FINAL

DIAZ CHEMICAL CORPORATION SUPERFUND SITE, OPERABLE UNIT 2

PHASE 2 REMEDIAL ACTION WORK PLAN

Village of Holley

Orleans County, New York

June 2020

Prepared for:

United States Army Corps of Engineers,

Kansas City District

Prepared by:

URS Group, Inc.

12120 Shamrock Plaza, Suite 300

Omaha, NE 68154

Contract No. W912DQ -15-D-3006, Delivery Order W912DQ 19F3063

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Tables in Text

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

°C	degrees Celsius
AMFT	Air Monitoring Field Technician
AMSL	above mean sea level
APP	Accident Prevention Plan
ARAR	applicable or relevant and appropriate requirements
BACT	best available control technology
bgs	below ground surface
BOD	biological oxygen demand
BTU	British thermal unit
C3	cooling-compression-condensation unit
CAMP	Community Air Monitoring Plan
CCTV	closed circuit television
COC	constituents of concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1990
CFP	2-chloro-6-fluorophenol
CFR	Code of Federal Regulations
C1	heat exchange/chiller unit
CO	carbon monoxide
COMP1	air compressor unit
COR	Contracting Officer's Representative
CQC	contractor quality control
CQMC	Contractor Quality Management Certificate
CQCP	Quality Control Management Plan
CQCSM	Contractor Quality Control System Manager
CQSM	Contractor Quality System Manager
CSM	conceptual site model
DBCP	dibromochloropropane

DGA	dense grade aggregate
EDD	electronic data deliverable
EPP	Environmental Protection Plan
ESD	explanation of significant differences
eV	electron Volts
F	Fahrenheit
FS	Feasibility Study
ft/d	feet per day
GAC	granular activated carbon
GTR	gas thermal remediation
GVT	Genesee Valley Transportation
ISTR	in situ thermal remediation
KW	kilowatts
kWh	kilowatt hours
lbs	pounds
LGAC	liquid phase granular activated carbon
MCFH	thousand cubic feet per hour
MMBTU	one million British Thermal Units
MNA	monitored natural attenuation
MPE	multi-phase extraction
NAPL	non-aqueous phase liquids
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas
O&M	operations and maintenance
OM&M	operations-maintenance-monitoring activities
OU	Operable Unit
OU1	Operable Unit 1
OU2	Operable Unit 2

PC	performance criteria
pcf	pound per cubic foot
PE	professional engineer
PID	photoionization detector
PLC	Programmable Logic Control
PMP	pressure monitoring point
POTW	publicly operated treatment works
PWS	Performance Work Statement
QAPP	Quality Assurance Project Plan
QC	quality control
RA	remedial action
RACR	Remedial Action Completion Reports
RAO	remedial action objective
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
ROD	Record of Decision
SCADA	supervisory control and data acquisition
scfm	standardized cubic feet per minute
SMP	Site Management Plan
sq. ft	square feet
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SVE	soil vapor extraction
SVOC	semi-volatile organic compounds
TBC	to-be-considered
TBD	to be determined
TCH	thermal conductive heating
TMP	temperature monitoring points

TPMP	temperature and pressure monitoring points
TTZ	target treatment zone
TCU	thermal control unit
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
U.S.	United States
URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UV	ultraviolet
VHDC	Village of Holley Development Corporation
VGAC	vapor phase granular activated carbon
VOC	volatile organic compounds

The United States (U.S.) Army Corps of Engineers (USACE), Kansas City District has contracted URS Group, Inc. (URS) to perform remediation construction activities at the Diaz Chemical Corporation Operable Unit (OU) 2 Superfund Site in Holley, New York. URS project work will be conducted for the USACE Kansas City District under Contract Number W912DQ-15-D-3006, Client Task Order Number W912DQ19F3063. This document constitutes the Phase 2 Remedial Action Work Plan (RAWP) to implement In Situ Thermal Remediation (ISTR) for the Diaz Superfund Site OU2 (the site).

The Phase 2 RAWP details requirements and implementation procedures for the ISTR program as required in the Diaz Chemical Corporation OU2 Superfund Site In Situ Thermal Remediation Action, Phase 2, Performance Work Statement (PWS). The specifics of the current approach have been provided based on the information and site data presented in the PWS and associated documents. Procedures will be further reviewed based on site-specific observations and through the collection of additional data to be obtained once the Remedial Action efforts begin at the site (i.e., inhalation and odor concerns related to the excavated soils and confirmation of soil volume required for excavation and treatment). The major components of the selected source area and groundwater remedy include installation and operation of an in situ thermal soil and groundwater treatment system. Natural attenuation is anticipated to address the groundwater contaminants in the areas downgradient of the source areas

Section 2 of this document provides an overview of the site, site operational history, regulatory requirements of the work, the remedial action (RA) technology to be implemented, and the objectives of the RA. Section 3 of this document introduces the overall strategy for the RA to meet the performance requirements of this project. Section 4 describes the principle remedial components in terms of their basis for the overall design criteria. Section 5 details those engineering design components and how they were developed. Section 6 presents the sequence of how the remedial efforts will be constructed and the implementation of operations-maintenance-monitoring activities (OM&M). Section 7 provides administrative requirements such as any revisions necessary between the Stage 1 and Stage 2 RA, meetings, reports, and the overall organization of the project team.

2.1 SITE DESCRIPTION

The Diaz Chemical Facility (Site) is an approximately five-acre former specialty chemicals manufacturing plant located at 40 Jackson Street in the Village of Holley, Orleans County, New York. The Site is located approximately 25 miles west of Rochester and 50 miles east of Buffalo (**Figure 2-1**). The Diaz Chemical Corporation is no longer active. The Site is bounded on the north by Jackson Street, where both residential parcels and a parcel of land owned by Diaz Chemical, which includes a parking lot and a warehouse, are located. To the east, the property is bounded by residential parcels along South Main Street. To the south and west, the property is bordered by railroad tracks operated by Genesee Valley Transportation, and beyond that by undeveloped land and a group of buildings. Refer to **Figure 2-2** for the Existing Conditions Site Layout.

2.1.1 Site Characteristics

Several documents have been reviewed to provide key background information concerning site-specific information that URS has used in the preparation of this Phase 2 RAWP. These include the Final Remedial Investigation (RI) Report (CDM Smith, July 10, 2012, Feasibility Study Report (CDM Smith, 2012), Record of Decision (ROD) Diaz Chemical Corporation Superfund Site (United States Environmental Protection Agency [USEPA] Region II, September 2012), and the Interim Remedial Action Report Diaz Chemical Corporation (Versar, April 2019).

The Site lies at approximately 540 feet above mean sea level (AMSL). The ground surface across the Site is generally flat. The eastern edge of the Site slopes down toward the East Branch of Sandy Creek ravine. Any surface runoff not collected by the Site drainage system is expected to flow with topography as sheet flow, ultimately discharging to either the unnamed tributary to the south or the East Branch of Sandy Creek ravine to the east. The East Branch of Sandy Creek has no surface water intakes and is not used for public water supply.

The Site is comprised of overburden underlain by bedrock. Typically, the bedrock across the Site is comprised of a layer of weathered bedrock material that overlies competent rock. The weathered bedrock layer ranges in thickness from a couple of inches to over 11 feet. The top of competent bedrock contours at the Site reveal the presence of an east-southeast trending trough-like feature.

Three major hydrogeologic zones have been defined at the Site: overburden/weathered bedrock; shallow bedrock; and deep bedrock. The overburden sediments and weathered bedrock are grouped into the same groundwater zone because of their hydrogeological similarities. The weathered bedrock is shale and sandstone that can be penetrated by an auger.

The overburden at the site, where the vast majority of site impacts occur, consist of fill overlying lake bottom sediments that overlie glacial till. Anthropogenic surface fill, approximately four to eight feet thick, covers most of the flat-lying areas across the site and consists of fine and gravelly sands with cobbles, cinders, fragments of bricks, wood, and root fibers. Lake bottom sediments immediately overlie the glacial till and consist of medium-dense to dense silty fine sands and silt with occasionally occurring clay seams. Sediment thickness ranges from 10 feet in the west with a gradual increase to 20 feet in the east. Glacial till, ranging between 3 to 14 feet thick, overlies the weathered bedrock and is comprised of fine-grained sediments with gravel, cobble and boulder sized clasts of weathered and eroded rock fragments. Till overlies the weathered bedrock across the Site.

The overburden geologic units are truncated abruptly to the east of the Site, where post-glacial erosion carved out the valley through which the East Branch of Sandy Creek flows. In the eastern portion of the site where the glacial till is absent, Lake Margin sands are present in thicknesses generally less than 10 feet and are laterally discontinuous.

Groundwater at the Site is approximately 10 to 15 feet below the ground surface (bgs) and flows primarily toward the east and the southeast through both overburden soils and bedrock. The overburden/weathered bedrock unit ranges from 4 to 21 feet bgs. The depth to water in the shallow bedrock ranges from 15 to 40 feet bgs. The water level elevations in shallow bedrock suggest unconfined to semi-confined conditions. Water that occurs in the deep bedrock hydrogeologic zone is largely restricted to joints and fractures. Geophysical logging indicates the fractures in the deep bedrock zone are relatively small and are generally low-yield water-bearing features.

2.1.2 Site History

The Diaz Chemical facility was initially developed as an industrial plant in the 1890s and was used primarily for tomato processing and cider vinegar production before being purchased by Diaz Chemical in 1974. Diaz Chemical was a manufacturer of specialty organic intermediates for the agricultural, pharmaceutical, photographic, color and dye, and personal care products industries. The Diaz Chemical product line varied over the years of operation, but it primarily consisted of halogenated aromatic compounds and substituted benzotrifluorides.

The Diaz Chemical facility had a long history of chemical releases to the environment, extending from 1975 to 2002. Poor housekeeping practices, loss of control of manufacturing systems, and faulty containment systems resulted in the release of a range of chemical substances to the air, water, and soil. Some releases were not limited to the Diaz Chemical facility and migrated to off-property areas.

From 1994 to 1999, Diaz Chemical conducted a remedial investigation (RI) at the site under the oversight of the NYSDEC. The RI revealed that soils and groundwater at the Diaz Chemical facility were contaminated with volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

An accidental air release from the Diaz Chemical facility occurred on January 5, 2002, when a reactor vessel in a process building overheated, causing its safety valve to rupture and release approximately 75 gallons of a chemical mixture through a roof stack vent. The release consisted primarily of a mixture of steam, toluene, and 2-chloro-6-fluorophenol (CFP), as well as related phenolic compounds. The mixture landed on properties in the residential neighborhood immediately adjacent to the Diaz Chemical facility and was visible as red colored droplets on homes. Soon after the release, residents complained of acute health effects and several voluntarily relocated to area hotels with assistance from Diaz Chemical.

On March 8, 2002, the State of New York obtained a court order that required Diaz Chemical to continue to fund the relocations. On March 28, 2002, NYSDEC selected a remedy for the Diaz Chemical site, which required the continued operation of a groundwater extraction and treatment system via a trench which Diaz Chemical installed as an interim remedial measure in 1995. This system provided partial containment of the groundwater contaminant plume.

In May 2002, when Diaz Chemical sought to discontinue the relocations for ability-to-pay reasons, Diaz Chemical and the New York State Law Department requested that USEPA continue the funding of the temporary relocations. On May 16, 2002, USEPA, under its removal authority, assumed responsibility for the temporary relocation expenses of the residents who remained relocated at that time.

Subsequently, the New York State Law Department and USEPA performed sampling of indoor air, soil, interior surfaces, and household items in the affected neighborhood. A qualitative review of the data collected as part of this effort resulted in the conclusion that there were no immediate or short-term threats to human health. Therefore, no further actions related to the residential properties under USEPA’s removal authority were deemed necessary.

In June 2003, Diaz Chemical filed for bankruptcy and abandoned the Diaz Chemical facility, leaving behind large volumes of chemicals in drums and tanks. USEPA, under its removal authority, mobilized to the site and began providing 24-hour security at the Diaz Chemical facility to prevent public access. USEPA also began operating and maintaining the groundwater extraction and treatment system. In addition, over the course of the next number of years, USEPA removed all hazardous substances, drums, tanks, reactor vessels and facility piping, and dismantled all the production buildings.

On July 22, 2004, the site was placed on the National Priorities List.

On March 29, 2005, USEPA selected a remedy for operable unit 1 (OU1) involving the property acquisition and permanent relocation of eight owner-occupant and two tenant families who had remained in temporary quarters since January 2002. The eight homes that were acquired by USEPA were secured and maintained.

From 2004 through 2012, USEPA performed a comprehensive investigation of the site to determine the nature and extent of contamination, assess potential risks to human health and the environment and develop, screen and evaluate alternative treatment technologies. On September 26, 2012, USEPA selected a cleanup plan for OU2 that included thermal treatment of the contaminated soil and groundwater located at the Diaz Chemical property and natural processes to address the groundwater contamination downgradient of the source areas. The cleanup plan also included building demolition to allow access to contaminated soils on-site. Currently, only 2 buildings remain: Building F on the facility property itself and Building H to the north of Jackson Street (refer to **Figure 2-2**).

The investigation of the site determined that site-related contamination did not exist in the surrounding residential area and, therefore, a residential cleanup was not warranted. Accordingly, USEPA determined that the sale or transfer of the eight USEPA-owned properties was consistent with the final cleanup and negotiated an agreement with the Village of Holley and the Village of Holley Development Corporation (VHDC), whereby USEPA transferred the eight properties to the VHDC in June 2017. The VHDC, working with a local realtor and law firm, sold the houses in September 2017.

2.1.3 Site Impacts

Most of the mass of the VOCs and SVOCs impacts observed at the Site is found in the overburden and weathered bedrock. The concentrations of VOCs and SVOCs in shallow bedrock groundwater zones have been observed to contain lower concentrations than the overburden/weathered bedrock groundwater zone. The deep bedrock wells show low concentrations of contaminants. Section 4.1.2 describes the conceptual site model (CSM) for the Site.

Elevated concentrations of 30 VOCs and SVOCs were detected in the soils at six primary locations on the Site. These soils are sources of contamination to the groundwater. Concentrations of thirty-five VOCs and SVOCs exceed their respective groundwater cleanup levels. Refer to the RI Report for more information on the nature and extent of environmental impacts at the Site.

2.2 ROD SELECTED REMEDY

On March 29, 2005, USEPA selected an interim remedy for OU1 for the initial ROD involving the property acquisition and permanent relocation of eight owner-occupants and two individual tenant families who had remained in temporary quarters since January 2002. The eight homes that were acquired by USEPA were secured and maintained.

The subsequent ROD for source area and groundwater remedy (OU2) selected ISTR as the preferred remedy to address contaminated soil and groundwater within the Site source areas to achieve cleanup goals. The selected remedy will address source materials constituting on-going principal threats.

The major components of the selected remedy include:

- Installation and operation of an in situ thermal soil and groundwater treatment system in six source areas.
- Extraction of vapor or gas phase chemicals via a co-located vapor recovery system.

- Treatment of the extracted vapors.
- Building demolition if required to obtain access to contaminated soils.
- If building demolition is required, the debris will be disposed of off-site in accordance with applicable regulatory requirements.
- Natural attenuation is anticipated to address the groundwater contaminants in the areas downgradient of the six source areas.
- Utilization of institutional controls in the form of an environmental easement to restrict the Diaz Chemical facility property to commercial use and restrict intrusive activities in areas where residual contamination remains unless the activities are in accordance with an USEPA-approved Site Management Plan (SMP), as described below. Since the entire groundwater plume will not immediately achieve cleanup levels upon implementation of this alternative, the environmental easement will also prevent the use of groundwater and will require that future buildings on the Diaz Chemical facility property either be subject to vapor intrusion study (with mitigation if determined to be necessary) or be built with vapor intrusion mitigation systems in place until the cleanup criteria have been achieved throughout the property. To prevent the installation of wells in the affected off-property areas, an additional measure will be implemented to inform the governmental entity that would authorize the installation of private wells that private wells cannot be installed in these areas.
- Upon completion of the treatment of the six source areas, placement of a one-foot soil cover over the areas other than the source areas where surface soils exceed New York State's commercial soil cleanup objectives on the Site. Before the placement of the soil cover, a readily-visible and permeable demarcation layer will be placed over these areas to delineate the interface between the contaminated native soils and the clean soil cover.
- Development of a SMP to provide for the proper management of all post-construction remedy components. Specifically, the SMP will describe procedures to confirm that the requisite restrictions are in place and that nothing has occurred that will impair the ability of the controls to protect public health or the environment. The SMP will also include the necessary provisions for the implementation of the requirements of the above-noted environmental easement; a provision for the performance of the operation, maintenance, and monitoring required by the remedy; and a provision requiring periodic certifications that the institutional and engineering controls (i.e., demarcation layer) are in place.

The OU2 investigation determined that site-related contamination does not exist in the surrounding residential area and, therefore, a cleanup in this area was not warranted. Subsequently, USEPA entered into an agreement transferring the eight properties to the VHDC in June 2017, who then sold the houses in September 2017.

2.3 REGULATORY FRAMEWORK

Remediation of the Diaz Chemical facility is being conducted in accordance with the 2012 ROD issued by USEPA and subsequent Explanation of Significant Differences (ESD) published in March 2017. The ROD for OU2 was issued in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1990, as amended (CERCLA), 42 U.S.C. ‘9601-9675, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations (CFR) Part 300. The NYSDEC was consulted on the proposed remedy in accordance with CERCLA Section 121(f), 42 U.S.C ‘9621(f), and it concurs with the selected remedy. USEPA is the lead agency for the site, with remedial activities being administered by the USACE. Certain project elements, such as obtaining permit equivalents, will require coordination with the NYSDEC. Federal, state, and local environmental regulations regarding hazardous and non-hazardous waste management apply to this work and will be implemented accordingly.

2.4 REMEDIAL ACTION OBJECTIVES

The RA objectives (RAOs) for OU2 are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels.

Per the OU2 ROD, the following RAO were established for the site:

- Reduce or eliminate any direct contact, ingestion, or inhalation threat associated with contaminated soils;
- Reduce or eliminate the migration of contaminants in soils to groundwater;
- Reduce or eliminate the uptake of contaminants in soil by biota;
- Protect human health by preventing exposure to contaminated soil, groundwater, and soil vapor; and
- Restore groundwater to levels that meet state and federal standards within a reasonable time frame.

2.5 TECHNOLOGIES SELECTED

The process to select the remedial alternative for OU2 included preparation of the 2012 FS Report, in accordance with Guidance for Conducting RIs and FSs under CERCLA (EPA, 1988). The FS identified and developed a range of remedial alternatives (five for soil and four for groundwater) for the contaminated media and provided a basis for the recommendation of a remedial alternative.

The technologies selected for remediation of soil and groundwater for OU2 consist of in situ thermal treatment using thermal conductive heating (TCH) and multi-phase extraction (MPE) for onsite soil and groundwater with subsequent monitored natural attenuation (MNA) to address downgradient portions of the groundwater contaminant plume.

Pre-design bench and field pilot-scale (Phase I) testing were conducted to evaluate the effectiveness of the various ISTR treatment technologies. In general, the bench-scale results for saturated and vadose zone soils were similar after simulated thermal treatment at 100 degrees Celsius (°C), 150°C and 200°C. The Phase I field ISTR pilot test was performed in an upgradient area at Building F. Treatment was initiated at 100°C for 60 days, and then increased to 150°C for an equivalent period. Conclusions of the test were that SVOCs were recovered effectively at 100°C from the target treatment zone (TTZ), with the remaining contaminants in the surface soils within 3 feet of ground surface. Testing of vapor phase contaminant treatment was simulated using activated carbon and thermal oxidation. Thermal oxidation treatment indicated that hydrochloric acid, nitric acid, and hydrobromic acid were produced in the discharge air. Generally, lower air effluent concentrations of contaminants were observed from the carbon treatment than the thermal oxidizer.

Three primary ISTR Performance Requirements have been set forth regarding increasing subsurface temperatures, achieving diminishing returns in contaminant mass within the vapor phase recovery, and reaching final ISTR soil concentration goals, which are to be achieved sequentially, as listed. Performance Criteria (PC) are discussed in detail under Section 4.1.3.

The thermal approach to be utilized is in-situ TCH which will be implemented in two stages to achieve cleanup of impacted soil and groundwater across the Site. This method is proven effective in treating both VOCs and SVOCs, and was the approach used in Phase I. While many of the site constituents of concern (COCs) will be remediated at temperatures less than 100°C, the presence of SVOCs means that temperatures greater than 100°C may be needed. As the first listed PC is attainment of 100°C for the target temperature, the TCH approach chosen provides the flexibility of increasing temperature above 100°C to enhance removal of these SVOCs, should it prove necessary.

The TCH approach will utilize the thermal treatment contractor, GEO's patented GTR™ (Gas Thermal Remediation) process which uses natural gas (or an appropriate substitute fuel source) to provide the heat energy for the in situ thermal process. The GTR process minimizes the reliance on significant electrical needs, which are limited at the Diaz site. Natural gas demand per Stage will be on the order of 13 MCFH (thousand cubic feet per hour) over the heat-up period. Based on discussion with New York State Electric and Gas (NYSEG), this natural gas demand can be met with the existing service, and greater supply may be available particularly outside of the winter months (heating season).

The proposed work sequence is to stagger the performance of each Stage of the remediation, which will allow for greater flexibility and the opportunity to apply lessons learned from Stage 1. An updated Project Schedule is provided as **Figure 3-1** to indicate the sequencing and overlap of activities between Stage 1 and Stage 2, affording efficiencies in the overall schedule.

During the excavation of impacted soils from five areas and consolidation of that soil within the Stage 1 treatment area, an R-20+ insulating surface cap will be installed over the entire treatment surface to enhance heat retention in this critical shallow zone and to promote attainment of temperature and soil cleanup goals. Refer to Section 6.2.4 for information on the soil excavation and its preparation. The ISTR system will also include an aggressively concentrated placement of heater wells and soil vapor extraction (SVE)/MPE wells to provide focused heating and pneumatic/hydraulic control of the heated zone to ensure these performance metrics are attained to the ground surface.

The treatment approach presented in this Phase 2 RAWP has been developed with the use of adaptive management processes to better achieve the Performance Requirements. The technology, power source, construction approach, and sequencing have all been selected and designed to provide maximum advantage in addressing the site specifics, as further described in Section 6.9.

4.1 BASIS OF DESIGN

The Basis of Design is the documentation of how the actual design details described in Section 5 will support the performance and operational requirements of the treatment system and the overall project. Key aspects and components of the ISTR program and site-specific characteristics are described below as factors for the Basis of Design.

4.1.1 Constituents of Concern

Based on previous remedial investigations at the Site, 37 specific VOCs and SVOCs have been identified in the PWS as the COCs for OU2. These include typical aromatic and chlorinated aliphatic solvents, as well as several atypical bromo- and fluoro-substituted aromatic compounds. The PWS established ISTR soil goals for these 37 COCs. **Table 4-1** presents the COCs and their ISTR soil goals for this RA together with the ultimate OU2 cleanup goals for soil and groundwater following MNA. The ISTR soil goals are the basis for the ISTR design. Analytical method development procedures must be completed for some of these compounds to confirm their identity and to quantify them accurately, as part of the ISTR monitoring program.

Based on a review of the vapor pressures and boiling points of these compounds, many are near or above 100°C, warranting an aggressive and flexible treatment strategy to quickly achieve the steam generation temperature for water, and target higher temperatures for COCs with higher boiling points. TCH is a thermal application that can achieve this criterion. The initial target temperature for the ISTR design will be 100°C, as per the PWS, however temperatures in excess of 100°C are anticipated within areas of the TTZ, as described in Section 5.1.

4.1.2 Conceptual Site Model

The CSM integrates the various types of information collected during previous remedial investigations, including geology, hydrogeology, site setting, and the fate and transport of contamination associated with the Site.

Contaminant spills, leaks, and discharges have occurred at the Site in the past. Six source areas have been identified in the former chemical production, transfer, and storage areas, and a range of Site-related chemicals have been detected in surface and subsurface soil. The compounds present in soils in source areas are primarily SVOCs. These compounds tend to remain in unsaturated soils, while the more soluble compounds are leached from soils and dissolve in groundwater. In four of the source areas, contaminants were present in soils at the water table (8 to 16 feet bgs). Therefore, soil contaminants in the source areas are expected to be continuing sources of groundwater contamination.

A variety of VOC and SVOC contaminants were detected in groundwater samples collected at the Site. Historical information indicates that many of these chemicals were known to be used at the Site or were the constituents of releases that occurred at the Site in the past. The Diaz Chemical facility is underlain by three hydrostratigraphic units or zones: overburden/weathered bedrock, shallow bedrock, and deep bedrock. The highest concentrations of organic compounds detected in monitoring wells occur in the overburden/weathered bedrock zone. The overburden aquifer is unconfined, ranging in thickness from 20 to 42 feet, and thins to the east and southeast.

Depth to groundwater in the overburden/weathered bedrock is shallow, ranging from 4 to 21 feet bgs. The primary water bearing features are usually found in the weathered bedrock. Groundwater flow direction in this zone is toward the east-southeast. Groundwater in the overburden/weathered bedrock zone either flows down into the shallow bedrock or discharges to the surface in the ravine where the overburden/shallow bedrock outcrops.

Contaminants in the overburden/weathered bedrock zone have migrated slightly east relative to the locations of source areas. Given the time period since releases have occurred at the Site, the current location and geometry of the plume, and the relatively poor transmitting characteristics of the bedrock, the plume is expected to continue to migrate slowly eastward toward the ravine and the East Branch of Sandy Creek. In addition, contaminants in soil source areas will continue to contribute to groundwater.

Several of the constituents in groundwater are VOCs. As such, these contaminants have the potential to volatilize to the atmosphere and within the unsaturated soil zone. Portions of the groundwater plume extend below residences on South Main Street, although the concentrations in this downgradient portion of the plume are much lower than the concentrations in groundwater below the Site. USEPA conducted vapor intrusion sampling at residences in the Site plume area to identify any homes that might be affected and has installed sub-slab soil depressurization systems and/or carbon filtration systems in affected residences.

Based on the CSM, targeting ISTR for the soil source areas and the shallow overburden groundwater to the depths of the weathered bedrock at the Site would provide the most effective treatment and lasting benefits to overall groundwater migration at the Site and in the down-gradient plume direction (eastward). The TTZ identified in the PWS as the Northern, Central, Railroad Spur and Trench Areas are consistent with the CSM’s depiction of the most impacted areas of the Site.

4.1.3 Remediation Performance Criteria

The PWS establishes Performance Criteria (PC), both primary and secondary for the operation of the ISTR system. More specifically, the primary PCs are:

- 90 percent of temperature sensors shall meet a minimum temperature target of 100°C, with no single sensor below 85°C.
- Once temperature targets are achieved, asymptotic conditions must be demonstrated as defined by the incidence of three consecutive events spanning a minimum of 2 weeks where contaminant mass removal is less than ten percent of the total mass removal peak and where

volumetric flow rate from the well field varies not more than 25% during those 3 consecutive events.

- Following achievement of diminishing returns, soil sampling can be conducted to evaluate attainment of ISTR soil concentration goals. The ISTR soil goals shall be met for 95% of the samples, with no sample having a compound concentration greater than 3 times the ISTR soil cleanup goal and no sample having greater than 5 mg/kg combined total COC.

The Secondary PCs are:

- Pneumatic control of the contaminant vapors and associated pressures within the TTZ as judged by shallow monitoring wells, photoionization detector (PID) and steam observations.
- Hydraulic control of the groundwater or non-aqueous phase liquids (NAPL) within the TTZ as judged by temperature increases and COC concentrations in wells within and down-gradient of the TTZ.
- ISTR system uptime of 90% outside of maintenance and 100% for vapor recovery for pneumatic control on a weekly basis.
- ISTR vapor treatment efficiency of 90% vapor destruction or removal on a weekly basis

Most of these PCs themselves serve as design basis criteria for the ISTR system and the decisions that consider the following design components: target temperature; the number and density of the heater well, SVE, and MPE well arrays; temperature monitoring point (TMP), pressure monitoring point (PMS), and monitoring well locations; and the nature of the vapor/liquid recovery and treatment equipment and their operations.

4.1.4 ISTR Remediation Target Zones

Based on historical data presented in the Site's RI and previous information, the PWS identified the ISTR treatment region as four areas spanning approximately 63,000 square feet (sq. ft) and totaling a volume of 66,200 cubic yards. The TTZ consists of the Northern Area from ground surface to 30 ft bgs, the Central Area from ground surface to 30 ft bgs, the Railroad Spur Area from ground surface to 25 ft bgs, and the saturated zone of the Trench Area from the water table (ranging from 22 to 28 ft bgs) to 5 ft into bedrock (approximately 40 to 54 ft bgs).

Additionally, six areas adjacent to these ISTR zones with contaminated soil above the water table totaling 2,150 in-place cubic yards has also been identified for excavation and thermal treatment. Soils requiring excavation in these areas are from ground surface to approximately five feet in depth, except for Area 5 where excavation is to be to four feet in depth over most of it with and a small portion to six feet in depth. The ISTR Treatment and excavation areas are shown on **Figure 4-1**.

Given that the majority of these TTZs start at the ground surface, the remedial design will need to incorporate methods to minimize loss of heat to the ambient air to enhance the volatilization of the

COCs in shallow soils to the maximum extent practicable. The chosen solution for this issue is to incorporate an insulated thermal cover over the ISTR areas. The cover will also function as a cap over a small permeable plenum area just underneath it to allow contaminant vapors and steam to be collected to maintain pneumatic control of the ISTR area and to prevent their re-condensing in shallow soils.

4.1.5 Contaminant Mass

The estimate provided in the PWS (**Appendix A**) of contaminant mass in the site's TTZ from previous investigations is 74,000 pounds (lbs). Relying on the results of prior in situ sampling and analyses, GEO modeled the in situ contaminant mass in order to evaluate the mass contours, concentrations and different types of COCs detected in the subsurface of the site. This effort was focused on determining the appropriate thermal remediation approach for the design process. Two distinct groups of COCs– VOCs and SVOCs – were previously documented in the subsurface of the TTZ. Two dimensional displays of both VOCs and SVOCs distributions over the ISTR TTZ were generated from these models and are presented in **Figures 4-2 and 4-3**.

Based on GEO's modeling of in situ contaminant mass within the volumes of the TTZ, an estimated 47,173 lbs of COCs exist in various phases. Of this total estimated mass, 30,300 lbs are composed of VOCs, while SVOCs occupy 16,873 lbs of the total, estimated COC mass. While GEO's modelling of in situ mass is considered conservative (i.e. biased to higher mass concentration metrics), GEO estimated that the TTZ may contain approximately 35,000 to 70,000 lbs of COCs (mass range at 90% confidence interval). The 70,000-pound upper limit of this range was considered by GEO as the design basis for critical ISTR elements (i.e., ISTR technology selection, vapor treatment system, well field arrangement).

4.1.6 Treatment of Multiple Media

The ISTR system is designed to focus primarily on contaminated soils, which will be largely addressed in four TTZs designated for this Site. The historical chemical releases of the former Diaz Chemical Corporation were from the manufacturing processes, drums, tanks, reactor vessels, product lines, containment systems, bulk wastes, stack vents, and poor housekeeping practices. These releases would have primarily impacted the surface and near surface soils, which would have then migrated to the site groundwater. Additionally, excavation and thermal treatment were selected to address contaminated soil above the water table in five areas adjacent to the four ISTR zones. To the extent that the ISTR soil treatment process will heat the subsurface over the defined target area, impacted site groundwater and soil gas in the soil pore space will also be treated by the ISTR process.

The Primary ISTR Performance Criteria identified in the PWS is consistent with these multiple media. Temperature increases within the vertical extent of the TTZ is the first criterion listed. This would cause a phase change of contaminants adsorbed to soils during volatilization. Any NAPL present would also be affected by this process. The increase in temperatures due to the ISTR process would also affect contaminants in groundwater as the soil vapor concentrations further increased. Diminishing return of contaminant mass recovery as they are removed by the treatment system's vapor and liquid recovery processes is the next criterion. Finally, specific ISTR soil concentration goals have been developed in the PWS for each of the site COC as determined from confirmatory soil borings over the vertical extent of the TTZ.

4.1.7 Site Logistics

The ISTR system will be constructed with considerations to existing surface obstructions, i.e., structures, vegetation, debris, former well bollards, railroad track siding remnants, concrete pads, etc. To the extent practicable and necessary, these will be removed (recycled or disposed) during site preparation/grading and as site roadways are prepared to allow for the construction and operation of the ISTR system. Existing wells within the proposed ISTR areas (Stage 1 and 2) that are not compatible with the temperatures that will be attained or may cause short circuiting of vapors or steam, will be abandoned in accordance with applicable requirements and with materials compatible to ISTR system criteria (sand, grout, etc.).

Where necessary, access agreements with select abutting residential properties will be developed, with the assistance of USACE and USEPA. This also includes a small portion of the ISTR area south of the Site leased from Orleans County by Genesee Valley Transportation Company. ISTR will be prohibited within 15 feet of any property boundary shared with a residential property and for this reason, all ISTR Stage 1 and 2 areas will be located outside of this buffer. In order to define specific locations for access, a property metes and bounds survey assessment will be performed to confirm comprehensive survey data previously completed.

Subsurface slabs, foundations, utility infrastructure, fill, debris, and other obstructions will likely exist below ground surface in the areas of both soil excavation and the ISTR system. In addition, there may be voids associated with these structures or other past site activities. Some of these may affect the workflow during soil excavation, or the performance of the ISTR system. A geophysical survey has been performed at the site to document subsurface conditions. These results will be reviewed during site preparation to determine if any specific steps need to be taken. Additional subsurface clearance will be performed immediately following site mobilization (if not earlier) to provide active utility safety clearance for drilling activities.

The historical building information presented in **Appendix A** will be used to assist the geophysical survey to determine areas of potential subsurface obstructions and voids. Subsurface materials or voids that may present interferences with the ISTR process may be removed or filled with flowable fill during site preparation. Neat cement (grout), air-entrained concrete and/or similar flowable materials such as sand should be used. All of these would have a positive impact in the shallow subsurface to increased temperatures, as compared to the alternative of an air-filled void space. The primary purpose of these flowable fill types is to materially replace the volume of air [gasses] in said void with a material that exhibits superior thermal diffusivity and thermal conductivity. Even if measurable shrinking or cracking of the flowable fill occurs, the thermal effects of such occurrence would not be detectable, since the fill material would still occupy the [void] volume previously filled by air [gasses].To the extent subsurface obstructions are left in place, either wellfield adjustments will be made and recorded on an as-built plan, or they will be documented, and attention paid during ISTR to its performance and whether in-place material is having an adverse effect.

4.1.8 Treatment in Stages

URS' design is based on treating the impacted soils in two stages (Stage 1 and 2). The plan for treating the impacted soils in stages, rather than all together or in more consecutive stages, was a function of limited energy and utility infrastructure at the Site, as well as funding installments outlined by the client. The PWS describes excavation of a total of approximately 2,150 in-place cubic yards from five excavation areas (Area 1 through Area 5). The PWS also describes ISTR of four areas (Northern Area, Central Area, Railroad Spur Area, and Trench Area) spanning approximately 63,000 sq. ft, totaling a volume of approximately 66,200 cubic yards.

URS plans to excavate the soil from the five excavation areas and spread it over the surface of the ISTR area to be treated in Stage 1 (all the Northern and Railroad Spur Areas, and the majority of the Central Area). Drill cuttings from Stage 1 wells and heaters will also be assimilated into this area. Stage 1 will be approximately 32,363 sq. ft and a total of 35,695 cubic yards. Following treatment of Stage 1, Stage 2 will commence. Stage 2 will consist of the second half of the Central Area, the remainder of the Railroad Spur Area, and all the Trench Area. Stage 2 will be approximately 30,726 sq. ft and a total of 35,325 cubic yards, and as with the Stage 1 area, drill cuttings from the Stage 2 areas will be assimilated into this area for treatment.

After heating of the first stage is commenced, well field installation efforts shall continue in the second stage areas. This sequencing will allow for minimal delays in decommissioning the first stage and the start of heating at the second stage. Effluent extraction & treatment equipment will remain installed in and around the existing, onsite building during operation of both stages (i.e. utilized for both stages). Key observations and efficiencies will be incorporated into Stage 2 for potential enhancements, based on Stage 1 performance.

The decision to perform the Stage 1 treatment in the upgradient portion of the TTZ prior to the Stage 2 treatment was made to minimize the possibility of recontamination during treatment. Selected monitoring of ISTR treatment stage areas will be performed to ensure that there is no recontamination of previously treated areas. Once a staged treatment area has met its Performance Criteria, and thermal treatment has been terminated, no further performance sampling of that area is anticipated. Appreciable contaminant mass from outside of the ISTR treated area is not expected to migrate to that area immediately following treatment. Following Stage 1 treatment, some MPE and temperature and pressure monitoring points (TPMP) points will be left in place adjacent to the

Stage 2 treatment boundary to be used for monitoring of vapors, pressures, and temperatures to confirm pneumatic and hydraulic control during Stage 2 treatment. Stage 2 MPE/SVE wells will be activated for 1-2 weeks prior to Stage 2 heating to ensure hydraulic and pneumatic control of the Stage 2 area to protect Stage 1. If there is evidence of lack of pneumatic control such as steam surfacing or pressure developing in Stage 1 during Stage 2 treatment, the team will consider additional monitoring and potentially sampling. Migration of any residual groundwater impacts following thermal treatment may occur into the treated areas, but only with time.

4.1.9 Well Field Concept and Vapor/Liquid Treatment Processing

An evaluation of the merits and risks of various in situ thermal treatment modalities (electrical resistance heating, thermal conduction heating, steam enhanced extraction, radio frequency heating, in situ smoldering, and electrokinetic treatment) was performed for the Site. TCH was selected as the preferred in situ heating method because of its robust predicted heating of lateral and vertical volumes, including bedrock, overburden and man-made subsurface features. As described above, based on the chemical nature of the COCs and the elevated boiling points of some of them, TCH was chosen as the most effective thermal application for ISTR at the Site. The GTR technique of TCH was selected as the preferred technology because it is less impacted by electrical power constraints and potential outages, as compared to other TCH options that primarily rely on grid electricity.

The use of gas is a more cost-efficient and sustainable fuel for ISTR, and the use of TCH will allow flexibility in the system to reach temperatures much higher than the boiling point of water, should they be necessary during the ISTR program to treat the VOCs and SVOCs. TCH heating was the application used in the Phase I pilot treatment on the Site. The target temperature identified in the PWS is 100°C or the boiling point of water. This temperature will ensure steam generation in the soil pore spaces and saturated soils. This target temperature should be enough to reach the eutectic points of many of the COCs, should some of them exist at the site in the pure NAPL phase. If higher temperatures are determined to be required to effect complete treatment, the TCH approach will allow for this type of flexibility.

The heater well design for the well field is a function of the Site's geology, hydrogeology, geophysical characteristics, and COCs. A close spacing array of 13 feet on center for the TCH heater wells has been chosen to provide aggressive and rapid attainment of steam generation temperatures to maximize treatment time at the target temperature of 100°C. The arrangement of the TCH wells was designed to achieve the target treatment temperature within approximately 80 days after system startup, with reserve capacity to achieve superheated temperatures in a majority of TTZ volumes, should such efforts be required as part of the project's adaptive change management. The heater wellfield spacing can be quickly rearranged both laterally and vertically depending on the baseline soil sampling data, without modification of the materials or control equipment.

All heater wells in the Central, Railroad Spur, and Northern Areas will be installed vertically, while heater wells in the Trench Area will be installed at an approximate ten-degree angle from vertical to account for the off-set due to the subsurface debris from the trenching activities and the overhead utilities in this area, unless vertical installation will be more effective in certain locations. The total number of TCH heater wells estimated to heat the subsurface to the target temperature is 227 (Stage 1) and 212 (Stage 2). The TCH heater wells will be installed to depths of approximately 3 to 5 ft beneath the floor of the TTZ in each respective area, or to the top of bedrock (except in the Trench Area) in order to ensure thorough and complete heating of the target treatment volume, considering estimated upward, convective heat losses. See **Figure 4-4** for the spatial array of the TCH heaters in the Stage 1 and 2 TTZs.

During the active heating phase of the ISTR program, comprehensive pneumatic and hydraulic control of the vapors, steam, and groundwater is critical for the recovery of contaminant mass, as well as to ensure that contaminants do not migrate away from the TTZ. For these reasons, a robust network of SVE and MPE wells will be installed within the TTZ at key locations. The arrangement of the shallow horizontal SVE, SVE and MPE wells was selected to provide adequate pneumatic and hydraulic control throughout the TTZ volumes, to maximize COC mass removal and to minimize risks of COCs being mobilized outside of the TTZ. Details of the locations and constructions of these wells for pneumatic and hydraulic control are described in Section 5 of this Phase 2 RAWP. Hydraulic control, as judged by groundwater elevations within the ISTR area, will not be monitored during active treatment as the heat and pressure generated during treatment will be too great to safely or effectively monitor these elevations. Groundwater elevations will be monitored outside the perimeter of the ISTR treatment areas using the existing well network and/or other ISTR-related monitoring points that allow such measurements.

A slightly greater-than-required density of TMPs (one each 900 sq. ft) versus one each 1,000 sq. ft as required) was selected to provide enhanced real-time monitoring of TTZ temperatures. This will align each subzone of the TTZ heating to correlate with the gridding of the confirmation performance sampling regime (i.e. one location each 900 sq. ft).

Vapor treatment approaches using one or several of the following technologies were assessed: vapor phase activated carbon adsorption, thermal oxidation, regenerative resin bed adsorption, vapor condensation, catalytic oxidation and steam regenerated media adsorption. Oxidation-based methods were not retained because of high energy (i.e. fuel) demands and the requirement to operate complex acid gas scrubbing units prior to atmospheric release of treated vapors. Regenerative methods were not retained as commercially available units were much smaller than the required flow rate (especially at peak COC loading concentrations).

Based on verification of the contaminant mass present in the TTZ, and modeling of the anticipated mass balance during heating, the vapor concentrations during the overall heating process (early, maximum vapor recovery, late) were used to determine the best practices necessary for wastewater and vapor control and treatment. Mass balance calculations for the vapor phase and soil treatment are presented in **Table 4-2**. This table represents a worst-case scenario equal to the predicted maximum peak vapor concentrations of all COCs. This scenario assumes that all vapor extracted and treated comes from the extraction wells in the highest soil concentration areas for each COC at peak mass loading. This table is provided for vapor treatment capacity and technology selection at stress conditions, to assure the mixture of contaminants can be effectively extracted and processed [treated] even in such a severe and unlikely scenario. The anticipated vapor concentration(s) are predicted to be significantly lower than the values in **Table 4-2**, especially during the first 45 days and last 45 days of system operation and vapor treatment.

Since early and late phases of each ISTR stage will generate lower levels of VOCs/SVOCs, vapor phase granular activated carbon (VGAC) will be the most cost-effective method of vapor control. Most of the COCs present at the Site have good adsorptive partitioning to VGAC. For those periods when much higher levels will be volatilized and recovered from the subsurface, a cooling-compression-condensation unit (C3) will be used. These two processes will also be used in tandem. This vapor treatment approach will remove more than 99% of the contaminants before atmospheric discharge and eliminate the potential for odors.

This selection of which vapor treatment process to use will be based on the composition and concentration of the influent [untreated] vapors entering the ISTR system upgradient of the C3 Technology module(s). The influent location from the wellfield vapors would be monitored using both a PID and COC analytical lab testing to determine a correlation factor between total VOCs and the concentrations of the COCs. In concert, PID monitoring of the influent directly before the C3 unit will also be obtained and compared. If this data is interpreted as (i) VGAC having sufficient capacity to treat the vapor for at least 96 hours without breakthrough; and (ii) the economic variables and outputs from such a change are favorable, then one or several of the C3 Technology module(s) may be temporarily bypassed. Production of NAPL from the C3 system will also be used as a metric for determining if VGAC alone could be used. It is anticipated that the VGAC system will be solely used only at the initial and ending phases of the ISTR treatment.

A dual, parallel extraction pump approach was selected to provide an independent pump to each of the SVE and MPE trains, respectively. This redundancy was chosen to prevent a pump failure (or downtime maintenance) from shutting down the entire effluent extraction system.

From observations during the bench-scale treatment (Kemron, 2013) that nitric and other inorganic acids were present in the condensed vapors, a scrubber unit (direct contact heat exchanger) will be designed to manage pH levels in the early part of the vapor influent stream to protect down-stream process equipment.

An aqueous phase stream will be generated from the ISTR process. This may include groundwater from the MPE or other wells for hydraulic control, and from steam condensate produced during the cooling of the recovered vapors. Liquid and wastewater treatment approaches using one or several of the following technologies were assessed: liquid phase activated carbon adsorption, regenerative resin bed adsorption, air stripping, physical separation, ultraviolet (UV) treatment and chemical oxidation techniques. Regenerative resin and UV treatments were screened out of the selection process, as they carried high costs and were not necessarily required to meet water quality goals for discharge. As most of the contaminants will remain in the vapor phase, very little VOCs/SVOCs will partition to the liquids. For this reason, wastewater treatment design will consist of liquid phase GAC (LGAC) due to its simplicity, reliability, and scalable cost basis.

4.1.10 Permits, Notifications, and Approvals

Under CERCLA, response actions are exempted by law from the requirement to obtain Federal, state, or local permits related to activities conducted completely on site; however, this does not remove the requirement to meet substantive provisions of applicable permit regulations. URS shall be responsible for identifying permits that would be required at a non-CERCLA site to conduct the activities described in the PWS. URS shall provide the Government with documentation of meeting the substantive requirements of permits not required but applicable.

In accordance with these provisions, and in consideration of the project's impacts outside of the site boundaries themselves, several permit equivalent agreements and approvals will need to be obtained prior to commencement of work. These include local (Village of Holley) approvals, NYSDEC permits or approvals, and permits/approvals/agreements from private (third party) entities. Required permits and approvals are further described below, and agency/ approving entity contacts for each are presented in **Table 4-3**.

4.1.10.1 Village of Holley Permits and Approvals

Based on initial discussions with Village of Holley government officials, formal building permits are not required for the work. However, application must be made for both water/wastewater and electrical service, which is administered by the Village. This application form is included in **Appendix B**. The plans for sewer tie-in and site restoration will also require Village approval. Specific electrical and gas plumbing work will likely require review by the Village inspectors.

Discharge of treated water to the sanitary sewer also will not require issuance of a formal permit; however, it is anticipated that an approval letter will be issued for the proposed discharge. The proposed discharge plan was presented to representatives of the Village and their Publicly Operated Treatment Works (POTW) during a meeting on February 11, 2020. It is understood that their discharge analytical requirements include Biological Oxygen Demand (BOD), COCs only, total dissolved solids, total suspended solids, and ammonia. A request to the POTW for approval confirming acceptable discharge flow, and analytical and discharge requirements is provided in **Appendix C.** A copy of the approval of discharge to the Village will be provided under separate cover once received. Discharges will also comply with the requirements of the PWS (02 61 18 Section 1.7.4) including meeting site groundwater cleanup goals (**Table 4-1**) or similar analytical limits, as well as the requirements outlined below.

The proposed discharge connection will be made to the existing manhole located on Jackson Street to the west of the site entrance. A system interlock and controls will be installed to shut down the discharge pumping in the event of a backup within the localized sewer system. Because of a significant elevation difference, the interlock and controls will not serve to shutdown flow in the event of a system backup further downstream within the primary system. In that case, the Village POTW will provide direct communication to the on-site operational team. A curb and roadway cut will be performed to allow for connection to the manhole. The specific method of connection will be discussed with the Village for incorporation into a detail drawing for Village review and approval. The curb and roadway cut will be restored in kind following completion of the connection. A plan of the sewer tie-in construction is provided in **Figure 4-5**.

Discharging to the sanitary sewer requires the following:

- A minimum onsite holding capacity of 48-hours, primarily utilized during high precipitation or snow melt events and as directed by the Village of Holley
- All flow rates are subject to approval from the Village of Holley
- Submittal of discharge monitoring data (including available preliminary data) to the Village of Holley by the 28th of each month.

4.1.10.2 Utility Permits and Approvals

Approvals will be needed from the gas service provider (NYSEG) for the natural gas connection in support of project needs. A NYSEG Gas Request Form is included in **Appendix D**. Electric service is administered by the Village of Holley, and application for electrical service must be made to the Village as described above. It is understood that no other specific permits, including Village or County permits, are required to establish these utility connections at the site.

4.1.10.3 New York State Permits and Approvals

An Air Permit Equivalent request has been submitted to the NYSDEC for review and approval of emission discharges and off-gas treatment in accordance with the PWS. The project’s treatment emission rates, monitoring, and reporting requirements must be consistent with the air permit equivalent, the basis of which is described as follows:

> *“The 6 CRR-NY Part 212 regulations (212-1.4(a)) provides a reference to Subpart 201-3 that indicates air Strippers and soil vents that are operated at a Superfund site are trivial and exempt from permitting requirements and NYSDEC confirmed that since the Diaz Site is a USEPA regulated Superfund site, the exemption applies and a full formal permit is not required. However, as stated under 6 CRR-NY 201-3.3(b), the owner or operator of any emission source or activity that is listed as being trivial, on the basis of the use of appropriate emission controls, shall operate and maintain those controls in a manner consistent with manufacturer’s*

specifications and good engineering practices. Exempt treatment systems are required to comply with the substantive regulations in Part 212."

Based on correspondence and discussions with NYSDEC regional and central office representatives, NYSDEC's review of anticipated treatment performance and emissions levels using the best available control technology (BACT) and a perimeter air monitoring program was determined to be sufficient for approval of the Air Permit Equivalent. The air permit equivalent package, subsequent communications submitted to the NYSDEC, and the approval letter are included in **Appendix E**.

Since it is expected that all wastewater discharges will go to the sanitary sewer, no state pollutant discharge elimination system permits will need to be obtained. The site is not located within any federal or state jurisdictional wetland areas; therefore, no wetlands permitting will be required.

No formal permits are required for drilling or abandonment activities. Wells will be abandoned in accordance with NYSDEC CP-43 by a New York state licensed driller. The driller will prepare a well abandonment form for each decommissioned well. Existing wells within the thermal treatment zone or in proximity to the TTZ that may experience significant temperature increase must be abandoned with high temperature cement grout.

4.1.10.4 Access Agreements

Project work may take place on or otherwise impact private properties adjacent to the site. Project work will require coordination with the railroad company which operates along the rail line located to the south of the site. Based on discussions with Genesee Valley Transportation (GVT, the railroad), an entry permit will be required for any work that encroaches on the railroad property. GVT will review the application and determine the need for flagmen during construction work conducted proximate to the railroad. The entry permit application form is included in **Appendix F**.

Access agreements may also be needed from owners of the residential properties to the north and east of the property. This access may be needed due to the proximity of the excavation limit and the existing fence line along the property boundary. Furthermore, select trees may need to be removed due to potential impacts from the excavation work and thermal treatment. It is assumed that the USACE will assume responsibility for obtaining any access agreements with the residential property owners.

