Health: 2

Flammability: 3

Reactivity: 3

III. PHYSICAL DATA

Boiling Point: 1640 ^{o}C

Melting Point: 725 ^{O}C

Specific Gravity: 3.51 @ 20 ^{O}C

Solubility in H_2O: Reacts violently

Appearance and Odor: Silver gray metal, no odor**.**

IV. FIRE AND EXPLOSION HAZARDS DATA

Flash Point: N/A

Flammability: Highly flammable

Autoignition Temperature: N/E

Explosive Limits: **Lower**: N/E **Upper**: N/E

Extinguishing Media: FLAMMABLE SOLID!! Use dry chemical/dolomite (powdered limestone) or sodium chloride. DO NOT USE WATER, CARBON DIOXIDE, OR HALOGENATED EXTINGUISHERS!

Special Firefighting Procedures: Wear full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Flammable solid.

Unusual Fire and Explosion Hazards: Material readily reacts with water generating flammable and/or explosive hydrogen gas. Emits toxic fumes under fire conditions. **Caution!** Fire may reignite after having been extinguished. Blend with large excess of dolomite.

V. HEALTH HAZARD INFORMATION

Effects of Exposure:

To the best of our knowledge the chemical, physical, and toxicological properties of barium have not been thoroughly investigated and recorded.

Barium compounds may cause severe gastroenteritis, including abdominal pain, vomiting and diarrhea, tremors, faintness, paralysis of the arms and legs, and slow or irregular heartbeat. Severe cases may produce collapse and death due to respiratory failure. Soluble barium compounds are more likely to cause these effects than insoluble compounds. Inhalation of fumes may cause sore throat, coughing, labored breathing, and irritation of the respiratory tract as well as the above symptoms.

Acute Effects:

Inhalation: May cause severe irritation to the nose, throat, and upper respiratory tract.

Ingestion: May cause severe irritation of the mouth, throat, and esophagus.

Skin: Contact with skin can cause mild to moderate irritation. May cause chemical burns as it reacts with moisture on living tissue. Can lead to the development of a hypersensitivity in susceptible individuals.

Eye: May cause chemical burns as it reacts with moisture on living tissue.

Chronic Effects:

Inhalation: May cause sensitization.

Ingestion: May cause chronic barium poisoning.

Skin: May cause dermatitis.

Eye: May cause corneal opacity and blindness.

Target Organs: Respiratory System, Eye, Skin, Immune System (Allergic Reactions), Central Nervous System, and Heart.

Medical Conditions Generally Aggravated by Exposure: Pre-existing respiratory disorders.

Carcinogenicity: **NTP**: No **IARC**: No **OSHA**: No

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult, seek immediate medical attention.

INGESTION: Seek immediate medical attention.

SKIN: Remove metal particles. Remove contaminated clothing. Carefully brush material off skin and wash area with soap and water. Seek medical attention if irritation develops.

EYE: Remove metal particles. Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water. Lift upper and lower eye lids frequently. Get prompt medical attention.

NOTE TO PHYSICIAN: Treatment should be directed at preventing absorption, administering to the symptoms as they occur, and providing supportive therapy. Attention: Up to two days latent period.

VI. REACTIVITY DATA

Stability: Stable if used and stored according to specifications.

Conditions to Avoid: Water or moisture and air. Avoid friction, heat, sparks, and flame.

Incompatibility (Materials to Avoid): Water or moisture, oxidizing agents, oxygen, acids, alcohols, halocarbons, carbon dioxide, ammonia.

Hazardous Decomposition Products: Toxic fumes of hydrogen and barium oxide.

Hazardous Polymerization: Will not occur

VII. SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Wear appropriate respiratory and protective equipment specified in section VIII. Isolate spill area and provide ventilation. Protect from ignition sources. Keep unprotected persons away. Sweep or scoop spilled product and place in a closed container for further handling and disposal. Do not flush to sewer, stream, or other bodies of water. Cover very small quantities in the open with powdered limestone and let decompose.

Waste Disposal Method: Material in the elemental state should be recovered for reuse or recycling. Observe all federal, state & local regulations.

VIII. SPECIAL PROTECTION INFORMATION

Respiratory Protection: NIOSH approved cartridge respirator.

Ventilation: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below exposure limits. Handle in a controlled environment in an inert gas.

Protective Gloves: Leather-palmed, heat resistant gloves.

Eye Protection: Chemical splash goggles and a full face shield. An eye wash facility should be readily available.

Other Protective Clothing or Equipment: The use of fire resistant outer clothing is advisable.

IX. SPECIAL PRECAUTIONS

Precautions to Be Taken in Handling and Storage: Barium metal should be stored in tightly-closed containers under argon or mineral oil. When handling, wear non-sparking shoes and flame resistant clothing. Avoid friction, heat, sparks, and flame. Use only non-sparking tools and utensils. Ground all equipment, vessels, tables, and other metallic objects that may come into contact with the product. Do not store together with acids, halogens and oxidizing agents. Store away from water/moisture.

Other Precautions: Can autoignite in air. Extremely sensitive to shock, heat, friction and static electricity. Rubber gloves, rubber protective clothing and apron, goggles and gas filter mask should be worn when working in a barium storage area.

Empty Container Precautions: This container is hazardous when empty. Do not use heat, sparks, open flame, torches, or cigarettes on or near empty container. Empty containers can retain product residues. Do not reuse empty container for food, clothing, or other products for human or animal consumption or where skin contact may occur.

Work Practices: Implement engineering and work practice controls to reduce and maintain concentration of exposure at low levels. Do not use tobacco or food in work area. Wash thoroughly after handling, especially before eating, drinking, smoking, or using restroom facilities. Contaminated clothing and shoes should be thoroughly cleaned before reuse. Do not blow dust off clothing or skin with compressed air. Maintain eyewash capable of sustained flushing, safety drench shower and facilities for washing.

TSCA Listed: Yes

DOT Regulations:

Hazard Class: 4.3

Identification Number: UN1400

Packing Group: II

Proper Shipping Name: Barium

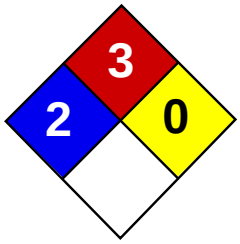
Label: Dangerous when wet

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damage resulting from handling or from contact with the above product.

Issued by: S. Dierks

Revised/Verified: July 2011





Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

Last Updated: 05/21/2013 12:00 PM

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ELECTRONIC SPACE PRODUCTS INTERNATIONAL

1050 Benson Way, Ashland, OR 97520
Toll Free (800) 638-2581 * Fax (541) 488-8313
E-Mail: sales@espimetals.com

MATERIAL SAFETY DATA SHEET

I PRODUCT IDENTIFICATION

Trade Name: Beryllium
Formula: Be
Chemical Family: Metallic Element
CAS #: 7440-41-7

II HAZARDOUS INGREDIENTS

Hazardous Components	%	OSHA/PEL	ACGIH/TLV
Beryllium	0-100	.002 mg/m^3	.002 mg/m^3

Toxic Substances Control Act: Beryllium (CAS # 7440-41-7) is listed on the TSCA Chemical Substance Inventory of Existing Chemical Substances.
NIOSH RTECS#: DS1750000

III PHYSICAL DATA

Boiling Point: 2970 ^{o}C
Density (g/cc): 1.85
Atomic Weight: 9.01
% Volatiles: None
Appearance and Odor: Grey metallic, odorless
Melting Point (^{o}C): 1289
Vapor Pressure: N/A
Evaporation Rate: N/A
Solubility in H_2O: None

IV FIRE AND EXPLOSION HAZARDS DATA

Flash Point (Method used): Non-combustible as a solid. Ignition occurred as a powder layer consisting of 1.0 to 5.0 micron particles between 540 ^{o}C and 700 ^{o}C. Coarser beryllium powder able to pass through a 74 micron sieve did not ignite under like testing.

Explosive limits: Not applicable to solids. As a cloud of 1.0 micron diameter powder ignition occurred at 910 ^{o}C. Beryllium powder greater than or equal to 2 microns in diameter did not ignite under like conditions. Regardless of powder size tested beryllium did not ignite as a cloud in a spark apparatus.

Extinguishing Media: As a solid, use extinguishing media appropriate to the surrounding fire. Do not use water or carbon dioxide to extinguish beryllium powder fires. As a powder, extinguish by smothering using a Class D fire extinguisher, dry sand, graphite powder, or sodium chloride.

Special Fire Fighting Procedures: If this material becomes airborne as a respirable particulate during a fire situation, pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the metal fumes.

Unusual Fire and Explosion Hazard: Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions. In addition, water may disassociate when in contact with burning beryllium powder or chips releasing flammable hydrogen gas which could burn and result in an explosion. Ventilation duct work which has accumulated a fine coating of

beryllium dust on its internal surface poses a potentially serious fire hazard. Extinguishing using Class D fire extinguisher media and shut down or isolate the affected portion of the ventilation system. Because of this potential risk, sources of ignition such as flame, spark, etc. must not be allowed to enter the ventilation duct work. Also, duct work must be made of non-combustible material.

V HEALTH HAZARD INFORMATION

Primary Routes of Exposure: **Inhalation**: An exposure to airborne beryllium in excess of the occupational standard can occur during routine handling, material transfer, chemical processing or further processing of powdered material and when machining, melting, casting, dross handling, picking, welding, grinding, sanding, polishing, milling, crushing, or otherwise abrading the surface of solid beryllium in a manner which generates finely divided particles. Machining operations conducted under a flood of liquid coolant usually require local exhaust ventilation. The cycling through a machine of liquid lubricant/coolant containing finely divided beryllium in suspension can result in the concentration building to a point where the particulate may become airborne during use. A filter, centrifuge, or settling chamber can be installed in-line if necessary. The potential for exposures also may occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, welding, etc.

Acute Effects:

Inhalation: This product is insoluble and does not cause acute health effects.
Ingestion: This product is insoluble and does not cause acute health effects.
Skin: Skin abrasion may cause irritation.
Eye: Injury to the eyes can result from particulate irritation or mechanical injury to the cornea or conjunctiva by dust or particulate.

Chronic Effects:

Inhalation: Overexposure to airborne beryllium particulate may cause a serious lung disease, in certain sensitive individuals, called chronic beryllium disease (chronic berylliosis). Chronic beryllium disease is a condition in which the tissues of the lungs become inflamed, restricting the exchange of oxygen between the lungs and the bloodstream. Symptoms may include cough, chest pain, shortness of breath, weight loss, weakness, and fatigue. Long term effects may include loss of lung function, fibrosis, or subsequent secondary effects on the heart with eventual permanent impairment.
Ingestion: There are no known cases of illness resulting from ingestion of beryllium.
Skin: Skin abrasion may cause irritation.
Eye: Injury to the eyes can result from particulate irritation or mechanical injury to the cornea or conjunctiva by dust or particulate.