The ISTR system fundamentally provides heat directed to multiple depths of the subsurface in a comprehensive fashion in order to cause volatilization and steam stripping of COCs, with the subsequent vapor extraction and treatment of steam and contaminant vapors via above-ground equipment. Key design criteria and detailed design information for the various ISTR components and monitoring processes are presented below.

5.1 HEATING MODEL

Using the basis of design information presented in Section 4 of this document, a heat transfer model was completed using site-specific factors for the TTZ. The time to achieve and maintain target temperature during thermal remediation is a product of the net sum of energy flux through the given treatment volume. In a simplified model, this is the sum of the energy input, minus the energy leaving the treatment volume (through heat transfer to soils above, below, and through the sides of the treatment volume), the heat energy being lost through groundwater flow impacts, as well as the energy being extracted from the subsurface through MPE and vapor recovery operations. The heat transfer model calculated an 80-day heating period to reach target temperatures. The energy balance parameter values are presented in **Table 5-1** below. A description of the model and a spreadsheet of the modeled temperatures with respect to time of heating is presented in **Appendix G**.

TABLE 5-1 ISTR HEAT TRANSFER MODEL PARAMETERS

DIAZ Energy Balance Table	Initial Heating to 100°C Design TTT	Maintenance Heating at 100°C Design TTT
Total volume (cubic yards), TTZ	2.97E+04	
Total volume (cubic yards), heated zone	4.20E+04	
soil weight (lbs)	9.19E+07	
GW weight (lbs)	1.80E+07	
soil heat capacity (BTU/F)	3.49E+07	
GW heat capacity (BTU/F)	1.80E+07	
total heat capacity (BTU/F)	5.29E+07	
total energy requirement (BTU)	8.10E+09	
net energy requirement (KW)	1.24E+03	
TCH fuel input rate, average (KW)	4.28E+03	2.14E+03
vapor and steam energy removal, average (KW)	1.76E+03	1.53E+03
heat loss top, average (KW)	6.16E+01	7.20E+01
heat loss from sides and bottom, average (KW)	3.67E+02	4.34E+02

DIAZ Energy Balance Table	Initial Heating to 100°C Design TTT	Maintenance Heating at 100°C Design TTT
Initial Temperature (°C)	15	
Target Treatment Temperature (°C)	100	
Average Heating Rate to 100°C (°C/day)	1	
Estimated Duration of Total Active Heating (days)	233	
Estimated Duration of Heating to 100°C (days)	80	
Estimated Duration of Heating at 100°C [stipulated in PWS, Section 011100 1.4.4 f] (days)	153	

Notes:
BTU - British thermal unit
F - Fahrenheit
KW - kilowatt

The designed conductive heating process is uniform in both its vertical and horizontal outputs. The relatively consistent thermal properties of the site's soil result in similar heating of the TTZ, regardless of whether clays, silts or sand predominate different regions. Although the target treatment temperature is 100°C, it is expected that superheated temperatures will be attained in a subset of the TTZ (i.e. temperatures greater than the boiling point of water, occurring only in dehumidified or dried soils). Shallow vadose and capillary fringe soils are predicted to become superheated, especially after about 90 days of maintenance heating at steaming temperatures. As this superheating occurs, any dense silts and clays that are present will dry and fracture, creating closely spaced airflow paths connecting to nearby extraction well(s). This provides additional permeability for vaporized contaminants to migrate toward the vacuum wells, even in very tight clay. The resultant heating and extraction interplay provide predictable, systematic COC removal capacity throughout the TTZ.

5.2 ISTR SYSTEM ENERGY DEMANDS

The ISTR system designed for the Diaz Chemical Site requires two sources of energy: 1) Natural Gas to provide the necessary heating requirements, and 2) electricity to operate the above ground extraction, collection and treatment systems. The TCH design approach has been estimated to achieve an energy injection rate of roughly 2 KW/meter of heater well length up to when the target temperature is reached, and then a reduction to from 1.1 to 1.5 KW/meter of heater well length during the maintenance period at the target temperature. The following energy will be required to operate the ISTR system:

1. For Stage 1 (day 1 through day 233)

   a. Natural Gas: 7.38E+05 Therms of natural gas (at a mean rate of 3.17E+03 Therms per day). This assumes 100% of TCH wells operating from day 1 through day 180, then 50% of TCH wells operating from day 181 through day 233.
   b. Electricity: 3.36E+06 kilowatt hours (kWh) of electricity will be delivered to the ISTR system at approximately 1,600 amps (480v 3ph), mean full load running amps estimated at 1,200.
2. For Stage 2 (day 1 through day 233)
   a. Natural Gas: 7.38E+05 Therms of natural gas (at a mean rate of 3.17E+03 Therms per day). This assumes 100% of TCH wells operating from day 1 through day 180, then 50% of TCH wells operating from day 181 through day 233.
   b. Electricity: 3.36E+06 kWh of electricity will be delivered to the ISTR system at approximately 1,600 amps (480v 3ph), mean full load running amps estimated at 1,200.
3. For the continued operation of the effluent extraction and treatment system for ~20 days after the cessation of active subsurface heating (*each* stage; typical of one of two stages)
   a. Electricity: 2.88E+05 kWh of electricity will be delivered to the effluent extraction and treatment system component of the ISTR system.

5.3 WELL FIELD DESIGN

The well field design for Stage 1 and Stage 2 is detailed in the following sections. TCH wells and baseline soil sampling will be installed primarily using sonic drilling techniques. A small amount of these may be installed using auger methods. The majority of MPE/SVE wells will be installed using auger techniques, with a minority placed using sonic drilling. All TPMPs will be placed using sonic drilling. Specific details related to the management of drilling cuttings is provided in the Waste Management Plan which is attached to the Environmental Protection Plan (EPP) for this project (**Appendix H**). **Figure 4-4** lays out the overall well field design for Stages 1 and 2. Note that the ISTR well density in the southern Railroad Area is less than in other parts of the wellfield due to the inaccessible slope just beyond the Diaz site boundary. Further details on this area are presented below. The specific installation location coordinates and well identifier names for each type of ISTR well will be provided in as-built drawings once construction is completed. The well field design for the project (total for both Stages) consists of the following components.

5.3.1 TCH Heater Wells

A total of 439 TCH heater wells will heat the subsurface from the ground surface (beneath the insulating surface cover) to the prescribed depth, i.e., overburden except for Trench Area. This density is designed to achieve and maintain the required temperatures in the TTZ. Note that all TCH wells for Stage 1 shall be installed vertically (**Figure 5-1**), with the exception of the Railroad and Trench Areas. The last row of TCH wells in the southern Railroad Area will be installed at angles towards the toe of the slope to allow for heating with depth (**Figure 5-2**). Additionally, TCH wells in the Trench area shall be installed at an approximate 10-degree angle from vertical (**Figure 5-3**) unless site logistics allow them to be installed vertically. Unlike the other treatment areas on the site, the heating in the Trench Area will begin at depth (22 to 28 ft bgs depending on depth to groundwater). The burner nozzles in these TCH heater wells will be set at a depth of 15 ft bgs in order to focus heating and effectively utilize the energy applied. The TCH heater wells will consist of a 5-inch diameter Schedule 40 carbon steel outer well casing with a 3-inch diameter, Schedule 10, stainless steel inner liner, surrounded by medium sand backfill and sealed at the top with refractory cement grout.

5.3.2 MPE Wells

A total of 172 Dual-Nested or proximately located MPE/SVE wells will be located throughout the TTZ (**Figure 4-4**), and will act as the primary COC extraction points, removing COC vapors, liquids and steam. The MPE wells will serve to maintain pneumatic and hydraulic control of the TTZ during all phases of heating. The vertical extraction wells will be constructed of 3-inch diameter carbon steel risers with a slotted steel screen (**Figure 5-4**). Following the installation of the extraction wells into their respective boreholes, the coarse sand pack will be installed in the annular space from the bottom of the borehole to a depth of 1 ft bgs. The annular space above the sand pack will then be filled with a high-temperature grout (~3 feet thickness) to the surface of the insulating cover to create the surface seal.

An inner 0.75-inch diameter stainless steel “stinger” tube (capped and slotted) is installed into the well and a cap covers the well. The “stinger” tube is placed at the bottom of the well and uses an air-assisted removal mechanism designed to commence liquid extraction (no manual adjustment of the stinger tube’s height is required). Note that all wells in the Central, Railroad and Northern areas shall be installed vertically, while wells in the Trench area shall be installed at an approximate 10-degree angle from vertical (**Figure 5-3**) unless site logistics allow them to be installed vertically.

The operational strategy is to dewater the wellfield prior to initial heat-up and then as heat is added, MPE well recovery will primarily remove vapors. Details on the steps to evaluate MPE hydraulic recovery is provided in the Operations and Maintenance (O&M) Manual (**Appendix I**).

The hot groundwater conditions at the MPE wells will require modification of the MPE wellheads to allow safe sampling and acceptable water samples. See **Appendix J** for details on the MPE wellhead modifications necessary for hot groundwater sampling.

5.3.3 SVE Wells

A total of 90 dedicated SVE wells will be located throughout the TTZ (**Figure 4-4**) and will act as the primary off-gas extraction points, removing COC vapors and steam. The SVE wells will maintain pneumatic control of the TTZ during all phases of heating (**Figure 5-5**). Note that all wells in the Central, Railroad and Northern areas shall be installed vertically, while wells in the

Trench area shall be installed at an approximate 10-degree angle from vertical (**Figure 5-3**) unless site logistics allow them to be installed vertically.

5.3.4 Horizontal Vacuum Extraction Points

A total of 99 two-inch diameter slotted carbon steel horizontal vapor extraction 21-foot lateral wells will be placed in the bedding (stone) just beneath the insulating vapor surface cover (**Figure 4-4**). These HSVE wells will be installed for Stage 1 above the incorporated soils under the insulating cap. (**Figure 5-6**). The horizontal points will be operated for pneumatic control to prevent any contaminated vapor accumulation in the upper vadose areas, especially during periods of peak steam production.

5.3.5 Temperature & Pressure Monitoring Points

At least 73 TPMP will be used to document heating effectiveness from just below the ground surface to the bottom treatment depth within the TTZ (**Figure 4-4**), with sensors placed at multiple vertical intervals. Three scenarios will exist, a TPMP installed within the TTZ through the incorporated soil, a TPMP within the TTZ outside of the incorporated soil, and a PMP outside of the TTZ (**Figure 5-7**). Each TMP will be cased in a 1.0-inch composite pipe and will contain thermocouples placed at 3 feet depth intervals within the TTZ from the ground surface to a terminal depth of 30 ft bgs (mean), with the exception of the Trench Area. Four additional TPMPs will be installed along the southern slope of the Railroad Area outside the TCH heaters to allow for monitoring temperature, pressure, and PID screening beyond the Diaz property boundary (**Figure 5-2**). Each point will contain one PMP in the upper portion of the vadose zone. Dedicated PMPs will also be installed within 5 feet of the outside perimeter of the ISTR treatment area and used to monitor pneumatic control during heating (**Figure 5-7 and Figure 5-8**).

5.3.6 Down-gradient Well Design

Based on the proximity of the Northern ISTR Area to the primary Stage 1 ISTR Area and because the area immediately downgradient of the Northern ISTR is in soil excavation area 1, no downgradient monitoring well specific to the Northern Area has been proposed to monitor hydraulic control. Any loss of hydraulic control from the Northern ISTR area would migrate down gradient and be captured by the primary Stage 1 hydraulic recovery system.

With respect to the ISTR Stage 1 treatment area, two co-located MPE/SVE wells will be placed downgradient in the Stage 2 treatment area (**Figure 5-9**). These will be used for monitoring visual steam, temperatures, vacuums/pressures, groundwater elevations (to the extent possible), and COC concentrations prior to and during Stage 1 treatment for hydraulic and pneumatic control purposes.

Regarding the area downgradient of the Trench ISTR Area, URS reviewed the geology and hydrogeology sections of the Final RI Report prepared by CDM Smith dated July 10, 2012. A mean hydraulic conductivity value, average groundwater seepage velocity and groundwater travel distances (for variable number of days) were calculated for overburden and bedrock. A summary of these calculations is provided in **Table 5-2**. The calculations show that the seepage velocity of the groundwater in the glaciolacustrine deposits is slow (0.204 feet per day [ft/d]). Due to a lower hydraulic conductivity the weathered bedrock zone had an even lower seepage velocity of 0.140 ft/d. It was estimated that it will take approximately 75 days for groundwater to travel a horizontal distance of 15 feet in overburden and over 100 days for groundwater to travel 15 feet in the weathered bedrock zone. Given that down-gradient monitoring wells are to be installed no less than 15 feet from the downgradient edge of the ISTR treatment areas, based on the slow groundwater flow velocity, the default distance of 15 feet will be used. The location of the ten monitoring wells (DG-1 through DG-10) in the down-gradient transect are shown in **Figure 5-9**.

Four 2-inch diameter steel casing wells will be installed using sonic drilling techniques downgradient of the ISTR Central/Railroad Spur Areas that will be screened in the glaciolacustrine deposits. These proposed wells include DG-1S through DG-4S. The treatment depths in the ISTR Central/Railroad Spur Areas includes the saturated overburden only and ranges from approximately 25 to 35 ft bgs. Therefore, each of these 2-inch wells (DG-1S through DG-4S) will be constructed using 10-ft long well screens that will be set above top of bedrock in the shallow aquifer zone.

The treatment depths of the ISTR system in the Trench Area are much deeper than the Central/Railroad Spur Areas and ranges from 40 to 54 ft bgs. The saturated thickness of the overburden deposits downgradient of the ISTR Trench Area ranges from 10 to 12 feet or less, depending on the groundwater table elevation. COCs have been observed in bedrock up to a depth of 54 ft bgs in this area. Therefore, three sets of 4-inch diameter steel casing well couplets (6 total wells) will be installed using sonic drilling techniques downgradient of the ISTR Trench Area. Each couplet will consist of one well screened in the glaciolacustrine deposits (S) and one in the fractured bedrock (BR). These couplets are identified as DG-5S/DG-5BR, DG-6S/DG-6BR and DG-7S/DG-7BR. Each overburden well will be installed above top of rock. Each bedrock well will be installed such that the top of the well screen will be 3 ft below the top of rock. Additionally, an existing well cluster, MW-105 S/SR/DR located approximately 20 feet east of the southern portion of the Trench Area, will also be used as a downgradient monitoring well (**Figure 5-9**). As can be seen from historical site information, the expected depth to bedrock is greater in the southern portion of the Trench Area than the northern section. Well construction details are provided in **Figure 5-10** and **Table 5-3**.

TABLE 5-3 DOWNGRADIENT WELL CONSTRUCTION DETAILS

Well	Approximate Ground Surface Elevation (ft AMSL)	Well Diameter (inches)	Length of well screen (ft)	Bottom of screen above top of rock	Top of screen 3 ft below top of rock	Approximate depth of top of screen (ft bgs)	Approximate depth of bottom of screen (ft bgs)
DG-1S	545	2	10	X		25	35
DG-2S	545	2	10	X		25	35
DG-3S	545	2	10	X		25	35
DG-4S	545	2	10	X		25	35
DG-5S	538	4	12	X		21	33
DG-5BR	538	4	12		X	35	40
DG-6S	535	4	12	X		24	36
DG-6BR	535	4	12		X	35	40
DG-7S	544	4	12	X		27	39
DG-7BR	544	4	12		X	40	45
MW-105S	559.2	2	10	534.2	544.2	15	25
MW-105SR	559.2	3	10	512.2	522.2	37	47
MW-105DR	559.2	3	3.2	503.7	506.9	52.3	55.5

Note: Elevations and depths are approximate. Final Construction details may be modified by the field geologist after consultation with project team

5.3.7 Insulated Thermal Cover

An insulating cover will be installed over the TTZ after well installation and excavated soil placement works have been substantially completed. This cover will provide a >20 R value to mitigate heat lost to atmosphere from shallow soils. The cover will further ensure capture of off-gas contaminants from the vadose zone via the horizontal SVE laterals described above (**Figure 5-6**). The hybrid-type insulating surface cover will allow for the reuse of a portion of the cover material from Stage 1 to Stage 2 of the project. The specifications of the cover material are presented in **Table 5-4**.

TABLE 5-4 SPECIFICATIONS FOR INSULATING SURFACE COVER

Layer	Section	Material	Specification
Support	Conveyance Support	Interlocking grid tiles	<1 R typical; recyclable UV-stabilized polypropylene calcium aluminate-based cement; 900°C rating

Layer	Section	Material	Specification
Top	Centers	Hardscape surface layer	Road base
Top	Proximate to Wells	Refractory cement	13 R typical; 1,000°C rating
Middle	ALL	Insulation layer, core	22 R typical; closed cell thermal insulation core with reflective reinforced foil outer surfaces overlapped and sealed with High temp foil tape
Base Lower	ALL	Vapor extraction plenum and base	#57 gravel or crushed stone
Base	ALL	Vapor extraction plenum and base	Construction Grade Expanded Perlite

5.4 UTILITIES

The following utility connections shall be made to the ISTR equipment:

5.4.1 Gas

The plan is to supply natural gas to the ISTR equipment via a connection to the natural gas main line located along the north side of Jackson Street. This main line will be a medium or high-pressure line, and therefore the pressure and volume of this main line will be enough for ISTR operations, subject to the NYSEG verification. The natural gas connection will be able to supply 18 MMBTU/hour at a metered connection of at least 5 psi.

Supply of the selected fuel to the network of TCH wells will be in accordance with applicable regulations, and shall include proper materials selection, materials testing, use of backflow preventers, regulators, and high visibility type piping. Additionally, each heater unit has an individual [secondary, internal] regulator and backflow preventer system that controls the pressure and flow from the fuel source to the individual heaters and prevents both high flow and backflow to the gas distribution system (**Figure 5-1**). The layout of the combustion air and natural gas manifold piping and tie-in point for the project is set forth in **Figures 5-11 and 5-12**.

Fire extinguishers and emergency shutoff valves will be located throughout the project installation, in compliance with OSHA standards and regulations. During thermal heater operations, regular monitoring of air quality in the heater well field for Lower Explosive Limit, and carbon monoxide vapors will be performed. Further details are provided in the GEO Site Safety and Health Plan (SSHP), which is attached to the project Accident Prevention Plan (APP)/SSHP.

5.4.2 Electricity

Electricity is required for operation of the effluent extraction and treatment system and TCH controls. The plan is to supply electricity to the ISTR equipment via a connection to the existing onsite transformers (subject to a functionality verification of this equipment). A metered electrical supply will be provided by NYSEG to a master electrical control panel [4 x 400-amp, 480-volt, 3 phase breakers] positioned in the equipment compound. The electrical supply from the transformer(s) to the ISTR equipment panel will supply 3 x 400 amp as well as 2 x 200-amp circuit breakers (480-volt, 3-phase) located in a single conex box or similar arrangement. Connections shall be temporary in nature, using flexible portable cord in place of conduit connections. The electrical one-line diagram for the ISTR system is presented in **Figure 5-13**.

A back-up generator will be installed and commissioned to provide an alternate, standby electrical power source capable of operating the ISTR vapor and liquid extraction treatment equipment as well as monitoring and controls to maintain pneumatic and hydraulic control in the event the primary electrical power source is lost. This generator will be paired with a diesel fuel storage tank of approximately 500 gallons capacity in order the ensure the generator can provide electricity required to maintain pneumatic and hydraulic control without refueling for at least 24 hours. This module will be installed and set to standby mode with an automatic transfer switch to engage the module automatically upon loss of primary electrical power. The primary fuel source for the module will be diesel fuel and the module's engine shall be USEPA Tier 4 Final certified.

Table 5-5 below sets forth the specifications of the electrical backup module's systems

TABLE 5-5 SPECIFICATIONS OF ELECTRICAL BACKUP MODULE'S SYSTEMS

System	Parameter	Specification
Generator	Emissions Certification	Tier 4 Final emissions compliant
Generator	Observed Noise	72 dB(A) at 23 feet
Generator	Standby Output	264 KW (330 KVA)
Generator	Prime Output	240 KW (300 KVA)
Generator	Fuel Consumption at Predicted Loading	13 gallons per hour diesel fuel
Engagement	Method of Activation	Automatic Transfer Switch
Fuel Tank	Capacity	500 gallons diesel fuel

Notes:
dB(A) – inverse of the 40 dB (at 1 kHz) equal-loudness curve for the human ear
KVA - kilovolt-amps

5.4.3 Potable Water

Potable water will be required at the site for project operations. It is assumed that a ¾-inch hose bib connection is enough for approximately 3,000 gallons per day maximum use, primarily for the use of makeup cooling water of the vapor effluent leading into the effluent treatment systems. Potable water will also be required for drilling, decontamination, and other purposes.

5.4.4 Wastewater Discharge Connection

A connection to the sanitary sewer for POTW processing will be required for ISTR system treated wastewater discharge (**Figure 4-5**). The connection will meet the following requirements for continuous treated wastewater discharge: mean flow of 5,000 gallons per day; and peak flow of 10,000 gallons per day. The majority of this will be contact wastewater with only 1-2% from non-contact water sources such as heat exchange cooling tower blow down. At the sewer tie-in point located within the sanitary sewer manhole or near the storm sewer inlet, a float monitoring system and system interlock will be installed to stop discharge in the event of overflow in the receiving sewer. A manual lockable valve will also be installed on the discharge line.

5.4.5 Freeze Protection

Freeze protection mitigations shall be installed and operated to prevent ice accumulation or blockages. A listing of these measures includes:

- Immersion heater elements in water collection and storage tanks
- Heat tracing lines
- Insulation of process flow conveyances and piping for:
  - Vapor / liquid separators
  - Water lines (portion)
  - Liquid lines (portion)

5.5 VAPOR AND LIQUID EXTRACTION AND TREATMENT

5.5.1 Extraction Conveyances

In this ISTR application, the vapor and liquid extraction systems and piping were designed using a recovered airflow and steam recovery rate of approximately 3,000 to 3,600 standard cubic feet per minute (scfm) from the total wellfield (condensable plus non-condensable flow in both the SVE and MPE lines). Additionally, 1,500 to 1,800 scfm at the SVE and MPE blowers (primarily non-condensable flow) and a liquid extraction/production rate of 3 to 25 gallons per minute (steam produced water and extracted liquid) were used as the design basis for the TTZ. Specifically, the vertical SVE and horizontal SVE flows are combined from one blower with a 600 scfm air flow design basis, or about 6-8 soil pore volumes per day total. Mass balance calculations are presented in **Table 4-2**.

The design basis for the recovered airflow/steam recovery rate is based on the required rate/volume that is required to maintain pneumatic control of the TTZ while accounting for the removal of steam (i.e. volumetric subsurface expansion of a small percentage of water that transitions from liquid to vapor phase). The design basis for the liquid extraction/production rate is based on the hot moist vapor and steam condensation rate when TTZ soil temperatures approach/stabilize at 100°C, which are estimated at 5-10 gpm, with a minimum flow of 3 gpm, an average of 7 gpm and a peak of 10 gpm. A conservative safety factor of a maximum flow rate of 25 gpm limited to a period of 4 hours has been estimated based on uncertain groundwater flows from the MPE wells.

The extraction conveyances will be constructed of chemical-resistant hoses connected to a main 4-inch or 6-inch steel manifold. All extracted media from the extraction wells is directed to the effluent treatment portion of the system. The vapor manifold piping system and connection to the SVE equipment compound is shown in **Figure 5-14**, while the MPE manifold piping system and connection to the MPE equipment compound is shown in **Figure 5-15**. A cross-section drawing of the well field conveyance and piping rack orientation is presented in **Figure 5-16**.

5.5.2 Vapor Processing

The vapor extraction and treatment systems include the following general components and sequential processes:

- Separation of vapors and liquids via air/water separators. Five vapor/liquid separators (also referred to as "knock outs") will be included in the effluent treatment system. Five vapor/liquid separators with 124-gallon capacity each are constructed of stainless steel to withstand the expected high concentrations of COCs in the effluent stream. Each vapor/liquid separator will be equipped with an alarm, high- and low-level switches. A 6.5-inch diameter cleanout will be used should manual cleaning or inspection be required.
- Hot vapors leave the knock-out separators and travel through an acid scrubber system (a contact vapor cooling tower) to neutralize any potentially generated inorganic acids extracted during the ISTR process, in order to protect downstream equipment. Vapors entering flow upward through polypropylene packing media while a caustic solution is introduced through a series of spray nozzles at the top of the tower. The spray rapidly cools the hot vapor stream. Resultant liquid condensate will drain by gravity into the scrubber sump tank. A portion of this liquid from this sump tank is then conveyed by pump to the wastewater (liquid) treatment module.
- Primary cooling of the recovered off-gas via heat exchangers, where condensable volumes of off-gas are recovered as liquids (C2 Technology). Two tube-in-shell type heat exchangers connected to chilled water (refrigerant) will be utilized to cool the off-gas leaving the vapor extraction wells prior to the vacuum blower. Cooling the off-gas is necessary to obtain optimal operating conditions for the downstream process equipment.
- Vacuum pumps; Two (2) rotary lobe type vacuum blower(s) will be capable of supplying up to 1,500 scfm (primarily non-condensable) flow rate each during operation of the extraction wells. A pulley-type drive system, with safety cage, will connect the blower and motor. Each of the SVE and MPE trains will be equipped with its own dedicated blower/motor/control system.

- Cooling of off-gas stream after the vacuum pumps. Two additional tube-in-shell type heat exchangers connected to chilled glycol (refrigerant) will be utilized to cool the off-gas exiting the vacuum blowers. This will allow for the control of temperature and humidity of the off-gas entering the vapor treatment module (VGAC filtration with or without C3 Technology removal of COCs).
- Further condensation of VOCs from off-gas (portion of off-gas treated by C3 Technology module). The vapor treatment system is comprised of the C3 Technology 500 scfm off-gas condensation module designed to recover 99% or greater VOC content from the air stream. This system is selected to cope with the high expected concentrations of VOCs to-be-recovered as off-gas. The main components of this system are the air compressor unit (COMP1), the heat exchanger / chiller unit (C1) and the refrigerated condensation and regenerative filtration unit (See details of C3 System in **Appendix K**).
- Recovered NAPL for offsite disposal (integrated NAPL collection, storage tank). A chemical storage tank of 2,000 to 4,000-gallon capacity will be used to collect and temporarily store any separated NAPL and condensate from the vapor treatment system. This tank shall be constructed of materials compatible with the COCs (i.e., steel) and shall be double-walled and double-contained UL-142 type.
- VGAC filtration prior to atmospheric discharge. Two vessels of vapor phase activated carbon (2,000-pound fill each) shall treat off-gas vapors prior to atmospheric release, pursuant to the substantive requirements of the air permit equivalency metric (pending NYSDEC guidance). Two additional backup VGAC vessels will be plumbed into the vapor treatment system and shut off until the first set of VGAC vessels are saturated, at which point the backup set will be put on-line while the spent set are being removed and disposed. The total consumption of VGAC material during both stages of ISTR operations is expected to be 32,000 lbs. Final need and requirements of the primary vapor treatment system will be determined by the air permit equivalency documentation pending NYSDEC issuance.

5.5.3 Liquid Processing

The liquid extraction and treatment systems include the following general components and sequential processes:

- Liquid pumps. Multiple ¾ horsepower liquid-phase pumps will be connected to the process equipment for conveyance of liquids to the aqueous phase (wastewater) treatment system at each knock out tank, the weir tank, and holding tank.
- Weir Tank. Aqueous phase liquids separated in the MPE and SVE streams is first directed to one 18,000-gallon capacity weir tank. This weir tank will equalize flow through the remaining system and separate solids, preventing downstream clogging. Separation of solids, NAPLs and aqueous phase liquids will occur in this tank.
- Bag filters. The bag filter assembly will be rated for a flow of at least 40 gallons per minute. The bag filter socks will remove/filter remaining solids from the wastewater flow.

- LGAC filtration. Two vessels of liquid phase activated carbon (500 - 1,000 lbs fill each) shall treat wastewater prior to holding tank and POTW discharge, pursuant to the substantive requirements of the permit equivalency metrics (pending Village of Holley guidance). The total consumption of LGAC fill during both stages of ISTR operations is expected to be 8,000 lbs or less. Final need and requirements of the primary water treatment system will be determined by Village of Holley.
- Holding Tanks. Treated water exiting LGAC2 will be directed to holding tank consisting of two frac tanks of 21,000-gallon capacity each. At the expected normalized, continuous flow rates of water treatment of between 5 and 10 gallons per minute, a holding tank capacity of between 14,400 and 28,800 gallons will be required to provide an onsite holding capacity of 48 hours. At this peak flow of 10 gpm, the on-site holding capacity will be between 65 and 70 hours. A conservative safety factor of a maximum flow rate of 25 gpm limited to a period of 4 hours has been estimated based on uncertain groundwater flows from the MPE wells. These flows have been communicated to the POTW. The primary holding tank (inside Building F) will be set with two high-level sensors: first (lower level) level sensor will trigger an alarm to alert operators that approximately 75% of the tank volume has been reached (i.e. prepare to valve over to second, reserve tank); and the second (higher level sensor) will trigger flow shutdown of water flow from water treatment system and "all alarm" notification.
- Discharge connections to Sanitary Sewer. Continuous discharge of treated water from the holding tank to the sanitary sewer will be made via a permanent connection to the sanitary sewer at the eastern manhole on Jackson Street, as per construction detail plan provided in **Figure 4-5**.
- The storage tanks (associated with effluent treatment system) and diesel fuel tank (associated with standby generator) are both UL-142 double-walled with integral secondary containment. C3 Technology modules (containerized units) are equipped with secondary containment and pressure-based process leak detectors plus VOC (vapor organic) internal space leak detectors. All other process tanks upstream of wastewater treatment system will be equipped with berm-style secondary containment or equivalent or similar.

The process flow diagram and process instrumentation diagram of the proposed liquid and vapor effluent extraction and treatment systems and components are presented in **Figures 5-17 and 5-18**.

5.6 WASTE GENERATION

Table 5-6 below shows the anticipated waste streams generated during construction, operation, and demobilization of the ISTR system and quantity estimates. Further details on management, characterization, and disposal of these is provided in the Waste Management Plan included in the EPP provided in **Appendix H**.

TABLE 5-6 ESTIMATE OF GENERATED WASTE STREAMS: STAGE 1 + STAGE 2

Item	Quantity	Unit
Rubble, debris from subsurface and surface preparation	To be determined (TBD)	Tons
Drill cuttings (i.e. soil) from drilling, treated onsite	150	Tons
Liquid waste from drilling, treated onsite	40,000	Gallons
Treated, discharged off-gas / vapor stream (to atmosphere)	1,500	mean scfm
NAPL recovered, for offsite disposal	40,814*	Pounds
Treated, discharged water (to sewer)	7	mean gpm
Vapor-phase GAC used (for offsite disposal)	32,000	Pounds
COC mass removed in vapor phase GAC media**	3,200	Pounds
Liquid-phase GAC used (for offsite disposal)	8,000	Pounds
COC mass removed in liquid phase GAC media**	800	Pounds
Decontamination water, for offsite disposal	1,000	Gallons
Surface insulating cover material (portion not reusable or recyclable), for offsite disposal	TBD	$yards^3$

* assumes mass loading is 0.1 lb contaminant per lb GAC

A contaminant mass balance was calculated. Estimated GAC needs remain the same at 32,000 lbs VGAC and 8,000 lbs of LGAC. Assuming the GAC loading rate shown in **Table 5-4**, the estimated contaminant mass removed by GAC will be 4,000 lbs. Some minor amounts of COCs will be emitted to the air and some will be discharged in process wastewater. It is assumed that the vast majority of vapor phase contaminants will be recovered as NAPL at the C3 condenser for an estimated total of 40,814 lbs. Note that these estimates/balances do not account for (i) COC mass destroyed in situ [hydrolysis, pyrolysis, oxidation], or (ii) residual mass that might remain in TTZ after thermal remediation (sorbed to soil, dissolved phase, soil gas). This recovered mass can be compared to 47,173 lbs of COC in the total treatment area assuming this value from the GEO's independent estimate is accurate; note that the PWS estimate is 74,000 lbs of contaminant.

6.1 MOBILIZATION AND SITE PREPARATION-SAFETY

Once planning documents have been approved by USACE/USEPA, URS will begin to sequence physical activities at the Site. **Figure 6-1** depicts the field construction sequencing of activities once site mobilization has occurred. Pre-construction activities that were performed in late 2019 include a geophysical survey of the subsurface for obstructions.

During site mobilization, a pre-construction health and safety orientation will take place. Following this, facilities (trailers, equipment, toilets, site security, decontamination pad, perimeter air monitoring stations) will be located on the Site. Access road improvements will begin, site fencing replacement/repairs completed, and utility tie-ins and connections will be made. Environmental protection measures will be put into place and the site will be cleared of debris and vegetation, where necessary.

Several trees are in areas proximate to the rear property boundaries of the residential properties on the south side of Jackson Street. An evaluation of those trees located on the residential properties will be performed by a certified arborist in order to generate an inventory of specimens which may be impacted by remediation activities. Depending upon proximity of the root zones to either Excavation Area 2 or the thermal treatment area, trees may need to be monitored and/or removed or replaced. It is assumed that an agreement will be secured with each property owner by the USACE for access to perform this survey and subsequent tree removals and replacements.

A critical part of site preparation is the performance of a Level B Personal Air Monitoring Evaluation. This Evaluation will be used to determine if hazardous levels of dibromochloropropane (DBCP) may be released during test pit excavations. This Evaluation is described in detail in the APP and its associated attachments. This will serve as an indication of whether other site work might require the highest level of respiratory protection during ISTR construction and operations.

Site preparation efforts will also involve organizing the areas for ISTR. This will include removing surface concrete and obstructions that would impede heating of underlying soils, abandoning existing wells in the ISTR areas, grading the treatment area, and any other work necessary as described above. Removal of the remaining Phase I pilot structures in Building F will commence, in preparation for mobilization of the Phase II ISTR equipment into that building. Locations of site preparatory facilities is shown in **Figure 4-1**. These site preparation activities are described in further detail below.

If features such as existing wells, conduits or voids that may allow for the passage or collection of water or steam vapor are detected in and near the TTZ from the geophysical investigation, they will be documented and removed or abandoned in place with flowable fill, if necessary, to prepare the area for ISTR installation. A topographical survey of the site property, to include and confirm metes and bounds, confirmation and definition of treatment areas, and existing conditions will then be performed.

6.1.1 Safety and Security

To prepare for ISTR construction and operations, safety procedures will be in place. All major construction vehicles will be inspected for safe working conditions. A perimeter air monitoring program will be initiated. While site preparation activities are being performed, the air monitoring stations will be built and then their operations confirmed. During non-invasive site work, baseline air monitoring data will be collected and documented for the monitoring program. The program will follow the details described in the Community Air Monitoring Plan (CAMP, **Appendix L**) for protection of both site workers and residential receptors.

Exclusion zone fencing will be erected around work areas with high potential for exposure to contamination, as indicated in the URS SSHP, which is attached to the APP. All equipment leaving the exclusion zone will be thoroughly decontaminated, as per procedures presented in the SSHP. Noise monitoring will also be performed, both during construction activities (drilling, heavy equipment) and during ISTR operations (blowers, pumps, emissions stack vibrations). The noise monitoring procedures and action levels for personal are presented in the SSHP and APP and discussed in the CAMP. ISTR construction and O&M activities performed by GEO will comply with general site safety procedures, however a SSHP has also been prepared specific to their ISTR work. GEO's Health and Safety Plan is provided as an attachment to the APP.

The Diaz site will be equipped with a number of security and monitoring related features to protect local residence, project personnel, and on-site equipment and materials. Site security will be closely tied to ongoing ISTR system safety, which is monitored 24/7 via a Programmable Logic Control (PLC) based notification system with interlocks for various system sensors (i.e., thermocouples, pressure sensors, level switches). A fault in any one of these sensors triggers an alarm and initiates an email chain that will go out to a predetermined list of URS/GEO personnel responsible for operational performance and safety. Similarly, the perimeter air monitoring CAMP stations are equipped with real-time monitoring detectors that in the event of an exceedance will trigger an auto-callout to a specific list of critical staff that will positioned to respond to this condition. Details of these systems are presented in the O&M Plan (**Appendix I**) and CAMP (**Appendix L**), respectively.

Integral to these remote monitoring programs is site security, which will cover the following items:

- Perimeter Security and Controlled Access Points
- Interior Security – Equipment Setup and Exclusion Zone
- Interior Security - Cameras, Motion Detectors, Flood Lights
- Material and Equipment Management
- Coordination with Local Police and Emergency Services Personnel

The first order of security includes an 8-foot wooden fence along portions of the northern and eastern site perimeter exposed to the public (sidewalks, roads, residential housing). This stockade-style privacy fence will essentially shield site operations and equipment from public view and help to minimize disruption to the residents. The remainder of this site will be secured using a chain link fence that runs in a continuous manner along the western and southern property boundaries. Access to the site will be controlled through two (2) gates, one on Jackson Street and another on Main Street. The use of these gates is detailed in the Traffic Control Plan (**Appendix H**). The gate on Jackson Street will be the primary daily entrance for personnel and visitors to the site, while the gate on Main Street (southern entrance) will be designed to accommodate the movement of equipment and materials into and out of the site. Both gates will be maintained in closed positions to provide access control, and locked when not in use to eliminate un-escorted access to the site.

Within the perimeter site fencing, separate “exclusion zone” fencing consisting of a temporary 6-foot chain link fence will be installed and utilized to restrict access to the ISTR well field area during active ISTR operations. The temporary fencing will surround each active Stage of operation and will be equipped with lockable access point(s) to restrict access to authorized personnel during both on and off-hour operations.

Off-hour security coverage will include multiple electric powered CCTV-type (closed circuit television) cameras linked to a cellular phone application-based system that will be provided to local URS/GEO operational personnel and the local police station to support live-monitoring of the site. Each camera will be equipped with motion-sensing devices that will auto-alert each connected cellular phone and activate where necessary, integral flood lights should unauthorized entry into the site occur. The camera systems will focus on the ISTR well field (exclusion zone), the Jackson Street entrance/job trailer area, and other critical operational areas. If determined to be needed, battery powered motion detector lighting will be installed at key locations around the site to support the primary camera-based system. To ensure uninterrupted site coverage, the security system will be tied into the on-site generator in the event of a loss of power.

An important aspect of site security will also include overall site lighting at night and the management and protection of equipment and materials. To facilitate a higher level of overnight security and to afford safe access to critical areas of the site during overnight hours, floodlight(s) will be installed in key areas of the site. The focus of the flood light(s) will be to provide adequate light to the main Jackson Street entrance, the job trailer area, and the main control panel for the ISTR system located on the eastern exterior wall of Build F. Regarding the management of equipment and materials, a significant portion of the ISTR process system will be located within Building F, which will have controlled access and will be locked at the end of each work day. Other equipment and materials will be properly staged in safe, discrete, and lighted locations (covered as applicable) and/or stored within lockable locations at the end of each workday (e.g., Building F, job trailer, truck).

Coordination and cooperation with the local police and emergency services personnel will be integral to the Diaz site security program and overall public relations. This will be accomplished through their understanding of site operations and schedules, and routine dialog throughout the course of the project. The local police and emergency personnel will be provided with keys/combinations to the perimeter gate locks should emergency access be required, they will be trained on the locations of the multiple “Emergency Stop” switches that will be integral to the ISTR system, they will be provided with a PID unit to support emergency air monitoring, and will be provided with contact information for key project and local URS/GEO personnel should immediate response be required. Details of this program are included in the O&M Plan (**Appendix I**).

6.2 INSTALLATION AND CONSTRUCTION

This section of the Phase 2 RAWP describes the steps to be taken in the field to prepare for and construct the actual functioning components of the ISTR system. The focus here is on Stage 1. Stage 2, which will be sequenced when Stage 1 is almost complete, will be very similar, with the exception that no excavated soils will be incorporated into that ISTR design. If any changes or modifications to the system, process, or procedures are made for Stage 2, an addendum to this Phase 2 RAWP will be provided accordingly. As indicated in **Figure 6-1**, the sequence of activities following site preparation consist of the drilling of ISTR subsurface points at the same time as baseline soil sampling. During the ISTR Stage 1 wellfield drilling, soils will be excavated from the five areas, combined with drill cuttings, and relocated to the ISTR area for incorporation. As soon as distributed, soils will be covered. Further details of the ISTR-related construction activities are provided below.

6.2.1 Demolition of Phase I Vapor Cap and Concrete Surfaces

Portions of the concrete vapor cap overlying the Phase I (Pilot Study) ISTR area will be demolished in advance of Phase II ISTR treatment system construction and soil excavation. URS understands the vapor cap to consist of low strength air entrained concrete, with a top layer comprised of 45 pound per cubic foot (pcf) cement and 1 pcf fiber mesh and a bottom layer comprised of 30 pcf cement. The typical thicknesses of the top and bottom layers are 4 and 8 inches, respectively. The concrete will be broken up using an excavator (the use of a demolition hammer is not anticipated). Water will be utilized to manage dust and particulates during this operation. Demolition of the vapor cap will begin inside of Building F first. At that time, the existing Phase I ISTR wells, where necessary, will be cut to grade (to the existing building slab) and temporarily sealed with a compression-type well plug and covered with a thin steel plate until well abandonment activities are completed at the end of the project. After the interior of Building F is prepared, demolition will continue along the northern side of Build F to afford access to the western and northern garage doors.

The demolished Phase I vapor cap concrete from within and north of Building F will not be sampled. This material will be transported using a skid steer and haul truck or small loader to one of two locations. Portions of the vapor cap within and in the immediate vicinity of Building F will be relocated to the existing low area to the north of Building F. As with the demolition work, water will be used to manage dust and particulates during this process. The crushed cement material will be compacted as practicable using a combination of skid steer, loader, and roller. The fill area will be covered with reclaimed gravel from the former Phase I staging area located to the east of Building F. It is anticipated that approximately 2 to 3 inches of gravel will be used to limit exposure of concrete fines after relocation from the Phase I cap demo.

Portions of the vapor cap to the south of Building F, which may be impacted with site COCs due to condensate generation beneath the slab from the Phase I ISTR process, will be left in place pending final site restoration efforts. At that time, samples will be collected from the remaining concrete material for laboratory analysis and profiling to determine whether it may be used as fill on-site or whether off-site disposal would be required. Note that a portion of this concrete material will be removed to support required test-pitting and soil excavation within the southern portion of this area. Concrete removal will be limited to only what is required to safely and efficiently complete these tasks and will be stockpiled and covered on the remaining cap area pending sample collection as noted above.

Demolition activities at the site will continue with the removal of concrete (former building slabs or driving surfaces) overlying the soil excavation areas and selected portions of the Stage 1 ISTR area where excavated soils will be spread out. Concrete demolition will involve saw cutting along the soil excavation areas and ISTR area limits followed by use of a demolition hammer-equipped excavator to break up the slabs into smaller pieces. This concrete will be transported by skid steer or loader and staged by location of generation in designated stockpiles on site. Representative samples will be collected from each demolished concrete stockpile for laboratory analysis and waste characterization. Once waste characterization and profiling are complete, the concrete will be sent off-site for disposal at an appropriate facility.

The work areas will be continuously monitored for dust. The work areas will be wetted during demolition operations to mitigate the generation of concrete dust. Similarly, the fill areas will also be wetted during relocation of the demolished concrete to aid in compaction and to mitigate dust. Other dust control measures may include application of an anti-dust agent such as calcium chloride where necessary to prevent airborne migration.

6.2.2 Pre-Excavation Confirmation Soil Sampling

The PWS describes the dimensions, areas, depths and in place volumes of the five areas to be excavated at the site (**Figure 4-1**), however these were only an estimate. Confirmation of these areas is required and will be obtained by the installation of soil borings and the collection of soil samples to delineate the horizontal and vertical extent of COC impacts, and in place volumes of the excavation areas. The pre-excavation soil samples will be collected via direct push methods using a track mounted probe unit. The soil cores will be collected in 5-foot-long disposable acetate sleeves. An URS geologist will oversee the drilling subcontractor and will log the soil cores in a field notebook. The geologist will screen the soil for visual or olfactory evidence of contamination. A PID will be used to screen the soil prior to sample collection. Recovered soil will be returned to the borehole after sampling is complete since the soil will be removed during the excavation work. The sampling core barrel will be decontaminated with an Alconox rinse and clean water between boring locations. A PID and dust monitor will be used to monitor the air quality at the work zone.

Boring locations, the number of samples, and sample collection procedures will be in accordance with the PWS and NYSDEC guidance document DER-10. Sidewall borings will be conducted at a frequency of one boring per 30 linear feet and one floor sample will be collected for each 900 sq. ft of excavation footprint. The borings at excavations 1, 3, 4, and 5 will be completed to 7.5 ft bgs or below pavement surface, whichever is greater. The borings at excavation 2 will be completed at 5 feet bgs or below pavement surface, whichever is greater.

For sidewall boring locations, samples will be collected for analysis of COCs from the last interval within the boring (7.5 feet bgs). If field screening indicates potentially impacted soil above the bottom sample interval, an additional sample at the depth with the highest suspected contamination will also be collected. It is assumed that a second sample will be required at ten (10) of the boring locations.

For floor sample locations, samples will be collected for analysis of COCs every 3 feet to support the baseline characterization of COC mass with the excavation limits. Therefore, vertical sampling includes three samples at each boring location completed to 7.5 feet (Excavations 1,3,4, and 5) and two samples per boring locations completed to 5 feet (Excavation 2).

If there are obvious signs of elevated contamination at a sidewall boring location, step-out borings would be advanced 5-feet back from the noted point of impact to provide additional horizontal delineation, where possible based on limitations outlined in the PWS.

The estimated number of sidewall and bottom borings for each excavation is presented in **Table 6-1** and the locations of the borings are shown on the attached **Figure 6-2**. As per the PWS, sidewall borings were not included where the excavation boundary borders a residential property or an ISTR treatment area. The estimated number of samples for laboratory analysis is included in **Table 6-2**.

TABLE 6-1- PRE-EXCAVATION BORING DETAILS

Excavation #	Perimeter* (Linear Feet)	Sidewall Boring Sample Locations	Excavation Area (sq. ft)	Floor Boring Sample Locations
1	89	4	3518	4
2	18	2	3228	4
3	110	7	888	1
4	85	4	988	2
5a	185	8	2066	3
5b	50	4	158	1

* Per the PWS, the perimeter calculation does not include excavation boundaries with ISTR and residential properties.

TABLE 6-2- PRE-EXCAVATION SOIL SAMPLES

Excavation #	Sidewall Boring Sample Locations	Sidewall Samples for Analysis	Floor Sample Locations	Vertical Samples for Analysis*	Total Samples for Analysis*
1	4	4	4	12	16
2	2	2	4	8	10
3	7	7	1	3	10
4	4	4	2	6	10
5a	8	8	3	9	17
5b	4	4	1	3	7

* Vertical sampling conducted every 3 feet and at bottom of boring. This includes three (3) samples at each boring location completed to 7.5 feet (Excavations 1,3,4, and 5) and two (2) samples per boring locations completed to 5 feet (Excavation 2).

**Does not include QA/QC samples, which will be collected in accordance with the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP)

Four (4) additional soil borings will be advanced on the railroad property to confirm the extent of COCs above the ISTR cleanup goals outside of the Diaz property limits and near the Genesee Valley Railroad. The borings will be advanced to a depth of 10 feet bgs and will be conducted during the same mobilization as the pre-excavation soil borings with the same methods as described above. Samples for laboratory analysis will be collected from every 2.5 feet, with the first sample collected between 0 to 0.5 feet. A total of 5 samples will be obtained for laboratory analysis at each boring location for a total of 20 samples.

URS will coordinate access with the Genesee Valley Railroad company including obtaining permits and flagging required for work along the rail siding. Soil cuttings from these four borings will be drummed and later blended with the soil from the excavations for treatment in the ISTR area. The borings will be grouted to the surface with thermal resistant grout. The boring locations will be surveyed in conjunction with the final survey for the pre-excavation soil borings.

URS will prepare a Pre-excavation Confirmation Soil Sampling Results Summary Report, which will include a brief narrative of the pre-excavation soil sampling field work and the laboratory results. The report will include laboratory results presented in data tables and a drawing depicting the horizontal and vertical control points for the excavation areas based on the results.

Because the analytical data generated for this modification will be the first generated through use of the newly developed methods for VOC and SVOC analysis in soil, we anticipate that the analytical results for a subset of COCs will differ from previously estimated historical data. Concentrations of several COCs during historical soil investigations were not quantitated using a full calibration. They were instead reported as Tentatively Identified Compounds with an assumed response of 1 relative to the internal standards used. As a result, concentrations previously reported for these specific compounds were only estimates.

URS will validate all laboratory data. Of the 10 sample delivery groups of data estimated, URS proposes to validate up to 10 percent to Stage 3 and 90 percent to Stage 2b. The Soil Sampling Results Summary Report will include a brief summary of data usability. Data from the excavation confirmation sampling will be incorporated into the Chemical Data Final Report generated at the conclusion of the remediation project.

6.2.3 Soil Excavation

Once remediation-specific activities commence, excavation of impacted soils will occur from soil treatment areas #1 through #5 based on the boundaries and depths determined during pre-excavation confirmation sampling. The excavation work currently consists of the removal and relocation of approximately 2,150 cubic yards (in place volume) of soil from the five designated areas of the site. The final volume of soil to be excavated will be determined though a pre-excavation confirmatory soil sampling effort that will be completed prior to commencement of excavation. Any required modifications to the planned scope of work resulting from the completion of this soil sampling effort will be addressed as an Amendment to this RAWP. The established excavation limits will be staked by the surveyor in the field. See **Figure 4-1** for locations of the areas of excavation and the haul route to the Stage 1 ISTR area. Note that this scope of work is subject to modification based on the results obtained from the pre-excavation confirmation soil sampling scope of work.

Excavation activities will be completed at the five designated excavation areas in accordance with the health and safety procedures outlined in the APP following the DBCP test pitting evaluation. Soil will be removed from each area using an excavator and transported to the Stage 1 ISTR area using equipment such as skid steers or small loaders. Excavated soil will be relocated to the ISTR areas for consolidation. A log will be maintained to document the soil removal and to make note of any visual signs of contamination.

Following removal to the designed limits, excavations will be inspected to determine whether contamination extends beyond those limits. Inspection methods will include both visual observation and screening using a PID. Additional soil removal may be performed as directed by the Contracting Officer. Any construction debris (concrete, metal, etc.) encountered during the excavation of these treatment areas will be removed, brushed clean, and disposed of properly after characterization, as per the Waste Management Plan.

Appropriate sedimentation and erosion control measures will be utilized during excavation activities as described in the Environmental Protection Plan (**Appendix H**). Surface water will be diverted as necessary to prevent it from entering excavation areas. It is not anticipated that dewatering will be necessary during excavation activities.