Carcinogenic references: Hazard communication regulations of the U.S. Occupational Safety & Health Administration require that caution labels for materials listed as potential carcinogens in either the International Agency for Cancer Research Monograph Series or the National Toxicology Program Annual Report on carcinogens must contain a cancer warning. Beryllium has also been so listed based principally on animal tests and therefore this material bears a label identifying it as a potential cancer hazard.

Medical Conditions Aggravated by Exposure: Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if excessive concentrations of dust or fume are inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) system has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause excessive exposure.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove to fresh air. Although no cases in which a person stopped breathing as a result of exposure are known, if breathing has stopped, perform artificial respiration and obtain medical help.
INGESTION: Swallowing metal powder or dust can be treated by having the affected person drink large quantities of water and attempting to induce vomiting if conscious. Obtain medical help.
SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. If irritation persists, seek medical attention.
EYE: Flush eyes with copious amounts of clean water. If irritation persists obtain medical help. Contact lenses should not be worn when working with metal dusts and powders because the contact lens must be removed to provide adequate treatment.

VI REACTIVITY DATA

Stability: Stable

Conditions to Avoid: Oxidation will form on solid shapes when moist.
Incompatibility (Material to Avoid): Avoid contact with mineral acids and oxidizing agents which may generate hydrogen gas. Hydrogen gas can be an explosion hazard.

Hazardous Decomposition Products: Melting and dross handling or powdering operations can emit airborne dusts or fumes.
Hazardous Polymerization: Will not Occur

VII SPILL AND LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: In solid form this material poses no health or environmental risk. If this material is in powder or dust form, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill. Cleanup should be conducted with a vacuum system utilizing a high efficiency particulate air filtration system followed by wet cleaning methods. Special care must be taken when changing filters on HEPA vacuum cleaners when used to clean up potentially toxic materials. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air and water. Depending upon the quantity of material released, fine powder or dust spills to the environment may require reporting the National Response Center at (800) 424-8802 as well as the State Emergency Response Commission and Local Emergency Planning Committee.

Waste Disposal Method: Dispose of in accordance with State, Federal and Local regulations.

VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used. Exposure to unknown concentrations of fumes or dusts requires the wearing of a pressure-demand self-contained breathing apparatus. Pressure-demand airline respirators are recommended for jobs with high potential exposures such as changing bags in a baghouse air cleaning device.

Ventilation: Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Powders should be stored and transported in tightly sealed containers and must only be handled under controlled ventilated conditions.
Protective Gloves: Wear gloves to prevent metal cuts and skin abrasions particularly during handling.
Eye Protection: Wear safety glasses, goggles, face shield, or welders helmet.

Other Protective Equipment: No protective equipment or clothing is required when handling solid forms. Protective overgarment or work clothing should be worn by persons who may become contaminated with dusts, fumes, or powders.

Work Practices: Vacuum or wet cleaning methods are recommended for dust removal. Be certain to de-energize electrical systems as necessary before beginning wet cleaning. Vacuum cleaners with high efficiency particulate air (HEPA) filters are the recommended type. The use of compressed air to remove dusts should be avoided as such an activity can result in unnecessary short-term elevated exposures to dusts. Contaminated work clothing and overgarment should be managed in such a manner so as to prevent secondary exposure to persons such as laundry operators and to prevent contamination to personal clothing. Never use compressed air to clean work clothing.

IX SPECIAL PRECAUTIONS

Packaging and Labeling Requirements: The following requirements of the U.S. Dept. of Transportation apply only to beryllium metal powder or dust, not to solid shapes:

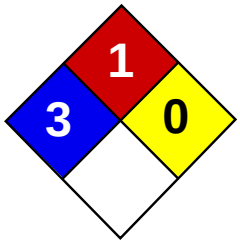
Shipping Name: RQ Flammable Solid, Poisonous, N.O.S. (Beryllium Metal Powder).
NOTE: **Must be marked on shipping papers and on the outside of the shipping container.**

Hazard Class:	Beryllium metal powder and dust are classified as Flammable Solid and Class B Poison. **NOTE**: **Hazard class must be included on shipping papers.**
Identification Number:	UN2926 **NOTE**: **Must be marked on shipping papers and on the outside of the shipping container.**
Label(s) Required:	Flammable Solid and Poison (For Beryllium Metal Powder or Dust Only). **NOTE**: **Place on the outside of the shipping container.**
Reportable Quantity:	10 lbs. (4.54). **NOTE**: **The RQ is limited to particles having a diameter less than 100 micrometers.**
DOT Specification Container:	Suitable for Flammable Solids. Recommended double overpack when shipping powder.
Other:	Emergency response information is provided within this MSDS. **NOTE**: **This information must be included, in some form, with the shipping papers.**

SARA Title III: Beryllium is reportable under Section 313

Issued by: S. Dierks
Date: November 1992





Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

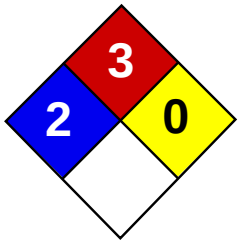
Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Chlorobenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chlorobenzene

Catalog Codes: SLC1654

CAS#: 108-90-7

RTECS: CZ0175000

TSCA: TSCA 8(b) inventory: Chlorobenzene

CI#: Not available.

Synonym: Monochlorobenzene

Chemical Name: Not available.

Chemical Formula: C6H5Cl

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chlorobenzene	108-90-7	100

Toxicological Data on Ingredients: Chlorobenzene: ORAL (LD50): Acute: 1110 mg/kg [Rat]. 2300 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator). Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 638°C (1180.4°F)

Flash Points: CLOSED CUP: 29.44°C (85°F).

Flammable Limits: LOWER: 1.3% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 (ppm) TWA: 46 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Almond-like.

Taste: Not available.

Molecular Weight: 112.56 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 132°C (269.6°F)

Melting Point: -45.6°C (-50.1°F)

Critical Temperature: Not available.

Specific Gravity: 1.1058 (Water = 1)

Vapor Pressure: 8.8 mm of Hg (@ 20°C)

Vapor Density: 3.88 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.2 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Soluble in methanol, diethyl ether. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 1110 mg/kg [Rat].

Chronic Effects on Humans: The substance is toxic to kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, sensitizer, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Chlorobenzene : UN1134 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Chlorobenzene Massachusetts RTK: Chlorobenzene TSCA 8(b) inventory: Chlorobenzene SARA 313 toxic chemical notification and release reporting: Chlorobenzene CERCLA: Hazardous substances.: Chlorobenzene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

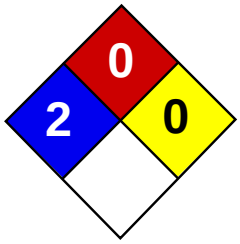
Other Special Considerations: Not available.

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Material Safety Data Sheet
Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m3) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m3) [United Kingdom (UK)] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutangen) and cause adverse reproductive effects(embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symtoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation),and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconoisis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Subtances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

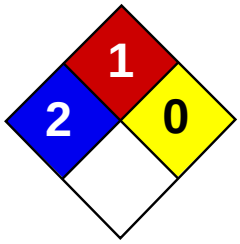
Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 05/21/2013 12:00 PM

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Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: CIS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
CIS-ACETYLENE DICHLORIDE; 1,2-DICHLOROETHYLENE; C2H2CL2; MAT05125; RTECS KV9420000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: CIS-1,2-DICHLOROETHYLENE
CAS NUMBER: 156-59-2
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2



EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pleasant odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any

discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
CIS-1,2-DICHLOROETHYLENE:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 ppm (790 mg/m3) OSHA TWA
200 ppm ACGIH TWA
200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
2000 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: pleasant odor
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 140 F (60 C)
FREEZING POINT: -114 F (-81 C)
VAPOR PRESSURE: 400 mmHg @ 41 C
VAPOR DENSITY (air=1): 3.34
SPECIFIC GRAVITY (water=1): 1.2837
WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: acetone, benzene, ether, alcohol

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

CIS-1,2-DICHLOROETHYLENE:
TOXICITY DATA: 13700 ppm inhalation-rat LC50
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders
MUTAGENIC DATA: Available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION



U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: 1,2-Dichloroethylene
ID NUMBER: UN1150
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: 1,2-Dichloroethylene
UN NUMBER: UN1150
CLASS: 3
PACKING GROUP/CATEGORY: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
1,2-DICHLOROETHYLENE (ALL ISOMERS)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: BD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

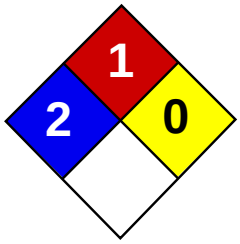
16. OTHER INFORMATION

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Material Safety Data Sheet
Cobalt MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cobalt

Catalog Codes: SLC1684, SLC3475

CAS#: 7440-48-4

RTECS: GF8750000

TSCA: TSCA 8(b) inventory: Cobalt

CI#: Not available.

Synonym:

Chemical Formula: Co

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cobalt	7440-48-4	100

Toxicological Data on Ingredients: Cobalt: ORAL (LD50): Acute: 6170 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Hazardous in case of inhalation. CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from OSHA Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 58.93 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 3100°C (5612°F)

Melting Point: 1493°C (2719.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.92 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6170 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. The substance is toxic to lungs.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Metal powder, Flammable, n.o.s. (Cobalt metal, powder) : UN3089 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cobalt California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cobalt Pennsylvania RTK: Cobalt Massachusetts RTK: Cobalt TSCA 8(b) inventory: Cobalt

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

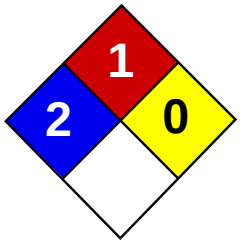
Other Special Considerations: Not available.

Created: 10/09/2005 04:57 PM

Last Updated: 05/21/2013 12:00 PM

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Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

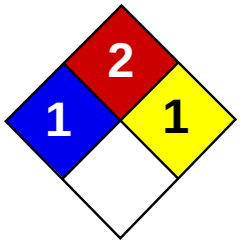
Other Special Considerations: Not available.

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Material Safety Data Sheet
Iron Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Iron Metal

Catalog Codes: SLI2047, SLI1996

CAS#: 7439-89-6

RTECS: NO4565500

TSCA: TSCA 8(b) inventory: Iron Metal

CI#: Not applicable.

Synonym:

Chemical Name: Iron

Chemical Formula: Fe

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Iron Metal, powder	7439-89-6	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to liver, cardiovascular system, upper respiratory tract, pancreas. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Chlorine Trifluoride reacts with iron with incandescence. Powdered iron reacts with fluorine below redness with incandescence. Reduced iron decomposes with nitrogen dioxide @ ordinary temperature with incandescence. Reacting mass formed by mixture of phosphorus and iron can become incandescent when heated. This material is flammable in powder form only.

Special Remarks on Explosion Hazards: Material in powdered form can explode when exposed to heat or flame

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Tasteless.

Molecular Weight: 55.85 g/mole

Color: Black to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 3000°C (5432°F)

Melting Point: 1535°C (2795°F)

Critical Temperature: Not available.

Specific Gravity: Density: 7.86 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, incompatible materials, water/moisture, air, dust generation.

Incompatibility with various substances:
Reactive with oxidizing agents, acids. Slightly reactive to reactive with moisture.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Hot iron(wire) burns in Chlorine gas. Violent decompositon of hydrogen peroxide (53% by weight or greater) may be caused by contact with iron. Readily oxidizes in moist air forming rust. Reactive with halogens. Incompatible with acetaldehyde, ammonium peroxodisulfate, chloroformamidinum, chloric acid, ammonium nitrate, dinitorgen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, sulfuric acid, sodium carbide. Readily attacked by dilute mineral acids and or attacked or dissolved by organic acids. Not appreciably attacked by cold sulfuric acid, or nitric acid, but is attacked by hot acids.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 30000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: liver, cardiovascular system, upper respiratory tract, pancreas.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Iron metal filings or dust: May cause skin irritation by mechanical action. Iron metal wire: Not likely to cause skin irritation Eyes: Iron metal filings or dust: Can irritate eyes by mechanical action. Iron metal wire: No hazard. Will not cause eye irritation. Inhalation: Iron dust: Can irritate the respiratory tract by mechanical action. Iron metal wire or filings: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Iron metal wire: Not an ingestion hazard: Iron metal filings or dust: The amount of ingested iron which constitutes a toxic dose is not well defined. Proposed toxic doses of elemental iron are 20 mg/kg for gastrointestinal irritation to greater than 60 mg/kg for systemic toxicity. Gastrointestinal effects are the first signs to appear, with hemorrhagic vomiting and diarrhea, hematochezia, abdominal pain, lethargy, metabolic acidosis, coagulaopathy, shock, coma and convulsions developing from 0 to 6 hours after ingestion. Leukocytosis may also occur. An asymptomatic phase may ensue at 6 to 12 hours postingestion, followed by hypoglycemia or hyperglycemia, hepatic and renal failure, severe acidosis, cyanosis, fever, CNS depression (lethargy, restlessness and/or confusion seizures), hypotension, and cardiovascular collapse/cardiac failure in 12 to 48 hours. Hepatic cirrhosis, gastrointestinal scarring and/or strictures may arise in 2 to 6 weeks. It may also cause an anaphylactoid reaction. Non-cardiogenic pulmonary edema also develop in severe cases of iron intoxication. Chronic Potential Health Effects: Inhalation: Chronic inhalation of iron dust can lead to accumulation in the lungs and a characteristic stippled appearance on X-rays. This condition, called SIDEROSIS, is considered benign in that it does not interfere with lung function and does not predispose to other disease. Chronic inhalation of iron dust may also cause fibrosis in the lungs. Ingestion: Clinical signs of iron overload appear when the total body iron is 5 to 10 times higher than normal. Neurobehavioral defects including depression, decreased activity, habituation, reflex startle, and conditioned avoidance response performance may occur. However, similiar effects were also seen in iron defficiency. It is therefore likely that these behavioral effects are secondary to general toxicity. High serum iron levels may be associated with an increased risk of fatal acute myocardial infarction (MI). Skin: Prolonged or repeated contact may cause hypersensivity.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Metal powder, flammable, n.o.s. (Iron metal powder) UNNA: 3089 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California Director's List of Hazardous Substances: Iron Metal TSCA 8(b) inventory: Iron Metal

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS B-4: Flammable solid.

DSCL (EEC):
R11- Highly flammable. S16- Keep away from sources of ignition - No smoking. S22- Do not breathe dust.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 2

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 2

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

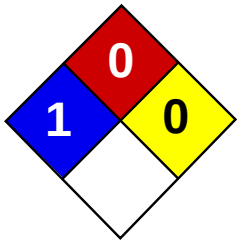
Other Special Considerations: Not available.

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

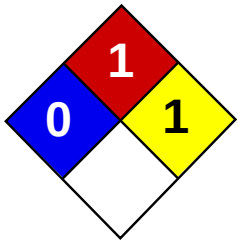
Other Special Considerations: Not available.

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Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of acids, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air. Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water. Insoluble in cold water. Insoluble in chromium trioxides, and mineral acids, alkalies. Slightly soluble with decomposition in hot water. Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents. Reacts with water to create hydrogen gas and heat. Must be kept dry. Reacts with acids to form hydrogen gas which is highly flammable and explosive. Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing. Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing. Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect. Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium Rhode Island RTK hazardous substances: Magnesium Pennsylvania RTK: Magnesium Massachusetts RTK: Magnesium Massachusetts spill list: Magnesium New Jersey: Magnesium TSCA 8(b) inventory: Magnesium

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable. R15- Contact with water liberates extremely flammable gases. S7/8- Keep container tightly closed and dry. S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

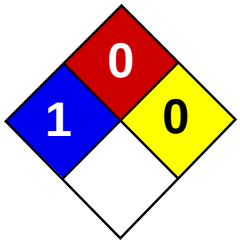
Other Special Considerations: Not available.

Created: 10/09/2005 06:00 PM

Last Updated: 05/21/2013 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame. When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence. Concentrated nitric acid reacts with powdered manganese with incandescence and explosion. Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to flame.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.1 (mg/m3) from ACGIH (TLV) [United States] TWA: 5 (mg/m3) [Canada] TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States] TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

pH (1% soln/water): Not applicable.

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air. Reacts with aqueous solutions of sodium or potassium bicarbonate. Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts. Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively. In the form of powder, it reduces most metallic oxides on heating. On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic. Also incompatible with hydroxides, cyanides, carbonates.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta. May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritaiton Eyes: Dust may cause mechanical irritation. Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation). Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism. Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese. Chronic Potential Health Effects: Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice) Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Manganese Rhode Island RTK hazardous substances: Manganese Pennsylvania RTK: Manganese Minnesota: Manganese Massachusetts RTK: Manganese New Jersey: Manganese New Jersey spill list: Manganese Louisiana spill reporting: Manganese California Director's List of Hazardous Substances: Manganese TSCA 8(b) inventory: Manganese SARA 313 toxic chemical notification and release reporting: Manganese

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

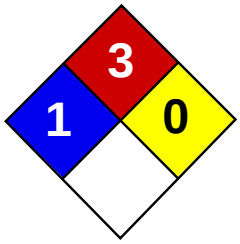
Other Special Considerations: Not available.

Created: 10/09/2005 06:03 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Methyl ethyl ketone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl ethyl ketone

Catalog Codes: SLM2626, SLM3232

CAS#: 78-93-3

RTECS: EL6475000

TSCA: TSCA 8(b) inventory: Methyl ethyl ketone

CI#: Not applicable.

Synonym: 2-Butanone

Chemical Name: Methyl Ethyl Ketone

Chemical Formula: C4H8O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl ethyl ketone	78-93-3	100

Toxicological Data on Ingredients: Methyl ethyl ketone: ORAL (LD50): Acute: 2737 mg/kg [Rat]. 4050 mg/kg [Mouse]. DERMAL (LD50): Acute: 6480 mg/kg [Rabbit]. VAPOR (LC50): Acute: 23500 mg/m 8 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation (lung irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 404°C (759.2°F)

Flash Points: CLOSED CUP: -9°C (15.8°F). OPEN CUP: -5.5556°C (22°F) (Tag).

Flammable Limits: LOWER: 1.8% UPPER: 10%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Ignition on contact with potassium t-butoxide. Vapor may cause a flash fire

Special Remarks on Explosion Hazards:
Reaction with Hydrogen Peroxide + nitric acid forms heat and shock-sensitive explosive product. Mixture with 2-propanol will produce explosive peroxides during storage.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 200 STEL: 300 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 150 STEL: 300 (ppm) [Australia] TWA: 590 STEL: 885 (mg/m3) from NIOSH TWA: 200 STEL: 300 (ppm) from NIOSH TWA: 590 STEL: 885 (mg/m3) [Canada] TWA: 200 STEL: 300 (ppm) from OSHA (PEL) [United States] TWA: 590 STEL: 885 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Acetone-like Pleasant. Pungent. Sweetish. (Strong.)

Taste: Not available.

Molecular Weight: 72.12g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 79.6 (175.3°F)

Melting Point: -86°C (-122.8°F)

Critical Temperature: 262.5°C (504.5°F)

Specific Gravity: 0.805(Water = 1)

Vapor Pressure: 10.3 kPa (@ 20°C)

Vapor Density: 2.41 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 0.3

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility: Soluble in cold water, diethyl ether, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, mechanical shock, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with chloroform, copper, hydrogen peroxide, nitric acid, potassium t-butoxide, 2-propanol, chlorosulfonic acid, strong oxidizers, amines, ammonia, inorganic acids, isocyanates, caustics, pyrindines. Vigorous reaction with chloroform +alkali.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2737 mg/kg [Rat]. Acute dermal toxicity (LD50): 6480 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 32000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. May cause damage to the following organs: gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation (lung irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause birth defects based on animal dats. Embryotoxic and/or foetotoxic in animal.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. May be absorbed through the skin. Eyes: Causes eye irritation. Inhalation: Inhalation of high concentrations may cause central nervous effects characterized by headache, dizziness, unconsciousness, and coma. Causes respiratory tract irritation and affects the sense organs. May affect the liver and urinary system. Ingestion: Causes gastrointestinal tract irritation with nausea, vomiting and diarrhea. May affect the liver. Chronic Potential Health Effects: Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 3220 mg/l 96 hours [Fathead Minnow]. 1690 mg/l 96 hours [Bluegill].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethyl methyl ketone UNNA: 1193 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Methyl ethyl ketone Rhode Island RTK hazardous substances: Methyl ethyl ketone Pennsylvania RTK: Methyl ethyl ketone Minnesota: Methyl ethyl ketone Massachusetts RTK: Methyl ethyl ketone New Jersey: Methyl ethyl ketone California Director's list of Hazardous Substances: Methyl ethyl ketone TSCA 8(b) inventory: Methyl ethyl ketone TSCA 8(d) H and S data reporting: Methyl ethyl ketone: Effective: 10/4/82; Sunset: 10/4/92 SARA 313 toxic chemical notification and release reporting: Methyl ethyl ketone CERCLA: Hazardous substances.: Methyl ethyl ketone: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R36/37- Irritating to eyes and respiratory system. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

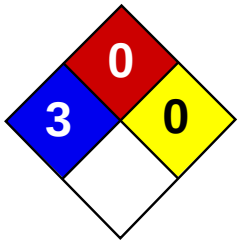
Other Special Considerations: Not available.