No personnel will enter excavations greater than 4 feet in depth. As a safety precaution, a temporary safety fence will be securely installed around any open excavations at the end of each workday. Health and safety procedures associated with the excavation activities are described in detail within the APP.

The final lateral and vertical extents of excavations will be located by survey. Survey information obtained will be sufficient for producing the excavation record drawings in accordance with the project specifications.

Following completion of soil removal effort and survey of each excavation area, backfilling will commence. Excavations will be backfilled with imported soil, including general fill, topsoil, and dense grade aggregate (DGA) that meets the requirements of NYSDEC DER-10 Section 5.4(e). Backfill delivered to the site will be staged in designated stockpiles prior to further transport across the site to the completed excavation areas. Backfill will be placed in one-foot lifts and compacted by tracking with a minimum of three passes by a roller. For grassed areas, general fill will be placed to within 4 inches below finish elevations, and 4 inches of topsoil will be placed over the general fill. Topsoil surfaces will be seeded for the establishment of turf, and erosion control matting will be installed as necessary. Former concrete areas will receive general fill to within 4 inches of the finish elevation, with DGA placed over top. All excavations will be restored to existing grades as shown in the initial conditions survey.

6.2.4 On-site Soil Consolidation

Consolidation of excavated soil and drill cuttings into the Stage 1 ISTR area will take place after drilling of ISTR heater wells, extraction wells, and temperature/pressure monitoring probes has commenced. Any necessary modifications to the approach provided below resulting from data obtained through the excavation test pitting work or from the pre-excavation confirmatory soil sampling effort will be addressed as an Addendum to this RAWP. In anticipation of odor mitigation being a necessary aspect of the soil consolidation process, the following approach presents our tentative plan for consolidation of these soils into the Stage 1 zone.

The five soil excavation areas will have already been delineated to confirm the dimensions, depths, and volumes of soil to be excavated. Therefore, the timing of excavation activities will be minimized based on knowledge of the impacts. Once the site has been properly prepared, drilling within the Stage 1 zone will commence within a given Area, i.e. – Northern Area or section of the Stage 1 combined Central Area/Railroad Spur Area. ISTR wells will be installed from the back corners of the Areas outward, using a minimum of two drill rigs, further minimizing the period of soil handling. Drill cuttings will continually be removed and stored in tarped roll-offs for maximum control until they are also incorporated into the ISTR zones. As drilling is completed in sections of the Areas, calculations will be made as to the amount of soil volume to be incorporated into each.

Once these drilled sections are completed, URS will excavate an appropriate amount of impacted soil from the excavation areas to match the volume needed. The plan is to only excavate the amount of contaminated soils that can be incorporated daily. As soon as the soils are incorporated, staff will follow behind and construct the vapor plenum and insulated cap. This immediate construction will minimize the amount of time excavated soils are exposed to help control dust, odors, vapors, and protect the underlying soils from weather events preventing erosion and runoff. Should minimal incorporated soils be left exposed at the end of the day, a visquene cover will be placed over the ISTR well area and temporarily secured with sandbags over the exposed soils until the insulated cap can be extended the next day.

The excavation areas will be backfilled as soon as the calculated amount of soil volume has been removed. If any one of the five excavation areas are not completely transferred for incorporation on any given day, two actions will be taken. First, the exposed face of the excavation pit will be lined with visquene or other liner material and the remainder of the pit will be backfilled. This liner will be used to demarcate where subsequent excavations will re-commence. Additionally, any soils excavated the previous day but not incorporated into the ISTR sections will be stored either in roll-off containers or a small stockpile placed in one of the ISTR treatment areas nearby and covered to protect it and control odors and vapors.

This sequencing will allow soil excavations to be completed efficiently, with excavated soils relocated to the Stage 1 ISTR area for treatment quickly and expeditiously. During transportation and consolidation of soils, care will be taken to maintain the integrity of all ISTR wells and monitoring points. Spotters will be used to guide equipment operators and established equipment routes will be utilized as feasible. Due to the spacing of wells, it is anticipated that small equipment (e.g., skid steers) will be used to distribute and compact the soil throughout the ISTR areas. Areas where soil consolidation will take place are depicted on **Figure 4-1**.

Based on the estimated volume of excavated soil, the total thickness placed in the ISTR areas for thermal treatment is estimated to be approximately 3.5 feet. The consolidated soil surface will be constructed with a 2:1 slope to existing grade around the perimeter of the ISTR areas. Excavated soil will not be placed beyond the limits of the ISTR areas, and erosion and sedimentation controls will be installed to prevent the migration of contaminated soil outside of those limits. Limited compaction of the constructed surface will be performed using the skid steers to achieve a stable surface for further construction of the vapor plenum and insulating vapor cover.

6.2.5 Well Installation

Each pre-marked ISTR well or excavation location will be cleared for drilling by utility locating equipment or ground penetrating radar. The Stage 1 and Stage 2 ISTR treatment areas will have their TCH wells, SVE and MPE wells, and any other monitoring points for temperature and vapor pressures installed using sonic and/or auger drilling techniques. The locations of these are shown on **Figure 4-4**. The western first row of TCH and MPE wells in the Stage 2 TTZ, which are proximal to the Stage 1 wellfield, may be installed during Stage 1 wellfield installation, as to avoid any potential issues that may arise concerning drilling and installation in hot soils. As an alternative, all Stage 2 wells will be installed during that separate mobilization, however the MPE and SVE vacuum flows in the Stage 1 TTZ will be maintained during the installation of the western first row of wells to ensure heat, steam, and vapor controls during drilling. Groundwater level(s) in existing monitoring wells will be observed for depth to groundwater, prior to their abandonment. This information will be compared to historical water levels in the area to assist in confirming installation depth of the ISTR wells. Observations during the baseline soil sampling and installation of other ISTR wells will also be utilized. Depth to shallow bedrock, if encountered during drilling will be recorded by the on-site geologist logging the drilling activity during baseline soil sampling and well installation. A field decision procedure for the well installation should bedrock be encountered at shallower depths than anticipated during ISTR subsurface drilling would consist of the following (all decisions/actions will be documented):

1. If contact of bedrock is observed to be <5 feet shallower than design depth of well installation, then GEO will decide to proceed with (and report) one of the following options:
    a. install well to originally anticipated depth (i.e. <5 feet into the bedrock); or
    b. field modify [shorten] well and install modified well to [new, corrected] depth to limit insertion into bedrock.
2. If contact of bedrock is observed to be >5 feet shallower than design depth of well installation, then GEO will report this situation to AECOM, including GEO's recommendation at the subject boring (well to-be-installed). GEO will "hold open" subject boring, pending AECOM's final decision, direction; and, GEO will proceed to the next planned boring and well installation location.

The TCH heater well casing will be hoisted and placed into the borehole using a telehandler or the winch on the drill rig. The heater casings will be manufactured offsite and delivered to the site. If the casings are required to be installed in sections, an onsite welder will make the casing seam connection as the sections are lowered into the boring. The primary purpose of the high-temperature non-shrinking cement grout is to provide a good seal at the top of the well to prevent vapor migrating during ISTR heating. A common elevation datum coordinate will be surveyed in at the site to use for sample and well installation purposes. During construction, these wells will be terminated several feet above the revised ground surface (to allow for elevation changes from excavated soil and drill cutting spreading, and the construction of the insulating surface cover) and their tops capped temporarily with properly fitted like-materials. These will later be completed with connections to conveyance piping and cabling once their seals are secured to the insulating thermal cover (see below).

In addition to the ISTR-specific wells, ten monitoring wells will be installed down-gradient of both the Stage 1 and Stage 2 ISTR areas to be used in demonstrating that hydraulic control is maintained throughout the treatment period (**Figure 5-9**). Additionally, nine PMPs will be installed around the outside perimeter of the Stage 1 ISTR area to measure pressures/vacuums to confirm pneumatic control during heating (**Figure 5-8**).

6.2.6 ISTR Equipment Construction

Horizontal vacuum extraction piping will be laid in the stone bedding material just below the insulating surface cover to provide a plenum for additional pneumatic control of the upper-most heated zone. The insulating surface cover shall immediately be installed over the top of the soils placed at Stage 1. Refer to **Figure 5-6** for further specifications of this arrangement and construction.

An insulating cover will be installed over the TTZ after well installation and excavated soil placement works have been substantially completed. This cover will provide a >20 R value to shallow soils to allow thermal treatment to the ground surface without heat loss, which will be necessary given the presence of SVOC compounds in the COCs. The composite of materials detailed for the thermal cover in Section 5 will create a hybrid-type insulating surface cover that will allow for the reuse of a portion of the cover material from Stage 1 to Stage 2 of the project (**Appendix M**).

Upon the completion of the insulating surface cover, the placed soils shall be encapsulated from ambient air and guarded against the effects of rain or surface water or high winds. Stormwater ponding will be controlled and infiltration into the thermal cap minimized by strategic, localized grading and sloping to direct runoff to existing site vegetated areas and away from the southern railroad tracks, which is described in the Stormwater Pollution Prevention Plan, as an attachment to the EPP (**Appendix H**). The penetrations of ISTR-related wells and other monitoring points through the insulated thermal cover will be sealed using high-temperature cement to control air flow, steam and COC vapor collection, and to maintain thermal insulation. At this juncture, the installation of above-grade features in the Stage 1 well field may proceed without interruption (i.e. conveyance connections, cabling, piping works).

Gas supply piping will be connected from the main supply meter to each of the TCH heater wells. Vapor recovery piping will be connected from each SVE/MPE well and returned via manifolded conveyances to the moisture separation unit, blower, and vapor treatment system. Liquid recovery piping will be connected from each vapor/liquid separation point and returned to the pumps and liquid treatment system. Electrical connections to energize the above-ground treatment system components will be connected to the main electrical panel. Freeze protection equipment will also be provided to those components most likely affected by such conditions and energized. Communication cabling will be connected from the TMPs, air monitoring stations, as well as security modules (motion sensors, cameras, alarms, disconnect interlocks) to internet terminals. These piping networks are presented in **Figures 5-11, 5-12, 5-14, and 5-15**. The ISTR treatment compound and ancillary equipment in and around Building F is shown in **Figure 4-1**.

Major above-ground equipment will be connected to all power and conveyance conduits. This will include the GTR heaters at every TCH well, various vacuum blowers and liquid pumps, vapor-liquid separators, heat exchangers, cooling towers, holding tanks, particulate filters, caustic scrubber, C3 vapor treatment modules, and liquid and vapor phase GAC vessels.

Typical spare parts and materials that will be stocked in inventory at the Site will include piping valves and connectors, filters, hoses, TCH units for the TCH wells, and other assorted materials and tools. Spare equipment staged on site will include liquid pumps, condenser motor vapor-oil separator cartridges, level sensors / switches, and thermocouples. Due to the size and expense, backup blowers will not be kept on site, however they can be delivered within four days. Should either one of the blowers malfunction and require replacement, the second blower would still maintain some vacuum control. Additionally, the C3 system has an integral compressor that will continue to pull a vacuum and independently maintain pneumatic control of the treatment system so that vapors present will continue to be treated by C3/VGAC to maintain the uptime requirement of the vapor extraction system. If pneumatic control cannot be achieved by these means during blower malfunction, the power to the TCH wells will be ramped down to reduce the steam generation from the site until repair or replacement.

A back-up generator will be installed and operated to provide an alternate, standby electrical power source capable of operating the ISTR vapor and liquid extraction and treatment equipment as well as monitoring and controls to maintain pneumatic and hydraulic control in the event the primary electrical power source is lost. However, the generator will not be sized to meet the considerable power demands of the TCH heaters or C3 vapor condensers during a power outage. In this circumstance, the vapor treatment system will remain operating in “C3 Technology bypassed” mode, meaning that the vacuum blower, vapor cooling/conditioning and VGAC treatment vessels will remain fully functioning. Heating operations will resume when primary power is returned to normalized service.

This generator will be paired with a diesel fuel storage tank of approximately 500 gallons capacity in order the ensure the generator can provide electricity required to maintain pneumatic and hydraulic control and freeze protection without refueling for at least 48 hours. This module will be installed and set to standby mode with an automatic transfer switch to engage the module automatically upon loss of primary electrical power. The primary fuel source for the module will be diesel fuel and the module's engine shall be USEPA Tier 4 Final certified.

All ISTR system connections will be made under the necessary permits/approvals by the appropriate licensed tradesperson. Once construction is completed based on the design drawings and specifications, any changes will be noted, and As-Built records will be prepared by a New York licensed Professional Engineer (PE). Photographic documentation of the ISTR system will also be recorded.

6.2.7 System Commissioning

Once the ISTR system is constructed and complete, the system will be ready for commissioning. The information presented in this section of the Phase 2 RAWP is the Commissioning Plan. The Contracting Officer's Representative (COR) will be notified at least 14 days prior to commissioning. Each phase of the ISTR system will be commissioned and documented.

The commissioning will consist of pre-commissioning checks and functional performance tests on the components of the entire ISTR system. Area classification steps will be taken. The hazardous area classification system determines required protection techniques and methods for electrical installations in the location, which is included in the APP.

Tests will include but not be limited to observations, pressure tests, leak tests, combustible organic vapor monitoring, arc flash checks, checks of interlocks and alarms, instruments, valves, meters, and checks of high and low sensors and controls. The components that will be checked or tested include but will not be limited to electrical supply, gas supply, backup generator, telemetry modules, TCH heaters, vapor recovery blowers, liquid recovery pumps, moisture handling/drying equipment, vapor treatment equipment (C3 and VGAC), liquid treatment equipment (LGAC), wastewater discharge connections, and TMP/PMP sensors.

Checklists for the various sub-system commissioning checks are presented in GEO's O&M Plan **Appendix I**. Related information for quality control (QC) purposes is presented in the Contractor's QC Management Plan (CQCP) and will be documented using the processes included in that Plan. Additional information will also be presented in the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP). Designated team members will sign off at each test and step during the commissioning checks and tests. Certificates of training and experience for the designated team members, installers and operators will be provided. When the commissioning QC tests are complete and satisfactory, a Commissioning Report will be prepared.

6.3 OPERATIONS AND MAINTENANCE

Once the system has been commissioned, which will serve as the Readiness Review, it will be activated fully for ISTR operations. Prior to continuous, normal well field heating, the vacuum extraction systems must be on and operating properly. Both the SVE and MPE systems must be at vacuum and all heat exchangers and cooling towers must be operational with vapor flow processed through the C3 and VGAC units. Once the SVE/MPE systems are operational, the well field can initiate continuous, normal heating. This requires a technician to individually start each thermal control unit (TCU). Each TCU is equipped with safety features including a temperature sensor/alarm, carbon monoxide (CO) sensor/alarm, and a differential pressure switch (**Figures 5-1 and 5-3**). Additional information is provided in the O&M Manual (**Appendix I**). Once the ISTR System is fully functioning, the TCUs will periodically be optimized to operate at the proper temperature profile and flue gas composition. During continuous combustion of the natural gas at the TCUs, exhaust fans run continuously for proper gas flow and vacuum to control heat in the TCH wells based on temperature, CO and oxygen levels. System air flows will be balanced, and data will begin to be collected from the various systems to verify working order.

The MPE hydraulic recovery performance will be verified in two ways. First, total extracted liquid flow from the wellfield will be evaluated by measuring the volume generated at the vapor-liquid separator (knockout tank) and its rate of generation. Secondly, individual MPE recoveries will be evaluated by periodic onsite evaluations by field personnel that will confirm liquid flow from these wells by observing vibrations and temperatures of the valves and hoses at the wellhead, as indications of hydraulic recovery. O&M activities, frequency, schedule, and decision points are described in detail in in the O&M Manual, which is included as **Appendix I**.

During operation of the ISTR system, URS will conduct daily safety meetings at the beginning of each day. In addition, a designated Site Safety and Health Officer (SSHO) will conduct daily safety inspections and document the results in a Daily Safety Inspection Log. The SSHO and the Air Monitoring Field Technician (AMFT) will each perform regular air monitoring screening and measurements in and around the ISTR operations area for total VOCs (PID), carbon monoxide (field meter), and ammonia (detector tube), as described in the SSHP and CAMP.

Noise will be monitored and documented monthly, at a minimum, and anytime new potential noise sources are added to the site activities. Monitoring will occur along the Site boundaries with a handheld dosimeter. Details on the noise monitoring program is provided in the APP. The PWS stipulates that the ISTR extraction and treatment system shall not exceed 75 decibels during daytime operations between 0700 and 1800, or 65 decibels during nighttime operation, at any point along the site boundary. This requirement will be met with engineering and administrative controls as needed. The housing of the treatment equipment within Building F should alleviate noise levels reaching the site action limits.

The installation and operation of the ISTR system is also expected to generate several waste streams including wastewater, NAPL, and spent GAC (LGAC and VGAC). These materials will be sent to approved receiving facilities as described in the Waste Management Plan included in the EPP. Site traffic due to staff and subcontractor parking, equipment deliveries, GAC change-out, and other activities will be scheduled to mitigate congestion and disruption in the residential areas as described in the Haul Route/Traffic Control Plan included in the EPP (**Appendix H**).

6.4 PERFORMANCE MONITORING AND COMPLIANCE-CONFIRMATION SAMPLING

During the ISTR process, both for Stage 1 and Stage 2 remediation, essentially two types of monitoring will take place. The first will be performance monitoring in order to document and ensure the continued effective treatment of the system. The second will be compliance monitoring for reasons of safety, meeting substantive permitting requirements, and to confirm the treatment objectives have been met. Both types of monitoring will be multi-media and include physical and engineering parameters associated with the specifics of the ISTR process. The overall monitoring program will follow the minimum monitoring requirements and frequencies identified in **Table 6-3**.

6.4.1 Baseline

As described above, baseline monitoring will be performed to establish background or starting conditions prior to ISTR operations. Baseline monitoring will be performed on subsurface soil COC concentrations, groundwater elevations and COC concentrations, air quality including noise, and for operating parameters of the ISTR system to include subsurface temperatures and pressures, and liquid and vapor recovery concentrations.

Analytical laboratory testing for the COCs in various media include several chemicals that are not typically included in VOC and SVOC standard analyses. Therefore, laboratory method development procedures are required to detect the following compounds by USEPA Method 8260C (VOCs): fluorobenzene, 1-bromo-2-chloroethane, 4-chlorobenzotrifluoride, 1-bromo-3-fluorobenzene, 4-bromofluorobenzene, 3,4-dichlorobenzotrifluoride, 1-bromo-4-ethylbenzene, 1,3-dibromobenzene and 1,4-dibromobenzene, and the following compounds via USEPA Method 8270D (SVOCs): 3-bromoacetophenone, 3-nitro-4-chlorobenzotrifluoride, 3-amino-4-chlorobenzeotrifluoride and 2-bromopyridine. For vapor analysis specifically, all COCs except 3-bromoacetophenone can be detected via USEPA TO-15. The two dibromobenzene isomers will co-elute and will not be separated. Details regarding the quantification methods, detection limits and other details are discussed in the UFP-QAPP.

Baseline soil monitoring of the site COCs will be performed on borings installed every 900 sq. ft and samples obtained at pre-set 5-foot intervals for a total of six samples per boring throughout the TTZ. The borings for baseline soil samples will also be used to advance the TPMPs. Borings for baseline soil samples in the Trench Area will be advanced vertically rather than at an angle, unless surface or overhead obstructions require an offset. Samples will be logged by a geologist and field screened using a PID at selected intervals. Visual and olfactory observations may also be used to determine samples for analysis. Soil sample collection details are presented in the UFP-QAPP. Planned baseline soil boring locations are presented in **Figure 6-3**, which must be approved by the Contracting Officer.

Baseline groundwater monitoring will be performed in selected on-site MPE wells, at least one every 2,000 sq. ft in the TTZ, and down-gradient monitoring wells. Water levels will initially be recorded for several of the groundwater monitoring wells prior to their sealing with pressure tolerant well heads. Water levels will be performed manually. Water level measurements for all designated wells shall be completed in not more than 48 hours, from start to finish. Groundwater sampling will be performed in accordance with the approved UFP-QAPP.

Air quality monitoring will include ambient temperatures, barometric pressure, precipitation, and wind speed/direction from the meteorological station. Air monitoring in the thermal operations area will be tested for baseline concentrations of total VOCs using a PID (10.6 eV), particulates and ammonia using detector tubes. Perimeter air monitoring stations will also sample and monitor for total VOCs with real time PID, site COCs via summa canisters and analytical lab testing, and ammonia via detector tubes. Noise levels will be recorded monthly at multiple locations on the site. These baseline air monitoring data will be collected prior to any ISTR construction or operations activities begin.

Once the ISTR system has been fully constructed and commissioned, as part of the shake-down process, and at the very beginning of its operation before consistent daily energy/heat is applied to the subsurface, several parameters will be monitored and recorded. These will include measurements at the ISTR system and within the subsurface of the TTZ. Temperatures at all TMPs will be recorded. Pressures at all PMPs will be recorded. Temperatures and pressures would be recorded for the down-gradient wells. All ISTR-specific operating parameters (energy, power, pressures, vacuums, air and water flows) should be recorded as part of commissioning prior to full activation of the system.

6.4.2 Performance

During active ISTR operations, significant changes to the subsurface conditions will occur that will enhance the removal of COCs. In order to track the performance of the thermal process, monitoring of the subsurface as well as multiple components and parameters of the ISTR system will be required. Subsurface temperatures will be continuously recorded. Thermocouple sensors will monitor subsurface temperatures at one centroid location (between heater wells) every 900 sq. ft and every 3 feet vertically over the entire treatment depth. These individual vertical profiles will be averaged and compared to the design model. Subsurface vapors and pressures will be monitored in the TTZ in shallow vapor points located at depths of 3 feet below grade every 900 sq. ft. Additional pneumatic vapor monitoring points will be located every 500 feet outside of the TTZ perimeter but within a range of 5 feet from the edge of the Zone. The construction of these monitoring points is presented in **Figure 5-8**.

Performance of the vapor recovery system will be monitored daily at the influent to the system (from the entire wellfield) and effluent sampling ports (at the VGAC unit) using a PID to determine the amount of COC mass being removed from the subsurface. Vacuums, air flows, and temperatures will also be recorded to ensure proper operations. The system influent will be monitored using summa canister samples analyzed by a laboratory for COC concentrations weekly to evaluate mass removal from the subsurface and to use for comparison to effluent samples in order to track vapor treatment compliance to permit requirements. Liquid treatment equipment will be monitored continuously for flow rates and total volumetric flow, and at its influent and effluent sampling ports weekly for comparison of samples analyzed by a laboratory for COC concentrations to evaluate effective treatment and compliance to the wastewater discharge permit requirements. Generation of the volumes and rates of NAPL, if observed, will also be recorded. **Table 6-3** provides locations of these samples.

MPE wells will be monitored monthly (to the extent water is retrievable) during ISTR to determine the effects of the treatment on COC concentrations (**Figures 6-5 and 6-6**). As the groundwater will have an increased temperature for on-site wells, special hot groundwater sampling procedures will be used where necessary to obtain samples for laboratory analysis of the COCs. During times of elevated temperatures, it is possible for steaming conditions to dry certain wells out and prevent their sampling. This is often a temporary condition which reverts to ambient status when active heating is terminated. Samples will also be obtained at the same frequency for down-gradient wells off-site.

The hot groundwater conditions at the MPE wells will require modification of the MPE wellheads to allow safe sampling and acceptable water samples (see **Appendix J** for Hot Groundwater Sampling SOP). Groundwater elevations in the ISTR area will not be monitored as the MPE wellheads will be sealed against the heat and pressure that will be generated during treatment and no safe or effective procedures can be used during thermal treatment to monitor these elevations.

Air monitoring will be performed continuously at the site perimeter for total VOCs, and monthly (biweekly during steam generation) for analytical testing of COCs and ammonia detector tubes. Details are provided in the CAMP (**Appendix L**). Air monitoring in soil disturbance areas and the thermal operations area will also be performed regularly for total VOC using a PID, for particulates (PM10) using a hand-held instrument, and for ammonia using a detector tube, to ensure a safe work environment. Noise monitoring will be performed at multiple site locations during ISTR operations weekly or as new equipment is brought on-line. These monitoring results will be compared to baseline results, as well as specific action levels for each test.

ISTR-specific parameters, such as temperatures, vacuums, energy and power consumption, gas flows, pH, conductivity, and others will be monitored continuously and recorded daily. Details of this monitoring is provided in the O&M Plan (**Appendix I**). Waste disposal sampling will also be required for material such as solid waste, spent activated carbon, and NAPL. These are identified in the Waste Management Plan, included in the EPP (**Appendix H**).

6.4.3 Confirmation

Vapor recovery and treatment monitoring as described above will be used at the end of the project to confirm that recovered mass has reached diminishing returns, or until treatment at the target temperature has been performed for 153 days as specified in the PWS Amendment 4. Upon the attainment of primary performance criteria (temperatures and diminishing vapor recovery), confirmation hot soil sampling will be performed in soil borings placed every 900 sq. ft. Plywood and matting will be located over the insulating cap to allow drilling equipment to advance confirmation borings without damaging the plenum, cap, or ISTR wells. Individual soil samples will be obtained every 5 feet over the entire vertical TTZ, i.e., 6 samples per boring. Confirmation sampling locations are not intended to be co-located with the baseline soil samples, merely proximate to one another. Locations of these samples are presented in **Figure 6-4**. These results will be compared to baseline soil data, as well as the overall project ISTR Soil Goals. **Appendix N** provides the Hot Soil Sampling Standard Operating Procedure (SOP).

6.5 DATA COLLECTION

During operation of the ISTR system, the real-time process monitoring data described in the previous section will consist of field data measured by operations staff and electronic data acquired and stored by a Supervisory Control and Data Acquisition (SCADA) system. Manually collected data include power usage, cumulative liquid flows, temperature and pressure gauge readings from the effluent treatment systems, and wellfield pressure readings. Field data will be documented on field forms and field logbooks. Field data will also include video and photographic documentation of pre-work site conditions and weekly updates of progress. Additionally, there will be analytical data from field samples that will be provided by fixed laboratories. The format of the laboratory and other data are more fully described in the UFP-QAPP as electronic data deliverables (EDDs) will be submitted to USEPA Region 2, as well as other organizations including USACE and NYSDEC.

For the remote ISTR monitoring system, the PLC will log selected system operating data including relevant temperatures, pressures, and flows through the aboveground vapor treatment equipment, as well as the position of safety sensors and controls (e.g., pressure switches, level switches, motor operated valves, etc.). Wellfield temperature data from the field thermocouples will be collected and logged by the PLC at least one time each ten minutes for each sensor. The PLC and temperature logging system will be accessible remotely through an internet connection, allowing

ISTR operations, engineering and project management staff in the office to access the PLC and observe the same operating information available to the field staff. Alarms and shutdown conditions will result in automatic notification of GEO's operators and engineering support staff by email and text message.

Electronic data from temperature monitoring and other key process parameters will be accessible in real-time through a project website accessible to Government personnel to serve as a central repository for selected operational data, project documents, reports, and additional documents as requested by the USEPA.

6.6 SHUTDOWN AND POST-SHUTDOWN COOL DOWN PERIOD

Shutdown may begin once the primary PC have been achieved for a given stage of ISTR treatment or following 153 days of treatment at the target temperature, and approval is granted by the Contracting Officer. The ISTR system will be shut down following these steps:

1. Turn off wellfield heater circuit breakers.
2. Continue operation of main blower and MPE pumps with associated vapor and water treatment for the specified cool down period, which will be determined based on performance monitoring data during operation but will be no less than 2 weeks in duration.
3. Shut down main blower, MPE pumps, and groundwater treatment system.
4. Lock and tag out breakers prior to working on circuits.
5. Disconnect power from pumps and instrumentation.

Following shutdown of each stage of treatment, a Shutdown Memorandum will be provided to the USACE summarizing the results of effectiveness monitoring and providing an evaluation and recommendations regarding meeting the performance criteria. The Contracting Officer will provide approval within 14 days of receipt of the Memorandum. Individual heating elements or portions of the ISTR treatment area may be terminated early at the discretion of the Contracting Officer (see Section 6.9).

6.7 DEMOBILIZATION AND SITE RESTORATION

Following shutdown of the ISTR system (following completion of both Stage 1 and Stage 2 remediation), all components of the thermal cap will be removed, and all ISTR related process wells will be abandoned in place. This includes wells remaining from the Phase I pilot study, as well as wells from the Phase II Stage 1 and 2 treatments. A subset of monitoring wells may be retained for long term monitoring. Well abandonment will entail removing the top 2 feet of any ISTR well casing as well as well field infrastructure and will also conform to the requirements of NYSDEC Policy CP-43. All piping and equipment associated with the ISTR system will be disassembled, decontaminated, removed and then sent off-site for reuse, recycling or disposal according the Waste Management Plan. Surface equipment, exclusion-zone fencing and support facilities will all be removed from the site, and all utilities will be disconnected and de-energized by the appropriate party. In accordance with the PWS, the Site will be restored to the pre-work conditions or by re-grading to ensure proper drainage and revegetating to prevent erosion. A final survey will be performed and documented in as-built drawings in a Remedial Action Report.

6.8 SCHEDULE

The updated schedule, which is a dynamic document undergoing minor modifications continually, is provided as **Figure 3-1**.

6.9 ADAPTIVE MANAGEMENT

In order to treat the VOCs and SVOCs at the site from ground surface to the bottom of the TTZ within the performance period, URS will bring an aggressive remedial approach to the Site, supported by continuous adaptive management practices. These begin with a review of the historical data which were modeled to evaluate the total COC mass and the discrimination of the VOC and SVOC components of this mass over the TTZ. An aerial and three-dimensional distribution of both the VOC and SVOC mass was developed (see Section 4.1). These distributions will continually be used, not only in the overall design of the ISTR system for Stage 1 and Stage 2 treatment, but also specifically during O&M to focus efforts in certain areas as well as to calibrate performance of the treatment in all areas.

Supplementing this historical information, the URS team will generate a high density of additional subsurface site data, both from baseline soil sampling and baseline groundwater sampling. Particular attention will also be paid to observations made during the significant drilling program that will be used to install the heater and monitoring points during system construction. This information may very well modify the current site understanding, which may be used to modify the ISTR design or assist in system O&M.

As discussed in Section 4.1.5, during the modeling of site investigation data, approximately 30% of the TTZ volume contains actionable concentrations of VOCs with no SVOCs present in the same volume. Such information may suggest locations where early treatment may be anticipated for shut down, or other areas where more aggressive or longer treatment may be needed requiring optimization of applied energy.

During O&M, monitoring of specific site locations or depths from individual TMPs, SVE or MPE wells, or vapor recovery lateral lines may allow further optimization of the ISTR process with respect to mass removal trends.

Interim soil sampling of select areas and depths of the Site will be a management tool that will be utilized to allow application of commensurate energy/heat/recovery efforts to locations. As specific temperature and vapor recovery results meet or approach the required PCs, early confirmation sampling will be considered. This may allow a savings of applied heat energy to the overall project.

If diminishing vapor recovery cannot be realized despite attainment of target temperatures for substantial durations, one notable reason may be the presence of significant contaminant mass adjacent to the treated area. If this is within the TTZ, a review of historical data, ISTR temperature profiles and vapor concentrations in these areas will be performed to determine optimizations and enhancements. If this situation is on the edge of a TTZ, additional recommendations or actions may be made. One critical parameter that may influence these situations could be the target temperatures of these areas, if a high proportion of the residual vapors contain SVOCs.

Towards the end of the project, other adaptive management strategies may be considered or recommended. These include the use of the existing heated groundwater to enhance biological activity as part of an engineered bioremediation approach, given that MNA is an important component of the long-term site management strategy. This may include broadening the monitoring parameters to include geochemical data to assist in understanding the Site's existing biological activity and its assimilatory capacity for the future.

6.10 GREEN REMEDIATION

In accordance with USEPA green remediation guidance, the URS Team plans on integrating several "Green" practices into the remediation that will be implemented during the execution of the project to enhance the overall sustainability of the process. These include:

- Reuse of the TCH heater wellheads between Stage 1 and Stage 2 treatment,
- Reuse of portions of the insulated cap material between Stage 1 and 2 and the removal of a significant concrete component to the cap, drastically minimizing concrete waste for off-site disposal,
- Recycling of significant metal present at the Site (former railroad siding tracks and other debris),
- Incorporation of drilling-derived soils into the ISTR program rather than disposing of them off-site as contaminated waste,
- Beneficial reuse of the insulated thermal cover remaining from Phase I as site backfill material,
- Location of the treatment system within Building F to reduce local noise and night-time light pollution resulting from 24-hour operations,

- Recycling of water from a portion of the condensate following treatment as cooling water to minimize potable water needs and off-site disposal of process water,
- Use of GEO's patented C3 treatment system for vapor treatment allowing vapors to be collected as NAPL thereby minimizing atmospheric discharges,
- Use energy efficient systems and office equipment in the job trailer,
- Reduce vehicle idling,
- Use renewable energy where possible or purchase Renewable Energy Credits
- Use of clean fuels, such as biodiesel, low sulfur/ultra-low sulfur diesel, and/or biodegradable vegetable-based fluids to power equipment, if possible.

This section of the Phase 2 RAWP describes the key procedures of modifying the Phase 2 RAWP, the key meetings and reports anticipated during the performance period of this contract, and the overall staff that will execute this project with their roles and responsibilities.

7.1 RAWP ADDENDUM

This Phase 2 RAWP addresses site activities, and design/construction/OM&M plans for the Stage 1 and Stage 2 ISTR. Should modifications or other changes be necessary, either during either stage or for Stage 2 based on lessons learned from Stage 1, an addendum to this Phase 2 RAWP will be prepared and submitted to the USACE for review.

7.2 MEETING REQUIREMENTS

Meeting requirements for this RA are summarized in **Table 7-1** below, which includes projected dates and requirements according to the PWS.

TABLE 7-1 MEETING REQUIREMENTS

Meeting	Date or Projected Date	Purpose/Requirements
Kick Off Meeting	October 2, 2019	Define project scope and organization. Fulfill requirements of Quality Assurance Project Plan (QAPP) Worksheet #9.
Pre-Construction Conference	October 30, 2019	Discuss details of UFP-QAPP, Air Quality Monitoring Plan, APP, Phase 2 RAWP, CQCP, and project schedule.
Pre-Construction Safety Conference	21 days after submission of APP/SSHP	Discuss details of APP/SSHP. Fulfill requirements of PWS Section 01 35 26 Part 1.5.3.
Project Status Teleconferences	Monthly initially then biweekly once construction begins	Provide updates on progress, scheduling problems, submittals, field orders, and change orders. Fulfill requirements of PWS Section 01 30 00 Part 1.7.
ISTR Draft Design Work Plan and Pre-Construction Review Meeting	Planned for January 28, 2020	Discuss details of ISTR design draft before beginning construction; USEPA Region 2 Headquarters
ISTR Pre-Construction Field Meeting	Before construction	Review findings Pre-Construction Conference and Pre-Construction Safety Conference with field staff. Review updates to plans.
ISTR Operational Kick Off Meeting	Before ISTR startup	Inspect ISTR system construction prior to startup. Perform readiness review.
Health & Safety Meeting with Local Agencies	Before mobilization to Site	Meet with local emergency response agencies and explain project. Fulfill requirements of PWS Section 01 30 00 Part 1.8.
Public Meetings (3)	During the course of the project	Discuss technical activities involving the construction project to a lay audience at the request of the USACE and USEPA. Fulfill requirements of PWS Section 01 30 00 Part 1.8.

7.3 REPORTING AND PROJECT CLOSEOUT

Work completed will be documented in various reports prepared as required by the PWS. Each report will be submitted to the USACE for review. Specific reports are further described below.

7.3.1 Baseline Monitoring Report

A baseline monitoring report will be prepared to describe the results of pre-treatment soil and groundwater sampling. The report will include documentation of barometric pressure readings and temperature and precipitation as recorded during baseline air monitoring activities. The report will be organized according to category (i.e. soil sampling, groundwater sampling, meteorological observations, etc.) with information and data presented chronologically. The report will include figures depicting monitoring locations and results for groundwater monitoring, groundwater elevations, and soil results. All baseline soil sampling locations will be logged by an onsite geologist who will record the observed soil sampling conditions, which may include the depth of competent bedrock if encountered. Such information will be presented in this report. Due to the timing of sampling and construction activities, it may be necessary to split the baseline monitoring report into two parts. It is anticipated that an updated report or a separate report may be prepared for the baseline monitoring for Stage 2.

7.3.2 Commissioning Report

A Commissioning Report will be prepared following construction activities and completion of pre-commissioning and functional tests. The Commissioning Report will include completed checklists for pre-commissioning checks and functional performance tests executed in accordance with the approved Commissioning Plan.

7.3.3 Weekly and Monthly Progress Reports

Routine operational data will be presented in weekly reports which will be submitted within 7 days of the reporting period. In addition, monthly progress reports will include cumulative operational data, as well as any analytical data collected. The monthly reports will also provide a summary of progress toward achieving performance criteria.

7.3.4 Shutdown Memorandum

For each stage of treatment, a Shutdown Memorandum will be provided to the USACE summarizing the results of effectiveness monitoring and providing an evaluation and recommendations regarding meeting the performance criteria.

7.3.5 Remedial Action Completion Reports (Stage-Specific and Final)

Remedial action completion reporting will be comprised of stage specific interim Remedial Action Completion Reports (RACR) to be submitted following completion of each respective stage of treatment. It is anticipated that the interim RACR following Stage 2 will present an updated version of the Stage 1 interim RACR to include documentation of activities and data from both stages.

As described in the PWS, the RACR will include, at a minimum, the following items:

- A chronology of events
- Lessons learned (as appendix)
- Waste disposal
- Energy and power usage
- Sampling results including:
  - Process monitoring
  - Confirmation sampling
  - Excavation end-point samples
  - Perimeter and work zone air monitoring
  - Interim monitoring
- Chemical data final report
- Deviations from the Phase 2 RAWP & QAPP
- Site restoration
- As-built drawings
- Cost information
- The Shutdown Memorandum (as attachment)

7.4 ORGANIZATION AND RESPONSIBILITIES OF PERSONNEL

Key project personnel are identified below with a description of each person's roles and responsibilities. **Figure 7-1** shows the project organizational chart for this project.

- **URS Project Manager, Mike Niederreither –** Responsible for overall management of the project and remediation team. Ensures that quality objectives are successfully achieved. Reports to the USACE Project Manager.
- **URS CQC System Manager, Deputy Project Manager, Sam Bartlett, CQMC –** Responsible for supporting implementation of the CQCP. Provides office support to the Contractor QC System Manager (CQCSM) and functions as the alternate CQCSM. Ensures an independent review or inspection of all site work. Oversees submittals, supports preparatory and initial meetings, and maintains project QC records. Has authority in all contractor QC (CQC) matters, including authority to require re-work or replacement of work. Has stop work authority. Reports any deviations from the anticipated conditions described in the plan to the Construction Manager and, if necessary, to the QC Manager.

- **URS Assistant Project Manager, Jim Kaczor –** Provides management support and direction to the Project Manager. Monitors project-specific QC performance to ensure a consistent, high-quality performance.
- **URS ISTR Technical Manager, Art Taddeo –** Responsible for supporting implementation of the Phase 2 RAWP. Provides technical review of ISTR submittals including performance monitoring results. Reports any deviations from the Phase 2 RAWP to the Project Manager.
- **URS Environmental Technical Specialist, Tony Ye** - Responsible for oversight of on-site environmental features of work. Shall coordinate with the Contractor Quality System Manager (CQSM) and be physically present on-site during activities related to the environmental features of work, such as air quality monitoring, soil logging during well installation, and environmental sampling.
- **URS Construction Manager, Scott Serviss –** Responsible for overall management of the construction team during field implementation of the Phase 2 RAWP. Reviews submittals and supports the Site Superintendent with maintenance of project QC records. Coordinates activities by subcontractors.
- **URS Site Superintendent/CQC System Manager, David Tiedman, CQMC** - Full time on-site responsibility for field implementation of the CQCP. Ensures an independent review or inspection of all site construction work. Oversees submittals, conducts preparatory and initial meetings, and maintains project QC records. Coordinates QC activities by subcontractors. Has authority in all CQC matters, including authority to require re-work or replacement of work. Has stop work authority. Reports any deviations from the anticipated conditions described in the plan to the Construction Manager and, if necessary, to the QC Manager.
- **GEO Program Manager, Grant Geckeler, and Project Manager, Iain Cowie –** Responsible for overall project management of GEO’s ISTR work. Prepare ISTR submittals and ensure compliance with the Phase 2 RAWP. Report to the URS ISTR Technical Manager and Project Managers.
- **GEO Lead Design Engineer, Xiaosong (Jason) Chen** - Responsible for development and certification of thermal treatment design and for oversight of on-site civil features of work. Shall coordinate with the URS and GEO site management team and be physically present on-site during activities related to the civil features of work.
- **GEO Thermal Construction Supervisor, Andre Remillard** - Full time on-site responsibility during ISTR system construction. Prepares and reviews field records and reports in consultation with the GEO and URS Site Superintendents.
- **GEO Site Superintendent, Brian Morris** - Full time on-site responsibility for overall ISTR system construction and operation. Provides oversight of GEO subcontractors. Prepares and reviews field records and reports in consultation with the URS Site Superintendent.

- **GEO Electrical Technical Specialists, Brian Krumbholz, Vu Tran & Chris Howe**- Responsible for oversight of on-site electrical features of work. Shall be physically present on-site during activities related to the electrical features of work.
- **GEO Geologist, Scott McKeag** - Responsible for oversight of drilling activities and preparation of field records.

CDM Smith, 2012. Diaz Final Feasibility Study Report

CDM Smith, 2012. Final Remedial Investigation Report, Diaz Chemical Superfund Site. July 10, 2012

Kemron, 2013. Diaz Chemical Thermal Treatability Study, November 26, 2013.

United States Environmental Protection Agency (USEPA), 1980. Comprehensive Environmental Response, Compensation, and Liability Act and amendments 42 U.S.C. 9601-9675. https://www.epa.gov/superfund/superfund-cercla-overview

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERLA, Interim Final. EAP/540/G-89/004. October 1988. https://nepis.epa.gov/

USEPA, National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations (CFR) Part 300. https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr300_main_02.tpl

United States Environmental Protection Agency (USEPA), 2012. Record of Decision, Diaz Chemical Corporation Superfund Site. September 2012.

USEPA, 2017. Explanation of Significant Differences, Diaz Chemical Corporation. March 2017

Versar, 2019. Interim Remedial Action Report, Diaz Chemical Corporation. April 2019

TABLES

Table 4-1
Site COCs and ISTR Soil and Groundwater Cleanup Goals
Diaz Superfund Site
Holley, NY

Chemical of Concern	CAS	OU2 Cleanup Goals		ISTR Goal
		GW ug/L	Soil ug/kg	Soil ug/kg
1,1,1-Trichloroethane	71-55-6	5	680	680
1,1-Dichloroethane	75-34-3	5	--	500
1,1-Dichloroethene	75-35-4	7	--	500
1,2-Dibromo-3-chloropropane	96-12-8	0.04	--	500
1,2-Dibromoethane	106-93-4	5	500	500
1,2-Dichloroethane	107-06-2	5	20	500
Benzene	71-43-2	1	60	500
Chlorobenzene	108-90-7	5	1,100	1,100
cis-1,3-Dichloropropene	10061-01-5	5	--	500
Cyclohexane	110-82-7	5	500	500
Ethylbenzene	100-41-4	5	1,000	1,000
Isopropylbenzene	98-82-8	5	500	500
m,p-Xylene	179601-23-	5	1600	1,600
Methylene Chloride	75-09-2	5	500	500
o-Xylene	95-47-6	5	1600	1,600
Styrene	100-42-5	5	--	500
Tetrachloroethene	127-18-4	5	1,300	1,300
Toluene	108-88-3	5	700	700
trans-1,2-Dichloroethene	156-60-5	5	--	500
trans-1,3-Dichloropropene	10061-02-6	0.4	--	500
Trichloroethene	79-01-6	5	470	500
Vinyl Chloride	75-01-4	2	20	500
2-Butanone	78-93-3	--	120	500
Methylcyclohexane	108-87-2	--	500	500
1-Bromo-2-chloroethane	107-04-0	5	500	500
1,3-Dibromobenzene	108-36-1	5	500	500
Fluorobenzene	462-06-6	5	500	500
4-Chlorobenzotrifluoride	98-56-6	5	500	500
1,4-Dibromobenzene	106-37-6	5	500	500
1-Bromo-3-fluorobenzene	1073-06-9	5	500	500
2-Bromopyridine	109-04-6	5	500	500
3-Nitro-4-chlorobenzotrifluoride	121-17-5	5	500	500
3-Amino-4-chlorobenzotrifluoride	121-50-6	5	500	500
1-Bromo-4-ethylbenzene	1585-07-5	5	500	500
3-Bromoacetophenone	2142-63-4	5	500	500
3,4-Dichlorobenzotrifluoride	328-84-7	5	500	500
4-Bromofluorobenzene	460-00-4	--	500	500

OU2: Operable Unit 2
GW: Groundwater
ISTR: In Situ Thermal Remediation

Table 4-2
Mass Balance Calculations - Vapors and Soils
Diaz Superfund Site
Holley, NY

Phase I summary

stream type	ID#	location	T (°C)	abs press (Kpa)	Total flow (scfm)	dry mass flow SCFM	dry mass flow ACFM	dry mass flow kg/hr	steam mass flow SCFM	steam mass flow ACFM	steam mass flow kg/hr	humidity	water conden. (gallon/day)	cooling capacity (KW)
SVE -C2	A1	field from SVE	100	-2	1171	470	600	945	701	895	874	1.49		
	B1	KO1 inlet	79	-12	1221	520	697	1045	701	939	874	1.35		
	C1	KO1 outlet/AS1 inlet	78	-12	1011	520	695	1045	491	657	613	0.94	1629	165
	D1	AS1 outlet	68	-18	790	520	724	1045	270	376	337	0.52	1724	183
	E1	HX-2-AC/KO2 outlet	20	-30	538	520	727	1045	18	25	22	0.03	1964	230
	F1	B1 inlet	20	-30	589	570	797	1146	19	27	24	0.03		
	G1	B1 out	60	0	589	570	637	1146	19	21	24	0.03		
	H1	HX-3-AA/KO3 out	15	-2	580	570	562	1146	10	10	12	0.02	73	23
SVE-C3	I1	before compressor 1	15	-4	528	520	523	1045	8	8	10	0.02		
	J1	C3-1 mid	-40	938	520	520	40	1045	0	0	0	0.00	61	6
	K1	C3-1 out	25	-4	470	470	489	945	0	0	0	0.00		
MPE-C2	A2	field from MPE	100	-16	2224	950	1413	1909	1274	1895	1589	1.34		
	B2	SO1 inlet	70	-26	2274	1000	1549	2010	1274	1974	1589	1.27		
	C2	SO1 outlet/AS2 inlet	69	-26	1646	1000	1545	2010	646	998	806	0.65	4885	493
	D2	AS2 outlet	60	-38	1457	1000	1791	2010	457	820	571	0.46	1470	161
	E2	HX-5-AC/KO4 outlet	20	-50	1048	1000	1947	2010	48	93	59	0.05	3191	369
	F2	B2 inlet	20	-50	1150	1100	2142	2211	50	97	62	0.05		
	G2	B2 out	60	0	1150	1100	1229	2211	50	55	62	0.05		
	H2	HX-6-AA/KO5 out	15	-2	1119	1100	1085	2211	19	19	24	0.02	237	55
MPE-C3	I2	before compressor	15	-4	1017	1000	1006	2010	17	17	21	0.02		
	J2	C3-2 mid	-40	938	1000	1000	76	2010	0	0	0	0.00	133	13
	K2	C3-2 out	25	-4	950	950	989	1909	0	0	0	0.00		
VGAC	L	GAC in	25	-4	1420	1420	1479	2854	0	0	0	0.00		
	M	vGAC2 out	25	0	1420	1420	1420	2854	0	0	0	0.00		

short term max COCs concentration (ug/m3)