Created: 10/10/2005 08:39 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet

Version 5.0
Revision Date 12/12/2012
Print Date 04/07/2014

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Dimethylmercury
Product Number	:	328081
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Carcinogen, Target Organ Effect, Toxic by inhalation., Highly toxic by ingestion, Highly toxic by skin absorption

Target Organs

Nerves., Kidney

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 2)
Acute toxicity, Inhalation (Category 2)
Acute toxicity, Dermal (Category 1)
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H300 + H310	Fatal if swallowed or in contact with skin
H330	Fatal if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash hands thoroughly after handling.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P284	Wear respiratory protection.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P310	Immediately call a POISON CENTER or doctor/ physician.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Health hazard:	4
Fire:	3
Reactivity Hazard:	0

Potential Health Effects

Inhalation	Toxic if inhaled. May cause respiratory tract irritation.
Skin	May be fatal if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be fatal if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Methylmercury

Formula : C_2H_6Hg

Molecular Weight : 230.66 g/mol

Component		Concentration
Dimethylmercury		
CAS-No.	593-74-8	-
EC-No.	209-805-3	
Index-No.	080-007-00-3	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Mercury/mercury oxides.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Dimethylmercury	593-74-8	TWA	0.01 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Kidney damage Central Nervous System & Peripheral Nervous System impairment Danger of cutaneous absorption varies			
		STEL	0.03 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Kidney damage Central Nervous System & Peripheral Nervous System impairment Danger of cutaneous absorption varies			
		TWA	0.01 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		STEL	0.03 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential for dermal absorption			

		C	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential for dermal absorption			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -43 °C (-45 °F) - lit.
Boiling point	93 - 94 °C (199 - 201 °F) - lit.
Flash point	5 °C (41 °F) - closed cup
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	2.961 g/cm3 at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 5
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available

Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Mercury/mercury oxides.
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
Dermal LD50
Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

Carcinogenicity

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Dimethylmercury)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Potential health effects

Inhalation	Toxic if inhaled. May cause respiratory tract irritation.
Ingestion	May be fatal if swallowed.
Skin	May be fatal if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
In contrast to inorganic mercury compounds, alkyl mercury compounds rapidly pass through the placenta and blood brain barrier. The peripheral and central nervous systems and the kidney are major target organs. Methylmercury poisoning symptoms result primarily from damage to the nervous system. The symptoms are primarily characterized by loss of sensation in the hands and feet and in areas around the mouth, diminution of vision resulting in tunnel vision, ataxia, dysarthria, and hearing loss. Severe poisoning produces blindness, coma and death. There is a latent period of weeks to months before development of the poisoning symptoms. Mercury shows a specificity to damage small nerve cells in the cerebellum and visual cortex. Methylmercury causes degeneration and necrosis of neurons in the focal areas of the cerebral cortex, especially within the visual areas of the occipital cortex and the granular layer of the cerebellum. It has been found that methylmercury inhibits protein synthesis in the brain before symptoms of poisoning appear and that recovery of protein synthesis does not occur in granular cells as it does recover in other neuronal cell types. Consumption by pregnant women has caused serious neurological disorders in their offspring resulting in mental retardation with cerebral palsy. Acute exposure to nonlethal levels of methylmercyry results in severely depressed lymphocyte response to T-cell mitogens thus depressing polyclonal activation of lymphocytes by T-cell mitogens and antibody responses to sepcific antigenic stimulation.

Synergistic effects
no data available

Additional Information
RTECS: OW3010000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3383 Class: 6.1 (3) Packing group: I
Proper shipping name: Toxic by inhalation liquid, flammable, n.o.s. (Dimethylmercury)
Marine Pollutant: No
Poison Inhalation Hazard: Hazard zone A

IMDG
UN number: 3383 Class: 6.1 (3) Packing group: I EMS-No: F-E, S-D
Proper shipping name: TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S. (Dimethylmercury)
Marine Pollutant: No

IATA
UN number: 3383 Class: 6.1 (3)
Proper shipping name: Toxic by inhalation liquid, flammable, n.o.s. (Dimethylmercury)
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Carcinogen, Target Organ Effect, Toxic by inhalation., Highly toxic by ingestion, Highly toxic by skin absorption

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dimethylmercury	593-74-8	2010-08-02

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dimethylmercury	593-74-8	2010-08-02

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dimethylmercury	593-74-8	2007-09-28

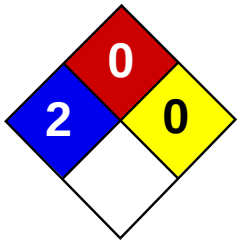
California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Dimethylmercury	593-74-8	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.







Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to skin. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion. Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode. Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion. Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable. TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Insoluble in Ammonia. Soluble in dilute Nitric Acid. Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. Causes damage to the following organs: skin. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc: LDL [Rat] - Route: Oral; Dose: 5000 mg/kg LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Nickel dust and fume can irritate skin. Eyes: Nickel dust and fume can irritate eyes. Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis. Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation). Chronic Potential Health Effects: Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis. Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count). Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy.

Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis. Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal Connecticut hazardous material survey.: Nickel metal Illinois toxic substances disclosure to employee act: Nickel metal Illinois chemical safety act: Nickel metal New York release reporting list: Nickel metal Rhode Island RTK hazardous substances: Nickel metal Pennsylvania RTK: Nickel metal Michigan critical material: Nickel metal Massachusetts RTK: Nickel metal Massachusetts spill list: Nickel metal New Jersey: Nickel metal New Jersey spill list: Nickel metal Louisiana spill reporting: Nickel metal California Director's List of Hazardous Substances: Nickel metal TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. S22- Do not breathe dust. S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

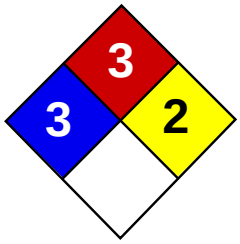
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:42 PM

Last Updated: 05/21/2013 12:00 PM

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Health	3
Fire	3
Reactivity	3
Personal Protection	J

Material Safety Data Sheet
Potassium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium

Catalog Codes: SLP3316

CAS#: 7440-09-7

RTECS: TS6460000

TSCA: TSCA 8(b) inventory: Potassium

CI#: Not available.

Synonym: Kalium

Chemical Name: Potassium

Chemical Formula: K

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium	7440-09-7	100

Toxicological Data on Ingredients: Potassium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive), of eye contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of moisture.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Produces flammable gases on contact with water. May ignite on contact with water or moist air. May ignite spontaneously in air or oxygen. May be ignited by heat, sparks, or flame. Fire will produce irritating, corrosive and/or toxic gases. Burns violently, accompanied by explosions which cause spattering.

Special Remarks on Explosion Hazards:
Can react vigorously or explosively on contact with water. Mixture of solid forms of potassium & carbon dioxide (as dry ice) explodes when subjected to shock. ... Potassium & its alloys form explosive mixtures with carbon tetrachloride / and/...chlorinated hydrocarbons.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, acids, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction. Moisture sensitive. Air Sensitive

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Soft Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 39.102 g/mole

Color: Silvery.-White.

pH (1% soln/water): Not available.

Boiling Point: 765.5°C (1409.9°F)

Melting Point: 63.2°C (145.8°F)

Critical Temperature: Not available.

Specific Gravity: 0.856 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Soluble in liquid ammonia, ethylenediamine, aniline, several metals, forming alloys. Soluble in acid, mercury.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Water, moisture, moist air, incompatible materials, heat, ignition sources

Incompatibility with various substances:
Highly reactive with moisture. Reactive with oxidizing agents, organic materials, metals, acids. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Air sensitive. Moisture sensitive. Oxidizes (tarnishes) when exposed to air. Peroxide formation may occur in containers that have been opened and remain in storage. May produce corrosive solutions on contact with water. Extremely dangerous in contact with water or moisture, releasing hydrogen with sufficient heat to cause ignition or explosion. Reacts violently with water, carbon dioxide, carbon tetrachloride. Also incompatible with acids, metal and non-metal halides, halogens, halocarbons, hydrogen iodide, silicates, sulfates, nitrates, carbonates, phosphates, oxides and hydroxides of heavy metals, organics, and Telfon.

Special Remarks on Corrosivity: Corrosive

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, upper respiratory tract.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Potential Health Effects: Skin: Causes severe skin irritation and burns. Eyes: Causes severe eye irritation and burns. Inhalation: Exposure to Potassium fumes can irritate the nose, and throat with sneezing, coughing and sore throat. Potassium

fumes can irritate the lungs. Repeated inhalation of Potassium fumes may cause sores of the inner nose, and bronchitis to develop with cough, phlegm, and/or shortness of breath. Ingestion: May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause systemic toxic effects of the heart, liver, and kidneys. It may affect the blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.3: Dangerous when wet material.

Identification: : Potassium UNNA: 2257 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Potassium Rhode Island RTK hazardous substances: Potassium Pennsylvania RTK: Potassium Massachusetts RTK: Potassium Massachusetts spill list: Potassium New Jersey: Potassium California Director's List of Hazardous Substances: Potassium TSCA 8(b) inventory: Potassium

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS E: Corrosive solid.

DSCL (EEC):
R14/15- Reacts violently with water, liberating extremely flammable gases. R34- Causes burns. S8- Keep container dry. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 3

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

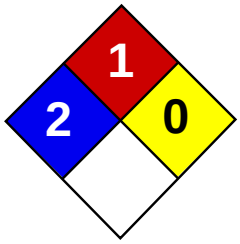
Other Special Considerations: Not available.

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Material Safety Data Sheet
Selenium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Selenium

Catalog Codes: SLS2629

CAS#: 7782-49-2

RTECS: VS7700000

TSCA: TSCA 8(b) inventory: Selenium

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Se

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Selenium	7782-49-2	100

Toxicological Data on Ingredients: Selenium: ORAL (LD50): Acute: 6700 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.2 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 78.96 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 684.9°C (1264.8°F)

Melting Point: 217°C (422.6°F)

Critical Temperature: Not available.

Specific Gravity: 4.81 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6700 mg/kg [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Selenium powder : UN2658 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Selenium Massachusetts RTK: Selenium TSCA 8(b) inventory: Selenium SARA 313 toxic chemical notification and release reporting: Selenium CERCLA: Hazardous substances.: Selenium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

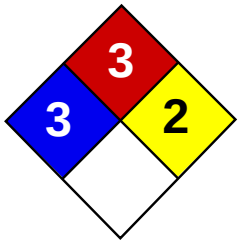
Other Special Considerations: Not available.

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Health	3
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 06:28 PM

Last Updated: 05/21/2013 12:00 PM

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TRICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
MTG MSDS 199; ACETYLENE TRICHLORIDE; ETHYLENE TRICHLORIDE; 1-CHLORO-2,2-DICHLOROETHYLENE; 1,1-DICHLORO-2-CHLOROETHYLENE; TCE; ETHINYL TRICHLORIDE; TRICHLOROETHENE; 1,1,2-TRICHLOROETHYLENE; 1,1,2-TRICHLOROETHENE; UN 1710; RCRA U228; C2HCl3; MAT23850; RTECS KX4550000

CHEMICAL FAMILY: halogenated, alkenes

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TRICHLOROETHYLENE
CAS NUMBER: 79-01-6
PERCENTAGE: >99

COMPONENT: INHIBITORS
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

COMPONENT: AMINES
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=1 REACTIVITY=0



EMERGENCY OVERVIEW:

COLOR: colorless
PHYSICAL FORM: liquid
ODOR: sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, allergic reactions, cancer hazard (in humans)
PHYSICAL HAZARDS: May polymerize. Containers may rupture or explode. May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, changes in blood pressure, nausea, vomiting, stomach pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, tremors, loss of coordination, visual disturbances, bluish skin color, lung congestion, kidney damage, liver damage, unconsciousness, coma
LONG TERM EXPOSURE: same as effects reported in short term exposure, loss of appetite, weight loss, blood disorders, brain damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, allergic reactions
LONG TERM EXPOSURE: irritation, allergic reactions, nausea, loss of appetite, weight loss, difficulty breathing, headache, drowsiness, dizziness, joint pain, loss of coordination, visual disturbances, paralysis
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), blurred vision
LONG TERM EXPOSURE: irritation (possibly severe), eye damage
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation
LONG TERM EXPOSURE: same as effects reported in long term inhalation

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Slight fire hazard.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.
LOWER FLAMMABLE LIMIT: 7.8% @ 100 C
UPPER FLAMMABLE LIMIT: 52% @ 100 C
AUTOIGNITION: 770 F (410 C)

6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TRICHLOROETHYLENE:
100 ppm OSHA TWA
200 ppm OSHA ceiling
300 ppm OSHA peak (5 minutes in any 2 hours)
50 ppm (269 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
200 ppm (1070 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
10 ppm ACGIH TWA
25 ppm ACGIH STEL
25 ppm NIOSH TWA 10 hour(s)
2 ppm NIOSH ceiling 60 minute(s) (used as halogenated anesthetic gas)

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: sweet odor
MOLECULAR WEIGHT: 131.39
MOLECULAR FORMULA: Cl-C-H-C-Cl2
BOILING POINT: 189 F (87 C)
FREEZING POINT: -99 F (-73 C)
VAPOR PRESSURE: 58 mmHg @ 20 C
VAPOR DENSITY (air=1): 4.53
SPECIFIC GRAVITY (water=1): 1.4642
WATER SOLUBILITY: 0.1%
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 21 ppm
EVAPORATION RATE: 0.69 (carbon tetrachloride=1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, acetone, chloroform, benzene, vegetable oils

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with heat or light and monitor inhibitor content.

11. TOXICOLOGICAL INFORMATION

TRICHLOROETHYLENE:
IRRITATION DATA: 2 mg/24 hour(s) skin-rabbit severe; 20 mg/24 hour(s) eyes-rabbit moderate
TOXICITY DATA: 140700 mg/m3/1 hour(s) inhalation-rat LC50; >20 gm/kg skin-rabbit LD50; 4920 mg/kg oral-rat LD50
CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence,

Animal Sufficient Evidence, Group 2A; ACGIH: A2 -Suspected Human Carcinogen
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation
Relatively Non-toxic: dermal absorption
TARGET ORGANS: immune system (sensitizer), central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: heart problems
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: May cross the placenta. Stimulants such as epinephrine may induce ventricular fibrillation.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 3100 ug/L 96 hour(s) LC50 (Mortality) Flagfish (Jordanella floridae)

INVERTEBRATE TOXICITY: 1700 ug/L 7 hour(s) EC50 (Regeneration) Flatworm (Dugesia japonica)

OTHER TOXICITY: 45000 ug/L 48 week(s) LC50 (Mortality) Clawed toad (Xenopus laevis)

FATE AND TRANSPORT:
BIOCONCENTRATION: 17 ug/L 1-14 hour(s) BCF (Residue) Bluegill (Lepomis macrochirus) 8.23 ug/L

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U228. Hazardous Waste Number(s): D040. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.5 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Trichloroethylene
ID NUMBER: UN1710
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: III
LABELING REQUIREMENTS: 6.1



CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Trichloroethylene
UN NUMBER: UN1710
CLASS: 6.1
PACKING GROUP/CATEGORY: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TRICHLOROETHYLENE: 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TRICHLOROETHYLENE

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TRICHLOROETHYLENE
Cancer (Apr 01, 1988)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

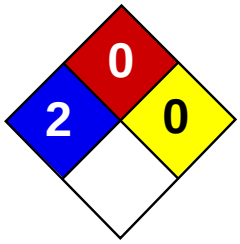
16. OTHER INFORMATION

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Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:29 PM

Last Updated: 05/21/2013 12:00 PM

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Thallium

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer/Supplier:

ESPI Metals

1050 Benson Way, Ashland, OR 97520

Toll Free (800) 638-2581 * Fax (541) 488-8313

E-Mail: sales@espimetals.com

Product Name: Thallium

Formula: Tl

CAS Number: 7440-28-0

II. HAZARDOUS INGREDIENTS

Hazardous Component: Thallium

Percent (%): 0-100

OSHA/PEL: 0.1 mg/m^3

ACGIH/TLV: 0.1 mg/m^3

HMIS Ratings:

Health: 3

Flammability: 0

Reactivity: 1

III. PHYSICAL DATA

Boiling Point: 1457 ^oC " 10 ^oC

Melting Point: 303.5 ^{O}C

Specific Gravity: 11.85 g/cc at 20 ^{O}C

Vapor Pressure: 1 mm at 825 ^{O}C

Solubility in H_2O: Insoluble

Appearance and Odor: Blue-white pieces, no odor.

IV. FIRE AND EXPLOSION HAZARDS DATA

Flash Point: N/A

Autoignition Temperature: N/E

Flammable Limits: **Lower**: N/A **Upper**: N/A

Extinguishing Media: Use suitable extinguishing media for surrounding materials and type of fire.

Special Fire Fighting Procedures: Firefighters must wear full face, self-contained breathing apparatus with full protective clothing to prevent contact with skin and eyes. Fumes from fire are hazardous. Isolate runoff to prevent environmental pollution.

Unusual Fire and Explosion Hazards: When heated to decomposition, thallium may emit toxic fumes of thallium. Flammable in the form of dust when exposed to heat or flame. May have a violent reaction with F_2. Reacts slowly with moisture. Reacts with some acids.

V. HEALTH HAZARD INFORMATION

Effects of Exposure: To the best of our knowledge the chemical, physical and toxicological properties of thallium have not been thoroughly investigated and recorded.

Thallium compounds are extremely toxic. Effects are cumulative and with continuous exposure toxicity occurs at much lower levels. Effects are on the nervous system, skin, and cardiovascular tract. The peripheral nervous system can be severely affected with dying-back of the longest sensory and motor fibers. Reproductive organs and the fetus are highly susceptible. (Sax, Dangerous Properties of Industrial Materials)

Acute Effects:

Inhalation: DANGER - POISON. May cause irritation to the mucous membrane, running nose, headache and pulmonary edema.

Ingestion: DANGER - POISON. May cause discoloration and loss of hair, joint pain, loss of appetite, fatigue, severe pain in the calves of the legs, albuminuria, eosinophilia, lymphocytosis and optic neuritis followed by atrophy. Large doses may cause gastrointestinal hemorrhage, gastroenteritis, metallic taste, salivation, nausea and vomiting.

Skin: May cause irritation.

Eye: May cause irritation.

Chronic Effects:

Inhalation: May cause neurologic symptoms, delirium, hallucinations, convulsions, tingling pain in the extremities, muscular weakness, coma and respiratory failure.

Ingestion: May cause alopecia, cardiac and renal disorders, endocrine disorders, psychoses, encephalitis and paralysis of the extremities.

Skin: No data

Eye: No chronic health effects recorded.

Target Organs: May affect the central nervous system, skin, eyes, cardiovascular tract, lungs, gastrointestinal tract and body hair.

Carcinogenicity: **NTP**: No **IARC**: No **OSHA**: No

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove victim to fresh air; keep warm and quiet; give oxygen if breathing is difficult and seek medical attention immediately.

INGESTION: Give 1-2 glasses of milk or water and induce vomiting; seek medical attention immediately. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing; brush material off skin; wash affected area with mild soap and water; seek medical attention if irritation if irritation persists.

EYE: Flush eyes with lukewarm water, lifting upper and lower eyelids, for at least 15 minutes. Seek medical attention if irritation persists.

VI. REACTIVITY DATA

Stability: Stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): Oxidizing agents, acids, halogens and antimony sulfide.

Hazardous Decomposition Products: Fumes of thallium.

Hazardous Polymerization: Will not occur.

VII. SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Wear appropriate respiratory and protective equipment specified in section VIII. Isolate spill area and provide ventilation. Vacuum up spill using a high efficiency particulate absolute (HEPA) air filter and place in a closed container for proper disposal. Take care not to raise dust.

Waste Disposal Method: Dispose of in accordance with Local, State and Federal Waste Disposal Regulations.

VIII. SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NIOSH approved dust respirator.

Ventilation: Handle under protective gas. Use local exhaust to maintain concentration at or below PEL, TLV. General exhaust is recommended.

Protective Gloves: Neoprene, PVC, butyl gloves.

Eye Protection: Safety glasses.

Other Protective Clothing or Equipment: Protective gear suitable to prevent contamination

IX. SPECIAL PRECAUTIONS

Precautions to Be Taken in Handling and Storage: Store in a tightly sealed container in a cool, dry, well-ventilated area. Handle and store under water or protective gas. Protect from air and oxidizing agents. Wash thoroughly after use.