ID#	1,1,1-Trichloroethane	1,2-Dibromoethane	1,2-Dichloroethane	1,4-Dibromobenzene	1-bromo-2-chloroethane	1-Bromo-4-ethylbenzene	2-Bromopyridine	3,4-Dichlorobenzotrifluoride	3-Amino-4-chlorobenzotrifluoride	3-Bromoacetophenone	3-nitro-4-chlorobenzotrifluoride	4-Bromofluorobenzene	4-Chlorobenzotrifluoride	cis-1,3-Dichloropropene	Benzene
A1	2.3E+06	7.7E+06	1.5E+07	2.0E+05	9.4E+06	9.4E+05	7.2E+04	1.9E+07	2.0E+07	8.4E+03	2.0E+05	2.5E+06	4.4E+07	0.0E+00	9.0E+05
B1	2.2E+06	7.4E+06	1.4E+07	2.0E+05	9.1E+06	9.0E+05	6.9E+04	1.8E+07	1.9E+07	8.1E+03	2.0E+05	2.4E+06	4.2E+07	0.0E+00	8.7E+05
C1	2.6E+06	8.9E+06	1.7E+07	2.4E+05	1.1E+07	1.1E+06	8.4E+04	2.2E+07	2.3E+07	9.7E+03	2.4E+05	2.9E+06	5.1E+07	0.0E+00	1.0E+06
D1	3.4E+06	1.1E+07	2.2E+07	3.0E+05	1.4E+07	1.4E+06	1.1E+05	2.9E+07	3.0E+07	1.2E+04	3.0E+05	3.7E+06	6.5E+07	0.0E+00	1.3E+06
E1	5.0E+06	1.7E+07	3.2E+07	1.5E+05	2.1E+07	2.1E+06	1.6E+05	2.8E+07	6.3E+05	1.8E+04	4.4E+05	5.4E+06	7.7E+07	0.0E+00	2.0E+06
F1	4.5E+06	1.5E+07	2.9E+07	1.3E+05	1.9E+07	1.9E+06	1.4E+05	2.5E+07	5.8E+05	1.7E+04	4.0E+05	4.9E+06	7.0E+07	0.0E+00	1.8E+06
G1	4.5E+06	1.5E+07	2.9E+07	1.3E+05	1.9E+07	1.9E+06	1.4E+05	2.5E+07	5.8E+05	1.7E+04	4.0E+05	4.9E+06	7.0E+07	0.0E+00	1.8E+06
H1	4.6E+06	1.6E+07	2.9E+07	4.4E+04	1.9E+07	1.9E+06	1.5E+05	1.5E+07	1.8E+05	1.7E+04	2.1E+05	5.0E+06	4.2E+07	0.0E+00	1.8E+06
I1	4.6E+06	7.9E+06	2.9E+07	3.9E+03	1.3E+07	3.2E+05	1.5E+05	1.3E+06	1.6E+04	8.2E+03	1.8E+04	1.8E+06	3.7E+06	0.0E+00	1.8E+06
J1	4.7E+03	8.0E+03	3.0E+04	4.0E+00	1.3E+04	3.3E+02	1.5E+02	1.3E+03	1.6E+01	8.3E+00	1.8E+01	1.9E+03	3.7E+03	0.0E+00	1.9E+03
K1	4.7E+03	8.0E+03	3.0E+04	4.0E+00	1.3E+04	3.3E+02	1.5E+02	1.3E+03	1.6E+01	8.3E+00	1.8E+01	1.9E+03	3.7E+03	0.0E+00	1.9E+03
A2	4.3E+05	1.0E+06	2.3E+08	1.5E+04	1.4E+06	2.7E+04	3.9E+04	3.4E+06	1.3E+07	6.6E+03	2.7E+04	1.7E+05	6.6E+07	3.2E+03	1.4E+07
B2	4.2E+05	9.8E+05	2.2E+08	1.5E+04	1.4E+06	2.6E+04	3.8E+04	3.4E+06	1.3E+07	6.5E+03	2.6E+04	1.7E+05	6.4E+07	3.1E+03	1.4E+07
C2	5.8E+05	1.4E+06	3.1E+08	2.0E+04	1.9E+06	3.6E+04	5.3E+04	4.6E+06	1.8E+07	8.9E+03	3.6E+04	2.3E+05	8.9E+07	4.3E+03	1.9E+07
D2	6.6E+05	1.5E+06	3.5E+08	2.3E+04	2.2E+06	4.1E+04	6.0E+04	5.2E+06	2.0E+07	1.0E+04	4.1E+04	2.6E+05	1.0E+08	4.9E+03	2.2E+07
E2	9.2E+05	2.1E+06	4.8E+08	3.2E+04	3.1E+06	5.7E+04	8.3E+04	7.3E+06	8.7E+05	1.4E+04	5.7E+04	3.7E+05	1.1E+08	6.8E+03	3.1E+07
F2	8.4E+05	1.9E+06	4.4E+08	2.9E+04	2.8E+06	5.2E+04	7.6E+04	6.6E+06	7.9E+05	1.3E+04	5.2E+04	3.4E+05	9.6E+07	6.2E+03	2.8E+07
G2	8.4E+05	1.9E+06	4.4E+08	2.9E+04	2.8E+06	5.2E+04	7.6E+04	6.6E+06	7.9E+05	1.3E+04	5.2E+04	3.4E+05	9.6E+07	6.2E+03	2.8E+07
H2	8.6E+05	2.0E+06	4.5E+08	3.0E+04	2.9E+06	5.4E+04	7.8E+04	6.8E+06	1.8E+05	1.3E+04	5.3E+04	3.4E+05	4.2E+07	6.3E+03	2.9E+07
I2	7.8E+04	1.8E+05	4.1E+07	2.7E+03	2.6E+05	4.9E+03	7.1E+03	6.2E+05	1.6E+04	1.2E+03	4.8E+03	3.1E+04	3.8E+06	5.8E+02	2.6E+06
J2	7.9E+01	1.8E+02	4.2E+04	2.8E+00	2.6E+02	5.0E+00	7.2E+00	6.3E+02	1.6E+01	1.2E+00	4.9E+00	3.2E+01	3.9E+03	5.9E-01	2.7E+03
K2	7.9E+01	1.8E+02	4.2E+04	2.8E+00	2.6E+02	5.0E+00	7.2E+00	6.3E+02	1.6E+01	1.2E+00	4.9E+00	3.2E+01	3.9E+03	5.9E-01	2.7E+03
L	2.4E+03	4.2E+03	5.6E+04	4.7E+00	6.7E+03	1.7E+02	8.1E+01	1.3E+03	2.4E+01	5.3E+00	1.4E+01	9.5E+02	5.7E+03	5.9E-01	3.6E+03
M	2.4E+01	4.2E+01	5.6E+02	4.7E-02	6.7E+01	1.7E+00	8.1E-01	1.3E+01	2.4E-01	5.3E-02	1.4E-01	9.5E+00	5.7E+01	5.9E-03	3.6E+01

ID#	Chlorobenzene	Ethylbenzene	Fluorobenzene	Isopropylbenzene	m,p-Xylene	Methylcyclohexane	Methylene chloride	o-Xylene	Tetrachoroethene	Toluene	Trichloroethene	Vinyl chloride	1,3-dibromobenzene	1-Bromo-3-fluorobenzene	1,1-Dichloroethane	1,1-Dichloroethene	Styrene	1,2-Dibromo-3-chloropropane	2-Butanone	Cyclohexane	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	total
A1	1.6E+03	1.4E+07	2.0E+06	3.1E+06	2.1E+07	5.6E+03	4.7E+04	6.4E+07	2.1E+05	3.1E+07	3.5E+04	6.2E+04	5.4E+05	3.4E+04	4.2E+02	2.1E+03	1.1E+05	9.4E+02	7.7E+05	2.5E+04	2.7E+02	4.4E+02	2.6E+08
B1	1.5E+03	1.4E+07	1.9E+06	3.0E+06	2.0E+07	5.4E+03	4.5E+04	6.1E+07	2.0E+05	3.0E+07	3.3E+04	5.9E+04	5.2E+05	3.2E+04	4.0E+02	2.0E+03	1.1E+05	9.0E+02	7.3E+05	2.4E+04	2.6E+02	4.2E+02	2.5E+08
C1	1.9E+03	1.6E+07	2.3E+06	3.6E+06	2.4E+07	6.5E+03	5.4E+04	7.4E+07	2.4E+05	3.6E+07	4.0E+04	7.2E+04	6.3E+05	3.9E+04	4.9E+02	2.5E+03	1.3E+05	1.1E+03	8.9E+05	2.9E+04	3.1E+02	5.1E+02	3.0E+08
D1	2.4E+03	2.1E+07	2.9E+06	4.6E+06	3.1E+07	8.3E+03	7.0E+04	9.5E+07	3.1E+05	4.6E+07	5.1E+04	9.2E+04	8.0E+05	5.0E+04	6.2E+02	3.2E+03	1.7E+05	1.4E+03	1.1E+06	3.7E+04	4.0E+02	6.5E+02	3.8E+08
E1	3.5E+03	3.1E+07	4.2E+06	6.8E+06	4.6E+07	1.2E+04	1.0E+05	6.0E+07	4.5E+05	6.7E+07	7.6E+04	1.3E+05	1.2E+06	7.4E+04	9.2E+02	4.6E+03	2.5E+05	2.1E+03	1.7E+06	5.4E+04	5.9E+02	9.6E+02	4.1E+08
F1	3.2E+03	2.8E+07	3.9E+06	6.2E+06	4.2E+07	1.1E+04	9.3E+04	5.5E+07	4.1E+05	6.1E+07	6.9E+04	1.2E+05	1.1E+06	6.7E+04	8.4E+02	4.2E+03	2.3E+05	1.9E+03	1.5E+06	5.0E+04	5.4E+02	8.7E+02	3.7E+08
G1	3.2E+03	2.8E+07	3.9E+06	6.2E+06	4.2E+07	1.1E+04	9.3E+04	5.5E+07	4.1E+05	6.1E+07	6.9E+04	1.2E+05	1.1E+06	6.7E+04	8.4E+02	4.2E+03	2.3E+05	1.9E+03	1.5E+06	5.0E+04	5.4E+02	8.7E+02	3.7E+08
H1	3.3E+03	2.9E+07	3.9E+06	6.3E+06	2.8E+07	1.1E+04	9.5E+04	3.2E+07	4.2E+05	6.2E+07	7.0E+04	1.3E+05	1.1E+06	6.8E+04	8.5E+02	4.3E+03	2.3E+05	1.9E+03	1.5E+06	5.0E+04	5.5E+02	8.9E+02	3.0E+08
I1	3.3E+03	2.9E+06	3.9E+06	1.4E+06	2.4E+06	1.1E+04	9.5E+04	2.9E+06	4.2E+05	7.5E+06	7.0E+04	1.3E+05	1.1E+06	6.8E+04	8.5E+02	4.3E+03	2.3E+05	1.9E+03	1.5E+06	5.0E+04	5.5E+02	8.9E+02	8.9E+07
J1	3.3E+00	2.9E+03	4.0E+03	1.4E+03	2.5E+03	1.1E+01	9.6E+01	2.9E+03	4.3E+02	7.6E+03	7.1E+01	1.3E+02	1.1E+03	7.0E+01	8.6E-01	4.4E+00	2.4E+02	1.9E+00	1.6E+03	5.1E+01	5.6E-01	9.0E-01	9.0E+04
K1	3.3E+00	2.9E+03	4.0E+03	1.4E+03	2.5E+03	1.1E+01	9.6E+01	2.9E+03	4.3E+02	7.6E+03	7.1E+01	1.3E+02	1.1E+03	7.0E+01	8.6E-01	4.4E+00	2.4E+02	1.9E+00	1.6E+03	5.1E+01	5.6E-01	9.0E-01	9.0E+04
A2	8.4E+03	1.9E+07	3.5E+06	3.7E+06	2.9E+07	5.0E+04	3.8E+06	7.2E+07	1.7E+04	7.2E+04	2.1E+04	1.2E+06	5.6E+04	2.0E+05	1.5E+04	4.4E+04	0.0E+00	0.0E+00	2.8E+04	4.2E+05	0.0E+00	0.0E+00	4.6E+08
B2	8.3E+03	1.9E+07	3.5E+06	3.6E+06	2.8E+07	4.9E+04	3.7E+06	7.0E+07	1.7E+04	7.0E+04	2.1E+04	1.1E+06	5.5E+04	1.9E+05	1.4E+04	4.3E+04	0.0E+00	0.0E+00	2.8E+04	4.1E+05	0.0E+00	0.0E+00	4.5E+08
C2	1.1E+04	2.6E+07	4.8E+06	5.0E+06	3.9E+07	6.7E+04	5.1E+06	9.7E+07	2.3E+04	9.7E+04	2.8E+04	1.6E+06	7.6E+04	2.6E+05	2.0E+04	6.0E+04	0.0E+00	0.0E+00	3.8E+04	5.6E+05	0.0E+00	0.0E+00	6.2E+08
D2	1.3E+04	2.9E+07	5.4E+06	5.7E+06	4.4E+07	7.6E+04	5.7E+06	1.1E+08	2.6E+04	1.1E+05	3.2E+04	1.8E+06	8.5E+04	3.0E+05	2.2E+04	6.8E+04	0.0E+00	0.0E+00	4.3E+04	6.4E+05	0.0E+00	0.0E+00	7.0E+08
E2	1.8E+04	4.1E+07	7.5E+06	7.9E+06	6.2E+07	1.1E+05	8.0E+06	8.2E+07	3.6E+04	1.5E+05	4.5E+04	2.5E+06	1.2E+05	4.2E+05	3.1E+04	9.4E+04	0.0E+00	0.0E+00	6.0E+04	8.8E+05	0.0E+00	0.0E+00	8.4E+08
F2	1.6E+04	3.7E+07	6.9E+06	7.2E+06	5.6E+07	9.7E+04	7.3E+06	7.5E+07	3.3E+04	1.4E+05	4.1E+04	2.3E+06	1.1E+05	3.8E+05	2.8E+04	8.6E+04	0.0E+00	0.0E+00	5.5E+04	8.1E+05	0.0E+00	0.0E+00	7.7E+08
G2	1.6E+04	3.7E+07	6.9E+06	7.2E+06	5.6E+07	9.7E+04	7.3E+06	7.5E+07	3.3E+04	1.4E+05	4.1E+04	2.3E+06	1.1E+05	3.8E+05	2.8E+04	8.6E+04	0.0E+00	0.0E+00	5.5E+04	8.1E+05	0.0E+00	0.0E+00	7.7E+08
H2	1.7E+04	3.2E+07	7.0E+06	7.4E+06	2.8E+07	9.9E+04	7.5E+06	3.2E+07	3.4E+04	1.4E+05	4.2E+04	2.3E+06	1.1E+05	3.9E+05	2.9E+04	8.8E+04	0.0E+00	0.0E+00	5.6E+04	8.3E+05	0.0E+00	0.0E+00	6.5E+08
I2	1.5E+03	3.0E+06	6.4E+05	6.7E+05	2.5E+06	9.0E+03	6.8E+05	3.0E+06	3.1E+03	1.3E+04	3.8E+03	2.1E+05	1.0E+04	3.5E+04	2.6E+03	8.0E+03	0.0E+00	0.0E+00	5.1E+03	7.5E+04	0.0E+00	0.0E+00	5.9E+07
J2	1.6E+00	3.0E+03	6.5E+02	6.8E+02	2.6E+03	9.2E+00	6.9E+02	3.0E+03	3.1E+00	1.3E+01	3.9E+00	2.2E+02	1.0E+01	3.6E+01	2.7E+00	8.2E+00	0.0E+00	0.0E+00	5.2E+00	7.7E+01	0.0E+00	0.0E+00	6.0E+04
K2	1.6E+00	3.0E+03	6.5E+02	6.8E+02	2.6E+03	9.2E+00	6.9E+02	3.0E+03	3.1E+00	1.3E+01	3.9E+00	2.2E+02	1.0E+01	3.6E+01	2.7E+00	8.2E+00	0.0E+00	0.0E+00	5.2E+00	7.7E+01	0.0E+00	0.0E+00	6.0E+04
L	3.2E+00	4.4E+03	2.6E+03	1.4E+03	3.8E+03	1.5E+01	7.4E+02	4.4E+03	2.1E+02	3.8E+03	3.9E+01	2.8E+02	5.6E+02	7.0E+01	3.1E+00	1.0E+01	1.2E+02	9.6E-01	7.8E+02	1.0E+02	2.8E-01	4.5E-01	1.0E+05
M	3.2E-02	4.4E+01	2.6E+01	1.4E+01	3.8E+01	1.5E-01	7.4E+00	4.4E+01	2.1E+00	3.8E+01	3.9E-01	2.8E+00	5.6E+00	7.0E-01	3.1E-02	1.0E-01	1.2E+00	9.6E-03	7.8E+00	1.0E+00	2.8E-03	4.5E-03	1.0E+03

Phase II summary

stream type	ID#	location	T (°C)	abs press (Kpa)	Total flow (scfm)	dry mass flow SCFM	dry mass flow ACFM	dry mass flow kg/hr	steam mass flow SCFM	steam mass flow ACFM	steam mass flow kg/hr	humidity	water conden. (gallon/day)	cooling capacity (KW)
SVE -C2	A1	field from SVE	100	-2	2110	900	1149	1809	1210	1545	1510	1.34		
	B1	KO1 inlet	78	-12	2160	950	1269	1909	1210	1617	1510	1.27		
	C1	KO1 outlet/AS1 inlet	76	-12	1717	950	1262	1909	767	1019	956	0.81	3452	351
	D1	AS1 outlet	68	-18	1443	950	1323	1909	493	687	615	0.52	2130	227
	E1	HX-2-AC/KO2 outlet	27	-30	1000	950	1360	1909	50	71	62	0.05	3451	398
	F1	B1 inlet	27	-30	1052	1000	1432	2010	52	74	65	0.05		
	G1	B1 out	67	0	1052	1000	1141	2010	52	59	65	0.05		
	H1	HX-3-AA/KO3 out	15	-2	1017	1000	986	2010	17	17	22	0.02	268	60
SVE-C3	I1	before compressor 1	15	-4	965	950	956	1909	15	15	19	0.02		
	J1	C3-1 mid	-40	938	950	950	72	1909	0	0	0	0.00	119	12
	K1	C3-1 out	25	-4	900	900	937	1809	0	0	0	0.00		
MPE-C2	A2	field from MPE	100	-16	1201	500	744	1005	701	1042	874	1.40		
	B2	SO1 inlet	70	-26	1251	550	853	1105	701	1087	874	1.27		
	C2	SO1 outlet/AS2 inlet	69	-38	1051	550	1013	1105	501	922	625	0.91	1555	158
	D2	AS2 outlet	60	-38	802	550	985	1105	252	451	314	0.46	1940	204
	E2	HX-5-AC/KO4 outlet	20	-50	576	550	1071	1105	26	51	33	0.05	1755	203
	F2	B2 inlet	20	-50	678	650	1266	1306	28	55	35	0.04		
	G2	B2 out	60	0	678	650	726	1306	28	31	35	0.04		
	H2	HX-6-AA/KO5 out	15	-2	661	650	641	1306	11	11	14	0.02	132	31
MPE-C3	I2	before compressor	15	-4	559	550	553	1105	9	9	12	0.02		
	J2	C3-2 mid	-40	938	550	550	42	1105	0	0	0	0.00	72	7
	K2	C3-2 out	25	-4	500	500	521	1005	0	0	0	0.00		
VGAC	L	GAC in	25	-4	1400	1400	1458	2814	0	0	0	0.00		
	M	vGAC2 out	25	0	1400	1400	1400	2814	0	0	0	0.00		

short termCOCs concentration (ug/m3)

ID#	1,1,1-Trichloroethane	1,2-Dibromoethane	1,2-Dichloroethane	1,4-Dibromobenzene	1-bromo-2-chloroethane	1-Bromo-4-ethylbenzene	2-Bromopyridine	3,4-Dichlorobenzotrifluoride	3-Amino-4-chlorobenzotrifluoride	3-Bromoacetophenone	3-nitro-4-chlorobenzotrifluoride	4-Bromofluorobenzene	4-Chlorobenzotrifluoride	cis-1,3-Dichloropropene	Benzene
A1	2.4E+06	8.2E+06	1.5E+07	2.2E+05	1.0E+07	1.0E+06	7.7E+04	2.0E+07	2.1E+07	8.9E+03	2.2E+05	2.6E+06	4.7E+07	0.0E+00	9.6E+05
B1	2.4E+06	8.0E+06	1.5E+07	2.1E+05	9.8E+06	9.8E+05	7.5E+04	2.0E+07	2.1E+07	8.7E+03	2.1E+05	2.6E+06	4.6E+07	0.0E+00	9.4E+05
C1	3.0E+06	1.0E+07	1.9E+07	2.7E+05	1.2E+07	1.2E+06	9.4E+04	2.5E+07	2.6E+07	1.1E+04	2.7E+05	3.2E+06	5.8E+07	0.0E+00	1.2E+06
D1	3.6E+06	1.2E+07	2.3E+07	3.2E+05	1.5E+07	1.5E+06	1.1E+05	3.0E+07	3.1E+07	1.3E+04	3.2E+05	3.8E+06	6.9E+07	0.0E+00	1.4E+06
E1	5.1E+06	1.7E+07	3.3E+07	4.4E+05	2.1E+07	2.1E+06	1.6E+05	4.1E+07	2.2E+06	1.9E+04	4.6E+05	5.5E+06	9.9E+07	0.0E+00	2.0E+06
F1	4.9E+06	1.6E+07	3.1E+07	4.1E+05	2.0E+07	2.0E+06	1.5E+05	3.9E+07	2.1E+06	1.8E+04	4.3E+05	5.3E+06	9.4E+07	0.0E+00	1.9E+06
G1	4.9E+06	1.6E+07	3.1E+07	4.1E+05	2.0E+07	2.0E+06	1.5E+05	3.9E+07	2.1E+06	1.8E+04	4.3E+05	5.3E+06	9.4E+07	0.0E+00	1.9E+06
H1	5.0E+06	1.7E+07	3.2E+07	4.4E+04	2.1E+07	2.1E+06	1.6E+05	1.5E+07	1.8E+05	1.9E+04	2.1E+05	5.4E+06	4.2E+07	0.0E+00	2.0E+06
I1	5.0E+06	4.5E+06	3.2E+07	2.2E+03	7.3E+06	1.8E+05	1.6E+05	7.5E+05	8.8E+03	4.6E+03	1.0E+04	1.0E+06	2.1E+06	0.0E+00	2.0E+06
J1	5.1E+03	4.6E+03	3.3E+04	2.3E+00	7.4E+03	1.9E+02	1.6E+02	7.6E+02	9.0E+00	4.7E+00	1.0E+01	1.1E+03	2.1E+03	0.0E+00	2.0E+03
K1	5.1E+03	4.6E+03	3.3E+04	2.3E+00	7.4E+03	1.9E+02	1.6E+02	7.6E+02	9.0E+00	4.7E+00	1.0E+01	1.1E+03	2.1E+03	0.0E+00	2.0E+03
A2	4.2E+05	9.8E+05	2.2E+08	1.5E+04	1.4E+06	2.6E+04	3.8E+04	3.3E+06	1.3E+07	6.4E+03	2.6E+04	1.7E+05	6.4E+07	3.1E+03	1.4E+07
B2	4.0E+05	9.4E+05	2.1E+08	1.4E+04	1.3E+06	2.5E+04	3.7E+04	3.2E+06	1.2E+07	6.2E+03	2.5E+04	1.6E+05	6.1E+07	3.0E+03	1.4E+07
C2	4.8E+05	1.1E+06	2.5E+08	1.7E+04	1.6E+06	3.0E+04	4.4E+04	3.8E+06	1.5E+07	7.3E+03	3.0E+04	1.9E+05	7.3E+07	3.6E+03	1.6E+07
D2	6.3E+05	1.5E+06	3.3E+08	2.2E+04	2.1E+06	3.9E+04	5.7E+04	5.0E+06	1.9E+07	9.6E+03	3.9E+04	2.5E+05	9.6E+07	4.7E+03	2.1E+07
E2	8.8E+05	2.0E+06	4.6E+08	3.0E+04	2.9E+06	5.5E+04	8.0E+04	7.0E+06	8.7E+05	1.3E+04	5.4E+04	3.5E+05	1.1E+08	6.5E+03	2.9E+07
F2	7.5E+05	1.7E+06	3.9E+08	2.6E+04	2.5E+06	4.7E+04	6.8E+04	5.9E+06	7.4E+05	1.1E+04	4.6E+04	3.0E+05	9.0E+07	5.5E+03	2.5E+07
G2	7.5E+05	1.7E+06	3.9E+08	2.6E+04	2.5E+06	4.7E+04	6.8E+04	5.9E+06	7.4E+05	1.1E+04	4.6E+04	3.0E+05	9.0E+07	5.5E+03	2.5E+07
H2	7.6E+05	1.8E+06	4.0E+08	2.6E+04	2.5E+06	4.8E+04	6.9E+04	6.1E+06	1.8E+05	1.2E+04	4.7E+04	3.1E+05	4.2E+07	5.7E+03	2.6E+07
I2	1.2E+05	2.7E+05	6.2E+07	4.1E+03	3.9E+05	7.3E+03	1.1E+04	9.4E+05	2.7E+04	1.8E+03	7.3E+03	4.7E+04	6.4E+06	8.7E+02	3.9E+06
J2	1.2E+02	2.8E+02	6.3E+04	4.1E+00	4.0E+02	7.5E+00	1.1E+01	9.5E+02	2.8E+01	1.8E+00	7.4E+00	4.8E+01	6.5E+03	8.8E-01	4.0E+03
K2	1.2E+02	2.8E+02	6.3E+04	4.1E+00	4.0E+02	7.5E+00	1.1E+01	9.5E+02	2.8E+01	1.8E+00	7.4E+00	4.8E+01	6.5E+03	8.8E-01	4.0E+03
L	9.4E+03	8.5E+03	1.2E+05	8.2E+00	1.4E+04	3.4E+02	3.0E+02	2.3E+03	4.4E+01	1.0E+01	2.6E+01	2.0E+03	1.0E+04	8.8E-01	7.6E+03
M	9.4E+01	8.5E+01	1.2E+03	8.2E-02	1.4E+02	3.4E+00	3.0E+00	2.3E+01	4.4E-01	1.0E-01	2.6E-01	2.0E+01	1.0E+02	8.8E-03	7.6E+01

ID#	Chlorobenzene	Ethylbenzene	Fluorobenzene	Isopropylbenzene	m,p-Xylene	Methylcyclohexane	Methylene chloride	o-Xylene	Tetrachoroethene	Toluene	Trichloroethene	Vinyl chloride	1,3-dibromobenzene	1-Bromo-3-fluorobenzene	1,1-Dichloroethane	1,1-Dichloroethene	Styrene	1,2-Dibromo-3-chloropropane	2-Butanone	Cyclohexane	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	total
A1	1.7E+03	1.5E+07	2.1E+06	3.3E+06	2.2E+07	5.9E+03	5.0E+04	6.8E+07	2.2E+05	3.3E+07	3.7E+04	6.6E+04	5.8E+05	3.6E+04	4.5E+02	2.3E+03	1.2E+05	1.0E+03	8.1E+05	2.7E+04	2.9E+02	4.7E+02	2.8E+08
B1	1.7E+03	1.5E+07	2.0E+06	3.3E+06	2.2E+07	5.8E+03	4.9E+04	6.6E+07	2.2E+05	3.2E+07	3.6E+04	6.4E+04	5.6E+05	3.5E+04	4.4E+02	2.2E+03	1.2E+05	9.8E+02	7.9E+05	2.6E+04	2.8E+02	4.6E+02	2.7E+08
C1	2.1E+03	1.9E+07	2.5E+06	4.1E+06	2.7E+07	7.3E+03	6.1E+04	8.4E+07	2.7E+05	4.0E+07	4.5E+04	8.1E+04	7.1E+05	4.4E+04	5.5E+02	2.8E+03	1.5E+05	1.2E+03	1.0E+06	3.3E+04	3.5E+02	5.7E+02	3.4E+08
D1	2.5E+03	2.2E+07	3.0E+06	4.9E+06	3.3E+07	8.7E+03	7.3E+04	9.9E+07	3.2E+05	4.8E+07	5.4E+04	9.6E+04	8.4E+05	5.3E+04	6.5E+02	3.3E+03	1.8E+05	1.5E+03	1.2E+06	3.9E+04	4.2E+02	6.8E+02	4.0E+08
E1	3.6E+03	3.2E+07	4.4E+06	7.0E+06	4.7E+07	1.3E+04	1.1E+05	8.7E+07	4.7E+05	6.9E+07	7.8E+04	1.4E+05	1.2E+06	7.6E+04	9.4E+02	4.8E+03	2.6E+05	2.1E+03	1.7E+06	5.6E+04	6.1E+02	9.9E+02	4.8E+08
F1	3.4E+03	3.0E+07	4.2E+06	6.7E+06	4.5E+07	1.2E+04	1.0E+05	8.3E+07	4.4E+05	6.6E+07	7.4E+04	1.3E+05	1.2E+06	7.2E+04	9.0E+02	4.5E+03	2.4E+05	2.0E+03	1.6E+06	5.3E+04	5.8E+02	9.4E+02	4.6E+08
G1	3.4E+03	3.0E+07	4.2E+06	6.7E+06	4.5E+07	1.2E+04	1.0E+05	8.3E+07	4.4E+05	6.6E+07	7.4E+04	1.3E+05	1.2E+06	7.2E+04	9.0E+02	4.5E+03	2.4E+05	2.0E+03	1.6E+06	5.3E+04	5.8E+02	9.4E+02	4.6E+08
H1	3.6E+03	3.1E+07	4.3E+06	6.9E+06	2.8E+07	1.2E+04	1.0E+05	3.2E+07	4.6E+05	6.8E+07	7.6E+04	1.4E+05	1.2E+06	7.5E+04	9.3E+02	4.7E+03	2.5E+05	2.1E+03	1.7E+06	5.5E+04	6.0E+02	9.7E+02	3.2E+08
I1	3.6E+03	1.6E+06	4.3E+06	7.7E+05	1.4E+06	1.2E+04	1.0E+05	1.6E+06	4.6E+05	4.2E+06	7.7E+04	1.4E+05	6.5E+05	7.5E+04	9.3E+02	4.7E+03	2.5E+05	2.1E+03	1.7E+06	5.5E+04	6.0E+02	9.7E+02	7.3E+07
J1	3.6E+00	1.7E+03	4.4E+03	7.9E+02	1.4E+03	1.3E+01	1.1E+02	1.7E+03	4.7E+02	4.3E+03	7.8E+01	1.4E+02	6.7E+02	7.6E+01	9.4E-01	4.8E+00	2.6E+02	2.1E+00	1.7E+03	5.6E+01	6.1E-01	9.9E-01	7.4E+04
K1	3.6E+00	1.7E+03	4.4E+03	7.9E+02	1.4E+03	1.3E+01	1.1E+02	1.7E+03	4.7E+02	4.3E+03	7.8E+01	1.4E+02	6.7E+02	7.6E+01	9.4E-01	4.8E+00	2.6E+02	2.1E+00	1.7E+03	5.6E+01	6.1E-01	9.9E-01	7.4E+04
A2	8.2E+03	1.9E+07	3.5E+06	3.6E+06	2.8E+07	4.9E+04	3.7E+06	7.0E+07	1.7E+04	7.0E+04	2.1E+04	1.1E+06	5.5E+04	1.9E+05	1.4E+04	4.3E+04	0.0E+00	0.0E+00	2.8E+04	4.1E+05	0.0E+00	0.0E+00	4.5E+08
B2	7.9E+03	1.8E+07	3.3E+06	3.5E+06	2.7E+07	4.7E+04	3.5E+06	6.7E+07	1.6E+04	6.7E+04	2.0E+04	1.1E+06	5.2E+04	1.8E+05	1.4E+04	4.2E+04	0.0E+00	0.0E+00	2.7E+04	3.9E+05	0.0E+00	0.0E+00	4.3E+08
C2	9.4E+03	2.1E+07	3.9E+06	4.1E+06	3.2E+07	5.6E+04	4.2E+06	8.0E+07	1.9E+04	8.0E+04	2.3E+04	1.3E+06	6.2E+04	2.2E+05	1.6E+04	4.9E+04	0.0E+00	0.0E+00	3.2E+04	4.6E+05	0.0E+00	0.0E+00	5.1E+08
D2	1.2E+04	2.8E+07	5.2E+06	5.4E+06	4.3E+07	7.3E+04	5.5E+06	1.0E+08	2.5E+04	1.0E+05	3.1E+04	1.7E+06	8.2E+04	2.9E+05	2.1E+04	6.5E+04	0.0E+00	0.0E+00	4.1E+04	6.1E+05	0.0E+00	0.0E+00	6.7E+08
E2	1.7E+04	3.9E+07	7.2E+06	7.6E+06	5.9E+07	1.0E+05	7.6E+06	8.2E+07	3.4E+04	1.5E+05	4.3E+04	2.4E+06	1.1E+05	4.0E+05	3.0E+04	9.0E+04	0.0E+00	0.0E+00	5.8E+04	8.5E+05	0.0E+00	0.0E+00	8.2E+08
F2	1.5E+04	3.3E+07	6.1E+06	6.4E+06	5.0E+07	8.6E+04	6.5E+06	7.0E+07	2.9E+04	1.2E+05	3.6E+04	2.0E+06	9.7E+04	3.4E+05	2.5E+04	7.7E+04	0.0E+00	0.0E+00	4.9E+04	7.2E+05	0.0E+00	0.0E+00	6.9E+08
G2	1.5E+04	3.3E+07	6.1E+06	6.4E+06	5.0E+07	8.6E+04	6.5E+06	7.0E+07	2.9E+04	1.2E+05	3.6E+04	2.0E+06	9.7E+04	3.4E+05	2.5E+04	7.7E+04	0.0E+00	0.0E+00	4.9E+04	7.2E+05	0.0E+00	0.0E+00	6.9E+08
H2	1.5E+04	3.2E+07	6.3E+06	6.6E+06	2.8E+07	8.8E+04	6.6E+06	3.2E+07	3.0E+04	1.3E+05	3.7E+04	2.1E+06	9.9E+04	3.5E+05	2.6E+04	7.9E+04	0.0E+00	0.0E+00	5.0E+04	7.4E+05	0.0E+00	0.0E+00	6.0E+08
I2	2.3E+03	5.0E+06	9.6E+05	1.0E+06	4.3E+06	1.4E+04	1.0E+06	5.0E+06	4.6E+03	2.0E+04	5.7E+03	3.2E+05	1.5E+04	5.3E+04	4.0E+03	1.2E+04	0.0E+00	0.0E+00	7.7E+03	1.1E+05	0.0E+00	0.0E+00	9.2E+07
J2	2.3E+00	5.1E+03	9.8E+02	1.0E+03	4.4E+03	1.4E+01	1.0E+03	5.1E+03	4.7E+00	2.0E+01	5.8E+00	3.3E+02	1.6E+01	5.4E+01	4.0E+00	1.2E+01	0.0E+00	0.0E+00	7.9E+00	1.2E+02	0.0E+00	0.0E+00	9.3E+04
K2	2.3E+00	5.1E+03	9.8E+02	1.0E+03	4.4E+03	1.4E+01	1.0E+03	5.1E+03	4.7E+00	2.0E+01	5.8E+00	3.3E+02	1.6E+01	5.4E+01	4.0E+00	1.2E+01	0.0E+00	0.0E+00	7.9E+00	1.2E+02	0.0E+00	0.0E+00	9.3E+04
L	8.9E+00	8.1E+03	8.9E+03	2.4E+03	6.9E+03	3.6E+01	1.2E+03	8.1E+03	8.4E+02	7.8E+03	1.5E+02	5.8E+02	1.2E+03	1.9E+02	5.7E+00	2.1E+01	4.6E+02	3.8E+00	3.1E+03	2.2E+02	1.1E+00	1.8E+00	2.3E+05
M	8.9E-02	8.1E+01	8.9E+01	2.4E+01	6.9E+01	3.6E-01	1.2E+01	8.1E+01	8.4E+00	7.8E+01	1.5E+00	5.8E+00	1.2E+01	1.9E+00	5.7E-02	2.1E-01	4.6E+00	3.8E-02	3.1E+01	2.2E+00	1.1E-02	1.8E-02	2.3E+03

Table 4-2 (continued)
Mass Balance Calculations - Vapors and Soils
Diaz Superfund Site
Holley, NY

heating days	Concentration of COCs remained in the soil (µg/Kg) during heating based on average concentratrationn																																				
	1,1,1-Trichloroethane	1,2-Dibromoethane	1,2-Dichloroethane	1,4-Dibromobenzene	1-bromo-2-chloroethane	1-Bromo-4-ethylbenzene	2-Bromopyridine	3,4-Dichlorobenzotrifluoride	3-Amino-4-chlorobenzotrifluori	3-Bromoacetophenone	3-nitro-4-chlorobenzotrifluorid	4-Bromofluorobenzene	4-Chlorobenzotrifluoride	cis-1,3-Dichloropropene	Benzene	Chlorobenzene	Ethylbenzene	Fluorobenzene	Isopropylbenzene	m,p-Xylene	Methylcyclohexane	Methylene chloride	o-Xylene	Tetrachloroethene	Toluene	Trichloroethene	Vinyl chloride	1,3-dibromobenzene	1-Bromo-3-fluorobenzene	1,1-Dichloroethane	1,1-Dichloroethene	Styrene	1,2-Dibromo-3-chloropropane	2-Butanone	Cyclohexane	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	total
0	18,000	371,000	69,000	218,000	200,000	460,000	30,000	3,500,000	105,000	53,000	580,000	251,100	2,800,000	2,000	8,470	73	750,000	21,000	280,000	1,200,000	97	130	3,370,000	6,800	730,000	400	42	94,000	900	2	5	8,100	400	7,000	2,700	1	10	15,137,230
5	17,392	364,415	65,537	214,592	195,978	452,770	29,528	3,444,216	103,358	52,172	570,932	247,043	2,753,378	1,956	8,219	72	737,262	20,429	275,464	1,179,853	95	119	3,312,766	6,676	715,619	389	24	92,508	885	2	4	7,967	394	6,800	2,657	1	10	14,881,482
10	16,798	357,932	62,203	211,238	192,020	445,653	29,064	3,389,298	101,743	51,356	562,006	243,048	2,707,473	1,912	7,974	70	724,720	19,869	270,998	1,160,016	93	109	3,256,410	6,554	701,462	379	13	91,039	871	2	4	7,836	388	6,604	2,614	1	10	14,629,780
15	16,205	351,515	58,912	207,936	188,081	438,644	28,607	3,335,176	100,152	50,553	553,220	239,108	2,662,129	1,869	7,729	69	712,319	19,309	266,593	1,140,410	91	100	3,200,685	6,432	687,388	368	7	89,591	857	2	3	7,706	381	6,408	2,571	1	9	14,381,136
20	15,584	345,088	55,478	204,686	184,063	431,737	28,156	3,281,694	98,586	49,763	544,570	235,204	2,616,975	1,824	7,473	68	699,925	18,726	262,222	1,120,850	88	90	3,144,999	6,310	673,061	357	4	88,161	842	2	3	7,578	375	6,203	2,530	1	9	14,133,285
25	14,900	338,543	51,699	201,486	179,827	424,920	27,711	3,228,628	97,043	48,985	536,053	231,309	2,571,485	1,777	7,191	67	687,356	18,090	257,852	1,101,070	86	80	3,088,518	6,184	658,027	345	2	86,743	828	1	3	7,448	369	5,977	2,488	1	9	13,883,101
30	14,115	331,747	47,389	198,335	175,202	418,180	27,271	3,175,678	95,520	48,219	527,667	227,386	2,524,949	1,726	6,869	65	674,362	17,366	253,432	1,080,715	83	69	3,030,133	6,049	641,720	332	1	85,328	814	1	2	7,316	364	5,717	2,446	1	9	13,626,578
35	13,190	324,531	42,415	195,231	169,977	411,496	26,834	3,122,422	94,008	47,465	519,407	223,382	2,476,405	1,669	6,490	64	660,617	16,516	248,892	1,059,305	81	57	2,968,372	5,902	623,433	316	0	83,906	798	1	2	7,179	358	5,408	2,403	1	9	13,358,542
40	12,094	316,681	36,731	192,169	163,897	404,840	26,398	3,068,288	92,477	46,722	511,265	219,226	2,424,565	1,602	6,038	62	645,692	15,501	244,139	1,036,208	77	44	2,901,309	5,736	602,319	297	0	82,460	781	1	1	7,033	352	5,036	2,359	0	8	13,072,408
45	10,809	307,933	30,439	189,142	156,675	398,174	25,960	3,012,506	90,828	45,990	503,235	214,822	2,367,757	1,525	5,499	61	629,051	14,287	239,046	1,010,621	73	32	2,826,535	5,545	577,416	275	0	80,968	761	1	1	6,875	346	4,589	2,312	0	8	12,760,097
50	9,339	297,972	23,817	186,139	148,018	391,447	25,517	2,954,084	88,774	45,268	495,302	210,046	2,303,905	1,434	4,871	59	610,054	12,854	233,454	981,575	68	21	2,741,174	5,319	547,723	249	0	79,401	736	1	0	6,697	340	4,064	2,261	0	8	12,411,991
55	7,724	286,426	17,308	183,140	137,650	384,589	25,063	2,891,744	85,534	44,556	487,450	204,739	2,230,464	1,329	4,159	56	587,951	11,205	227,169	947,919	62	12	2,641,860	5,051	512,272	219	0	77,722	705	1	0	6,494	334	3,467	2,205	0	7	12,016,586
60	6,046	272,926	11,463	180,119	125,422	377,519	24,591	2,824,020	79,317	43,852	479,653	198,724	2,144,746	1,207	3,391	54	562,007	9,383	219,977	908,495	55	6	2,525,283	4,734	470,458	185	0	75,887	665	0	0	6,258	328	2,819	2,142	0	6	11,561,738
65	4,417	257,105	6,761	177,042	111,337	370,136	24,094	2,749,186	66,873	43,155	471,879	191,797	2,043,912	1,070	2,609	50	531,502	7,470	211,648	862,143	48	2	2,388,218	4,361	422,130	149	0	73,848	612	0	0	5,982	321	2,159	2,070	0	6	11,034,092
70	2,966	238,705	3,455	173,866	95,671	362,329	23,564	2,665,454	45,435	42,463	464,090	183,762	1,925,585	921	1,869	47	495,936	5,587	201,970	807,989	40	1	2,228,404	3,934	367,975	114	0	71,552	546	0	0	5,661	314	1,535	1,986	0	5	10,423,731
75	1,804	217,817	1,492	170,558	79,132	354,013	22,993	2,571,677	20,202	41,775	456,248	174,521	1,789,417	765	1,232	42	455,461	3,885	190,865	746,127	32	0	2,046,540	3,462	310,097	81	0	68,968	467	0	0	5,291	307	1,001	1,890	0	4	9,738,166
80	982	194,929	532	167,097	62,730	345,145	22,378	2,467,612	4,349	41,090	448,329	164,111	1,637,509	612	739	38	410,959	2,490	178,416	677,741	24	0	1,846,577	2,964	251,670	53	0	66,090	381	0	0	4,880	299	593	1,783	0	3	9,003,105
85	473	170,815	153	163,476	47,493	335,719	21,720	2,353,810	305	40,406	440,322	152,683	1,473,878	469	401	33	363,819	1,460	164,840	604,811	17	0	1,634,762	2,463	196,115	33	0	62,936	295	0	0	4,435	290	316	1,664	0	3	8,240,415
90	199	146,373	35	159,702	34,228	325,757	21,019	2,231,310	4	39,725	432,227	140,460	1,303,535	344	194	28	315,646	777	150,428	529,680	12	0	1,418,305	1,982	146,305	18	0	59,538	216	0	0	3,969	281	150	1,538	0	2	7,463,987
95	74	123,071	6	155,848	23,625	315,470	20,294	2,104,356	0	39,048	424,113	128,024	1,136,116	242	85	23	269,177	379	135,865	456,546	8	0	1,209,503	1,552	105,053	9	0	56,020	151	0	0	3,506	271	64	1,409	0	1	6,709,909
100	24	101,268	1	151,910	15,516	304,837	19,543	1,973,170	0	38,376	415,973	115,478	973,896	163	33	19	225,089	167	121,287	386,435	5	0	1,011,398	1,178	72,186	4	0	52,388	101	0	0	3,052	261	24	1,278	0	1	5,985,061
105	6	81,127	0	147,858	9,577	293,762	18,759	1,836,979	0	37,706	407,773	102,825	817,853	103	11	15	183,700	65	106,718	319,823	3	0	825,427	859	46,955	2	0	48,624	64	0	0	2,609	251	8	1,146	0	1	5,290,609
110	1	62,833	0	143,654	5,462	282,126	17,934	1,694,890	0	37,037	399,469	90,083	669,247	61	3	11	145,394	21	92,205	257,299	1	0	653,304	596	28,489	1	0	44,704	37	0	0	2,179	240	2	1,011	0	0	4,628,294
115	0	46,593	0	139,247	2,811	269,772	17,057	1,545,904	0	36,366	391,001	77,293	529,704	32	1	8	110,622	6	77,828	199,590	1	0	497,062	388	15,790	0	0	40,604	20	0	0	1,768	229	0	876	0	0	4,000,573
120	0	32,627	0	134,570	1,261	256,496	16,114	1,388,976	0	35,689	382,288	64,533	401,314	15	0	6	79,909	1	63,712	147,584	0	0	359,056	232	7,759	0	0	36,300	9	0	0	1,379	216	0	739	0	0	3,410,785
125	0	21,150	0	129,529	469	242,033	15,086	1,223,200	0	35,002	373,219	51,949	286,696	6	0	4	53,828	0	50,063	102,323	0	0	241,866	124	3,234	0	0	31,773	4	0	0	1,022	203	0	603	0	0	2,863,386
130	0	12,327	0	124,001	133	226,053	13,953	1,048,241	0	34,297	363,639	39,787	188,954	2	0	2	32,937	0	37,196	64,936	0	0	147,997	56	1,069	0	0	27,021	1	0	0	705	188	0	470	0	0	2,363,965
135	0	6,188	0	117,830	26	208,177	12,692	865,207	0	33,566	353,338	28,441	111,289	0	0	1	17,616	0	25,573	36,416	0	0	79,156	20	252	0	0	22,086	0	0	0	440	171	0	343	0	0	1,918,828
140	0	2,514	0	110,831	3	188,049	11,282	678,088	0	32,796	342,048	18,471	55,968	0	0	0	7,791	0	15,779	17,157	0	0	35,006	5	36	0	0	17,091	0	0	0	240	153	0	229	0	0	1,533,537
145	0	756	0	102,825	0	165,488	9,723	495,224	0	31,971	329,457	10,512	22,568	0	0	0	2,635	0	8,386	6,329	0	0	11,842	1	2	0	0	12,275	0	0	0	107	132	0	135	0	0	1,210,368
150	0	149	0	93,682	0	140,690	8,042	329,117	0	31,076	315,233	5,002	6,699	0	0	0	612	0	3,636	1,660	0	0	2,751	0	0	0	0	7,978	0	0	0	37	110	0	68	0	0	946,542
155	0	16	0	83,366	0	114,338	6,303	193,061	0	30,090	299,044	1,869	1,298	0	0	0	83	0	1,196	270	0	0	375	0	0	0	0	4,543	0	0	0	9	87	0	27	0	0	735,975
160	0	1	0	71,960	0	87,641	4,607	96,009	0	28,992	280,566	502	137	0	0	0	5	0	269	22	0	0	23	0	0	0	0	2,171	0	0	0	1	64	0	8	0	0	572,978
165	0	0	0	59,774	0	62,366	3,081	38,510	0	27,763	259,597	86	6	0	0	0	0	0	36	1	0	0	0	0	0	0	0	825	0	0	0	0	43	0	2	0	0	452,090
170	0	0	0	47,418	0	40,572	1,849	11,816	0	26,392	236,253	8	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	236	0	0	0	0	26	0	0	0	0	364,572
175	0	0	0	35,673	0	23,778	979	2,621	0	24,878	210,970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	14	0	0	0	0	298,961
180	0	0	0	25,218	0	12,311	446	388	0	23,224	184,277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	7	0	0	0	0	245,877
185	0	0	0	16,495	0	5,449	168	33	0	21,421	156,629	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	200,198
190	0	0	0	9,730	0	1,950	49	1	0	19,449	128,431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	159,611
195	0	0	0	4,948	0	510	10	0	0	17,273	100,109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	122,850
200	0	0	0	1,988	0	79	1	0	0	14,827	72,141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89,036
205	0	0	0	511	0	4	0	0	0	11,980	45,131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57,626
210	0	0	0	39	0	0	0	0	0	8,412	20,124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28,575
215	0	0	0	0	0	0	0	0	0	2,768	764	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,532
220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-3
Required Permits - Approvals and Contacts
Diaz Superfund Site
Holley, NY

Permit/Approval	Agency/Entity	Contact	Contact phone and email
Air Permit Equivalent	NYSDEC Region 8	David Pratt, P.E. – Regional Hazardous Waste Remediation Engineer	P: (585) 226-5449 | david.pratt@dec.ny.gov
		Yuan Zeng, P.E. - Regional Air Pollution Control Engineer	P: (585) 226-5304 | yuan.zeng@dec.ny.gov
	NYSDEC Central	Jenelle Gaylord – Project Manager	P: (518) 402 9791| jenelle.gaylord@dec.ny.gov
Sanitary Sewer Discharges	Village of Holley	Matthew Campbell – Village Engineer	mcampbell@villageofholley.org 585-638-6587
Railroad Entry Permit	Genessee Valley Transportation Co.	Chris Henrici – Director of Operations and Projects	716-474-3647 cell 585-343-5398 office

Table 5-2
Groundwater Travel Time Calculations Overburden-Bedrock
Overburden - Diaz Superfund Site
Holley, NY

Well	Lithologic Unit	Test (1)	Type	T (ft^2/day)	Storativity (S)	Aquifer Thickness (b)	K (ft/day)	Method	Mean K (ft/day)
EPA-7S	OB/WB	EPA-7S_FH1	Falling head				2.2	KGS	1.85
EPA-7S	OB/WB	EPA-7S_RH1	Rising head	15.24	$1x10^{-3}$	10	1.5	Cooper	
EPA-11D	WB	EPA-11D_FH2	Falling head				0.69	KGS	0.595
EPA-11D	WB	EPA-11D_RH2	Rising head	4.974	$1x10^{-3}$	10	0.5	Cooper	
EPA-12S	OB	EPA-12S_FH1	Falling head	1.513	$1.15x10^{-3}$	10	0.2	Cooper	0.3
EPA-12S	OB	EPA-12S_RH1	Rising head	3.641	$1x10^{-5}$	10	0.4	Cooper	
EPA-12D	WB	EPA-12D_RH1	Rising head	8.1	$1x10^{-3}$	10	0.81	Cooper	0.81
EPA-13S	OB	EPA-13S_FH1	Falling head	$1.29x10^{-1}$	$1x10^{-3}$	10	0.01	Cooper	0.01
EPA-13S	OB	EPA-13S_RH1	Rising head	$6.9Xx10^{-2}$	$1x10^{-3}$	10	0.01	Cooper	
EPA-13D	OB	EPA-13D_FH1	Falling head	33.29	$1x10^{-5}$	10	3.33	Cooper	2.255
EPA-13D	OB	EPA-13D_RH1	Rising head	11.75	$2.29x10^{-4}$	10	1.18	Cooper	

Notes: Average S < 0.001

OB = Overburden

WB = Weathered bedrock

Mean K: 0.97 ft/d

Data obtained from Final Remedial Investigation Report prepared by CDM Smith dated July 10, 2012.

i = horizontal hydraulic gradient = 0.021 ft/ft

K = mean hydraulic conductivity = 0.97 ft/d

n_e = effective porosity = 0.1 ft/ft — specific yield of sandy silt to silt (Fetter, 1980) specific yield is approximately equal to effective porosity

Vs = seepage velocity

$\boxed{Vs = Ki/n_e}$ Vs = 0.204 ft/d

Distance (D) of GW particle after t = 30 days: $\boxed{D = t*Vs}$ D_{30} = 6.11 ft

Distance (D) of GW particle after t = 60 days: D_{60} = 12.22 ft

Distance (D) of GW particle after t = 75 days: D_{75} = 15.28 ft

Distance (D) of GW particle after t = 90 days: D_{90} = 18.33 ft

Distance (D) of GW particle after t = 120 days: D_{120} = 24.44 ft

Distance (D) of GW particle after t = 365 days: D_{365} = 74.35 ft

Table 5-2
Groundwater Travel Times - Weathered Bedrock Zone
Diaz Superfund Site
Holley, NY

Well	Lithologic Unit	Test (1)	Type	T (ft^2/day)	Storativity (S)	Aquifer Thickness (b)	K (ft/day)	Method	Mean K (ft/day)
EPA-11D	WB	EPA-11D_FH2	Falling head				0.69	KGS	0.69
EPA-11D	WB	EPA-11D_RH2	Rising head	4.974	$1x10^{-3}$	10	0.5	Cooper	0.50
EPA-12D	WB	EPA-12D_RH1	Rising head	8.1	$1x10^{-3}$	10	0.81	Cooper	0.81

Notes: Average S < 0.001
WB = Weathered bedrock

Mean K: 0.667 ft/d

Data obtained from Final Remedial Investigation Report prepared by CDM Smith dated July 10, 2012.

i = horizontal hydraulic gradient = 0.021 ft/ft
K = mean hydraulic conductivity = 0.667 ft/d
n_e = effective porosity = 0.1 ft/ft specific yield of sandy silt to silt (Fetter, 1980) specific yield is approximately equal to effective porosity
Vs = seepage velocity