Precautionary Labeling: DANGER! HIGHLY TOXIC! May be fatal if swallowed or inhaled. Avoid contact with skin and eyes. Wash very thoroughly after handling. Keep container tightly closed when not in use.

Work Practices: Implement engineering and work practice controls to reduce and maintain concentration of exposure at low levels. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating and smoking. Do not blow dust off clothing or skin with compressed air. Maintain eyewash capable of sustained flushing, safety drench shower and facilities for washing.

DOT Regulations:

Hazard Class: 6.1

Identification Number: UN1707

Packing Group: II

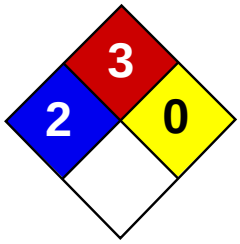
Proper Shipping Name: Thallium compounds, n.o.s., (thallium)

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damage resulting from handling or from contact with the above product.

Prepared by: S. Dierks

Dated: May 2006







Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N2O4; AgClO4; BrF3; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:30 PM

Last Updated: 05/21/2013 12:00 PM

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SAFETY DATA SHEET

Version 4.4
Revision Date 04/02/2014
Print Date 04/07/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : ***trans*-1,2-Dichloroethylene**

Product Number : D62209
Brand : Aldrich
Index-No. : 602-026-00-3
REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No. : 156-60-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H332 Harmful if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.

P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : trans-1,2-Dichloroethene
trans-Acetylene dichloride

Formula : $C_2H_2Cl_2$
Molecular Weight : 96.94 g/mol
CAS-No. : 156-60-5
EC-No. : 205-860-2
Index-No. : 602-026-00-3

Hazardous components

Component	Classification	Concentration
trans-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H412	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Light sensitive. Air and moisture sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
trans-Dichloroethylene	156-60-5	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: light yellow
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: -50 °C (-58 °F) - lit.
f)	Initial boiling point and boiling range	48 °C (118 °F) - lit.
g)	Flash point	6.0 °C (42.8 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 12.8 %(V) Lower explosion limit: 9.7 %(V)
k)	Vapour pressure	no data available
l)	Vapour density	no data available
m)	Relative density	1.257 g/mL at 25 °C (77 °F)
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	no data available

p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents, Bases

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 1,235 mg/kg

LD50 Oral - mouse - 2,122 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Somnolence (general depressed activity). Behavioral:Ataxia.

LC50 Inhalation - rat - 24100 ppm
Remarks: Behavioral:Somnolence (general depressed activity).

LD50 Dermal - rabbit - > 5,000 mg/kg
Remarks: Prolonged skin contact may cause skin irritation and/or dermatitis. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

no data available

Skin corrosion/irritation
Skin - rabbit
Result: Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit
Result: Eye irritation

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: KV9400000

prolonged or repeated exposure can cause:, narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 220.00 mg/l - 48 h

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE
Marine pollutant: No

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

15. REGULATORY INFORMATION

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
trans-Dichloroethylene	156-60-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
trans-Dichloroethylene	156-60-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
trans-Dichloroethylene	156-60-5	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

HMIS Rating
Health hazard: 2

Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

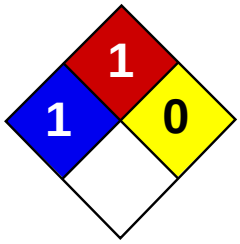
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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.4 Revision Date: 04/02/2014 Print Date: 04/07/2014





Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Vanadium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Vanadium

Catalog Codes: SLV1306

CAS#: 7440-62-2

RTECS: YW1355000

TSCA: TSCA 8(b) inventory: Vanadium

CI#: Not applicable.

Synonym:

Chemical Name: Vanadium

Chemical Formula: V

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Vanadium	7440-62-2	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Powdered Vanadium explodes with chlorine, even at 0 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States] Inhalation (Fume or Dust)Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 50.94 g/mole

Color: Grey. Grayish white. (Light.)

pH (1% soln/water): Not applicable.

Boiling Point: 3380°C (6116°F)

Melting Point: 1917°C (3482.6°F)

Critical Temperature: Not available.

Specific Gravity: 6.11 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Violent reaction with bromine trifluoride, chlorine, lithium, oxidants

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Not available.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: It can cause skin irritation. Eyes: Dust can cause eye irritation. Inhalation: It can irritate the nose, throat, and lungs causing coughing, wheezing and/or shortness of breath. Ingestion: Low hazard. Low toxicity. It may nausea, vomiting abdominal pain, and greenish discoloration of the tongue. It may also affect behavior/central nervous system and cause headache, dizziness, tremors. Chronic Potential health Effects: Ingestion: Prolonged or repeated ingestion may cause weight loss, and may cause kidney damage. It may also affect the blood and cause anemia. Inhalation: Prolonged or repeated inhalation may irritate the lungs. It may also cause bronchitis to develop with cough, phlegm, and/or shortness of breath. It may also cause an asthma-like allergy. Future exposure may cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Vanadium Massachusetts RTK: Vanadium New Jersey: Vanadium New Jersey spill list: Vanadium California Director's List of Hazardous Materials: Vanadium TSCA 8(b) inventory: Vanadium SARA 313 toxic chemical notification and release reporting: Vanadium

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
The classification of this product has not been validated yet by the Service du repertoire toxicologique.

DSCL (EEC):
This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:14 AM

Last Updated: 05/21/2013 12:00 PM

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: VINYL CHLORIDE

TRADE NAMES/SYNONYMS:
MTG MSDS 97; 1-CHLOROETHYLENE; 1-CHLOROETHENE; CHLOROETHYLENE; CHLOROETHENE; CHLORETHENE; CHLORETHYLENE; ETHYLENE MONOCHLORIDE; MONOCHLOROETHYLENE; MONOCHLORO ETHENE; MONOCHLOROETHENE; VINYL CHLORIDE MONOMER; VINYL CHLORIDE, INHIBITED; VINYL C MONOMER; RCRA U043; UN 1086; C2H3Cl; MAT24940; RTECS KU9625000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: VINYL CHLORIDE
CAS NUMBER: 75-01-4
PERCENTAGE: >99.9

COMPONENT: PHENOL
CAS NUMBER: 108-95-2
PERCENTAGE: <0.1

COMPONENT: INHIBITORS
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=4 REACTIVITY=1



EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: gas
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: harmful if swallowed, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)
PHYSICAL HAZARDS: Flammable gas. May cause flash fire. May polymerize. Containers may rupture or explode.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, joint pain, loss of coordination, hearing loss, lung congestion
LONG TERM EXPOSURE: impotence, bluish skin color, blood disorders, liver damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, blisters
LONG TERM EXPOSURE: irritation, blisters
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, eye damage
LONG TERM EXPOSURE: irritation, eye damage
INGESTION:
SHORT TERM EXPOSURE: frostbite
LONG TERM EXPOSURE: cancer

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

EYE CONTACT: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION: If a large amount is swallowed, get medical attention.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Severe explosion hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 500 meters (1/3 mile). Consider downwind evacuation if material is leaking.

FLASH POINT: -108 F (-78 C) (CC)
LOWER FLAMMABLE LIMIT: 3.6%
UPPER FLAMMABLE LIMIT: 33%
AUTOIGNITION: 882 F (472 C)

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Inside storage: Store in a cool, dry place. Store in a

well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Grounding and bonding required. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. See original container for storage recommendations. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
VINYL CHLORIDE:
1.0 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level 8 hour(s)
1 ppm ACGIH TWA
NIOSH TWA (lowest feasible concentration)

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.
OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1017.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
OSHA Standard:
Respirator selection should comply with 29 CFR 1910.134, 29 CFR 1910.1017, and the final rule published in the Federal Register on August 24, 2006.
NIOSH Recommendations:
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
Any appropriate escape-type, self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 62.50
MOLECULAR FORMULA: C-H2-C-H-Cl
BOILING POINT: 9 F (-13 C)
FREEZING POINT: -245 F (-154 C)
VAPOR PRESSURE: 2515.6 mmHg @ 21.1 C
VAPOR DENSITY (air=1): 2.2
SPECIFIC GRAVITY (water=1): 0.9106
WATER SOLUBILITY: 0.25%
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: 260 ppm
EVAPORATION RATE: Not applicable
VISCOSITY: 0.01072 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, carbon tetrachloride, benzene

10. STABILITY AND REACTIVITY

REACTIVITY: May polymerize. Avoid contact with light or storage and use above room temperature.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: metal carbide, metals, oxidizing materials, peroxides

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: halogenated compounds, oxides of carbon, phosgene

POLYMERIZATION: May polymerize. Avoid contact with heat, light, air, water or incompatible materials. Closed containers may rupture violently.

11. TOXICOLOGICAL INFORMATION

VINYL CHLORIDE:
TOXICITY DATA: 18 pph/15 minute(s) inhalation-rat LC50; 500 mg/kg oral-rat LD50
CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen;

EC: Category 1
LOCAL EFFECTS:
Irritant: skin, eye
ACUTE TOXICITY LEVEL:
Toxic: ingestion
Relatively Non-toxic: inhalation
TARGET ORGANS: central nervous system
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: Stimulants such as epinephrine may induce ventricular fibrillation. May cause birth defects.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 388000 ug/L 10 month(s) LETH (Mortality) Northern pike (Esox lucius)

INVERTEBRATE TOXICITY: 41.74 ug/L 72 day(s) (Residue) Mosquito (Culex pipiens quinquefasciata)

ALGAL TOXICITY: 41.74 ug/L 72 day(s) (Residue) Green algae (Oedogonium cardiacum)

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Hazardous Waste Number(s): D043. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.2 mg/L. U043.

14. TRANSPORT INFORMATION



U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Vinyl chloride, stabilized
ID NUMBER: UN1086
HAZARD CLASS OR DIVISION: 2.1
LABELING REQUIREMENTS: 2.1
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: 150 kg

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Vinyl chloride, stabilized
UN NUMBER: UN1086
CLASS: 2.1

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Vinyl chloride: 1 LBS RQ
PHENOL: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
Vinyl chloride

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
Vinyl chloride
Cancer (Feb 27, 1987)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

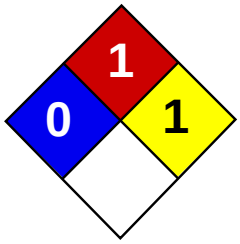
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Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

pH (1% soln/water): Not applicable.