$\boxed{Vs = Ki/n_e}$ Vs = 0.140 ft/d

Distance (D) of GW particle after t = 30 days: $\boxed{D = t*Vs}$ D_{30} = 4.20 ft

Distance (D) of GW particle after t = 60 days: D_{60} = 8.40 ft

Distance (D) of GW particle after t = 75 days: D_{75} = 10.50 ft

Distance (D) of GW particle after t = 90 days: D_{90} = 12.60 ft

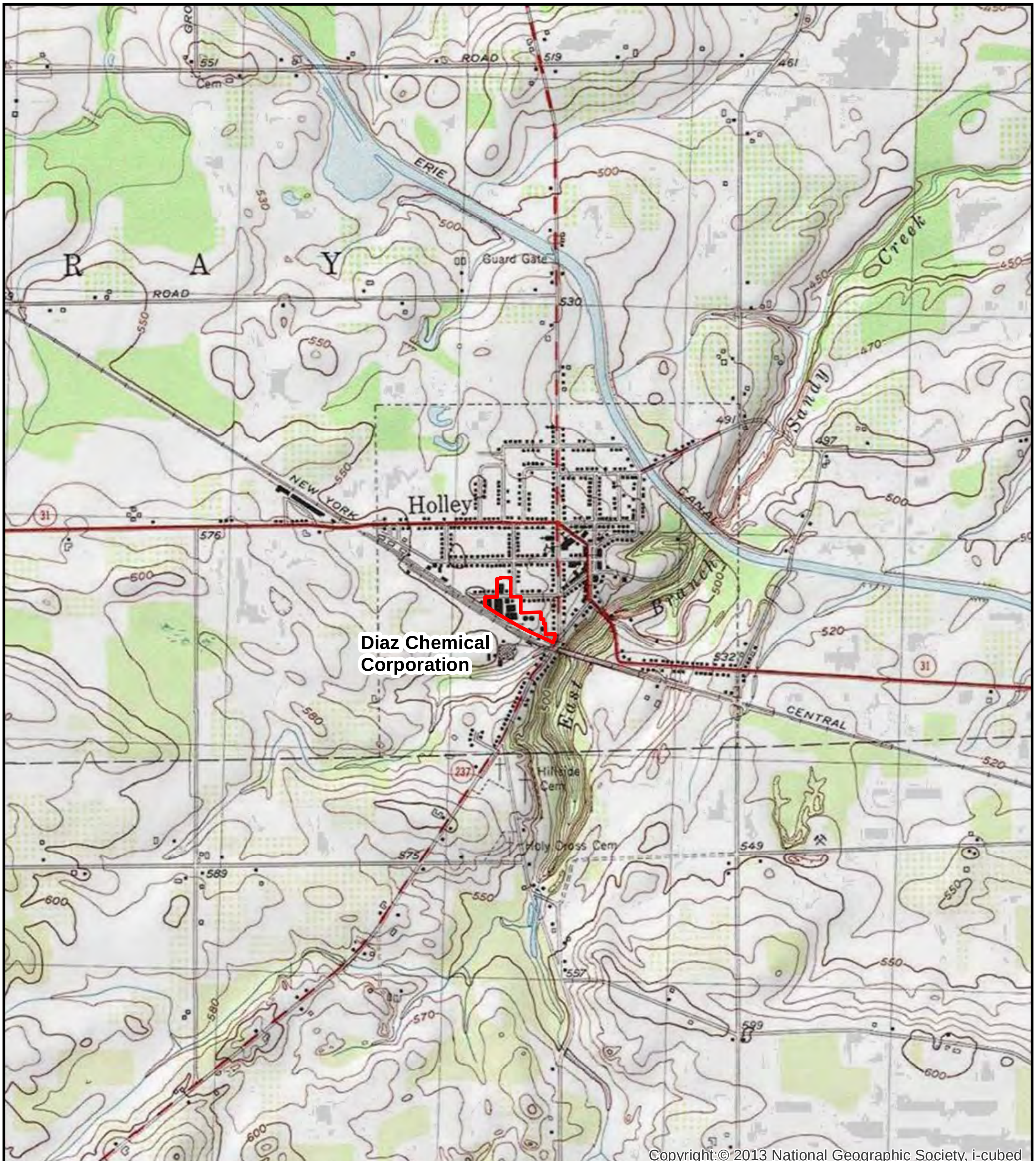
Distance (D) of GW particle after t = 110 days: D_{120} = 15.40 ft

Table 6-3 RAWP Conformity with ISTR Minimum Performance Monitoring Requirements

Type	Location(s)	Minimum Quantity	Matrix	Parameter	PWS Frequency	RAWP Frequency
Temperature	Temperature Monitoring Points, sensors every 3-ft within TTZ (Figure 4-4)	Every 1,000 sq ft	Soil and groundwater	Temperature	Daily	**Hourly**
Vapor Recovery	Influent from wellfield at P&ID locations SP1 (SVE) and SP3 (MPE) for daily PID and weekly summa samples for mass recovery estimates. Monitor vapor flows at locations VFM1 (SVE) and VFM2 (MPE); monitor vacuums at PI1 (SVE) and PI6 (MPE)		Vapor	COC Concentrations (Analytical)	Weekly [must also meet permit equivalent(s)]	**Weekly**
				PID	Daily (during work week)	**Daily**
				Vacuum, Flow, Temp	Daily	**Daily**
	Effluent into VGAC system at P&ID locations SP5, 6, 7, 8, 9, and 10 for daily PID for treatment effectiveness and locations SP7 or SP10 for summa samples for monthly air discharge		Vapor	COC Concentrations (Analytical) Ammonia (Sorbent tube)	Monthly [must also meet permit equivalent(s)]	**Monthly**
				PID	Daily (during work week)	**Daily**
				Vacuum, Flow, Temp	Daily	**Daily**
Liquid Treatment (contact water only	Knock Out Tanks		Condensate	Volume-flow rate	Daily	**Hourly**
	Influent from wellfield groundwater and condensate at P&ID location WT-1 weekly for lab testing for mass recovery estimates		Condensate, Extracted Groundwater, etc.	Volume-flow rate	Continuous	**Continuous**
				COC Concentrations (Analytical)	Weekly	**Weekly**
	Effluent (see Liquid Discharge location below)			Volume-flow rate	Continuous	**Continuous**
				COC Concentrations (Analytical)	Weekly	**Weekly**
NAPL	NAPL Collection Tank at P&ID location T-2 for mass recovery and waste characterization		NAPL	Level / Volume	Weekly	**Weekly**
				COC Concentrations + parameters needed for characterization and disposal	As needed for characterization	**As needed for characterization**
Liquid Discharge (Contact + Non-Contact Water)	Liquid Treatment System Discharge Sample Port at P&ID location LSP5 for POTW chemical analysis requirements. Monitor volumetric flow rates at locations WFM1 and WFM2		Liquid	Volume-flow rate	Continuous	**Continuous**
				COC Concentrations + Other Parameters in Permit (Analytical)	Weekly and Meets Permit Equivalent	**Weekly**
Groundwater Monitoring (Treatment Performance)	Multiphase Extraction Wells or Performance Monitoring Wells (Figures 6-5 and 6-6)	Every 2,000 sq ft within TTZ	Groundwater	COC Concentrations (Analytical)	Baseline, Monthly during operations, one post-operation event per Stage	**Baseline, Monthly during operations, one post-operation event per Stage**
				Temperature and Pressure	During Sampling Events	**During Sampling Events**
Baseline and Confirmation Soil Sampling	Soil Borings - samples every 5 ft across treatment zone, ~6 samples/boring (Figures 6-3 and 6-4)	Baseline - boring every 1,000 sq ft Confirmation[2] - boring every 900 sq ft	Soil	COC Concentrations (Analytical)	Baseline, Confirmation (additional confirmation events as needed.	**Baseline, Confirmation (and as required)**
Energy and Power	Well field, Treatment Equipment, Totals from meter readings at gas meter and each electrical transformer		Energy and Power	Utility measurements	Weekly	**Weekly**
Pneumatic Control	Shallow Vapor Monitoring Points (Figure 5-8)	Every 1,000 sq ft within TTZ, Every 500-ft around TTZ perimeter, up to 5-ft outside the perimeter	Soil Gas	Vacuum (PID or analytical if sustained pressure demonstrated)	Weekly (increased frequency if reoccuring pressure is recorded along perimeter)	**Weekly (increased frequency if reoccuring pressure is recorded along perimeter)**
	ISTR Well Field and Cover		Air	Visual indication of steam emissions	Daily (during work week)	**Daily**
Hydraulic Control	Downgradient Monitoring Wells (15-ft from heating zone or 30-day groundwater travel time, whichever is further; see Figure 5-9); Stage 1 to monitor at least wells 2 MPE wells and DG-1	Every 50-ft along downgradient portion of TTZ	Groundwater	COC Concentrations (Analytical)	Baseline, Monthly during operations, one post-operation event	**Baseline, Monthly during operations, one post-operation event**
				Temperature and Pressure	Weekly	**Weekly**
	TTZ Perimeter (with special	Up to 5 Locations		PID	Continuous (real-time readings available remotely)	**Continuous (real-time readings available remotely)**

Air Monitoring	attention paid to residential property boundaries. Four AMS shown in Figure 4-1 and CAMP. Ammonia monitored at two stations depending on wind direction and proximity to site activities	(Ammonia - 2 Locations)	Ambient Air	COC Concentrations (Analytical) and Ammonia (sorbent tube)	Monthly until steam production, every 2 weeks during steam production.	**Monthly until steam production, every 2 weeks during steam production.**
	Treatment Areas	ISTR Well field and Treatment Area	Ambient Air	PID	Daily (during work week)	**Daily (during work week)**
				Odors (significant changes noted)	Daily (during work week)	**Daily (during work week)**
Noise	Property perimeter		Noise	Noise - dBA	Monthly and after new sources of noise are introduced	**Monthly and after new sources of noise are introduced**

FIGURES



Map Location

N

Site Locus

Diaz Chemical Corporation Superfund Site, Operable Unit 2
Phase II In-Situ Remedial Action
Holley, New York

0 500 1,000 2,000 3,000 4,000 5,000 6,000 Feet

0 100 200 400 600 800 1,000 1,200 1,400 1,600 Meters

Map Projection: State Plane, NAD 83, Feet.
Image Source: USGS Topographic Quadrangle: Holley, NY.

Scale: 1:24,000

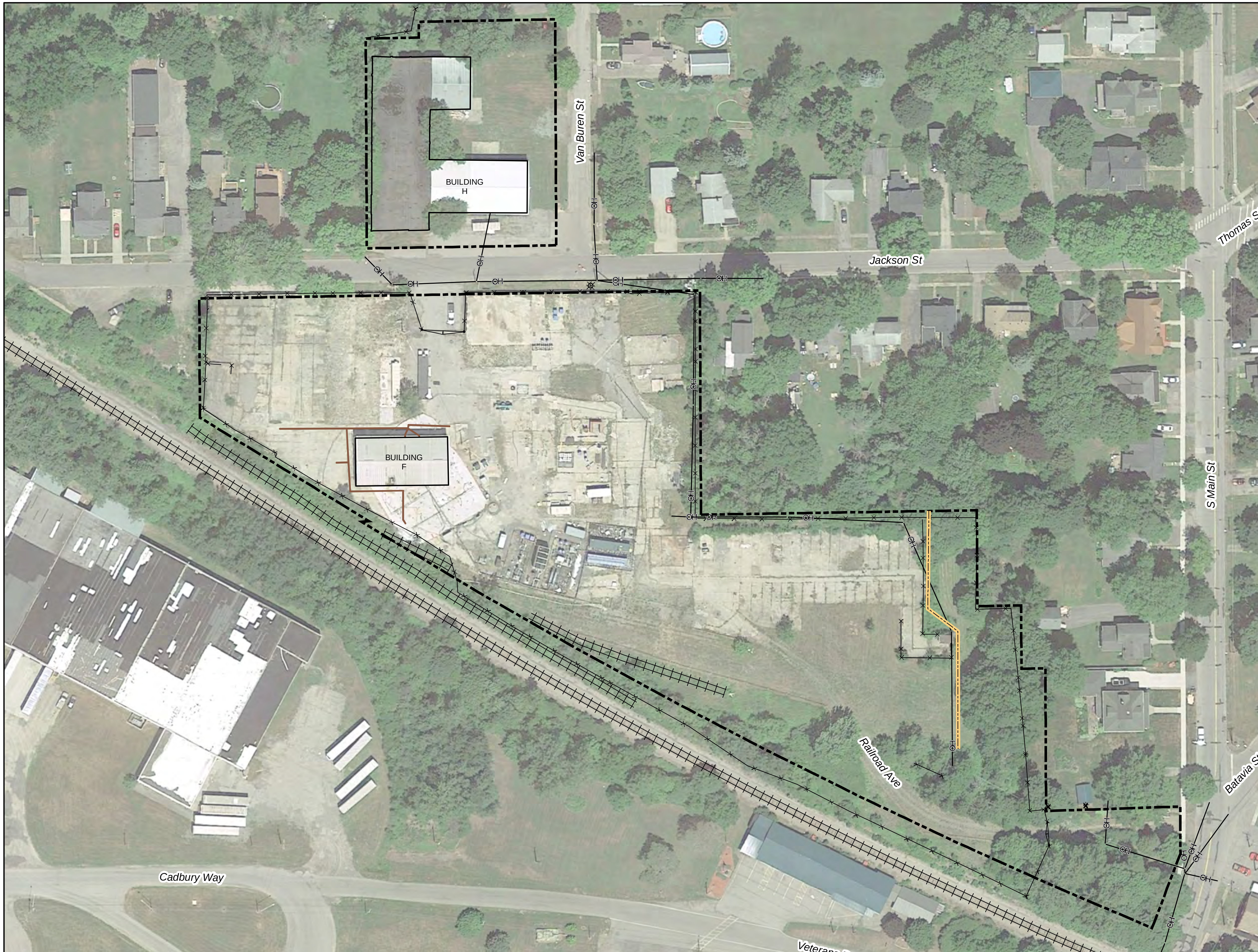
URS

Figure 2-1

Date: December 2019

Project #: 60615479

Path: \\uschl1fp001\Data\Projects\Govt\Projects\USACE New England HTRW 2019\Task Orders\DIAZ\900_GIS\Projects\RAWP\MXD\Fig_1_1_Site_Locus.mxd



Legend

- Diaz Facility Property Boundary
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

N

0 50 100 200 Feet

Title:	EXISTING CONDITIONS SITE PLAN
Location:	HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS Corporation 40 British American Boulevard Latham, New York 12110	Drafter: JB	Date: December 2019
	Drg. Size: 11 x17	Job No.: 60615479
	FIGURE 2-2	

Figure 3-1
Project Schedule
Diaz Chemical Superfund Site, Phase II ISTR
Village of Holley, NY

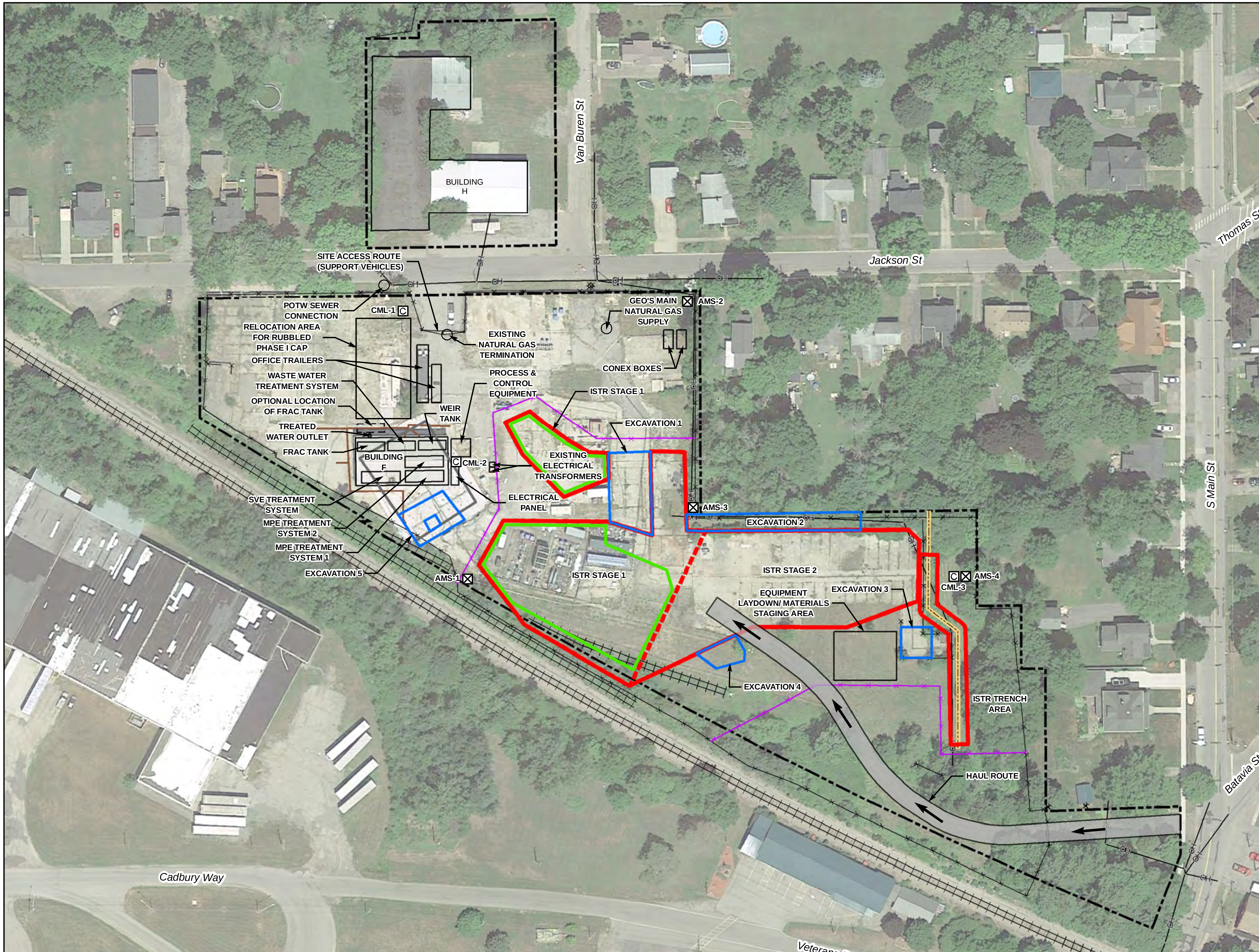
CLIN	Name	Duration (Business Days)	Duration (Elapsed Days)	Start	Finish
	Contract Total Base Award	**941**	**1316**	**9/17/2019**	**4/25/2023**
	Award Date - Notice To Proceed	1	0	9/17/2019	9/17/2019
	End of POP	1	0	4/25/2023	4/25/2023
1	**General Conditions, Pre-Work Submittals and Planning, Site Preparation**	**544**	**759**	**9/17/2019**	**10/15/2021**
1.1	**General Conditions**	**543**	**758**	**9/18/2019**	**10/15/2021**
1.1	**Project Schedule**	**57**	**78**	**9/18/2019**	**12/5/2019**
1.1	Submit Initial Project Schedule	1	0	10/4/2019	10/4/2019
1.1	Government review of Initial Project Schedule	11	15	10/4/2019	10/19/2019
1.1	Submit Draft Project Schedule	1	0	11/11/2019	11/11/2019
1.1	Government review of Draft Project Schedule	12	15	11/12/2019	11/27/2019
1.1	Submit RAWP Project Schedule	1	0	12/20/2019	12/20/2019
1.1	Government review of RAWP Project Schedule	30	41	12/21/2019	1/31/2020
1.1	**Work Plan Preparation Progress Meetings (monthly teleconference)**	**125**	**174**	**10/2/2019**	**3/24/2020**
1.1	Work Plan Preparation Progress Meetings 1 - Kick Off Meeting	1	0	10/2/2019	10/2/2019
1.1	Work Plan Preparation Progress Meetings 2 - Pre-Con Meeting	1	0	10/30/2019	10/30/2019
1.1	Work Plan Preparation Progress Meetings 3	1	0	11/20/2019	11/20/2019
1.1	Work Plan Preparation Progress Meetings 4	1	0	1/9/2019	1/9/2019
1.1	Work Plan Preparation Progress Meetings 5 - Coincides with RAWP Meeting (CLIN 1.2)	1	0	1/28/2020	1/28/2020
1.1	Work Plan Preparation Progress Meetings 6	1	0	2/19/2020	2/19/2020
1.1	Work Plan Preparation Progress Meetings 7	1	1	3/24/2020	3/24/2020
1.1	**Project Progress Meetings (bi-weekly teleconference)**	**321**	**448**	**6/8/2020**	**8/30/2021**
1.1	Project Meetings Progress Meetings 1	1	0	6/8/2020	6/8/2020
1.1	Project Meetings Progress Meetings 2	1	0	6/22/2020	6/22/2020
1.1	Project Meetings Progress Meetings 3	1	0	7/6/2020	7/6/2020
1.1	Project Meetings Progress Meetings 4	1	0	7/20/2020	7/20/2020
1.1	Project Meetings Progress Meetings 5	1	0	8/3/2020	8/3/2020
1.1	Project Meetings Progress Meetings 6	1	0	8/17/2020	8/17/2020
1.1	Project Meetings Progress Meetings 7	1	0	8/31/2020	8/31/2020
1.1	Project Meetings Progress Meetings 8	1	0	9/14/2020	9/14/2020
1.1	Project Meetings Progress Meetings 9	1	0	9/28/2020	9/28/2020
1.1	Project Meetings Progress Meetings 10	1	0	10/12/2020	10/12/2020
1.1	Project Meetings Progress Meetings 11	1	0	10/26/2020	10/26/2020
1.1	Project Meetings Progress Meetings 12	1	0	11/9/2020	11/9/2020
1.1	Project Meetings Progress Meetings 13	1	0	11/23/2020	11/23/2020
1.1	Project Meetings Progress Meetings 14	1	0	12/7/2020	12/7/2020
1.1	Project Meetings Progress Meetings 15	1	0	12/21/2020	12/21/2020
1.1	Project Meetings Progress Meetings 16	1	0	1/4/2021	1/4/2021
1.1	Project Meetings Progress Meetings 17	1	0	1/18/2021	1/18/2021
1.1	Project Meetings Progress Meetings 18	1	0	2/1/2021	2/1/2021
1.1	Project Meetings Progress Meetings 19	1	0	2/15/2021	2/15/2021
1.1	Project Meetings Progress Meetings 20	1	0	3/1/2021	3/1/2021
1.1	Project Meetings Progress Meetings 21	1	0	3/15/2021	3/15/2021
1.1	Project Meetings Progress Meetings 22	1	0	3/29/2021	3/29/2021
1.1	Project Meetings Progress Meetings 23	1	0	4/12/2021	4/12/2021
1.1	Project Meetings Progress Meetings 24	1	0	4/26/2021	4/26/2021
1.1	Project Meetings Progress Meetings 25	1	0	5/10/2021	5/10/2021
1.1	Project Meetings Progress Meetings 26	1	0	5/24/2021	5/24/2021
1.1	Project Meetings Progress Meetings 27	1	0	6/7/2021	6/7/2021
1.1	Project Meetings Progress Meetings 28	1	0	6/21/2021	6/21/2021
1.1	Project Meetings Progress Meetings 29	1	0	7/5/2021	7/5/2021
1.1	Project Meetings Progress Meetings 30	1	0	7/19/2021	7/19/2021
1.1	Project Meetings Progress Meetings 31	1	0	8/2/2021	8/2/2021
1.1	Project Meetings Progress Meetings 32	1	0	8/16/2021	8/16/2021
1.1	Project Meetings Progress Meetings 33	1	0	8/30/2021	8/30/2021
1.2	**Pre-Work Submittals and Planning**	**213**	**296**	**9/17/2019**	**7/9/2020**
1.2	**Contractor Quality Control Plan**	**72**	**99**	**9/17/2019**	**12/25/2019**
1.2	Prepare and Submit Draft CQCP	35	48	9/17/2019	11/4/2019
1.2	Government Review Draft CQCP	13	16	11/5/2019	11/21/2019
1.2	Prepare and Submit Final Version	22	31	11/22/2019	12/23/2019
1.2	Government Approval of Final CQCP	2	1	12/24/2019	12/25/2019
1.2	**Health and Safety Plan (includes APP/SSHP)**	**213**	**296**	**9/17/2019**	**7/9/2020**
1.2	Prepare and Submit Draft HSP	66	91	9/17/2019	12/17/2019
1.2	Government Review Draft HSP	28	37	12/17/2019	1/23/2020
1.2	RTC (Prepare and Submit Draft Final Version)	25	34	1/24/2020	2/27/2020
1.2	Government Review Draft Final HSP	11	15	2/28/2020	3/14/2020
1.2	RTC (Prepare and Submit Final Version)	10	12	3/15/2020	3/27/2020
1.2	Development of COVID-19 Mitigation Plan Addendum to APP/SSHP	5	5	3/15/2020	3/20/2020
1.2	Government Approval of Final HSP & COVID-19 Mitigation Plan	5	7	3/28/2020	4/4/2020
1.2	Submit Final APP-SSHP	1	0	5/4/2020	5/4/2020
1.2	Prepare and Submit HSP Addendum (based on Test Pit results)	6	7	6/24/2020	7/1/2020
1.2	Government Approval of HSP Addendum	6	7	7/2/2020	7/9/2020
1.2	**Environmental Protection Plan (EPP)**	**181**	**252**	**9/17/2019**	**5/26/2020**
1.2	Prepare and Submit Draft EPP	68	93	9/17/2019	12/19/2019
1.2	Government Review Draft EPP	29	40	12/19/2019	1/28/2020
1.2	RTC (Prepare and Submit Draft Final Version)	22	29	1/29/2020	2/27/2020
1.2	Regulators Review Draft Final EPP	17	22	2/27/2020	3/20/2020
1.2	RTC (Prepare and Submit Final Version) - Combined with RAWP submittal	11	14	4/10/2020	4/24/2020
1.2	Government Approval of Final EPP - Combined with RAWP submittal	6	7	5/19/2020	5/26/2020

Figure 3-1 (continued)
Project Schedule
Diaz Chemical Superfund Site, Phase II ISTR
Village of Holley, NY

1.2	**Remedial Action Work Plan (includes all required licenses and permits)**	**186**	**168**	**9/17/2019**	**6/2/2020**
1.2	Prepare and Submit Draft RAWP	69	94	9/17/2019	12/20/2019
1.2	Government & Regulatory Review Draft RAWP	30	41	12/21/2019	1/31/2020
1.2	Remedial Action Work Plan Meeting	1	0	1/28/2020	1/28/2020
1.2	Prepare and Submit RTCs	22	31	1/31/2020	3/2/2020
1.2	Prepare and Submit Draft Final Version	26	35	1/31/2020	3/6/2020
1.2	Government & Regulators Review RTCs and Draft Final RAWP	27	36	3/2/2020	4/7/2020
1.2	RTC (Prepare and Submit Final Version)	27	38	4/10/2020	5/18/2020
1.2	Government Approval of Final RAWP	11	14	5/19/2020	6/2/2020
1.2	**UFP-QAPP**	**192**	**267**	**9/17/2019**	**6/10/2020**
1.2	Prepare and Submit Draft UFP-QAPP	87	120	9/17/2019	1/15/2020
1.2	Method Development anticipated with Draft	87	120	9/17/2019	1/15/2020
1.2	Government Review Draft UFP-QAPP	24	33	1/16/2020	2/18/2020
1.2	Prepare and Submit RTCs	21	28	2/19/2020	3/18/2020
1.2	Prepare and Submit Draft Final Version	27	36	2/19/2020	3/26/2020
1.2	Regulators Review Draft Final UFP-QAPP	18	25	4/2/2020	4/27/2020
1.2	RTC (Prepare and Submit Final Version)	21	28	4/28/2020	5/26/2020
1.2	Government Approval of Final UFP-QAPP	11	14	5/27/2020	6/10/2020
--	**Stop Work Notice**	39	52	3/30/2020	5/21/2020
--	**URS/GEO Ramp Up - Engage subs, field team, order equipment, etc.** **Expect to be in the field May 26th**	3	4	5/21/2020	5/25/2020
1.3	**Site Preparation**	**297**	**414**	**9/17/2019**	**11/4/2020**
1.3	**Mobilization, Pre-Construction Site Work, and DBCP Test Pitting**	**217**	**0**	**1/7/2020**	**11/4/2020**
1.3	Geophysical Survey - To be completed in Winter/Spring, weather dependent	3	2	1/7/2020	1/9/2020
1.3	Prepare and Submit DBCP Sampling Memo	18	25	2/20/2020	3/16/2020
1.3	Pre-Construction Survey - To be completed in Winter/Spring, weather dependent	3	2	3/2/2020	3/4/2020
1.3	Government Review of Sampling Memo	7	8	3/16/2020	3/24/2020
1.3	Resolution of Comments and Approval of Final Memo	1	0	3/24/2020	3/24/2020
	URS CONTROLLED MOB - Minimal Staff and Subs	1	30	5/27/2020	6/26/2020
1.3	Mobilization (Trailers/Equipment)	1	0	6/1/2020	6/1/2020
1.3	Concrete Removal and Prep for Test Pits	2	1	6/1/2020	6/2/2020
1.3	Test Pitting and Sample Collection	2	1	6/8/2020	6/9/2020
1.3	Analysis of DBCP Samples - 5 day TAT	5	6	6/10/2020	6/16/2020
1.3	Phase 1 Cover Removal (Part 1 - Building F and northern and eastern edge)	6	7	6/3/2020	6/10/2020
1.3	Install Access Road	2	2	6/11/2020	6/13/2020
1.3	Install Cont Entrance/Decon Pad	1	2	6/13/2020	6/15/2020
1.3	Validation and Acceptance of DBCP Results	6	7	6/17/2020	6/24/2020
1.3	Install Silt Fence	2	1	6/10/2020	6/11/2020
	GEO CONTROLLED MOB - Material Delivery	1	1	6/10/2020	6/10/2020
1.3	Mobilize treat system skids and bring inside Building F	6	7	6/10/2020	6/17/2020
1.3	Mobilize ISTR Wells	5	6	6/15/2020	6/21/2020
1.3	Brush Clearing	1	1	6/12/2020	6/13/2020
1.3	Utility Coordination (Water, POTW, Electrical, Gas)	6	9	6/13/2020	6/22/2020
1.3	Conference to review DBCP Results with USACE	1	0	6/24/2020	6/24/2020
	URS + GEO FULL MOB with Subs				
1.3	Concrete Removal within Stage 1 Area (in tandem with drilling)	5	5	6/22/2020	6/27/2020
1.3	Install CAMP	5	6	6/15/2020	6/21/2020
1.3	Fence Installation (Part 1)	6	7	6/22/2020	6/29/2020
1.3	Site Security	2	1	6/22/2020	6/23/2020
1.3	Abandon Wells within Stage 1 treatment zone (in tandem with drilling)	5	6	7/3/2020	7/9/2020
1.3	Perimeter Well Installation	6	7	7/9/2020	7/16/2020
1.3	Fence Installation (Part 2) - Following Excavation and Relocation (CLIN 4.1)	5	6	10/29/2020	11/4/2020
1.3	Lawn Care/Snow Removal	-	-	Reoccurring as needed	
1.4	**MOD 1: Pre-Excavation Confirmation Soil Sampling**	**58**	**0**	**6/22/2020**	**9/9/2020**
1.4	Residential Wooden Planter Relocation	2	1	6/10/2020	6/11/2020
1.4	Survey Work Control Points	2	1	6/22/2020	6/23/2020
1.4	Geoprobe Drilling for Excavation Areas and Railroad	5	4	6/29/2020	7/3/2020
1.4	Survey Step Out Locations (as needed)	1	1	7/3/2020	7/4/2020
1.4	Laboratory analysis (15 day TAT)	10	15	7/4/2020	7/19/2020
1.4	Review preliminary data with USACE team	1	0	7/20/2020	7/20/2020
1.4	Data Validation (15 days)	15	20	7/19/2020	8/8/2020
1.4	Discussion of Validated Results	1	0	8/10/2020	8/10/2020
1.4	Draft Summary Report	26	35	7/20/2020	8/24/2020
1.4	Government Review Draft Summary Report	11	14	8/24/2020	9/7/2020
1.4	Final Summary Report	2	1	9/8/2020	9/9/2020
2	**Demobilization**	**326**	**456**	**9/3/2021**	**12/3/2022**
2	Decommissioning Stage 1	22	31	10/23/2021	11/23/2021
2	Decommissioning Stage 2	22	29	7/12/2022	8/10/2022
2	Subcontractor Demobilization	10	14	11/19/2022	12/3/2022
3	**Reporting and Project Closeout**	**83**	**114**	**12/19/2022**	**4/12/2023**
3	**Report**	**83**	**114**	**12/19/2022**	**4/12/2023**
3	Prepare and Submit Draft Report	23	30	12/19/2022	1/18/2023
3	Government Review Draft Report	16	21	1/19/2023	2/9/2023
3	RTC (Prepare and Submit Draft Final Version)	11	14	2/10/2023	2/24/2023
3	Regulators Review Draft Final Report	16	21	2/27/2023	3/20/2023
3	RTC (Prepare and Submit Final Version)	11	14	3/21/2023	4/4/2023
3	Government Approval of Final Report	6	7	4/5/2023	4/12/2023
4	**Thermal Treatment of Excavation Areas 1 through 5**	**557**	**780**	**9/11/2020**	**10/31/2022**
4.1	Excavation and Relocation of Soil (approx. 3 weeks- relocation at 80% drilling completion [CLIN 5.1])	25	34	9/11/2020	10/15/2020
4.1	Backfill Excavation Areas	5	6	10/16/2020	10/22/2020
4.2	Onsite Thermal Treatment	168	233	1/6/2021	8/27/2021
4.3	Collect Waste Disposal Samples for Laboratory Analysis	15	20	8/30/2021	9/19/2021
4.3	Offsite Disposal of Treated Soils	10	13	10/18/2022	10/31/2022

Figure 3-1 (continued)
Project Schedule
Diaz Chemical Superfund Site, Phase II ISTR
Village of Holley, NY

5	**Thermal Treatment - Stage 1 (OPTION)**	**454**	**635**	**3/13/2020**	**12/8/2021**
5.1	**Thermal Treatment Construction - Stage 1**	**288**	**402**	**12/1/2019**	**1/6/2021**
5.1	**Pre-Construction Activities**	**229**	**319**	**12/1/2019**	**10/15/2020**
5.1	ISTR Material Procurement	1	1	12/1/2019	12/2/2019
5.1	Initiate System Construction	1	1	12/1/2019	12/2/2019
5.1	Driller Commitment and Material Procurement	1	1	12/1/2019	12/2/2019
5.1	Survey and markout GEO well locations	6	7	6/22/2020	6/29/2020
5.1	Baseline Sampling - During Well Install	74	101	6/29/2020	10/8/2020
6.1	Survey Baseline Sampling Locations and Well Install Locations	6	7	10/8/2020	10/15/2020
5.1	**Construction**	**138**	**191**	**6/29/2020**	**1/6/2021**
5.1	Install Well Field	74	101	6/29/2020	10/8/2020
5.1	Install Aboveground Treatment Equipment	42	59	10/9/2020	12/7/2020
5.1	Commissioning	22	29	12/8/2020	1/6/2021
5.2	**Thermal Treatment Operation - Stage 1**	**241**	**336**	**1/6/2021**	**12/8/2021**
5.2	Thermal Treatment Period	168	233	1/6/2021	8/27/2021
5.2	O&M	168	233	1/6/2021	8/27/2021
5.2	Confirmation Sampling	74	103	8/27/2021	12/8/2021
5.2	Cooldown Period	20	27	8/27/2021	9/23/2021
7	**Thermal Treatment - Stage 2 (OPTION)**	**378**	**529**	**3/18/2021**	**8/29/2022**
7.1	**Thermal Treatment Construction - Stage 2**	**138**	**193**	**3/18/2021**	**9/27/2021**
7.1	Baseline Sampling - To be completed during well installation	72	101	3/18/2021	6/27/2021
7.1	Pre-Construction Activities - ISTR Material Procurement	1	0	1/15/2021	1/15/2021
7.1	Pre-Construction Activities - Driller Commitment and Material Procurement	1	0	1/15/2021	1/15/2021
7.1	**Construction**	**138**	**193**	**3/18/2021**	**9/27/2021**
7.1	Install Well Field	72	101	3/18/2021	6/27/2021
7.1	Install Aboveground Treatment Equipment	45	61	6/28/2021	8/28/2021
7.1	Commissioning	21	29	8/29/2021	9/27/2021
7.1	**Thermal Treatment Operation - Stage 2**	**241**	**336**	**9/27/2021**	**8/29/2022**
7.1	Thermal Treatment Period	168	233	9/27/2021	5/18/2022
7.1	O&M	168	233	9/27/2021	5/18/2022
7.1	Confirmation Sampling	74	103	5/18/2022	8/29/2022
7.1	Cooldown Period	18	25	5/18/2022	6/12/2022
11	**Site Restoration (Well Abandonment and Cover Removal) (OPTION)**	**65**	**90**	**8/29/2022**	**11/27/2022**
11.1	Well Abandonment	45	61	8/29/2022	10/29/2022
11.2	**Cover Removal**	**20**	**29**	**10/29/2022**	**11/27/2022**
11.2	Phase 1 (remaining)	7	10	10/29/2022	11/8/2022
11.2	Phase 2	9	10	11/8/2022	11/18/2022
11.3	Regrading and Revegetation	5	8	11/19/2022	11/27/2022



Legend

- Diaz Facility Property Boundary
- Excavation Area
- Phase I Thermal Treatment Area
- Phase 2 Thermal Treatment Zone
- Areas for Placement of Excavated Soil
- Temporary Fence
- Camera, Motion Sensor, Floodlight Location
- Air Monitoring Station
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

N

0 50 100 200 Feet

Title:	SITE PREPARATION PLAN
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

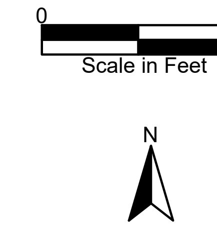
URS

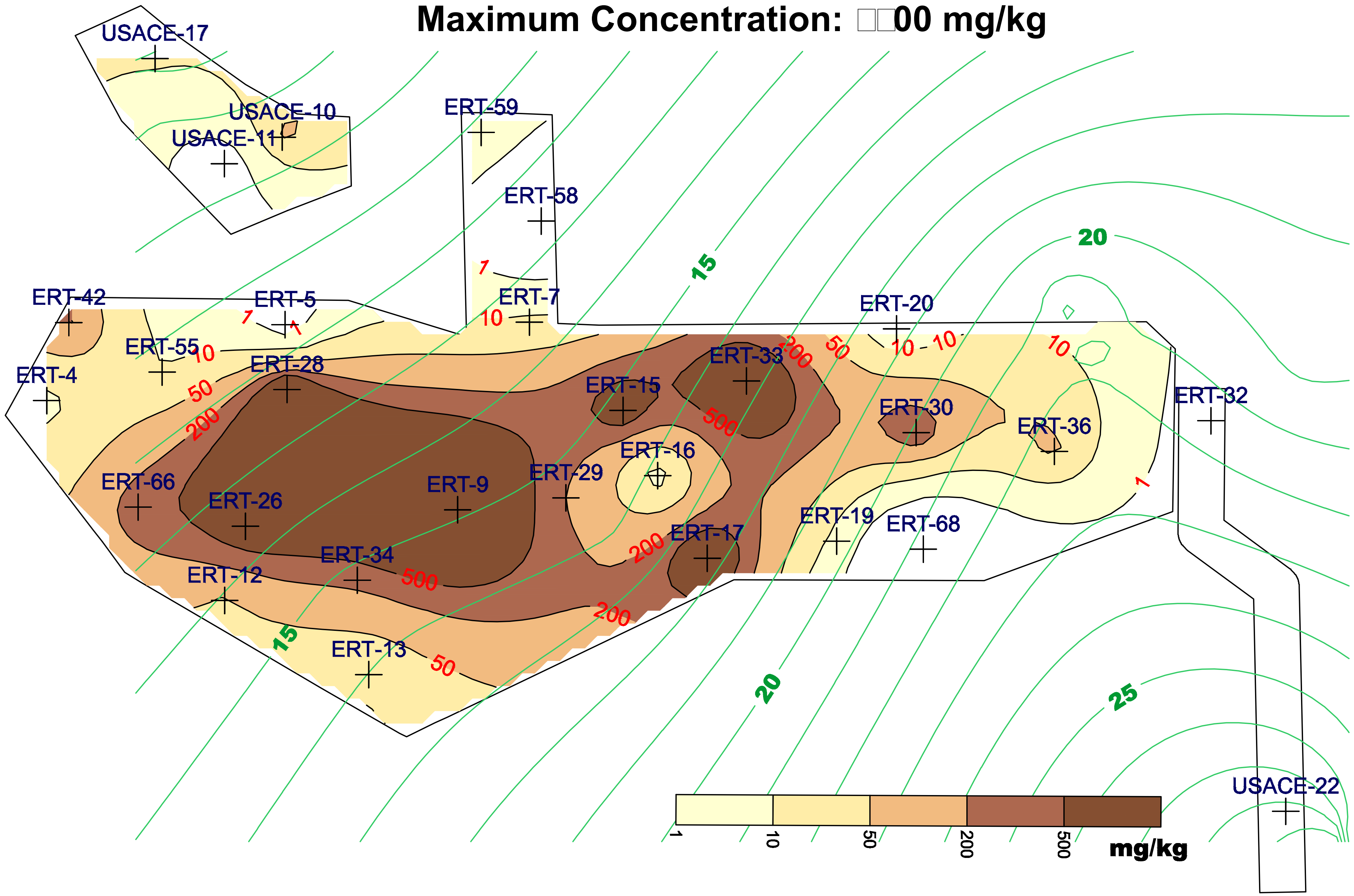
URS Corporation
40 British American Boulevard
Latham, New York 12110

Drafter:	Date:
JB	December 2019
Drg. Size: 11 x17	Job No.: 60615479

FIGURE 4-1

VOCS Maximum Concentration (Including □□ COCs)
Maximum Concentration: □□00 mg/kg





	VOC
1	1, 1. 1-Trichloroethane
2	1, 2 - Dibromoethane
3	1, 2 - Dichloroethane
4	1 - bromo - 2 - chloroethane
5	3 - Bromoacetophenone
6	4 - Chlorobenzotrifluoride
7	cis - 1, 3 - Dichloropropene
8	Benzene
9	Chlorobenzene
10	Ethylbenzene
11	Fluorobenzene
12	Isopropylbenzene
13	m, p - Xylene
14	Methylcyclohexane
15	Methylene chloride
16	o - Xylene
17	Tetrachloroethene
18	Toluene
19	Trichloroethene
20	Vinyl chloride
21	1 - Bromo - 3 - fluorobenzene
22	1, 1 - Dichloroethane
23	1, 1 - Dichloroethene
24	Styrene

LEGEND

HISTORICAL SOIL SAMPLING POINTS

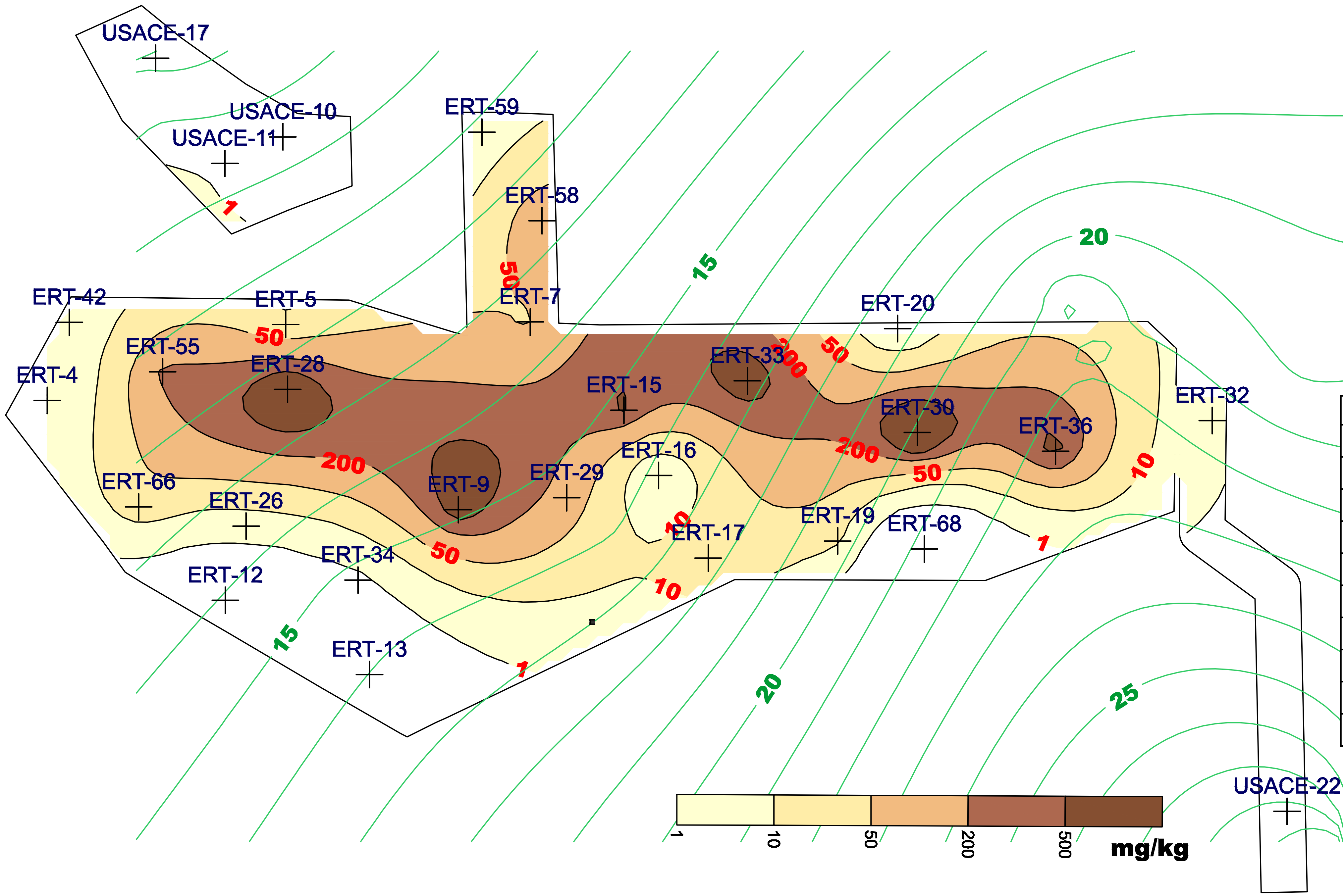
15 GROUNDWATER LEVEL CONTOUR (FT BGS)

APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	02/25/20	TITLE VOC 2-D Distribution	
CHKD XC	02/25/20	SIZE B	DWG NO. Figure 4-2
APVD XC	02/25/20	SCALE 1:50	UNITS: FEET & INCHES SHEET 1 OF 1

SVOCS Maximum Concentration (Including 10 COCs)
Maximum Concentration: 3500 mg/kg

0 50
Scale in Feet

N



	SVOC
1	1, 4 - Dibromobenzene
2	1 - Bromo - 4 - ethylbenzene
3	2 - Bromopyridine
4	3, 4 - Dichlorobenzotrifluoride
5	3 - Amino - 4 - chlorobenzotrifluoride
6	3 - nitro - 4 - chlorobenzotrifluoride
7	4 - Bromofluorobenzene
8	1, 3 - dibromobenzene
9	1, 2 - Dibromo - 3 - chloropropane
10	2 - Butanone

LEGEND

HISTORICAL SOIL SAMPLING POINTS

15 GROUNDWATER LEVEL CONTOUR (FT BGS)

APPROVED	DATE
DRAWN TW	02/26/20
CHKD XC	02/26/20
APVD XC	02/26/20

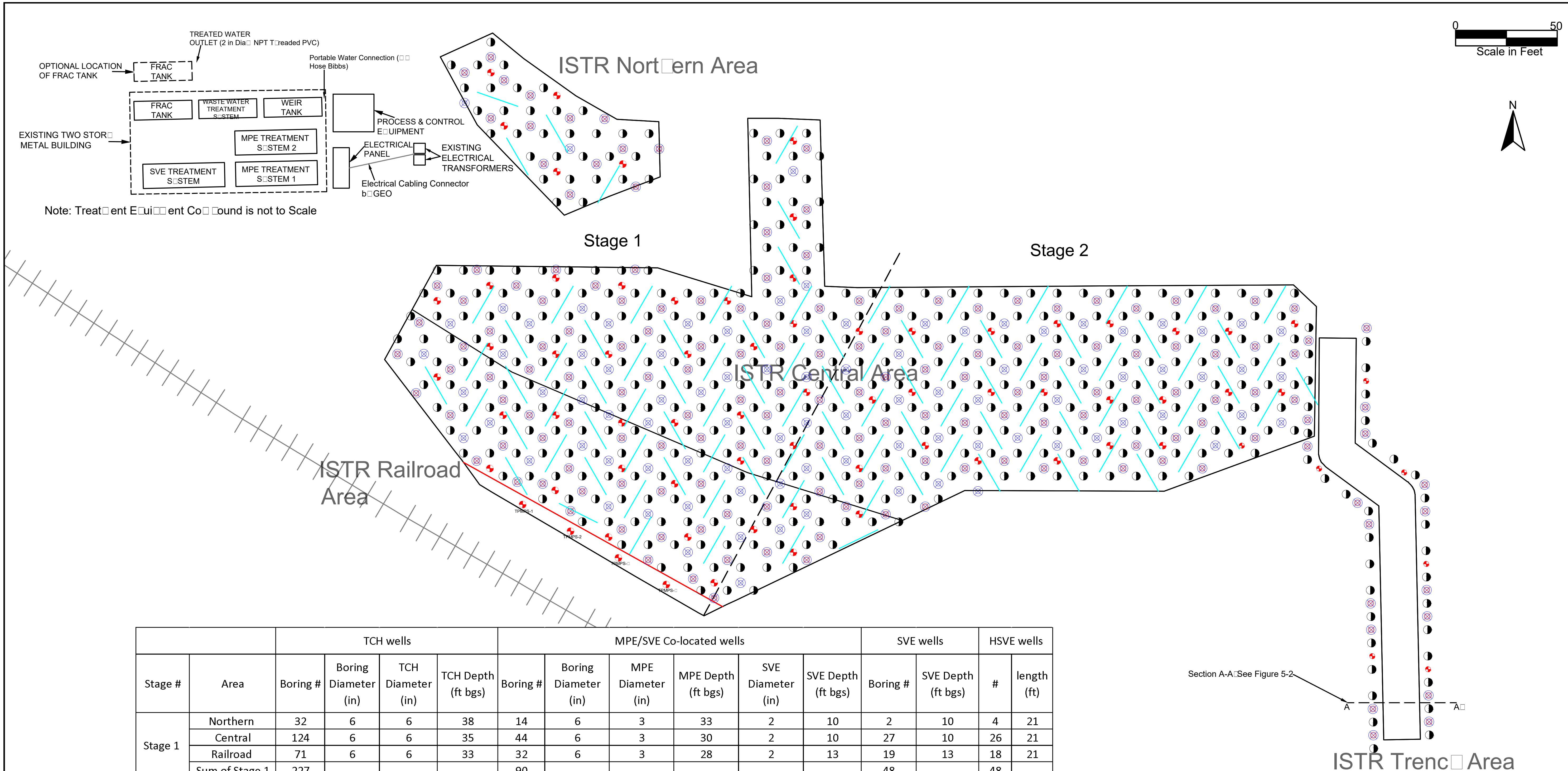
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE SVOC 2-D Distribution