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:18 AM

Last Updated: 05/21/2013 12:00 PM

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APPENDIX D
RAILWAY PEDESTRIAN SAFETY

Railway Pedestrian Safety

- Railroad tracks, trestles, yards and equipment are private property and trespassers are subject to arrest and fine.
- Cross tracks ONLY at designated pedestrian or roadway crossings.
- It can take a mile or more to stop a train, so a locomotive engineer who suddenly spots you ahead has little chance to miss you. Railroad property is private property. For your safety, it is illegal to be there unless you are at a designated public crossing.
- Trains overhang the tracks by at least three feet in both directions and loose straps hanging from rail cars may extend even further. If you are in the right-of-way next to the tracks, you can be hit by the train.
- The only safe place to cross is at a designated public crossing with either a crossbuck, flashing red lights or a gate. If you cross at any other place, you are trespassing and can be ticketed or fined.
- Do not cross the tracks immediately after a train passes. A second train might be blocked by the first. Trains can come from either direction. Wait until you can see clearly around the first train in both directions.
- Flashing red lights signal that a train is approaching from either direction. You can be fined for failure to obey these signals. Never walk around or behind lowered gates at a crossing. Stay Alive! DO NOT cross the tracks until the lights have stopped flashing and it is safe to do so.
- If you are in a rail yard uninvited, you are trespassing and subject to criminal prosecution. The worst penalty is death.
- DO NOT hunt, fish or bungee jump from railroad trestles. There is only enough clearance on the tracks for a train to pass. Trestles are not meant to be sidewalks or pedestrian bridges!
- DO NOT attempt to hop aboard railroad equipment at any time. A slip of the foot can cost you a limb or your life.
- Be aware trains do not follow set schedules. Any Time is Train Time!
- Do not walk, run, cycle or operate all terrain vehicles (ATVs) on railroad tracks or rights-of-way or through tunnels.
- Freight trains do not travel on a predictable schedule; schedules for passenger trains change. Always expect a train at every highway-rail intersection.
- Train tracks are private property, no matter which railroad owns them. Trains have the right of way 100% of the time — over ambulances, fire engines, cars, the police and pedestrians.
- If there are rails on the railroad ties, assume that the track is in use, even if there are weeds or the track looks "rusty."
- A typical locomotive weighs approximately 400,000 pounds or 200 tons. When 100 railcars are added to the locomotive, the train can weigh approximately 6,000 tons. The weight ratio of an automobile to a train is proportional to a soda can and an automobile.
- A train may extend three feet or more outside the steel rail, which makes the safety zone for pedestrians well beyond the rails themselves.
- Trains cannot stop quickly. It is a simple law of physics: the huge weight and size of the train and the speed of the train dictate how quickly it can stop under ideal conditions. A 100-car freight train traveling at 55 miles per hour will need more than a mile to stop — that's approximately 18 football fields — once the train is set into emergency braking.
- There are approximately 140,000 miles of railroad tracks in the United States (source: Association of American Railroads, 2006).
- Trains can move in either direction at any time. Trains are sometimes pushed by locomotives instead of being pulled. This is especially true in commuter and light rail passenger service.
- Modern trains are quieter than ever, with no telltale "clackety-clack." Also, an approaching train will always be closer and moving faster than you think.
- Cross tracks ONLY at designated pedestrian or roadway crossings. Observe and obey all warning signs and signals.
- Never walk down a train track; it's illegal and it's dangerous. By the time a locomotive engineer can see a trespasser or a vehicle on the tracks, it is too late. The train cannot stop quickly enough to avoid a collision.

Railway Pedestrian Safety Guidelines adopted from http://www.oli.org/

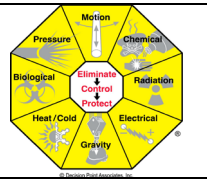
Pedestrian Bridge Safety

One of the possible work tasks that may be required for this site includes working from a pedestrian bridge to collect samples and/or conduct water gauging and/or other necessary tasks. The following items are provided as guidelines for this type of work and may be revised based on specific site conditions or requirements with concurrence of the site safety officer and the project manager.

- Work shall try to be arranged such that tasks shall not require breaking the outer plane of the bridge structure. Work shall be conducted within the bridge to the extent possible.
- Work tasks and equipment shall be arranged to minimize slip/trip hazards while working from the bridge as well as to prevent knocking items off the bridge.
- Work shall be preferably performed from a bridge location that is securely guarded with a railing or similar means.
- If work requires breaking the outer plane of the bridge with no adequate railing type system, a life vest and fall protection shall be used.
- Work over or near the water edge shall be conducted using a buddy system with one person acting as a watch with means to immediately summon emergency services.
- All work from the bridge shall be preceded by a notification call to the project manager (or designee) if not on-site. Upon completion of the work from the bridge, the project manager (or designee) shall be notified that work is completed on the bridge.

APPENDIX E
JOB SAFETY ANALYSIS

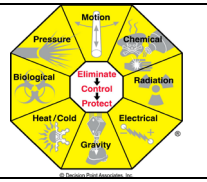
JOB SAFETY ANALYSIS



Job Safety Analysis for: ***(State Task)***			
CONTRACTOR:	*Antea Group Consultants*	DATE:	
PROJECT MANAGER/SITE SUPERVISOR (List Name(s)::**			
PERMITS REQUIRED (Y/N) List Type: **?**			
JSA TEAM MEMBERS:			
LOCATION OF WORKSITE	Street, w/Cross Street:		
	City, State, Zip:		
DESCRIPTION OF WORK:			
Team Leader Reviewed by Signature:		Date:	

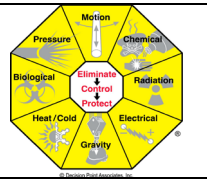
Sequence of Basic Job/Task Steps *List the tasks required to perform the activity in the sequence they are carried out.*	**Potential Hazards (Energy Sources) Involved with Task/Environment** *Against each task list the hazards that could cause injury when the task is performed.*	**Control Measures (Eliminate, Control, Protect)** *List the control measures required to eliminate or minimize the risk of injury arising from the identified hazard.*	**Stop Work Triggers** 

JOB SAFETY ANALYSIS



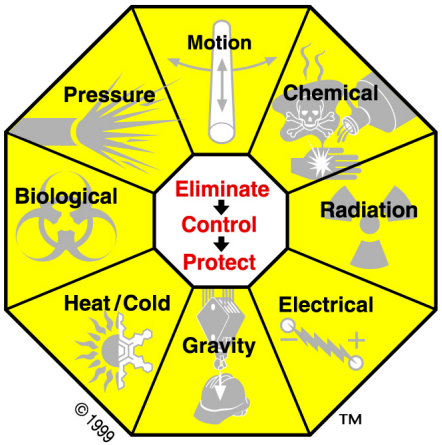
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JOB SAFETY ANALYSIS



Sequence of Basic Job/Task Steps *List the tasks required to perform the activity in the sequence they are carried out.*	**Potential Hazards (Energy Sources) Involved with Task/Environment** *Against each task list the hazards that could cause injury when the task is performed.*	**Control Measures (Eliminate, Control, Protect)** *List the control measures required to eliminate or minimize the risk of injury arising from the identified hazard.*	**Stop Work Triggers** 

HRP Team Process
Worksite Hazard Assessment Tool
(WHAT energy is present?)



For use with a JSA big picture or a worksite HSE inspection. Using the HRP Octagon in a clockwise manner starting with Energy of Motion, assess the worksite and determine what energy sources are present and/or what recognized hazards are associated with those energy sources.

© Decision Point Associates, Inc.

Use the following to help you DRAFT the job steps before starting the JSA:

DRAFT STEPS

1.

2.

3.

4.

5.

6.

7.

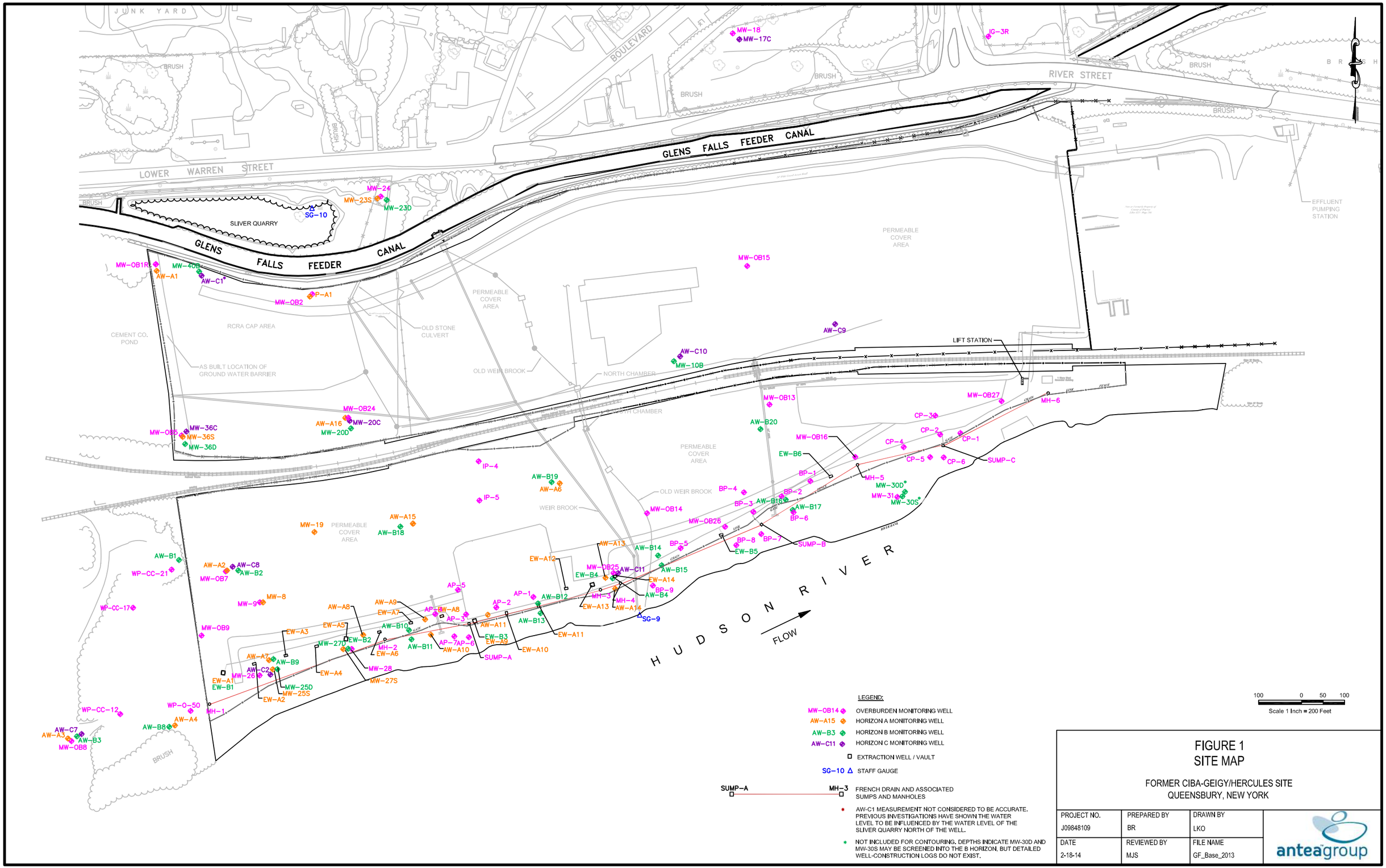
8.