SIZE B | DWG NO. Figure 4-3

SCALE 1:50 | UNITS: FEET & INCHES | SHEET 1 OF 1



		TCH wells				MPE/SVE Co-located wells						SVE wells		HSVE wells	
Stage #	Area	Boring #	Boring Diameter (in)	TCH Diameter (in)	TCH Depth (ft bgs)	Boring #	Boring Diameter (in)	MPE Diameter (in)	MPE Depth (ft bgs)	SVE Diameter (in)	SVE Depth (ft bgs)	Boring #	SVE Depth (ft bgs)	#	length (ft)
Stage 1	Northern	32	6	6	38	14	6	3	33	2	10	2	10	4	21
	Central	124	6	6	35	44	6	3	30	2	10	27	10	26	21
	Railroad	71	6	6	33	32	6	3	28	2	13	19	13	18	21
	Sum of Stage 1	227	-	-	-	90	-	-	-	-	-	48	-	48	-
Stage 2	Central	160	6	6	35	59	6	3	30	2	15	39	15	48	21
	Railroad	17	6	6	33	5	6	3	28	2	21	3	21	3	21
	Trench	35	6	6	45	18	6	3	40	2	20	0	20	0	-
	Sum of Stage 2	212	-	-	-	82	-	-	-	-	-	42	-	51	-
Sum		439	-	-	-	172	-	-	-	-	-	90	-	99	-

LEGEND

- TCH WELL: □□9
- MPE/SVE COLACATED WELL: 172
- SVE WELL: 90
- HORIZONTAL SVE: 99
- TPMP: 7□

APPROVED	DATE
DRAWN TW	05/11/20
CHKD XC	05/11/20
APVD XC	05/11/20

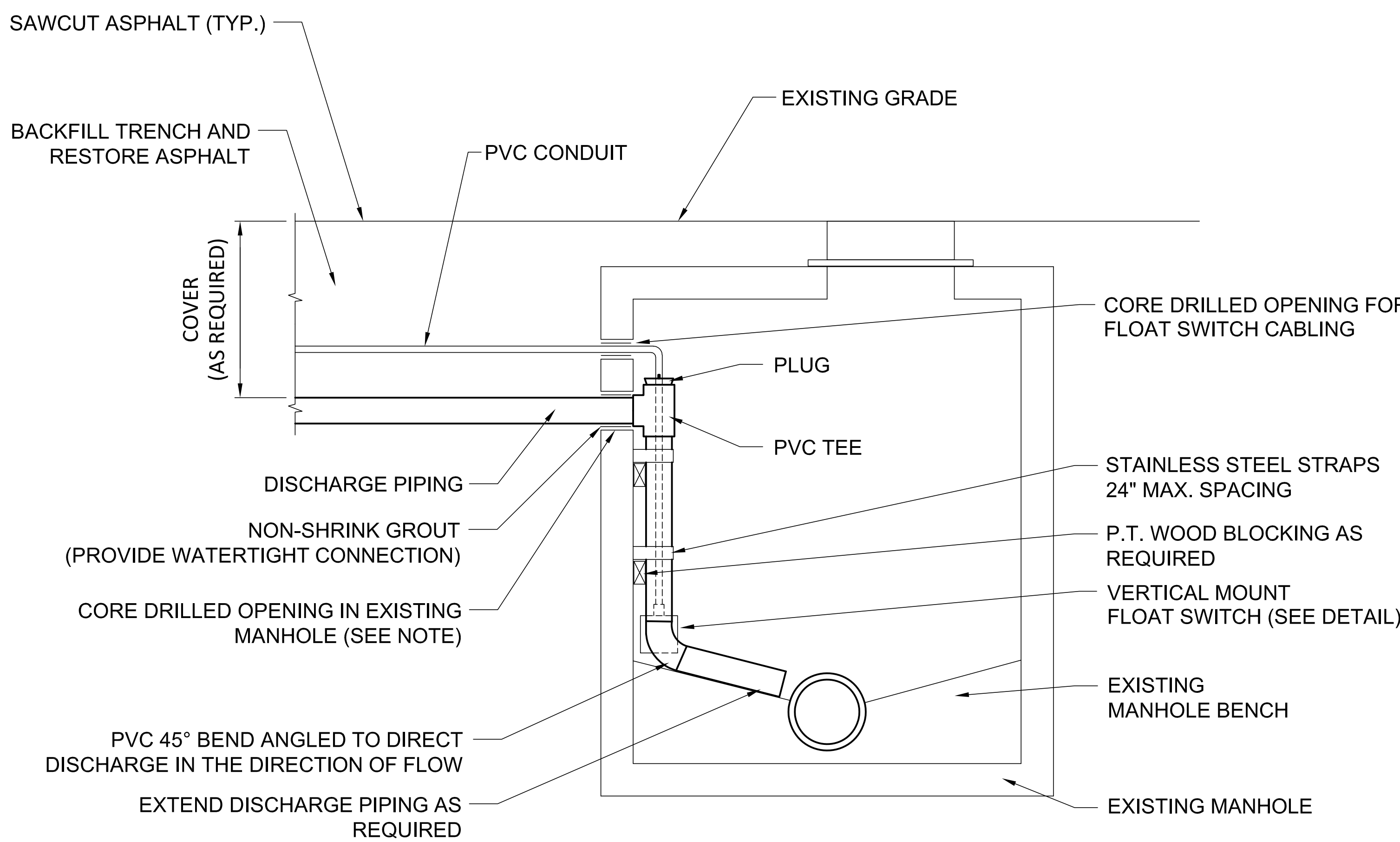
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE Well La□out

SIZE B | DWG NO. Figure 4-4

SCALE 1:50 | UNITS: FEET & INCHES | SHEET 1 OF 1

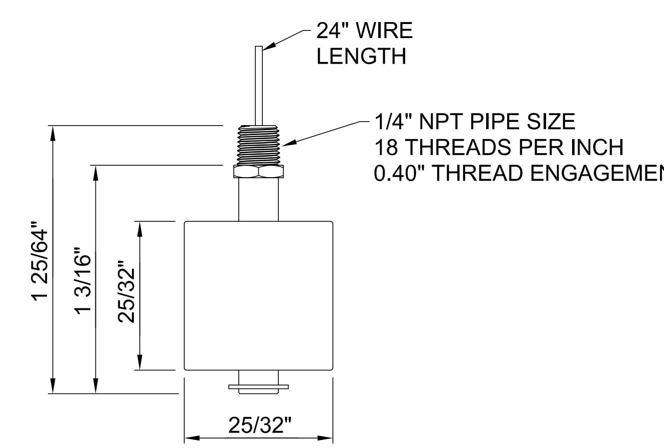


TYPICAL TREATED WATER DISCHARGE CONNECTION TO EXISTING SANITARY SEWER MANHOLE

NOT TO SCALE

NOTES:

1. PORTION OF TREATED WATER DISCHARGE TO BE BURIED BETWEEN WORK ZONE AREA SECURITY FENCE AND EXISTING MANHOLES.
2. CORE DRILLED OPENINGS IN EXISTING MANHOLE SHALL BE FILLED AND SEALED WITH NON-SHRINK GROUT AT THE COMPLETION OF THE DISCHARGE OPERATION.
3. FLOAT SWITCH SHALL BE McMASTER-CARR MODEL 5128K230 OR SIMILAR.
4. FLOAT SWITCH TO BE INSTALLED AND SET AT DEPTH AS APPROPRIATE TO MONITOR SEWER OVERFLOW LEVEL.



FLOAT SWITCH

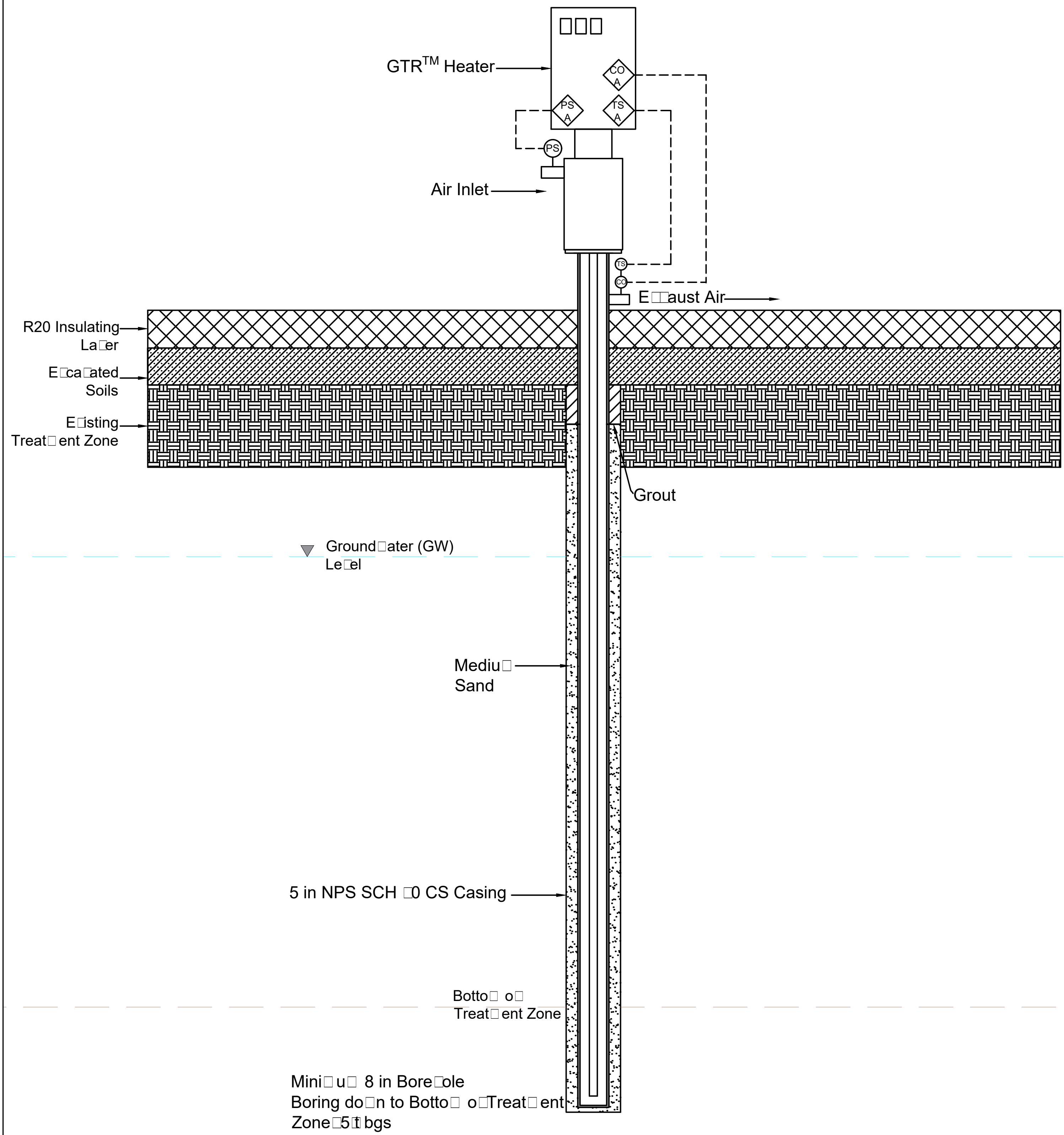
NOT TO SCALE

Title:	SANITARY SEWER CONNECTION DETAIL
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT
Drafter: KPB	Date: February 2020
Drg. Size: 11 x 17	Job No.: 60615479

URS

URS Corporation
40 British American Boulevard
Latham, New York 12110

FIGURE 4-5



Te□ □erature Alar□
Te□ □erature Sensor
CO Alar□
CO Sensor
Pressure S□itc□ Alar□
Pressure S□itc□

	APPROVED	DATE
DRAWN	TW	0□/20/20
CHKD	XC	0□/20/20
APVD	XC	0□/20/20

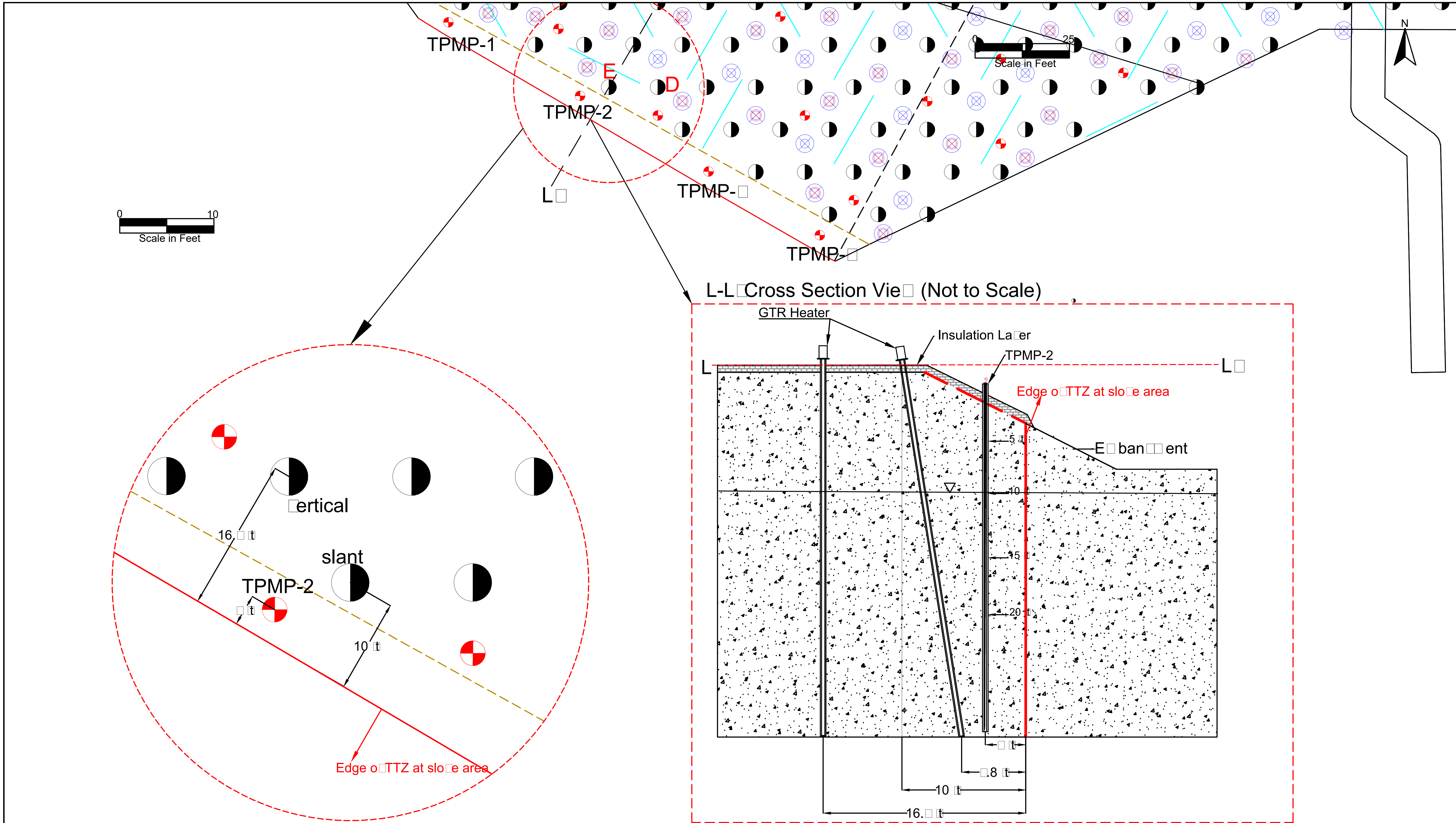
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE: TCH Well Construction Diagra□

SIZE: A | DWG NO.: Figure 5-1

SCALE: NTS | UNITS: FEET & INCHES | SHEET 1 OF 1



LEGEND

- TCH WELL
- MPE/SVE COLACATED WELL
- SVE WELL
- HORIZONTAL SVE
- TPMP

	APPROVED	DATE
DRAWN	TW	05/11/20
CHKD	XC	05/11/20
APVD	XC	05/11/20

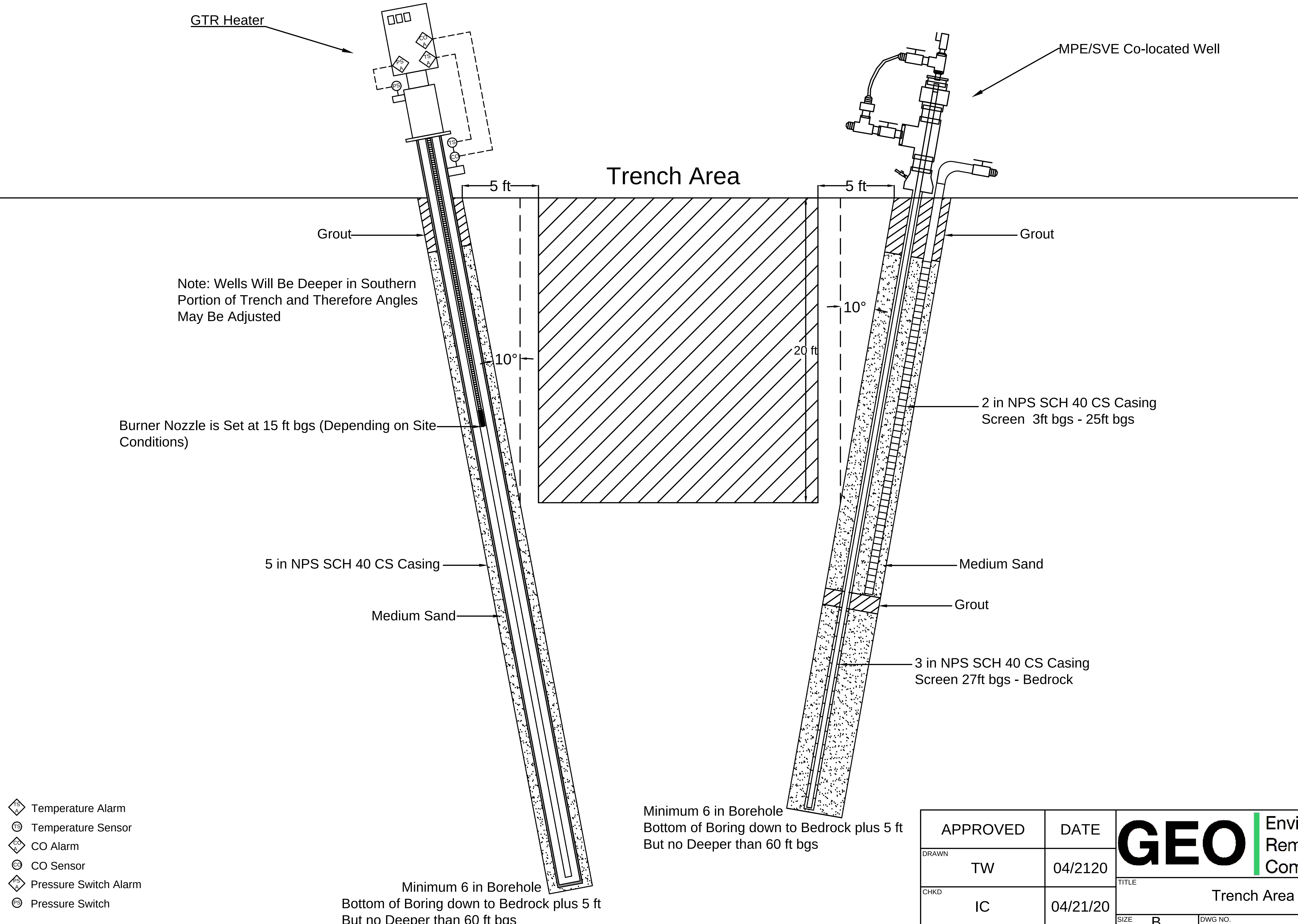
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

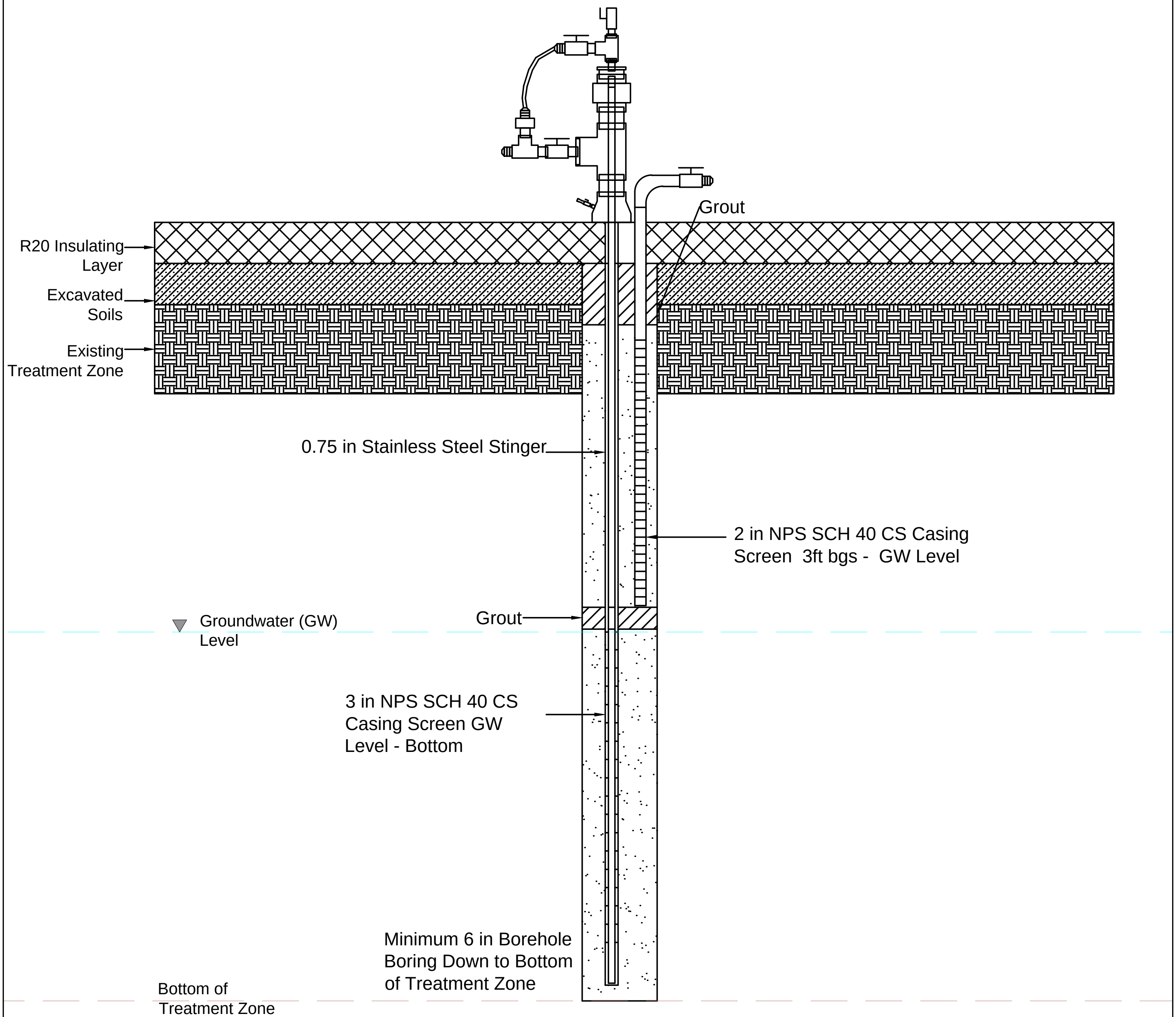
TITLE: South Slope Well Layout Detail

SIZE: B | DWG NO.: Figure 5-2

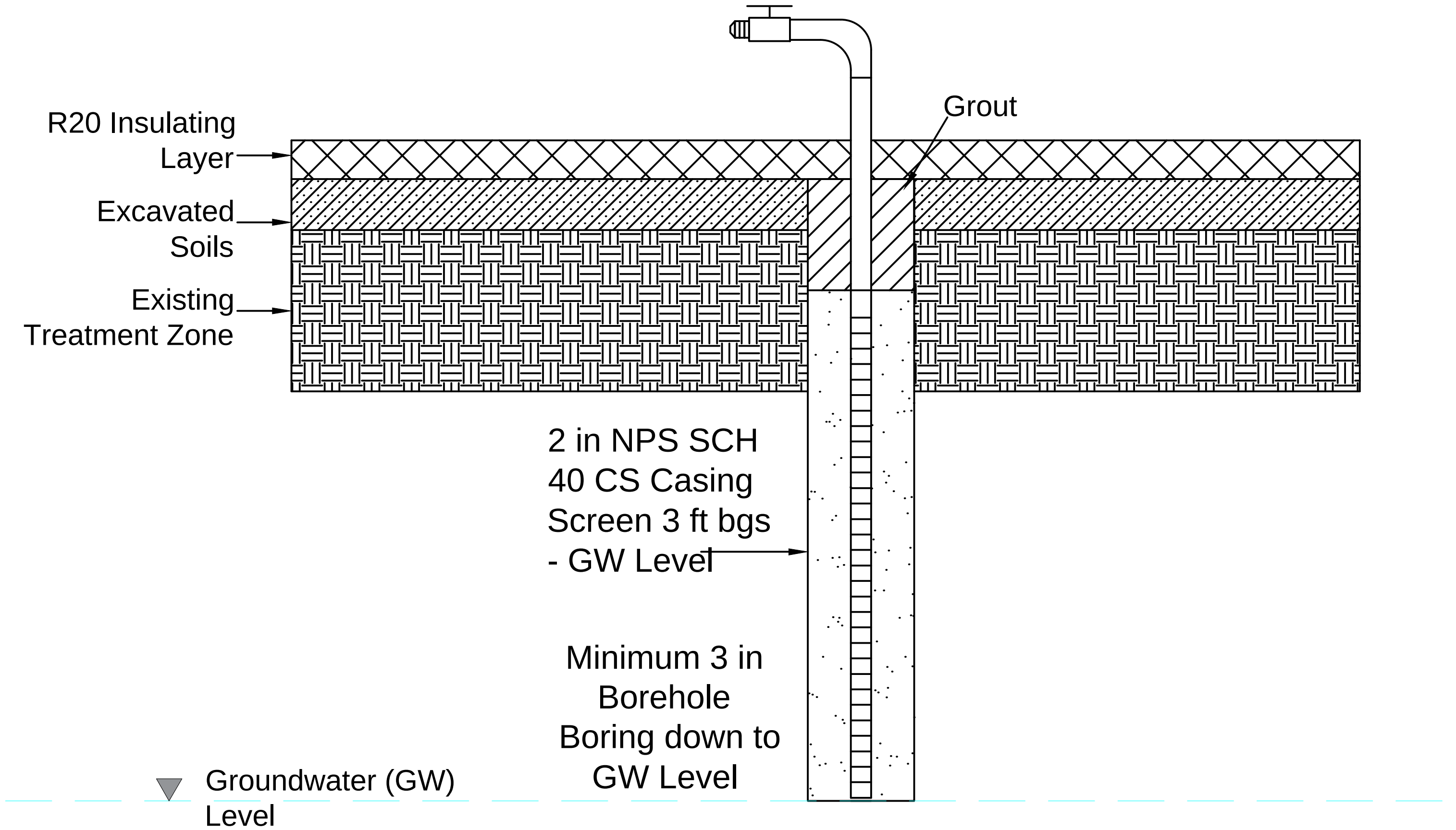
SCALE: N/A | UNITS: FEET & INCHES | SHEET 1 OF 1



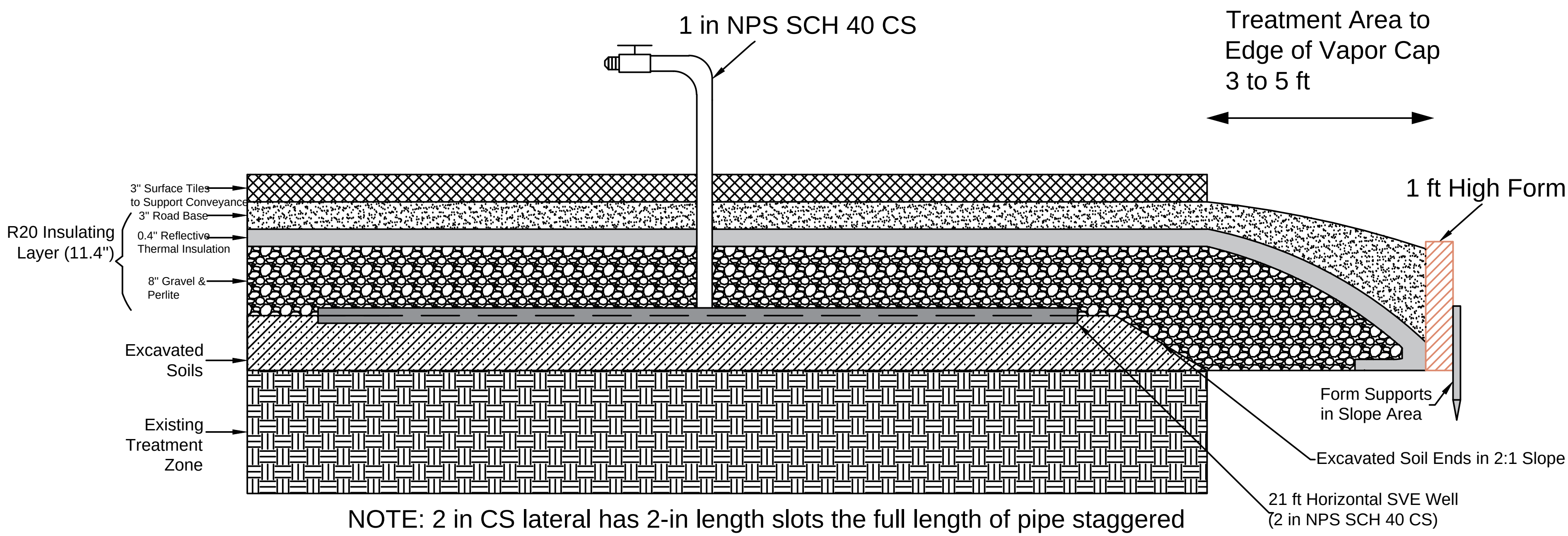
APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA ORANGE, CA. 92867
DRAWN TW	04/2120	TITLE Trench Area Slant Well Diagram	
CHKD IC	04/21/20	SIZE B	DWG NO. Figure 5-3
APVD IC	04/21/20	SCALE NTS	UNITS: FEET & INCHES; SHEET 1 OF 1



APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	02/05/20	TITLE MPE/SVE Colocated Well Construction Diagram	
CHKD XC	02/05/20	SIZE A	DWG NO. Figure 5-4
APVD XC	02/05/20	SCALE NST	UNITS: FEET & INCHES — SHEET 1 OF 1



APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	02/05/20	TITLE SVE Well Construction Diagram	
CHKD XC	02/05/20	SIZE A	DWG NO. Figure 5-5
APVD XC	02/05/20	SCALE NST	UNITS: FEET & INCHES — SHEET 1 OF 1



NOTE: 2 in CS lateral has 2-in length slots the full length of pipe staggered along the diameter

NOTE: Pneumatic Control - Sub Vapor Cap Pressure will be Monitored at Each TPMP Control Unit Location

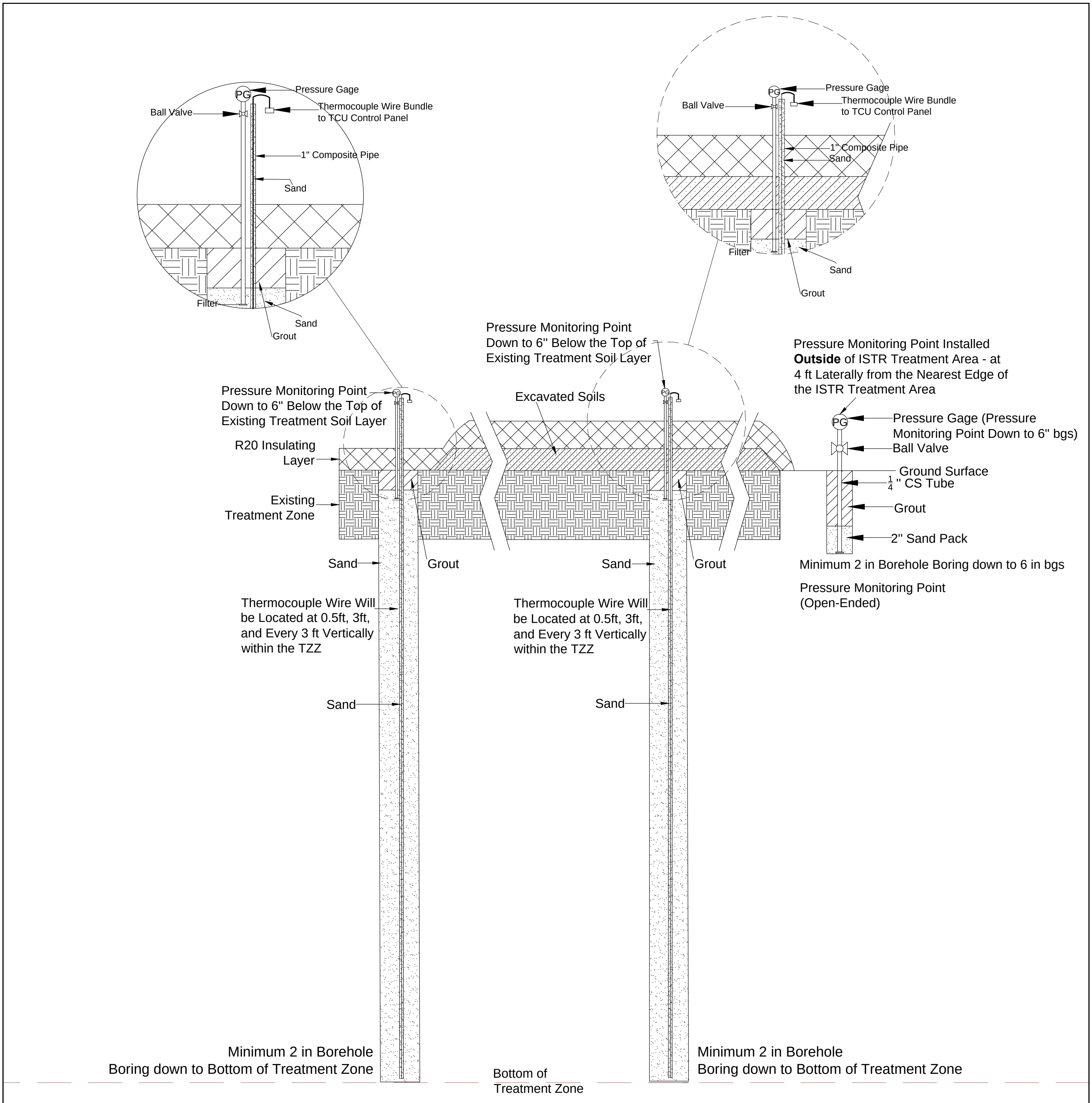
APPROVED	DATE
DRAWN TW	05/11/20
CHKD XC	05/11/20
APVD XC	05/11/20

GEO Environmental Remediation Company

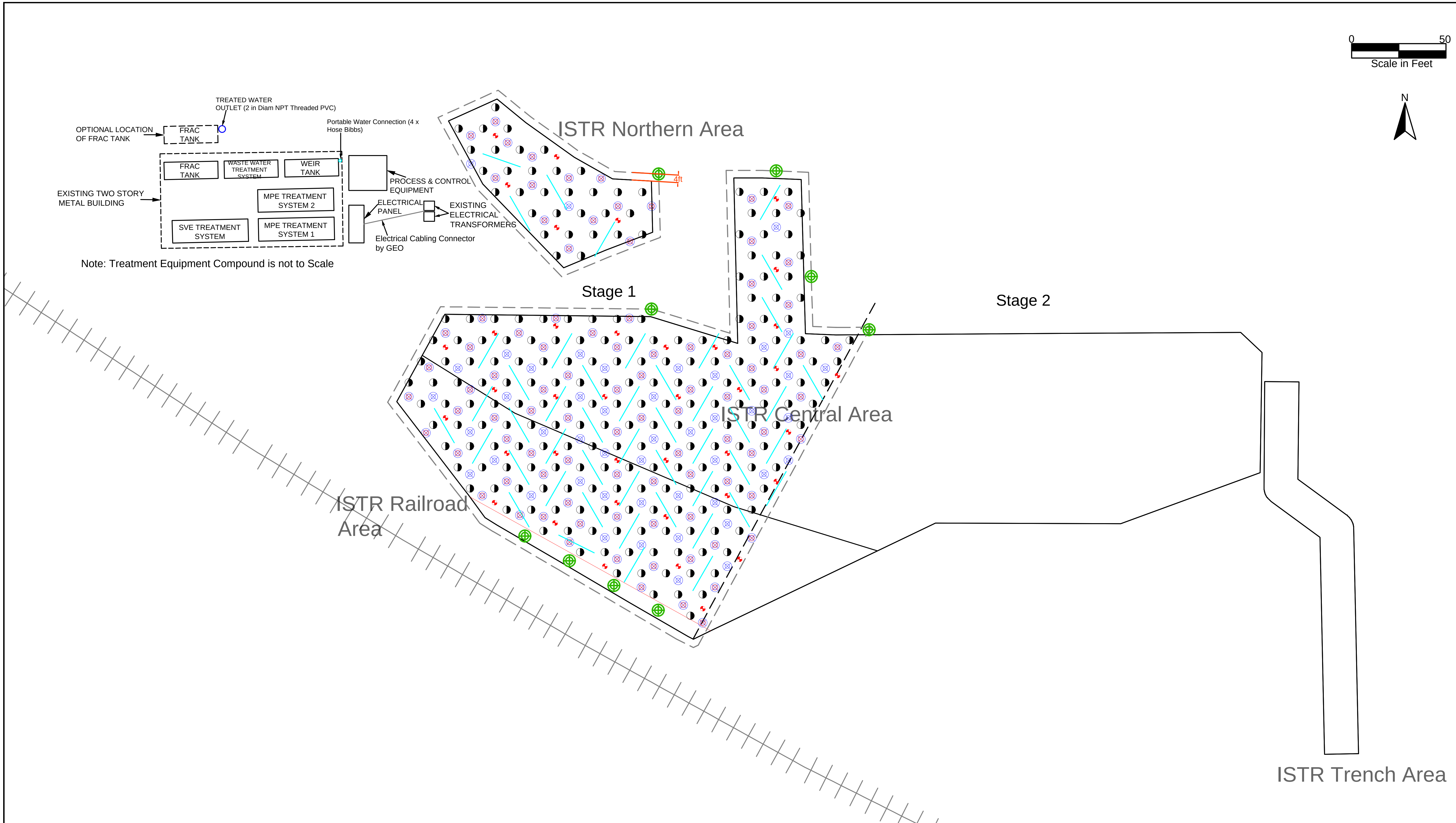
1500 W KATELLA AVE
ORANGE, CA 92867

TITLE: Horizontal SVE Well Construction Diagram

SIZE B	DWG NO. Figure 5-6		
SCALE NTS	UNITS: FEET & INCHES	SHEET 1 OF 1	



APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	05/14/20	TITLE Temperature Pressure Monitoring Point	
CHKD XC	05/14/20	SIZE A	DWG NO. Figure 5-7
APVD XC	05/14/20	SCALE NTS	UNITS: FEET & INCHES — SHEET 1 OF 1



LEGEND

- TCH WELL
- MPE/SVE COLACATED WELL
- SVE WELL
- HORIZONTAL SVE
- TPMP
- Pressure Monitoring Points

APPROVED	DATE
DRAWN TW	05/15/20
CHKD XC	05/15/20
APVD XC	05/15/20

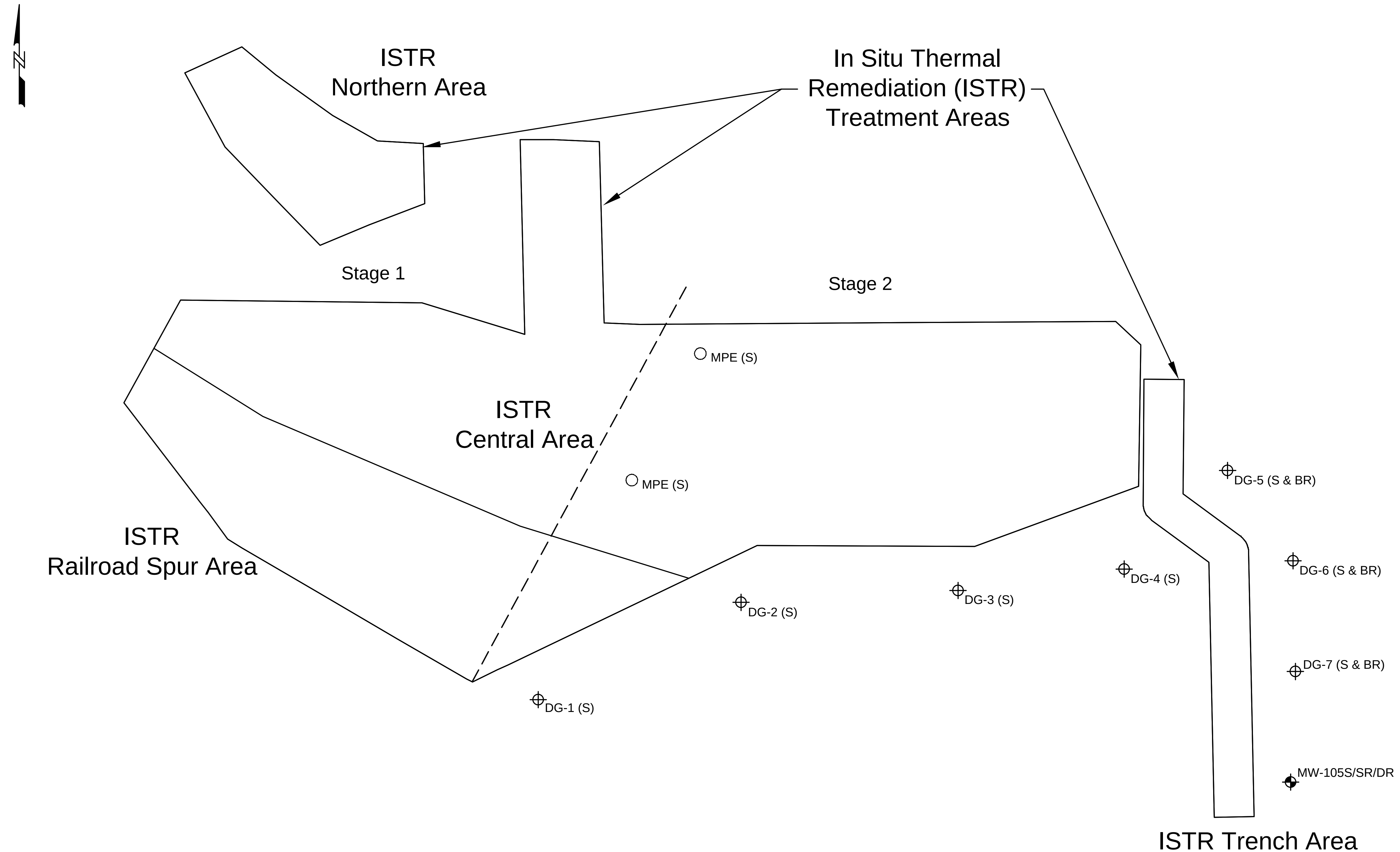
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE: Stage I Pressure Monitoring Points Location

SIZE: B | DWG NO.: Figure 5-8

SCALE: 1:50 | UNITS: FEET & INCHES | SHEET 1 OF 1



LEGEND

SITE MONITORING WELL

PROPOSED MONITORING WELL

DG-1, DG-2, DG-3, DG-4 — 2" CAST IRON STEEL WELLS TO TOP OF BEDROCK (~30' bgs)
10' SCREEN FROM ABOVE TOP OF TILL

DG-5, DG-6, DG-7 — 4" CAST IRON STEEL WELLS TO TOP OF BEDROCK (~35' bgs)
12' SCREEN ON BOTTOM 23'-35'

MPE WELL FROM STAGE 2

(S) SHALLOW

(BR) BEDROCK

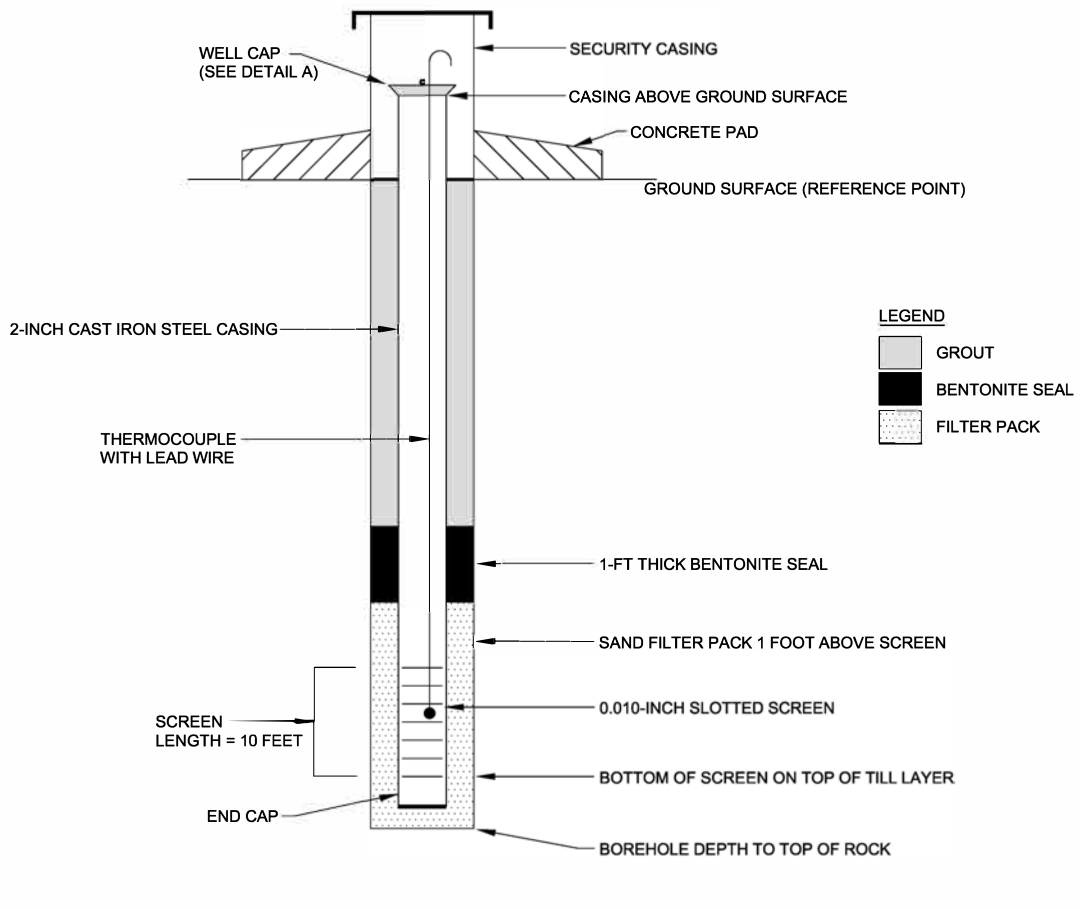
NOTE:
ALL WELLS TO BE LOCATED AT LEAST 15 FEET LATERALLY FROM EDGE OF ISTR TREATMENT AREAS.

0 50
Scale in Feet

Title:	DOWNGRADIENT MONITORING WELL LOCATIONS
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT
Drafter: KPB	Date: April 2020
Drg. Size: 11 x 17	Job No.: 60615479

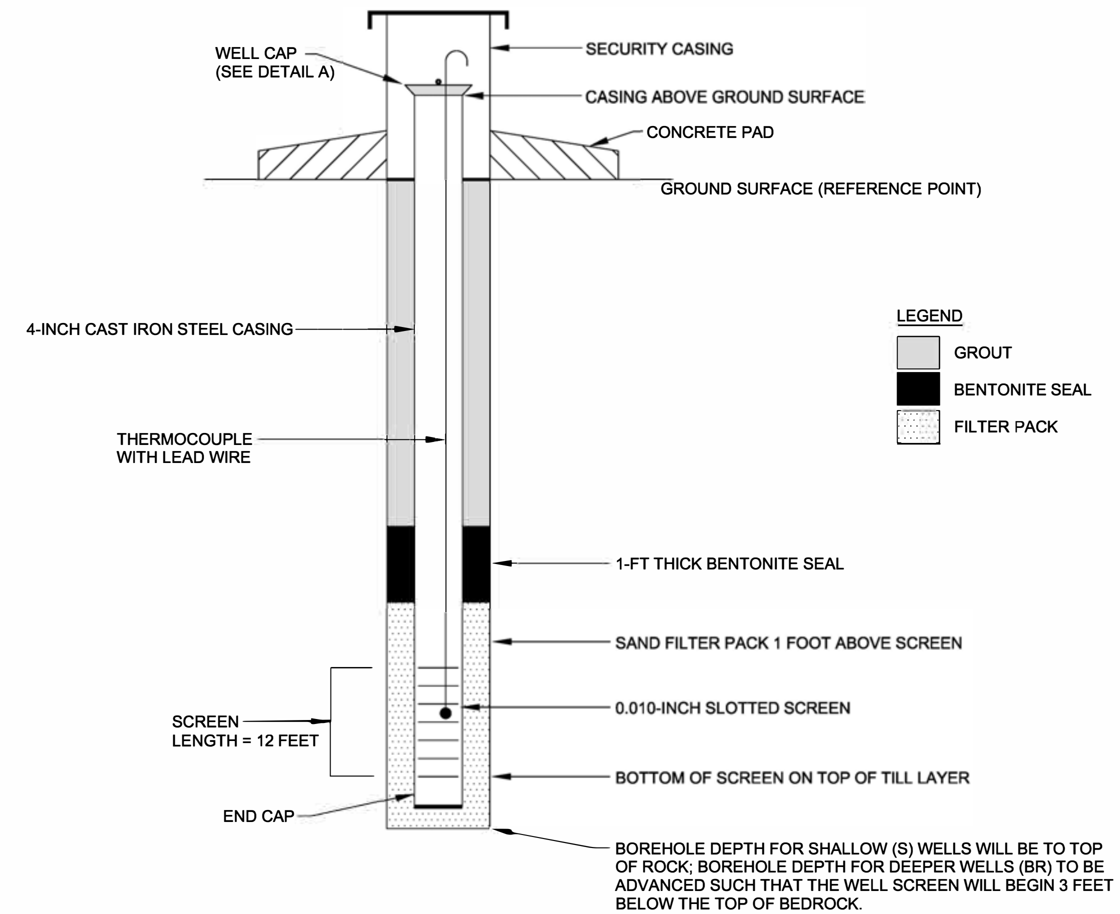
URS
URS Corporation
40 British American Boulevard
Latham, New York 12110

FIGURE 5-9



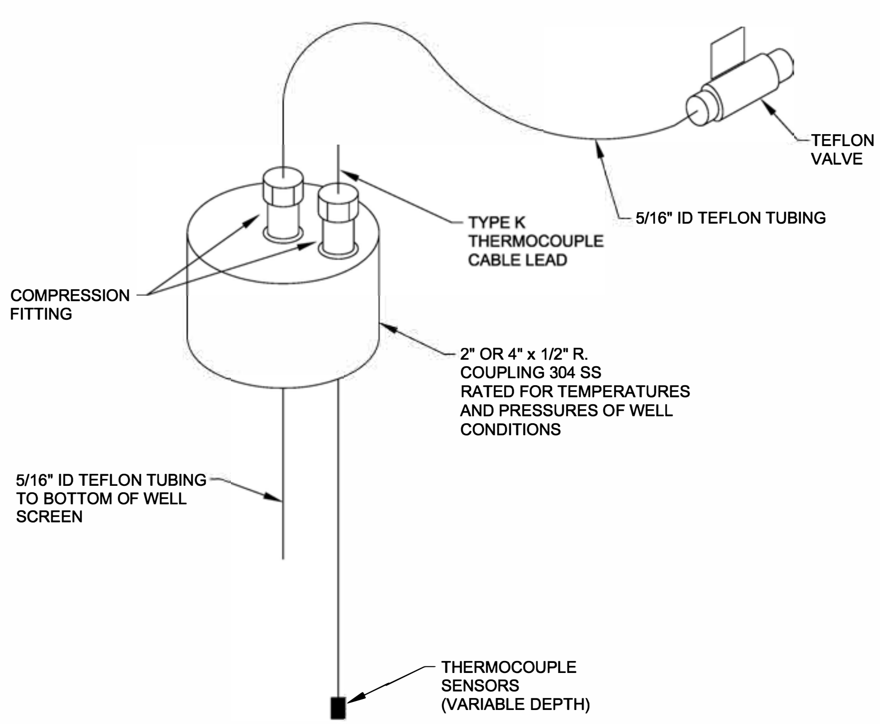
2-INCH WELL CONSTRUCTION

NOT TO SCALE



4-INCH WELL CONSTRUCTION

NOT TO SCALE



DETAIL A

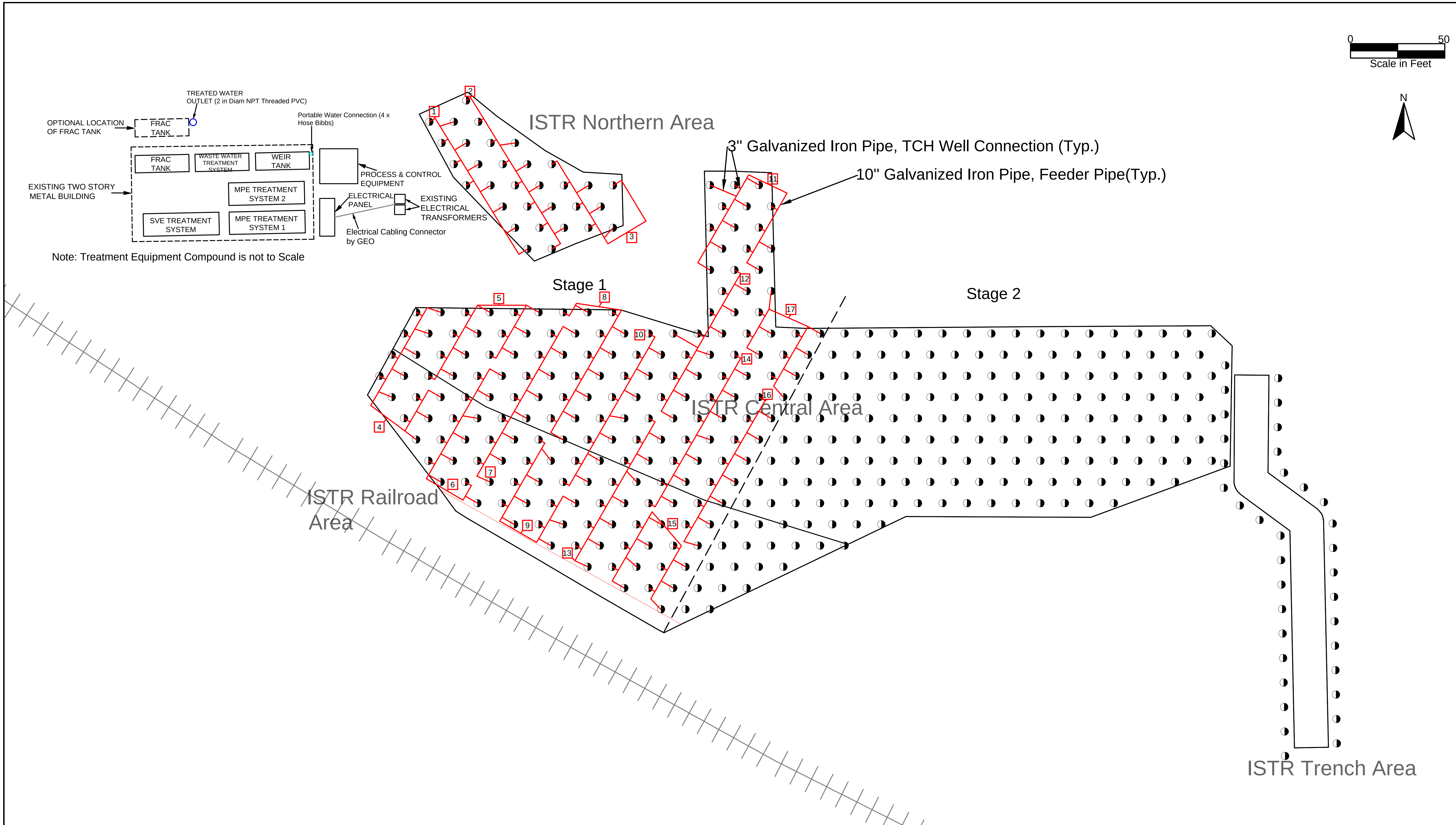
NOT TO SCALE

Title:	DOWNGRADIENT WELL CONSTRUCTION DETAILS
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS Corporation
40 British American Boulevard
Latham, New York 12110

Drafter: KPB	Date: April 2020
Drg. Size: 11 x 17	Job No.: 60615479

FIGURE 5-10



LEGEND

◑ TCH WELL

COMBUSTION AIR PIPING - PIPE SIZE AS INDICATED

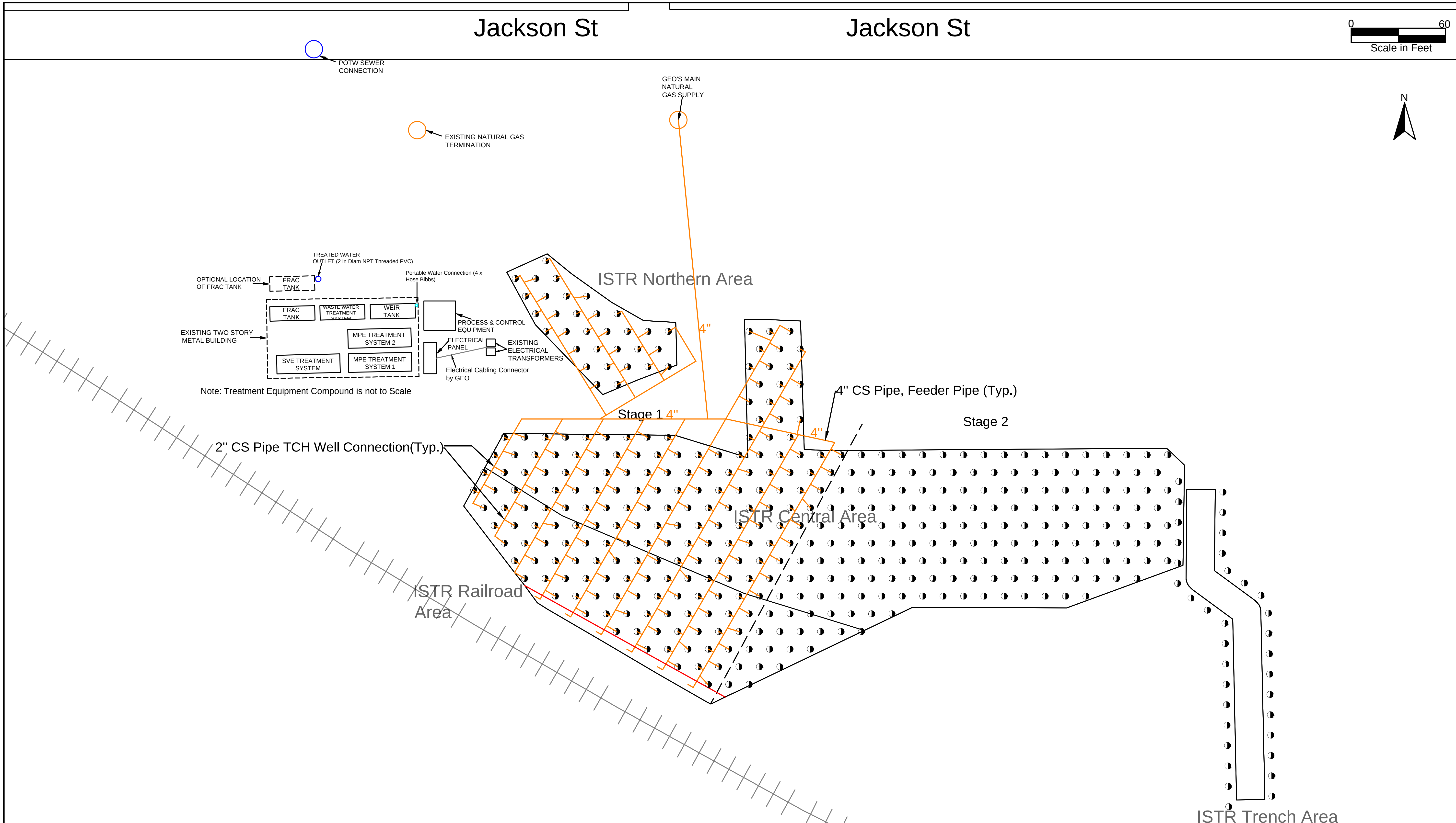
1 COMBUSTION FAN: 17

APPROVED	DATE
DRAWN TW	05/12/20
CHKD XC	05/12/20
APVD XC	05/12/20

GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE	Stage I Combustion Air Piping		
SIZE B	DWG NO. Figure 5-11		
SCALE 1:50	UNITS: FEET & INCHES	SHEET 1 OF 1	



LEGEND

◑ TCH WELL

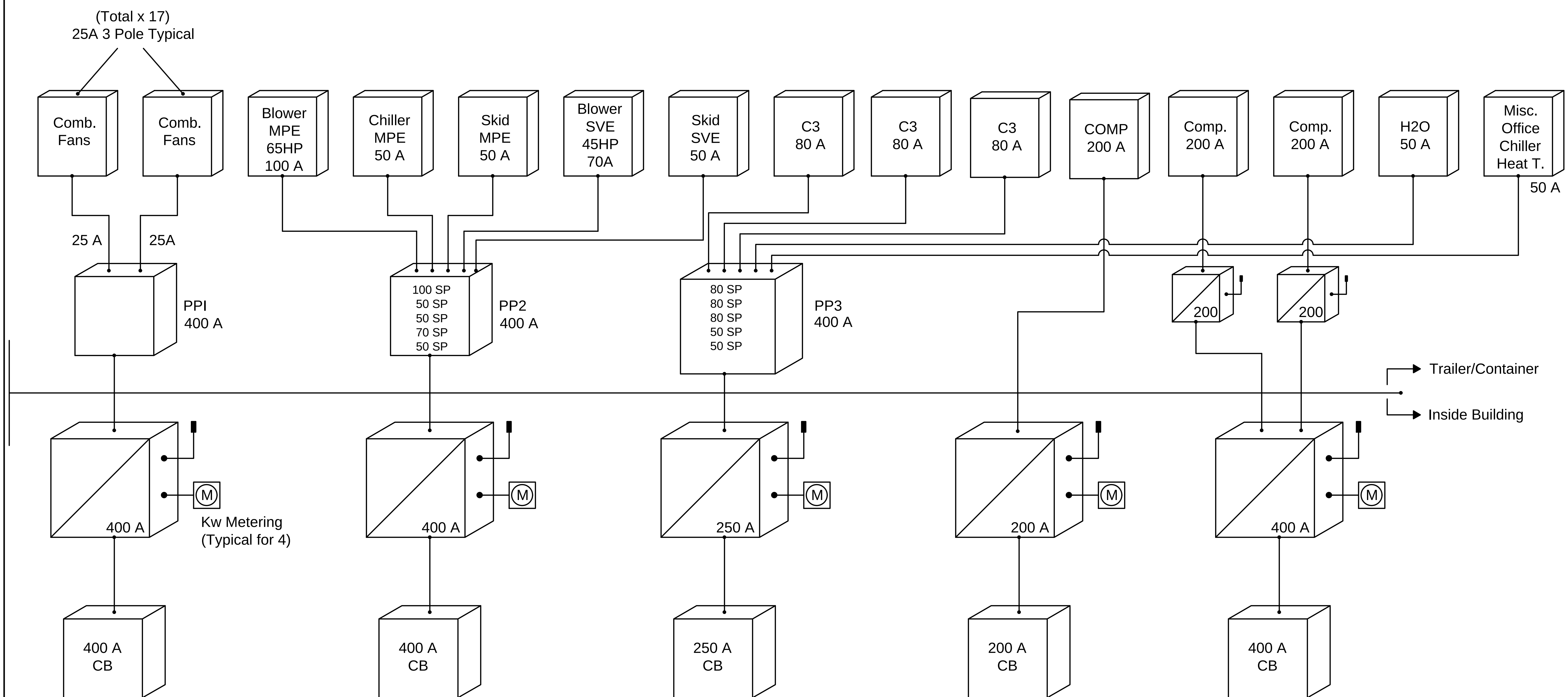
NATURAL GAS MANIFOLD -PIPE SIZE AS INDICATED

APPROVED	DATE
DRAWN TW	05/12/20
CHKD XC	05/12/20
APVD XC	05/12/20

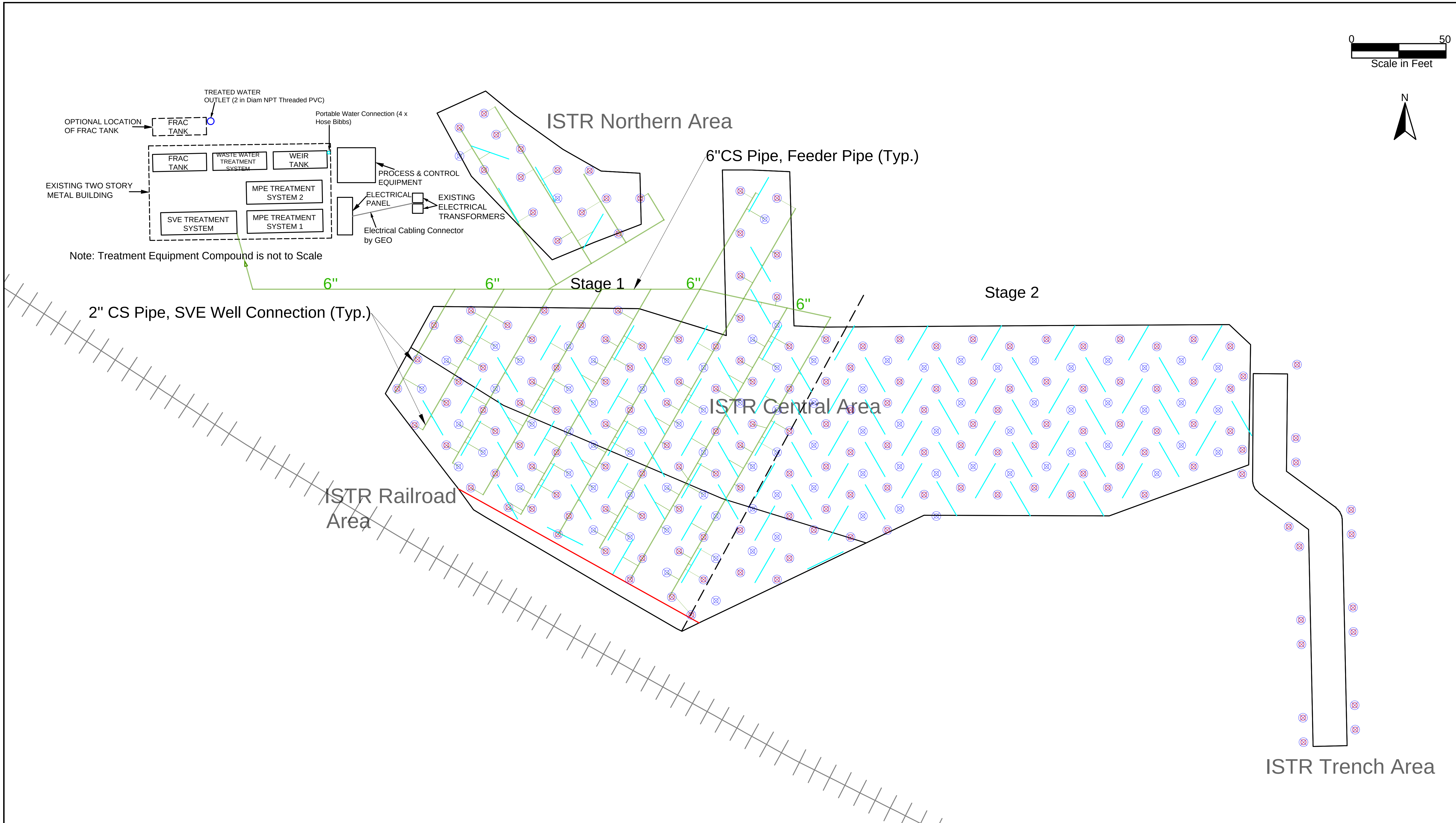
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE	Stage 1 Natural Gas Manifold
SIZE B	DWG NO. Figure 5-12
SCALE 1:50	UNITS: FEET & INCHES
SHEET 1 OF 1	



APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	12/12/19	TITLE Electrical One Line Diagram	
CHKD BK	12/12/19	SIZE B	DWG NO. Figure 5-13
APVD BK	12/12/19	SCALE	UNITS: SHEET 1 OF 1



LEGEND

- MPE/SVE COLACATED WELL
- SVE WELL
- HORIZONTAL SVE
- SVE MANIFOLD - PIPE SIZE AS INDICATED

	APPROVED	DATE
DRAWN	TW	05/12/20
CHKD	XC	05/12/20
APVD	XC	05/12/20

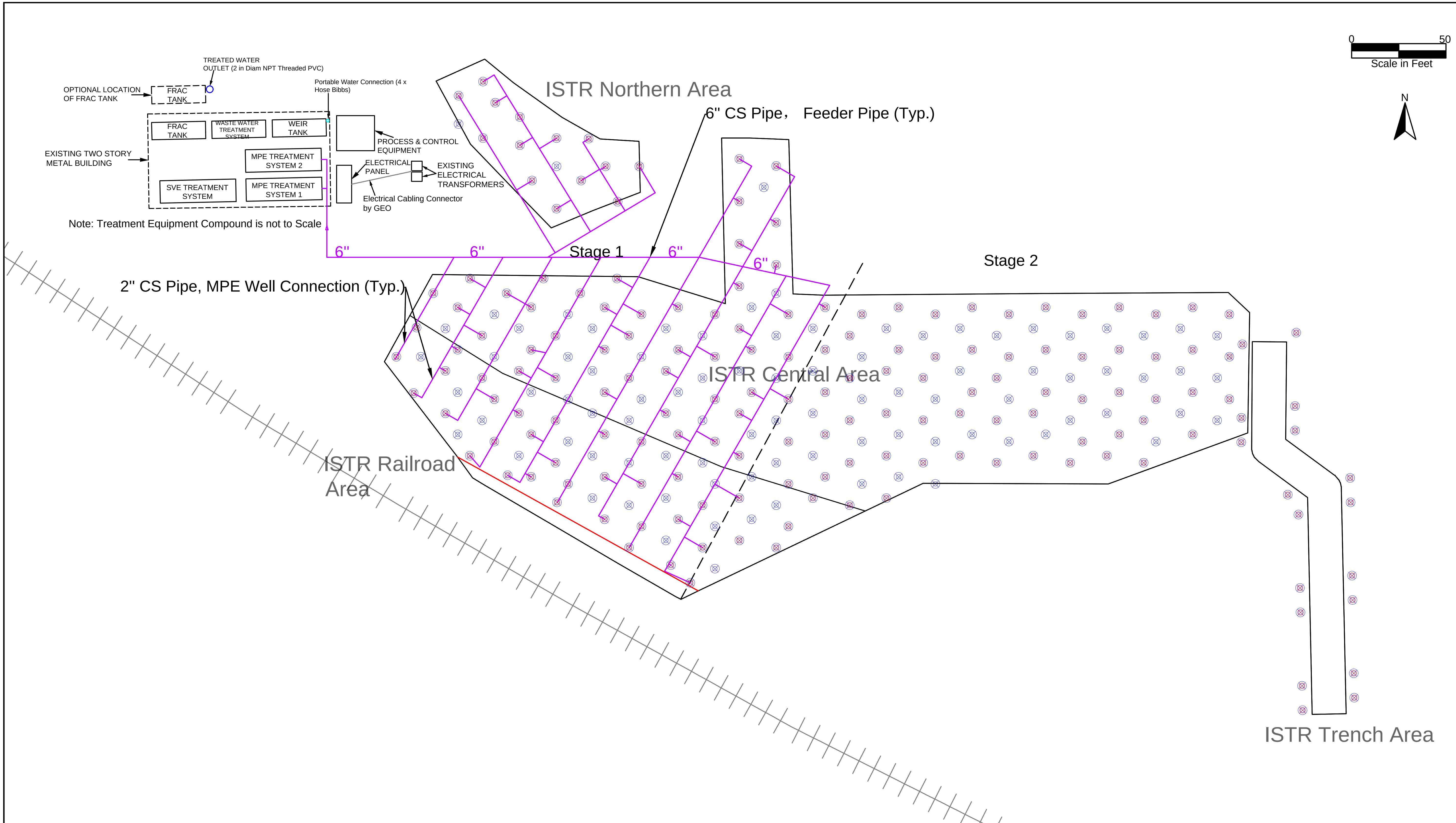
GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE: Stage 1 SVE Manifold

SIZE: B | DWG NO.: Figure 5-14

SCALE: 1:50 | UNITS: FEET & INCHES | SHEET 1 OF 1



LEGEND

⊗ MPE/SVE COLACATED WELL

⊗ SVE WELL

MPE MANIFOLD - PIPE
SIZE AS INDICATED

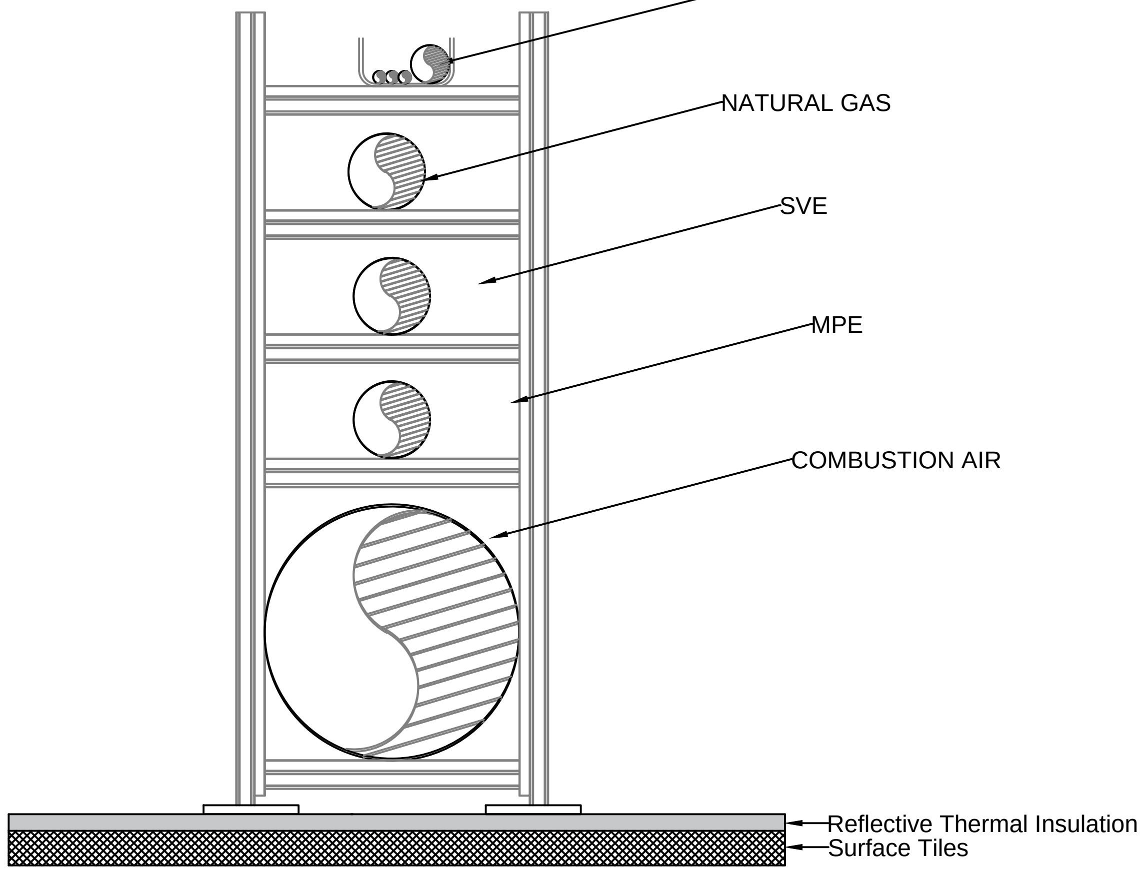
APPROVED	DATE
DRAWN TW	05/12/20
CHKD XC	05/12/20
APVD XC	05/12/20

GEO Environmental Remediation Company

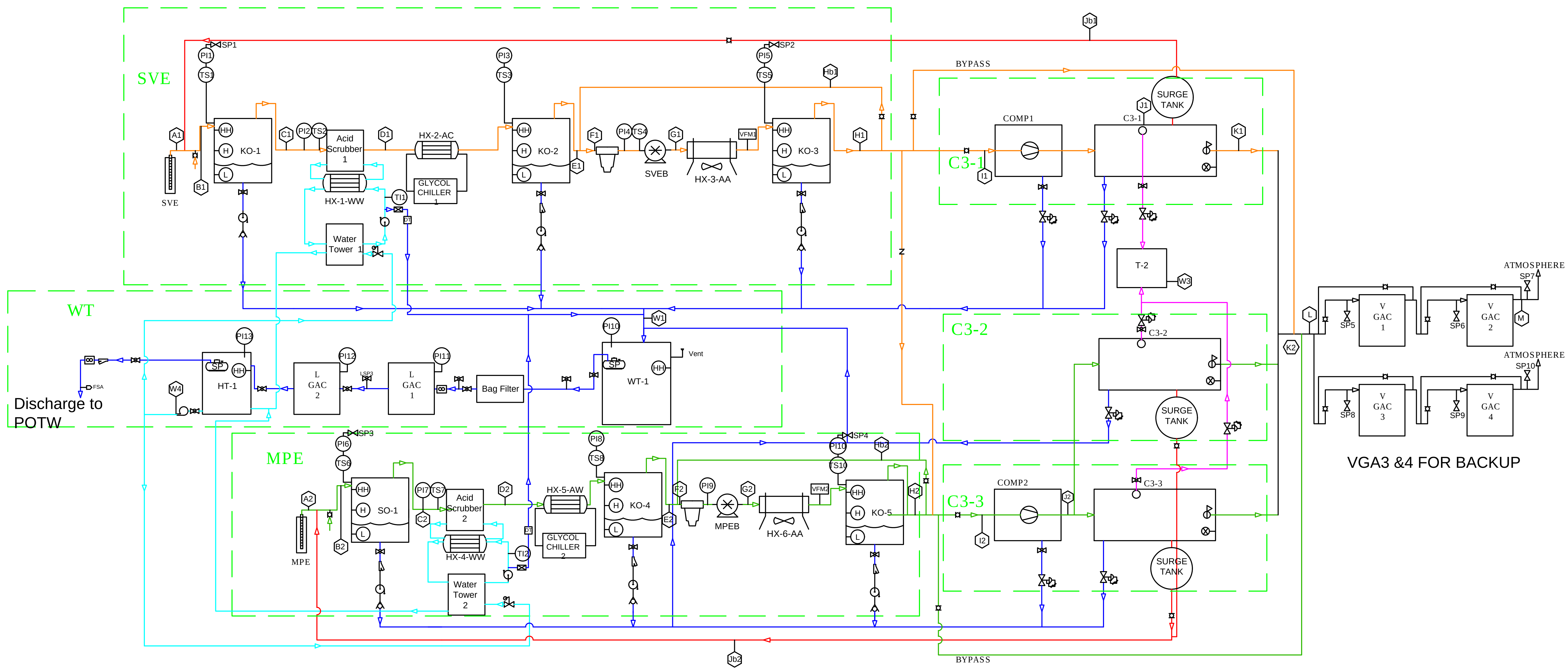
1500 W KATELLA AVE
ORANGE, CA 92867

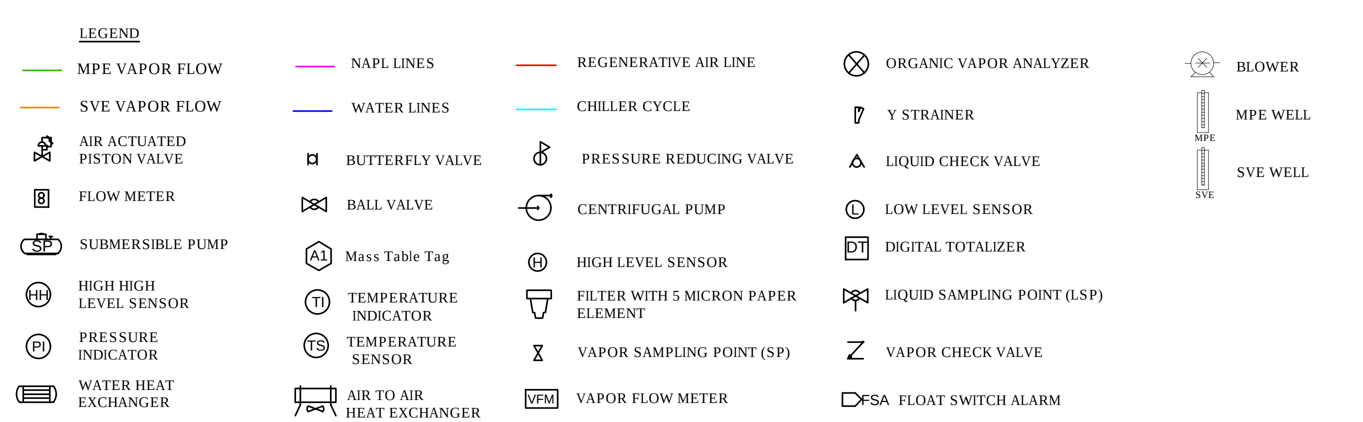
TITLE: Stage 1 MPE Manifold

SIZE	DWG NO.	
B	Figure 5-15	
SCALE 1:50	UNITS: FEET & INCHES	SHEET 1 OF 1

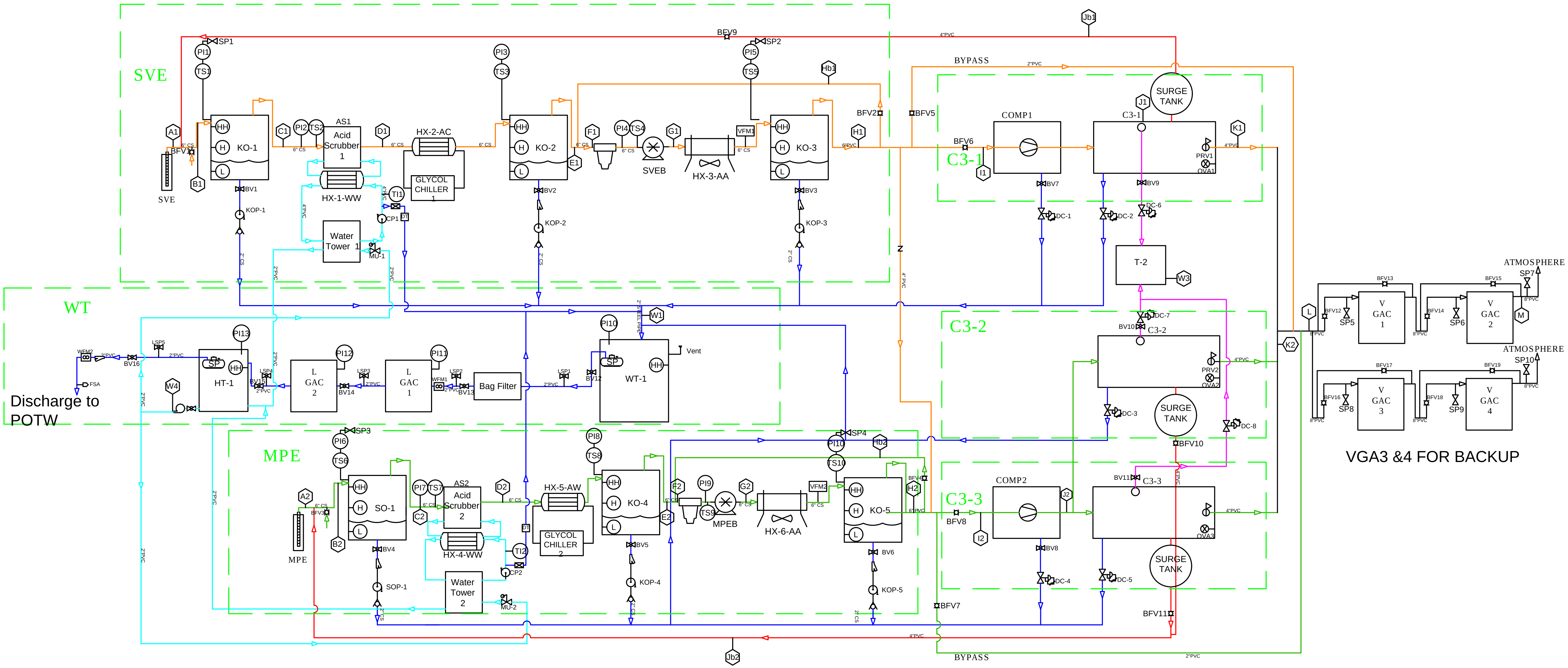


APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	05/15/20	TITLE Typical Stand Details	
CHKD XC	05/15/20	SIZE B	DWG NO. Figure 5-16
APVD XC	05/15/20	SCALE NTS	UNITS: SHEET 1 OF 1





APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	03/05/20	TITLE Process Flow Diagram	
CHKD XC	03/05/20	SIZE B	DWG NO. Figure 5-17
APVD XC	03/05/20	SCALE NST	UNITS: NA · SHEET 1 OF 1

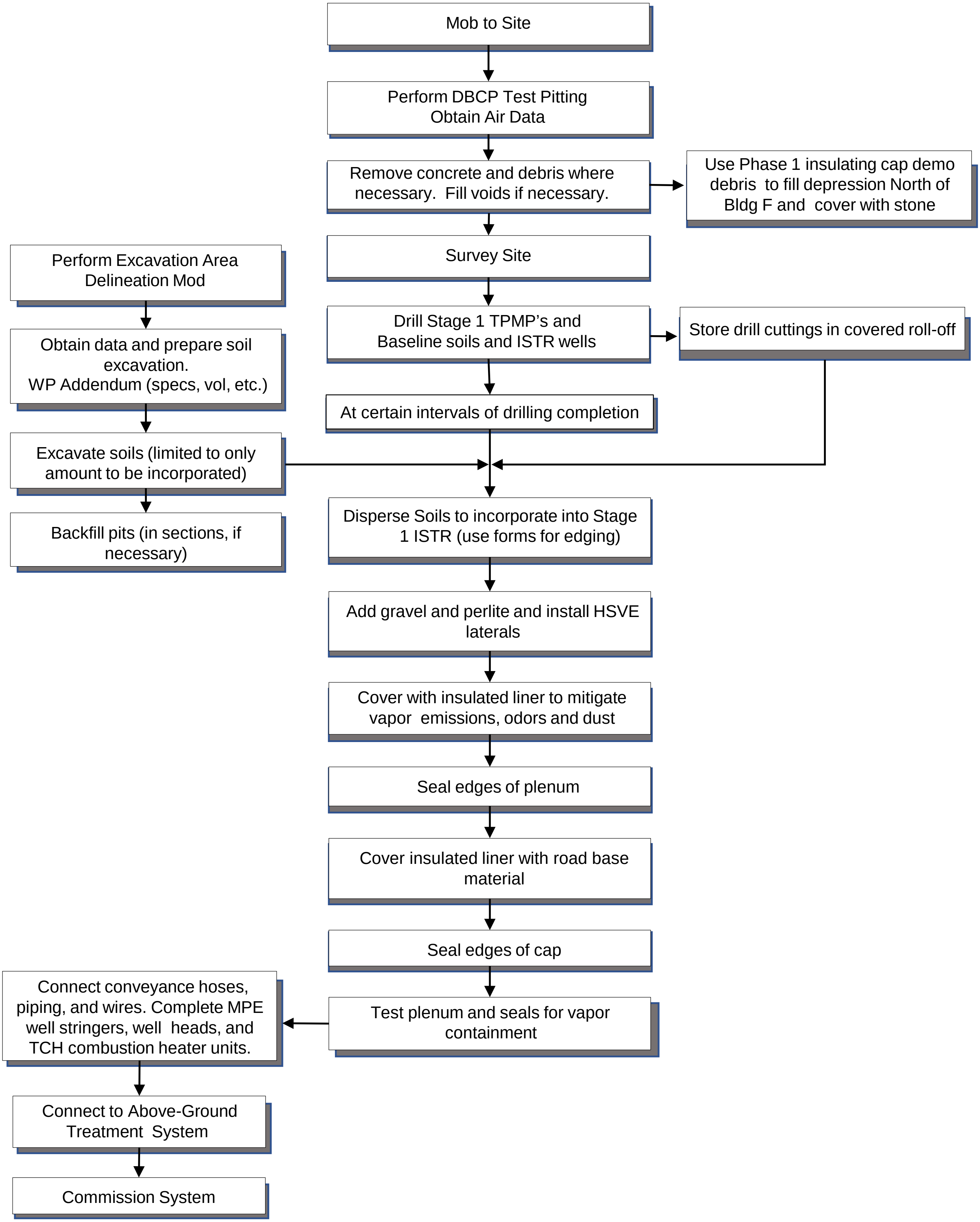


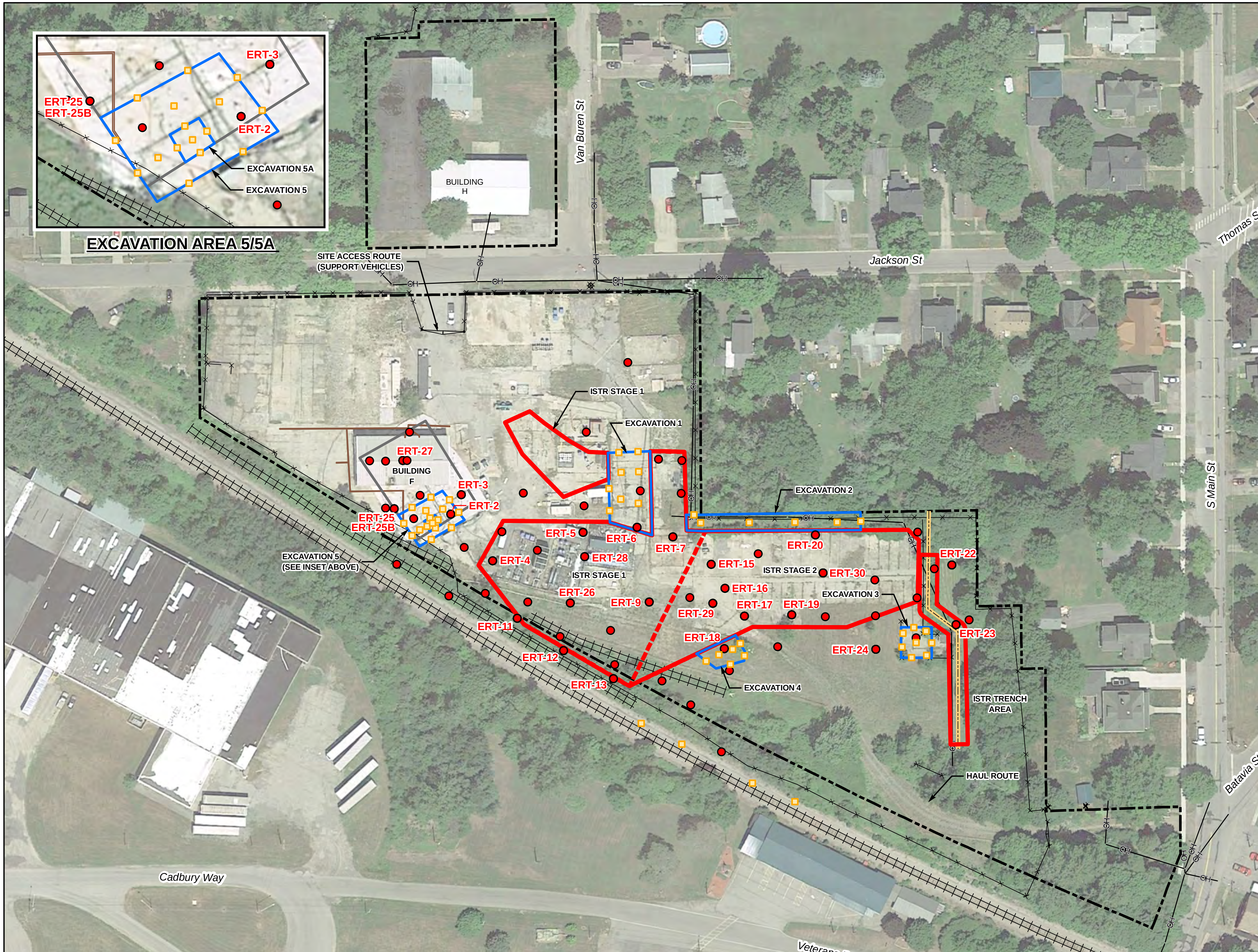
LEGEND

- MPE VAPOR FLOW
- SVE VAPOR FLOW
- AIR ACTUATED PISTON VALVE
- FLOW METER
- SUBMERSIBLE PUMP
- HIGH HIGH LEVEL SENSOR
- PRESSURE INDICATOR
- WATER HEAT EXCHANGER
- NAPL LINES
- WATER LINES
- BUTTERFLY VALVE (BFV)
- BALL VALVE (BV)
- Mass Table Tag
- TEMPERATURE INDICATOR
- TEMPERATURE SENSOR
- AIR TO AIR HEAT EXCHANGER
- REGENERATIVE AIR LINE
- CHILLER CYCLE
- PRESSURE REDUCING VALVE (PRV)
- CENTRIFUGAL PUMP (CP)
- HIGH LEVEL SENSOR
- FILTER WITH 5 MICRON PAPER ELEMENT
- VAPOR SAMPLING POINT (SP)
- VFM VAPOR FLOW METER
- OVA ORGANIC VAPOR ANALYZER
- Y STRAINER
- LIQUID CHECK VALVE
- LOW LEVEL SENSOR
- DT DIGITAL TOTALIZER
- LIQUID SAMPLING POINT (LSP)
- VAPOR CHECK VALVE
- FSA FLOAT SWITCH ALARM
- BLOWER
- MPE WELL
- SVE WELL

APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	03/05/20	TITLE Process & Instrumentation Diagram	
CHKD XC	03/05/20	SIZE B	DWG NO. Figure 5-18
APVD XC	03/05/20	SCALE NST	UNITS: NA SHEET 1 OF 1

Figure 6-1
ISTR System Field Construction Sequencing





Legend

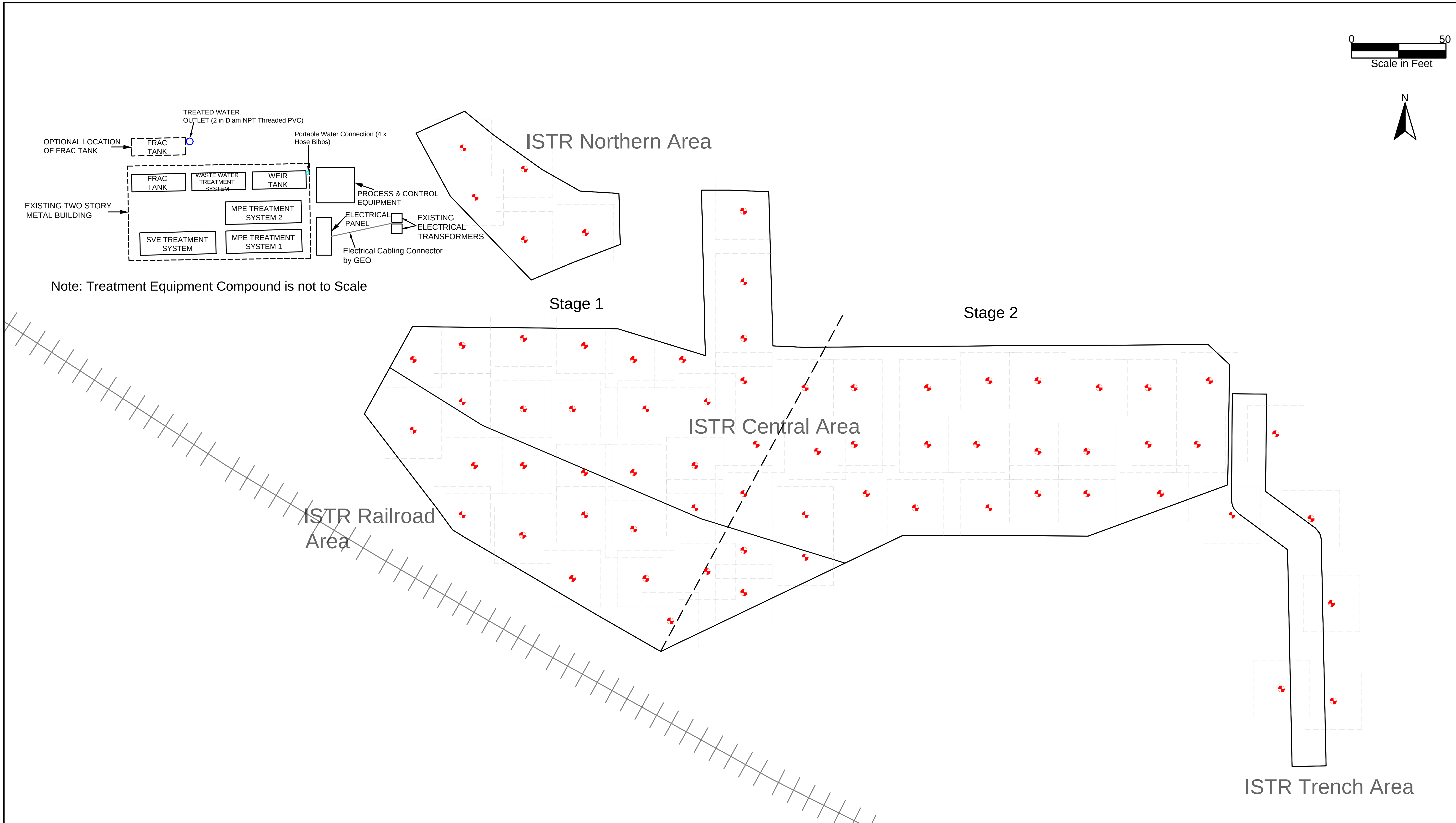
- Proposed Pre-Excavation Boring Location
- Historical Boring Location
- Diaz Facility Property Boundary
- Excavation Area
- Phase I Thermal Treatment Area
- Phase 2 Thermal Treatment Zone
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

N

0 50 100 200 Feet

Title:	PRE-EXCAVATION SAMPLING LOCATIONS
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS URS Corporation 40 British American Boulevard Latham, New York 12110	Drafter: JB	Date: February 19, 2020
	Drg. Size: 11 x17	Job No.: 60615479
	FIGURE 6-2	