ADDITIONAL FIELD NOTES/OBSERVATIONS:

APPENDIX F
On-site Chemical MSDS's

FIGURES

ROUTE TO HOSPITAL MAP
AND
SITE MAPS



LEGEND:

- MW-OB14 — OVERBURDEN MONITORING WELL
- AW-A15 — HORIZON A MONITORING WELL
- AW-B3 — HORIZON B MONITORING WELL
- AW-C11 — HORIZON C MONITORING WELL
- EXTRACTION WELL / VAULT
- SG-10 — STAFF GAUGE
- SUMP-A — MH-3: FRENCH DRAIN AND ASSOCIATED SUMPS AND MANHOLES

* AW-C1 MEASUREMENT NOT CONSIDERED TO BE ACCURATE. PREVIOUS INVESTIGATIONS HAVE SHOWN THE WATER LEVEL TO BE INFLUENCED BY THE WATER LEVEL OF THE SLIVER QUARRY NORTH OF THE WELL.

* NOT INCLUDED FOR CONTOURING. DEPTHS INDICATE MW-30D AND MW-30S MAY BE SCREENED INTO THE B HORIZON, BUT DETAILED WELL-CONSTRUCTION LOGS DO NOT EXIST.

100 0 50 100

Scale 1 Inch = 200 Feet

FIGURE 1
SITE MAP

FORMER CIBA-GEIGY/HERCULES SITE
QUEENSBURY, NEW YORK

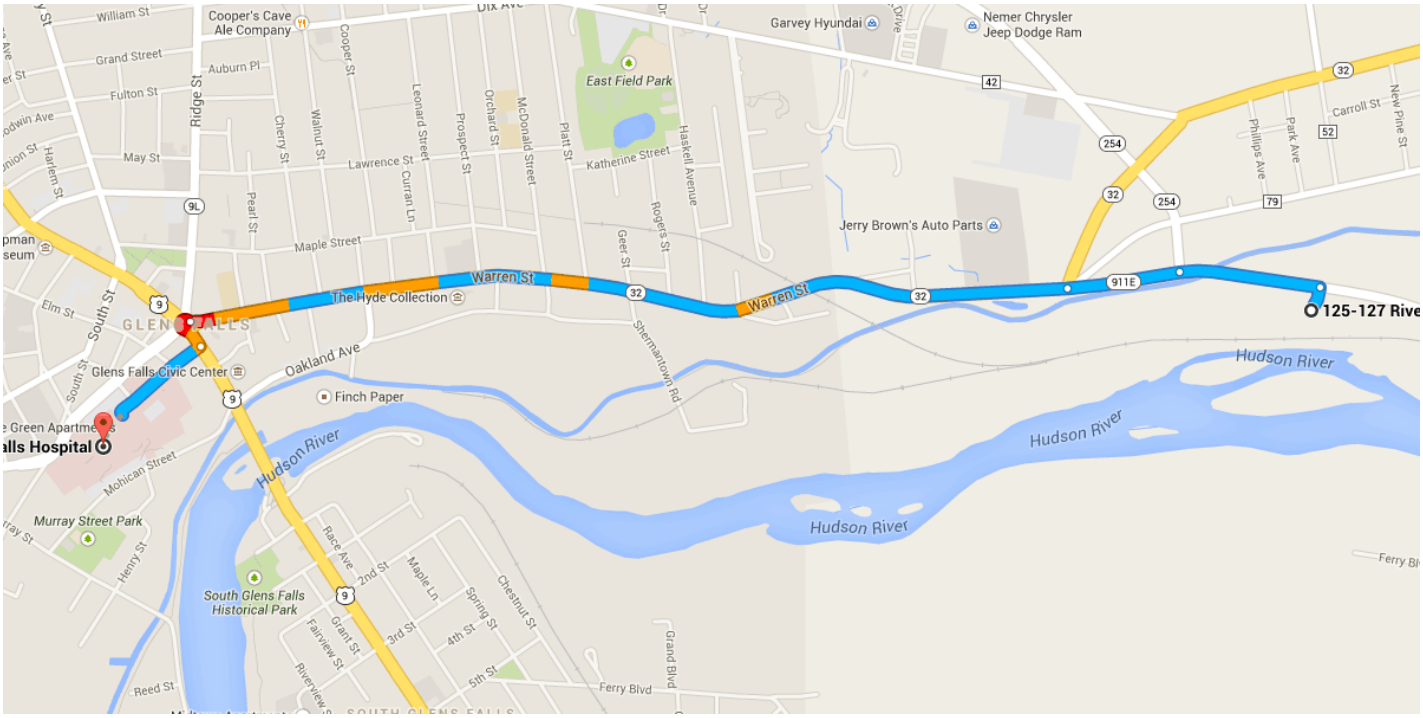
PROJECT NO.	PREPARED BY	DRAWN BY
J09848109	BR	LKO
DATE	REVIEWED BY	FILE NAME
2-18-14	MJS	GF_Base_2013

anteagroup

Google

Drive 2.4 miles, 7 min

Directions from **125-127 River St** to **Glens Falls Hospital**



125-127 River St

Queensbury, NY 12804

1. Head **northeast** toward **NY-254 E**

240 ft

2. Turn **left** onto **NY-254 W**

0.3 mi

3. Continue onto **NY-911E**

0.2 mi

4. Continue onto **NY-32 S/Warren St**

1.6 mi

5. At **Centennial Cir**, take the **4th** exit onto **Glen St**

420 ft

6. Turn **right** onto **Park St**

Destination will be on the right

0.2 mi

Glens Falls Hospital

100 Park St, Glens Falls, NY 12801

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2014 Google

ATTACHMENT H

Closure, Post Closure and/or Corrective Action Cost Estimate(s)

Hercules LLC
A wholly owned subsidiary of Ashland Inc.
P.O. Box 2219
Columbus, OH 43216

August 28, 2024

Kevin Chazhikattu
Engineer Trainee, Hazardous Waste Corrective Action & Post Closure
Bureau of Hazardous Waste and Radiation Management
Division of Materials Management
New York State Department of Environmental Conservation
625 Broadway 9th Floor, Albany, NY 12233-7256

Subject: Post Closure Care Cost Estimate for Financial Assurance
Former Ciba-Geigy/Hercules Site
EPA ID: NYD002069748
Glens Falls NY Site Number: 557011

Dear Kevin:

Hercules LLC ("Hercules", a wholly owned subsidiary of Ashland Inc.) and Ciba-Geigy Corporation ("CIBA," previously acquired by BASF Corporation) are the Permittees and share responsibility for ongoing environmental activities at the Former Ciba-Geigy/Hercules Site ("Site") located at 89 Lower Warren Street, Queensbury, NY.

On behalf of the Permittees, Hercules is submitting this updated estimated post-closure care costs for financial assurance to the New York State Department of Environmental Conservation (NYSDEC). This financial assurance is provided in support of the renewal of the Part 373 NYSDEC Permit No. 5-5234-00008/00096 ("Permit") last issued on March 6, 2015, with an expiration date of March 5, 2025. Currently Bond No. K41768927 issued by the Federal Insurance Company in the amount of $11,189,479 is in place to cover the post-closure care costs at the Site.

This Financial Assurance cost estimate is calculated based on the 30-year time frame found in the post-closure regulations in Code of Federal Regulation (CFR) §§264.144 and §§264.117. Hercules periodically reviews spending on its remediation obligations, and the below estimates come from our most recent review. The updated post-closure care costs for the site can be broken into routine costs (annual) and non-routine costs.

The cost estimate was built as follows:

Task 200 – Operations and Maintenance (O&M), $205,000 annually including:

- Consultant/contractor costs for system O&M
- Routine inspections, system performance monitoring, and quarterly POTW (publicly owned wastewater treatment plant) compliance sampling
- Groundwater disposal cost to POTW
- Consultant/contractor costs for annual reporting
- Electricity costs paid to National Grid

- Fee paid to Town of Queensbury for potable water

Task 400 – Monitoring, $105,000 annually including:
- Consultant/contractor costs for periodic groundwater sampling
- Laboratory costs for sample analysis
- Consultant/contractor costs for periodic reporting

Task 500 – Project Management, $5,000 annually including:
- Project financial management
- Project schedule management

Task 600 – Agency Fees, $15,000 annually including:
- Periodic NYSDEC fees
- Access fees charged by the Canal Corporation

The annual cost adds up to approximately $330,000 per year. Thus over 30 years, the routine cost would total to approximately $9,900,000.

Other costs include:
- Approximately $6,000 for work related to finalizing of the *Site Conceptualization and Groundwater Corrective Measures Effectiveness Evaluation Report* (SCGCMEE) Report.
- Approximately $110,000 for work related to the Sliver Quarry Area investigation, sample analysis, data interpretation, and remedial alternative review plus discussions with the landowner .
- Approximately $44,000 for non-routine or non-annual O&M and monitoring activities (e.g. POTW permit renewal fee paid every 5 years, well decommissioning, pump replacement, etc.).

Therefore, the total amount needed for the 30-year monitoring period is $10,060,000, which is covered by the existing surety bond.

Please contact me at 614.323.5448 or jevondracek@ashland.com if you have any questions.

James Vondracek

James E. Vondracek
Remediation Project Manager

cc: Lynn Winterberger – NYSDEC
Stephen Havlik –BASF
Elena Dadukova, Stacey Koch – EHS Support LLC

ATTACHMENT I
On-going Corrective Action Documents

ATTACHMENT J

Other Laws

ATTACHMENT J
OTHER LAWS

The Facility holds permits that were issued pursuant to the Clean Water Act, the Resource Conservation & Recovery Act, and the New York State Environmental Conservation Law. These permits are identified in Section 4 - Other Environmental Permits of **Attachment B** of this Permit.

Other laws applicable or potentially applicable to site operations include the Atomic Energy Act, the Safe Drinking Water Act, the Federal Insecticide, Fungicide, Rodenticide Act, the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act of 1986. The site is currently in compliance with applicable provisions of these statutes.