LEGEND

BASELINE SOIL SAMPLING AND TPMP POINTS: 69

900 FT^2 AREA

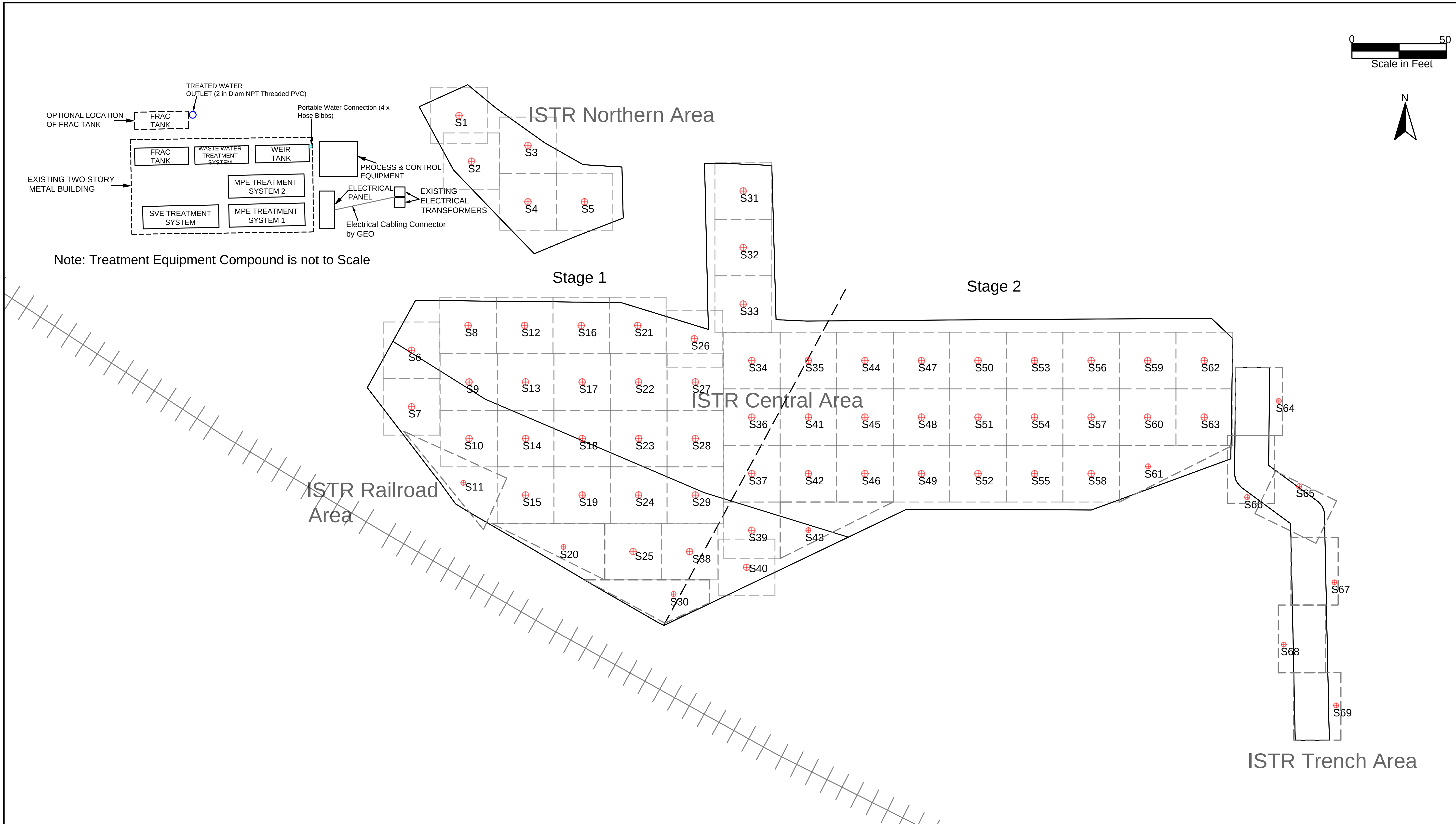
NOTE: ALL TPMPS TO BE CO-LOCATED WITH BASELINE SOIL BORINGS

APPROVED	DATE
DRAWN TW	03/05/20
CHKD XC	03/05/20
APVD XC	03/05/20

GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE	Baseline Soil Sampling and TPMP Locations	
SIZE B	DWG NO. Figure 6-3	
SCALE 1:50	UNITS: FEET & INCHES	SHEET 1 OF 1

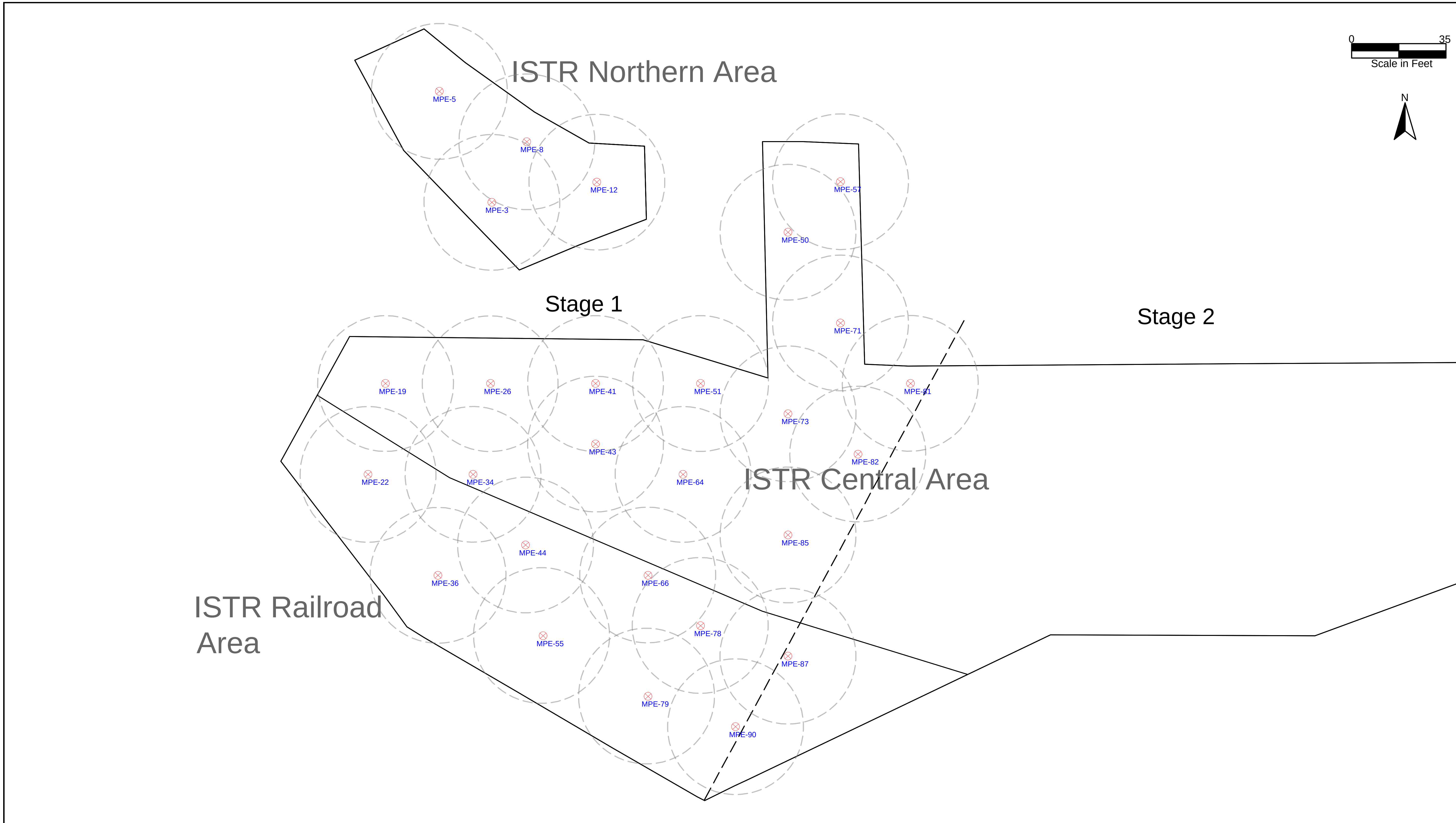


LEGEND

⊕ Sampling Points: 69

900 FT^2 AREA

APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	03/05/20	TITLE Confirmation Soil Sampling Locations	
CHKD XC	03/05/20	SIZE B	DWG NO. Figure 6-4
APVD XC	03/05/20	SCALE 1:50	UNITS: FEET & INCHES — SHEET 1 OF 1



LEGEND

MPE-# MPE Well Used to be Performance Monitoring Well: 27

2,000 ft^2 Area

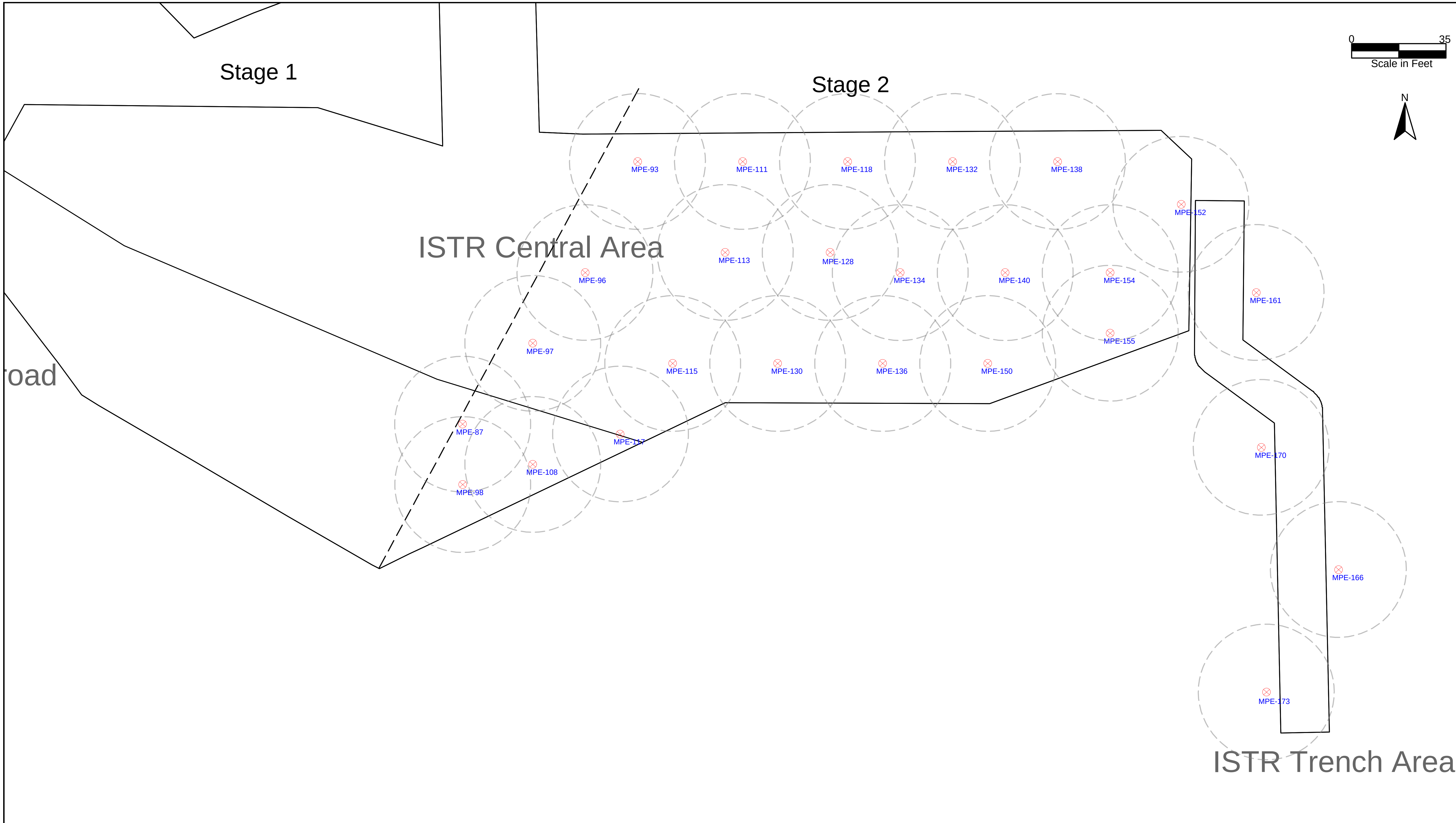
APPROVED	DATE
DRAWN TW	03/20/20
CHKD GG	03/20/20
APVD GG	03/20/20

GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE Stage 1-Performance Monitoring Well Location

SIZE B	DWG NO. Figure 6-5	
SCALE 1:35	UNITS: FEET & INCHES	SHEET 1 OF 1



LEGEND

MPE-# MPE Well Used to be Performance Monitoring Well: 26

2,000 ft^2 Area

	APPROVED	DATE
DRAWN	TW	03/20/20
CHKD	GG	03/20/20
APVD	GG	03/20/20

GEO Environmental Remediation Company

1500 W KATELLA AVE
ORANGE, CA 92867

TITLE Stage 2 Performance Monitoring Well Location

SIZE B

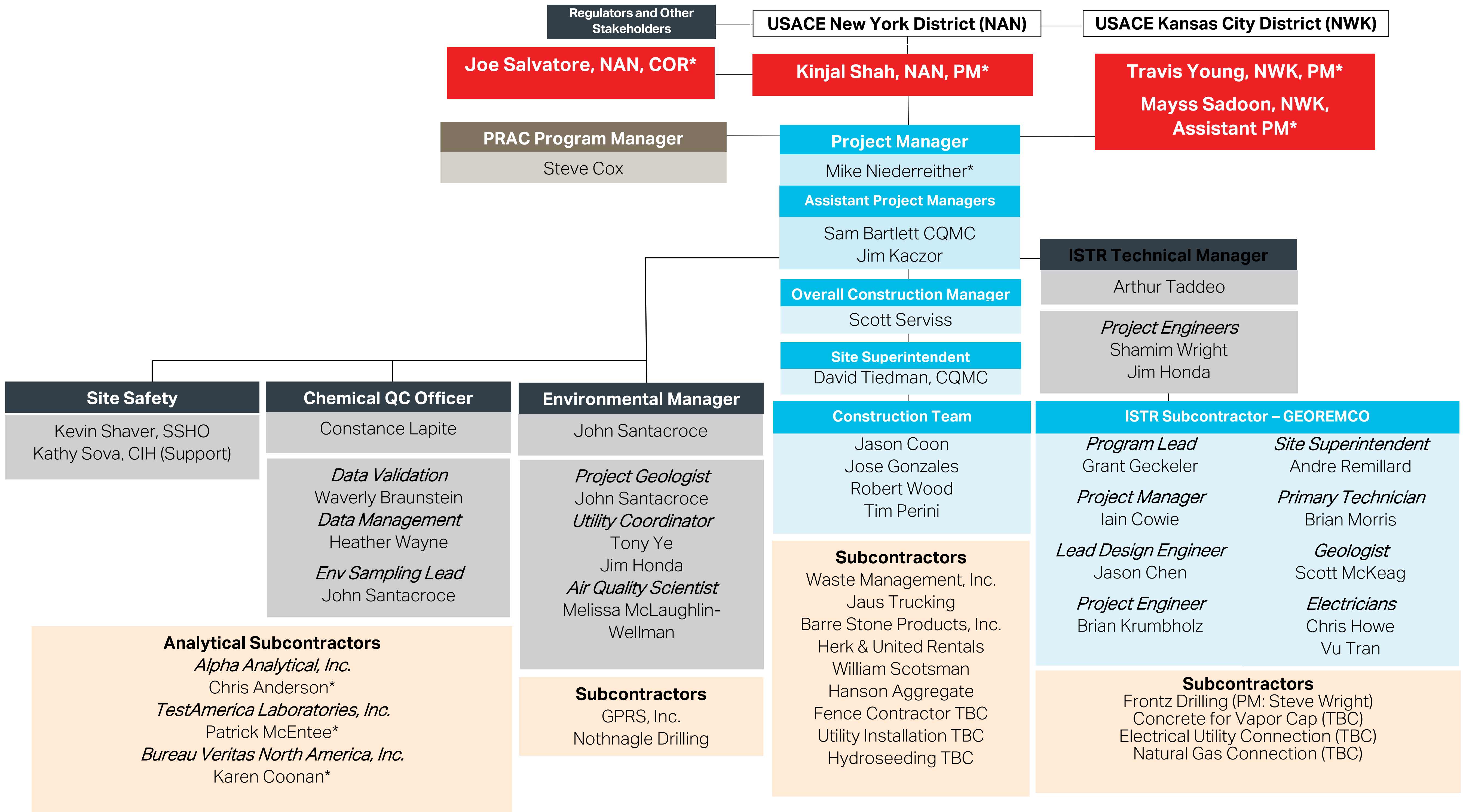
DWG NO. Figure 6-6

SCALE 1:35

UNITS: FEET & INCHES

SHEET 1 OF 1

Figure 7-1 Remediation Team Organizational Chart



APPENDIX A Historical Building Information

Figure 20:

Undated aerial photograph of Diaz Chemical Company Facility.

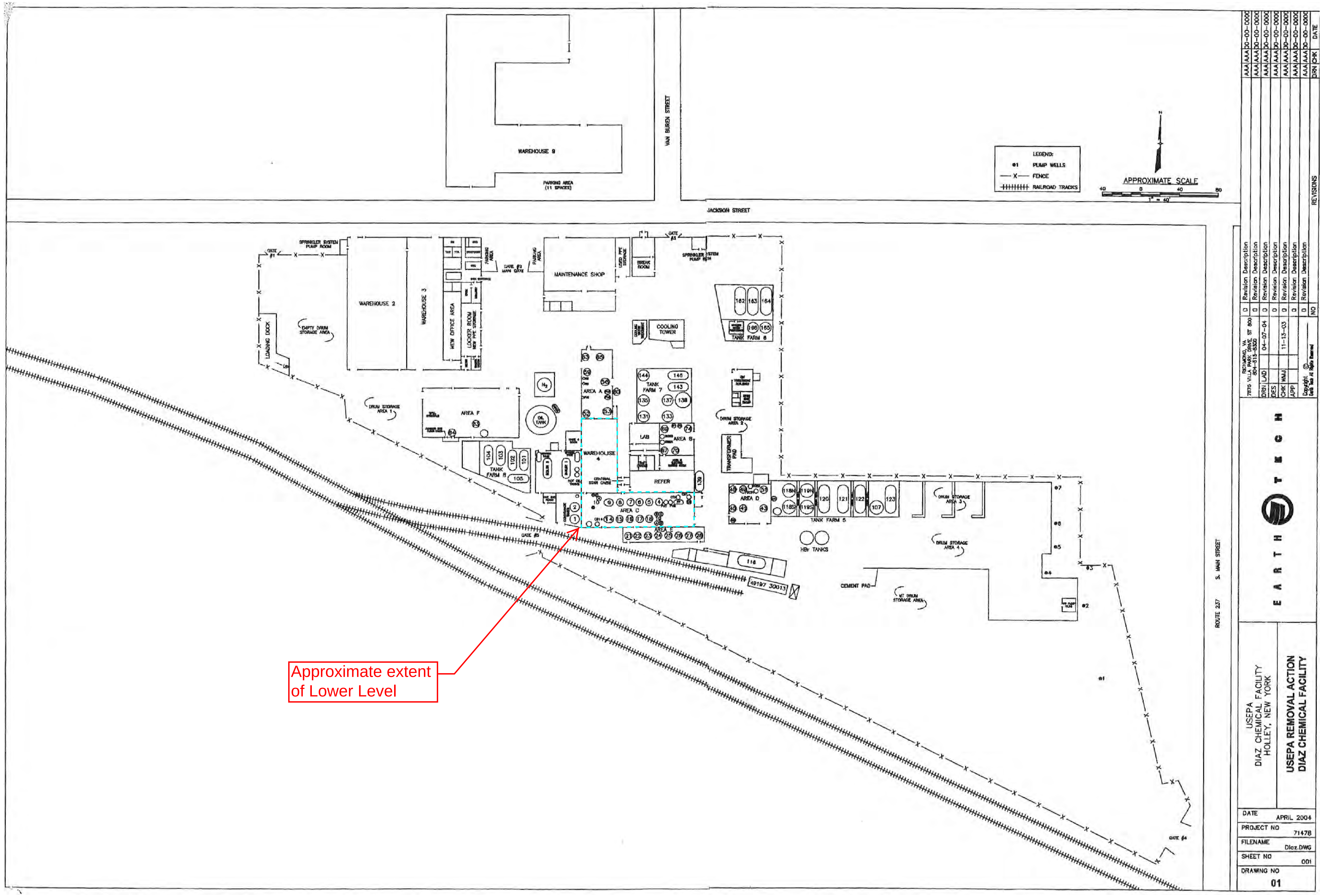
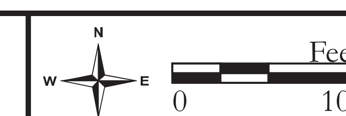
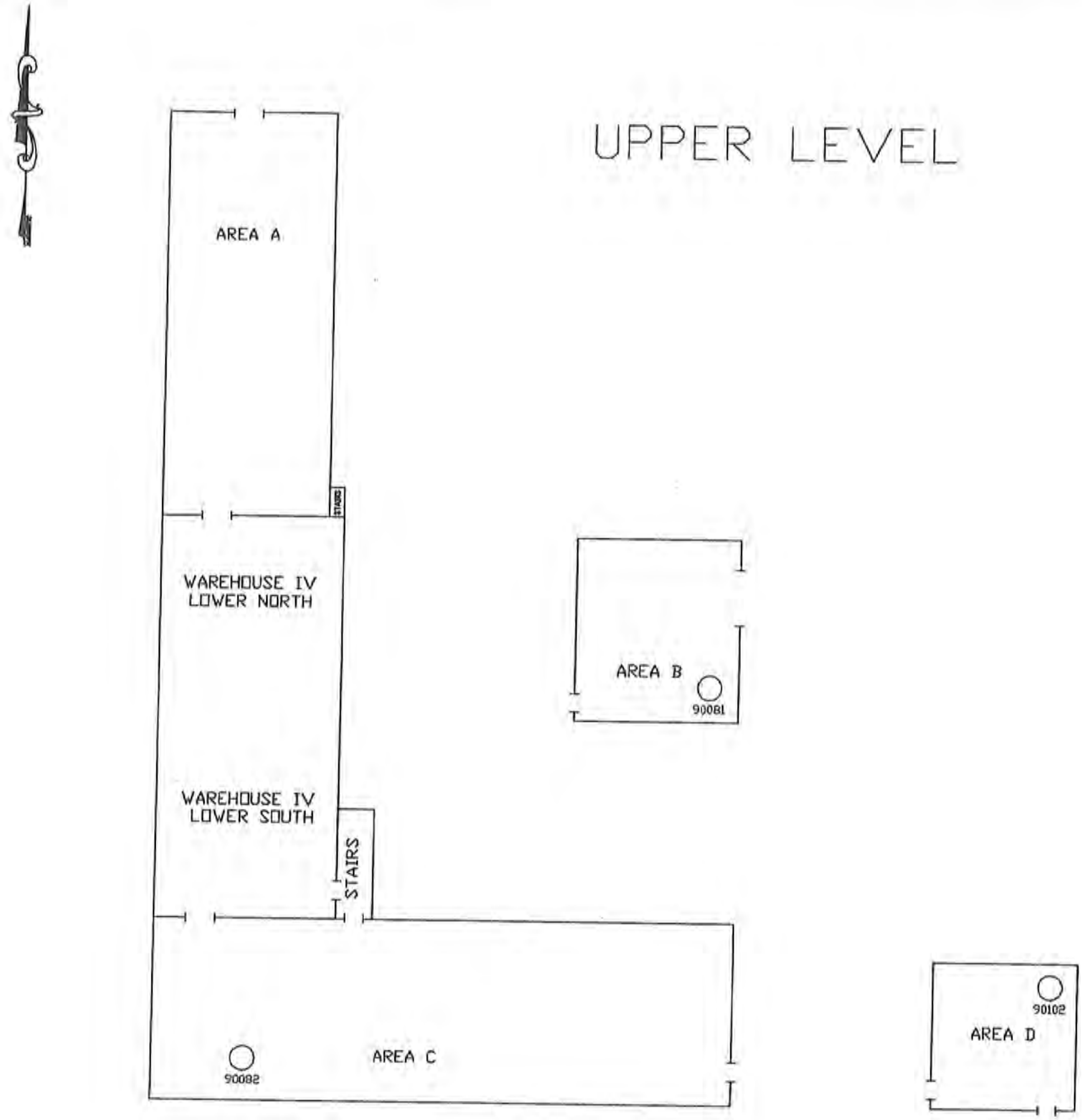


Figure 19:

USEPA Removal Action, Diaz Chemical Facility (Earthtech 2004).





GRAPHIC SCALE
20 0 20 40 FEET
1 " = approximately 40'

DATE MODIFIED 5-25-05

WESTON SOLUTIONS
Restoring Resource Efficiency

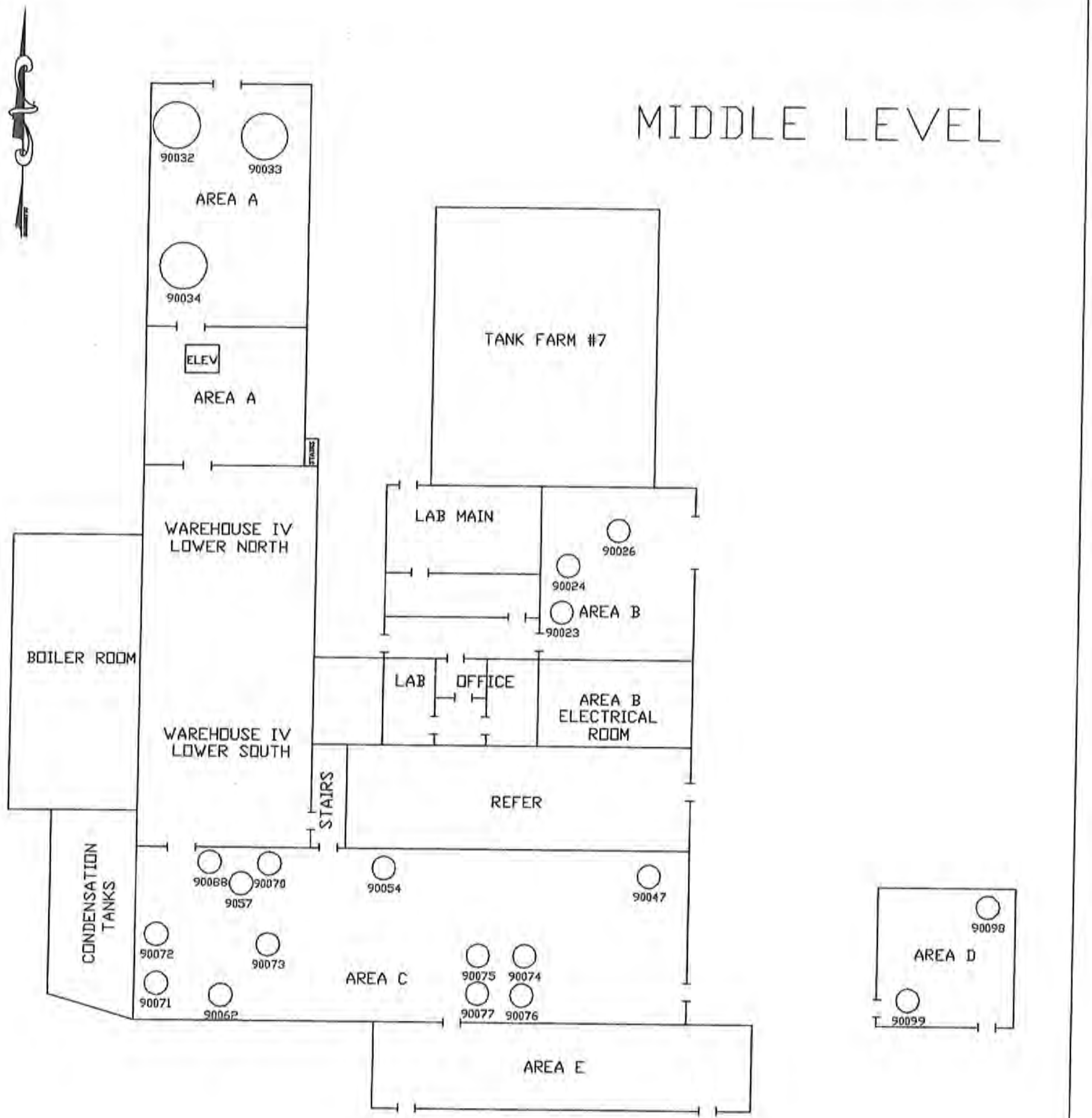
Weston Solutions, Inc.
Federal Programs Division

IN ASSOCIATION WITH
INNOVATIVE TECHNOLOGICAL SOLUTIONS, INC.,
SCIENTIFIC AND ENVIRONMENTAL ASSOCIATES, INC.,
AND TERRANEAR PMC LLC

Figure 1
INACCESSIBLE TANKS & TOWERS
DIAZ CHEMICAL SITE
40 JACKSON STREET
HOLLEY, NEW YORK

US ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM
CONTRACT # 68-W-00-113

DRAWN BY:	B. HENSPERGER
EPA OSC:	K. MATHEIS
RST SPM:	G. BUSHRA
FILENAME:	DIAZ3



GRAPHIC SCALE

20 0 20 40 FEET

1 " = approximately 40'

DATE MODIFIED 9-25-03

WESTON SOLUTIONS

Weston Solutions, Inc.
Federal Programs Division

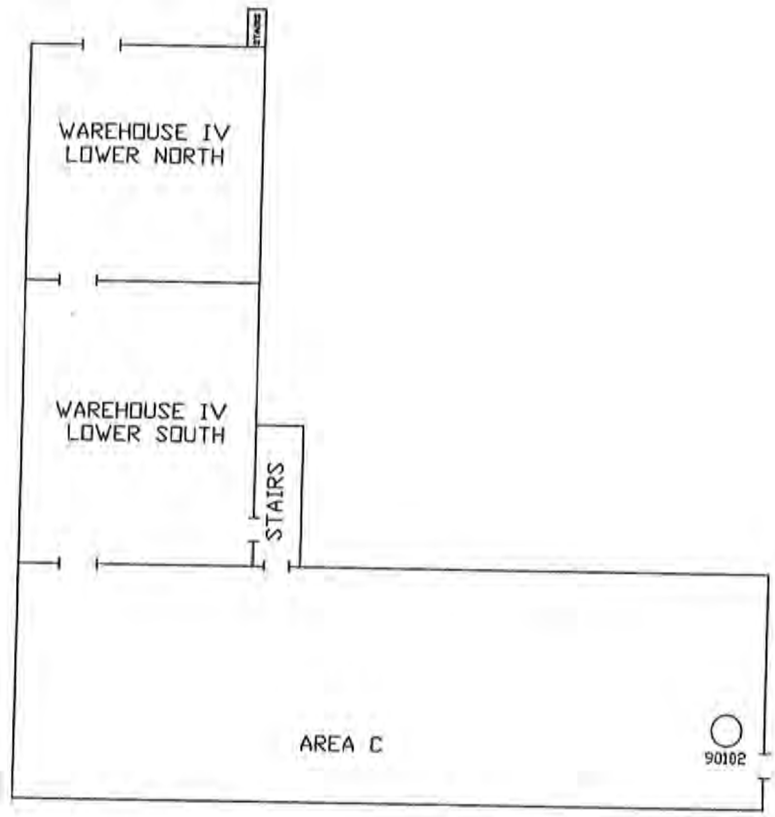
IN ASSOCIATION WITH
INNOVATIVE TECHNOLOGICAL SOLUTIONS, INC.,
SCIENTIFIC AND ENVIRONMENTAL ASSOCIATES, INC.,
AND TERRANEAR PMC LLC

Figure 2
INACCESSIBLE TANKS & TOWERS
DIAZ CHEMICAL SITE
40 JACKSON STREET
HOLLEY, NEW YORK

US ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM
CONTRACT # 68-W-00-113

DRAWN BY:	B. HENSPERGER
EPA OSC:	K. MATHEIS
RST SPM:	G. BUSHRA
FILENAME:	DIAZ3

LOWER LEVEL



GRAPHIC SCALE
20 0 20 40 FEET
1 " = approximately 40'

DATE MODIFIED 9-25-05

Weston Solutions, Inc.
Federal Programs Division

IN ASSOCIATION WITH
INNOVATIVE TECHNOLOGICAL SOLUTIONS, INC.,
SCIENTIFIC AND ENVIRONMENTAL ASSOCIATES, INC.,
AND TERRANEAR PMC LLC

Figure 3
INACCESSIBLE TANKS & TOWERS
DIAZ CHEMICAL SITE
40 JACKSON STREET
HOLLEY, NEW YORK

US ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM
CONTRACT # 68-W-00-113

DRAWN BY:	B. HENSPERGER
EPA OSC:	K. MATHEIS
RST SPM:	G. BUSHRA
FILENAME:	DIAZ3

Legend

New Sump	Area C	Electric Room B
Area A	Area D	Building R
Area B	South of Area E	Warehouse 4

0 25 50 100 150 200 Feet

N E S W

Weston Solutions, Inc.
Federal Programs Division

In Association With
Avatar Environmental, LLC.,
Innovative Technical Solutions, Inc. and
Scientific and Environmental Associates, Inc.

DATE MODIFIED: 06/19/2007

Figure 1: Sump and Sump Channel Location Map

DIAZ CHEMICAL SITE
HOLLEY, NEW YORK

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM 2
CONTRACT # EP-W-06-072

GIS ANALYST:	F. CAMPBELL
EPA OSC:	K. MATHEIS
RST SPM:	A. MISIR
FILENAME:	DIAZCHEMICAL.MXD

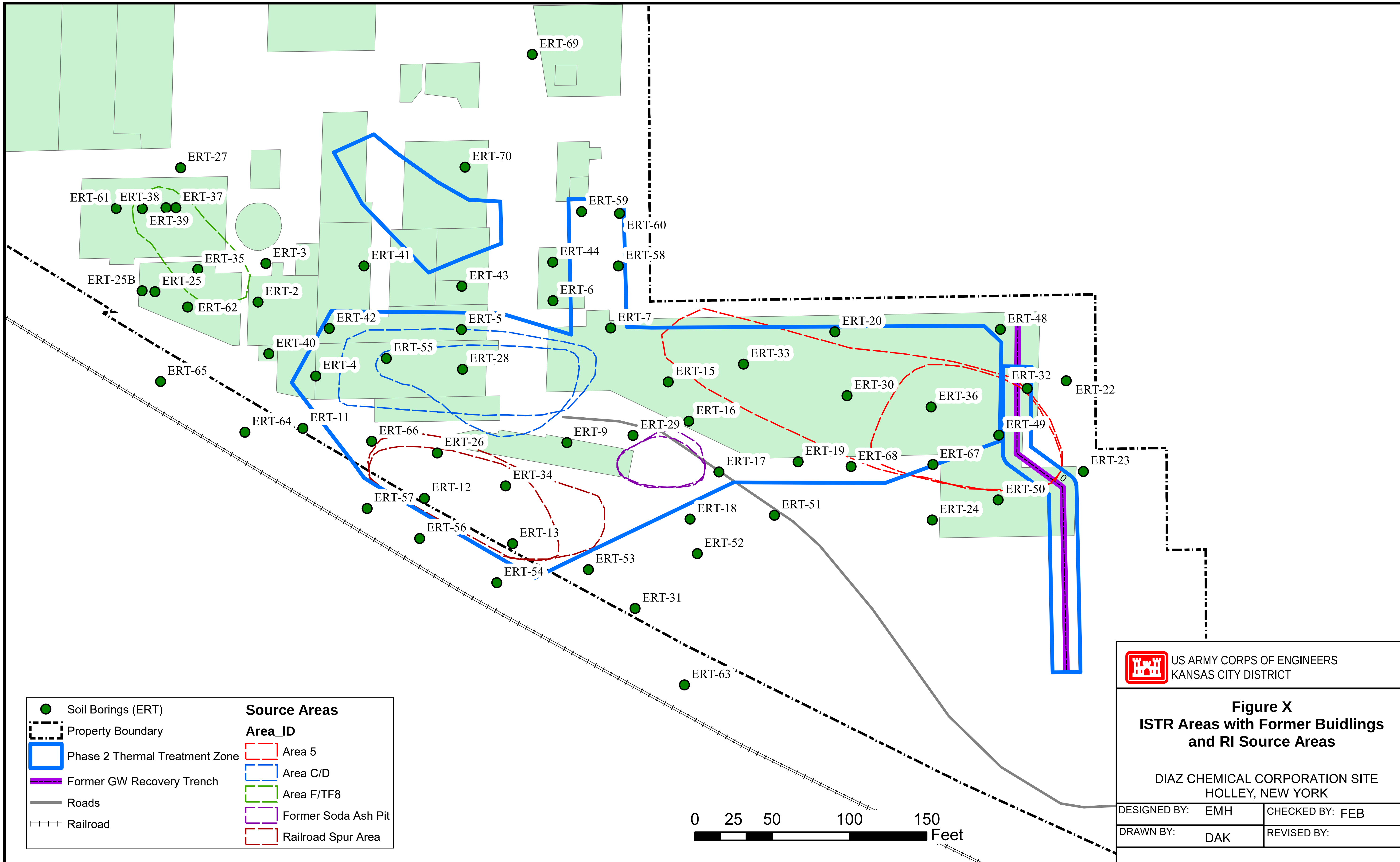


Figure X
ISTR Areas with Former Buidlings and RI Source Areas

Coordinate System: NAD 1983 StatePlane New York West FIPS 3103 Feet
Projection: Transverse Mercator
Datum: North American 1983

Google Maps 40 Jackson St

X= Voids found during demobilization

Imagery ©2018 Google, Map data ©2018 Google 50 ft

40 Jackson St

Holley, NY 14470

VILLAGE OF HOLLEY

72 PUBLIC SQUARE
HOLLEY, NY 14470
COUNTY OF ORLEANS
585-638-6367
FAX: 585-638-7540

1. Print Name: AECOM - TONY, YE Account#:________
2. Drivers License#____________________ Social Security#______________
3. Address: 40 JACKSON STREET, HOLLEY, NY 14470 Date: 01/08/2020
4. Mailing Address: 257 WEST GENESEE STREET, BUFFALO, NY 14202
5. Telephone Number: 716-923-1232 Move In Date: TBD (est. 03/2020)
   Work: TONY.YE@AECOM.COM X Electric / X Water
6. Marital Status: ____________________
7. Spouse's name and Maiden Name: ______________
8. Have you ever resided in the Village of Holley: Yes ____ No ____

****

9. Residential Owner: __________ Residential Renter: __________
   Commercial Owner: __________ Commercial Renter: X
10. Apartment Location: 1^{ST} Floor _____ 2^{nd} Floor _____ 3^{rd} Floor _____
12. Do you have Gas Heat _____ or Electric Heat _____?
13. Are you presently employed? _______ Name of Company: ______________
    Address____________________________ Phone______________
14. Are you a student? _____ Name of Institution: ______________
15. Do you have a rental lease? _____ Period it covers: ______________
16. Do you intend to reside at this location for more than a year? __________
17. Are you 62 years of age or older? __________
18. Are you receiving public assistance, supplementary security income benefits or additional state payments? ____________________

I, TONY, YE**, REQUEST ELECTRICAL SERVICE AT THE ABOVE LOCATION. I FULLY UNDERSTAND THAT THE SERVICE IS BEING SUPPLIED BY THE VILLAGE OF HOLLEY, NY, UNDER ITS RULES, REGULATIONS AND GENERAL SCHEDULES AS FILED PERIODICALLY WITH THE NEW YORK POWER AUTHORITY. SAID SERVICE IS TO BE PAID FOR BY THE UNDERSIGNED IN ACCORDANCE WITH SERVICE APPLICABLE. ALSO, THAT THE LANDLORD WILL BE NOTIFIED MONTHLY OF ANY OUTSTANDING BALANCES OF BILLS UNPAID.**

Tony

Signature of Subscriber

Village of Holley Use Only

ELECTRIC DEPOSIT REQUIRED: YES X NO ____
AMOUNT OF DEPOSIT: $ 200.00

WATER DEPOSIT REQUIRED: YES - $25.00 NON-REFUNDABLE

NOT APPLICABLE

VILLAGE OF HOLLEY
PAGE 2

Account Number: ______________

OCCUPANCY INFORMATION:

NAME: ____
ADDRESS: ____

PLEASE CHECK EITHER 'YES' OR 'NO' COLUMN AS IT PERTAINS TO YOUR HOUSEHOLD AND FILL IN ALL OTHER REQUIRED INFORMATION.

DOES YOUR HOUSEHOLD HAVE THE FOLLOWING?

	YES	NO
1. Children under 18 years old?	____	____
Name ____________________ Age _____		
Name ____________________ Age _____		
Name ____________________ Age _____		
2. A handicapped occupant?	____	____
3. A life support system?	____	____
4. An occupant 62 yrs of age or older?	____	____
5. An occupant with any serious illness or factual information that loss of electricity will effect?	____	____

Explain in Detail (Wheelchair, Blindness, other):

____
____

Explain in Detail (Dialysis, Iron Lung, other):

____
____

Explain in Detail (Other Reasons):

____
____

APPENDIX C

Holley Sanitary Sewer Discharge Approval Request

URS

URS Group, Inc.
12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

Aric Albright
Village of Albion –
Joint Municipal Industrial Pollution Control Facility
14740 Densmore Street
Albion, NY 14411

March 5, 2020

RE: Diaz Chemical Site – Treated Water Discharges

Dear Mr. Albright,

This letter provides details regarding the proposed discharge of treated process water to the sanitary sewer at the former Diaz Chemical Site (the Site) in the Village of Holley, New York. The treated water will result from planned Phase II remediation activities at the Site. The intent of the provided information is for your review and issuance of an approval letter for the discharge as described herein.

Water discharges will consist of extracted groundwater (condensed vapor and extracted liquid water) generated through the in-situ thermal remediation (ISTR) process. ISTR system startup is currently planned for November 2020. Extracted and condensed liquids will be processed through a treatment system. The treatment system will include a weir tank and bag filters for removal of solids prior to processing through liquid phase granular activated carbon (GAC) vessels for removal of site constituents of concern. Collected vapors will also be processed through a condenser unit for removal of non-aqueous phase liquid (NAPL) prior to liquid GAC treatment as described above. The treated water will be stored in holding tanks prior to discharge to the sanitary sewer via a permanent connection to the manhole on Jackson Street. Discharge will be achieved by gravity flow through a below-grade pipe. A figure detailing the proposed sewer connection is provided in attachment.

The proposed discharge will be continuous in nature, and estimated flows are further described as follows:

- Mean continuous discharge rate of 7 gallons per minute (gpm).
- Minimum continuous discharge rate to the sewer is estimated to be 3 gpm.
- Maximum continuous discharge rate to sewer is 25 gpm limited to a period of less than 4 hours in any 24 hour period. This range of flows is a safety factor to account for the uncertainties in totalized groundwater extraction rates from the MPE wells at various stages of operation.
- Sustained flows above 10 gpm are not anticipated for durations of more than 4 hours during any 40 hour period.

- For peak flow rates anticipated to be sustained for longer than 4 consecutive hours of operation:
  - Peak water production from condensing of condensable-portion of vapors is estimated to be at a sustained rate of 10 gpm.
  - At this rate of 10 gpm, the combined capacity of the primary 21,000 gallon holding tank plus the reserve [separate] 21,000 gallon holding tank will allow for at least 67 hours of on-site holding capacity.

The discharge will meet the following criteria:

- TDS discharge limit will be 1100 mg/L and TSS discharge limit will be 200 mg/L.
- BOD-5 limit will be 200 mg/L.
- Ammonia discharge concentrations will be monitored.
- Site Contaminants of Concern (COCs), including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) will be tested for comparison with the cleanup standards presented on the attached draft table. Note that a number of compounds are identified as 'to be determined' due to ongoing laboratory method development.

A monthly report will be submitted to the Pollution Control Facility on the 28th day of each month that includes analytical results for weekly samples of Site COCs and monthly samples of TDS/TSS, BOD-5, and NH_3. Due to the lab lag, the first monthly report will include samples from week 1 and 2, while the following reports will include week 3, 4, 1, and 2.

URS understands that the approval letter for the discharge will include the Diaz's VOCs and SVOCs and water quality discharge criteria and the discharge rate. The finalized table of Site COCs will be provided to the PCF in future correspondence following completion of method development.

We appreciate your ongoing cooperation in this important project. Please do not hesitate to contact me with any questions or comments.

Sincerely,

James T. Honda

3/5/2020

James T. Honda, PE
(518) 951-2303
URS Project Engineer

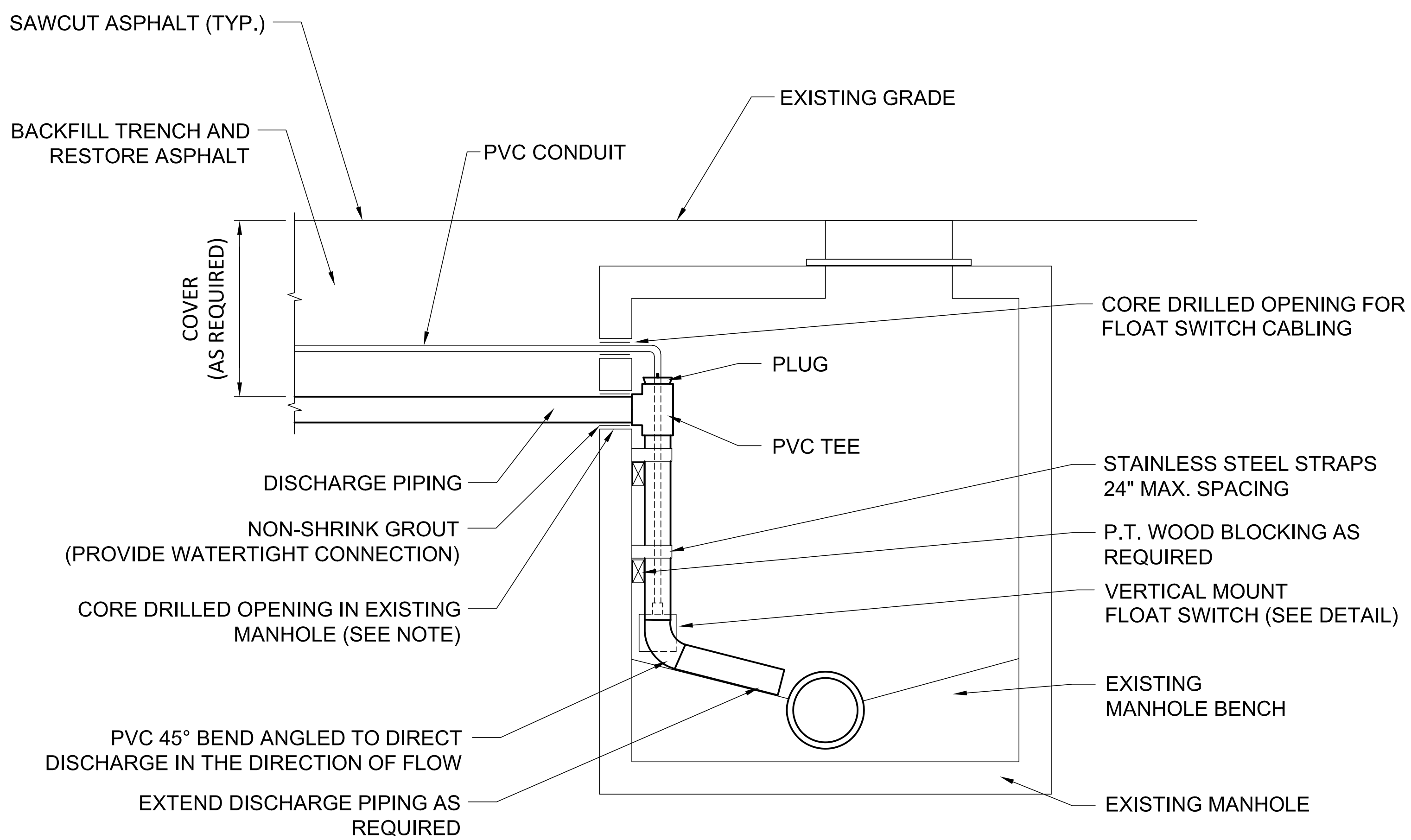
Date

Cc: Mayor Brian Sorochty, Village of Holley
Dave Nenni, Department of Public Works – Village of Holley
Travis Young, USACE Kansas City District
John DiMartino, USEPA
Mike Niederreither, URS Project Manager

DRAFT Proposed Discharge Limits
Diaz Chemical Site Phase II Remediation

Chemical of Concern	CAS #	Limit	Units
1,1,1-Trichloroethane	71-55-6	5	ug/L
1,1-Dichloroethane	75-34-3	5	ug/L
1,1-Dichloroethene	75-35-4	7	ug/L
1,2-Dibromoethane	106-93-4	5	ug/L
1,2-Dichloroethane	107-06-2	5	ug/L
Benzene	71-43-2	1	ug/L
Chlorobenzene	108-90-7	5	ug/L
cis-1,3-Dichloropropene	10061-01-5	5	ug/L
Cyclohexane	110-82-7	5	ug/L
Ethylbenzene	100-41-4	5	ug/L
Isopropylbenzene	98-82-8	5	ug/L
m,p-Xylene	179601-23-1	5	ug/L
Methylene Chloride	75-09-2	5	ug/L
o-Xylene	95-47-6	5	ug/L
Styrene	100-42-5	5	ug/L
Tetrachloroethene	127-18-4	5	ug/L
Toluene	108-88-3	5	ug/L
trans-1,2-Dichloroethene	156-60-5	5	ug/L
trans-1,3-Dichloropropene	10061-02-6	TBD	ug/L
Trichloroethene	79-01-6	5	ug/L
Vinyl Chloride	75-01-4	2	ug/L
2-Butanone	78-93-3	NA	ug/L
Methylcyclohexane	108-87-2	NA	ug/L
1-Bromo-2-chloroethane	107-04-0	5	ug/L
1,3-Dibromobenzene	108-36-1	5	ug/L
Fluorobenzene	462-06-6	5	ug/L
4-Chlorobenzotrifluoride	98-56-6	5	ug/L
1,4-Dibromobenzene	106-37-6	5	ug/L
1-Bromo-3-fluorobenzene	1073-06-9	5	ug/L
1-Bromo-4-ethylbenzene	1585-07-5	5	ug/L
3,4-Dichlorobenzotrifluoride	328-84-7	5	ug/L
4-Bromofluorobenzene	460-00-4	NA	ug/L
1,2-Dibromo-3-chloropropane	96-12-8	0.04	ug/L
2-Bromopyridine	109-04-6	TBD	ug/L
3-Nitro-4-chlorobenzotrifluoride	121-17-5	TBD	ug/L
3-Amino-4-chlorobenzotrifluoride	121-50-6	TBD	ug/L
3-Bromoacetophenone	2142-63-4	TBD	ug/L

Notes:
CAS # - Chemical Abstracts Service Registry number
NA - Not Applicable
TBD - To Be Determined

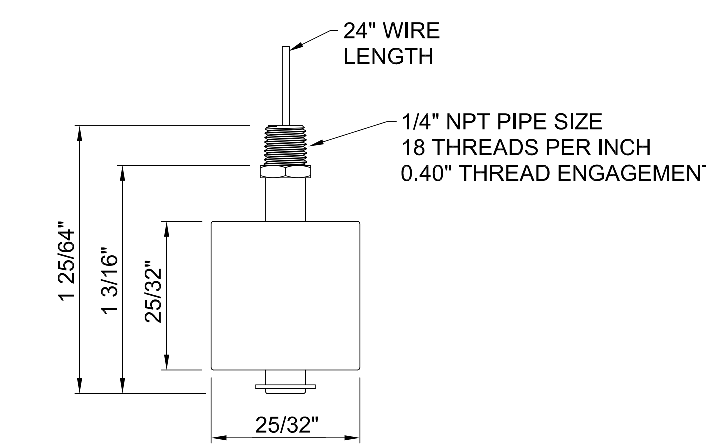


TYPICAL TREATED WATER DISCHARGE CONNECTION TO EXISTING SANITARY SEWER MANHOLE

NOT TO SCALE

NOTES:

1. PORTION OF TREATED WATER DISCHARGE TO BE BURIED BETWEEN WORK ZONE AREA SECURITY FENCE AND EXISTING MANHOLES.
2. CORE DRILLED OPENINGS IN EXISTING MANHOLE SHALL BE FILLED AND SEALED WITH NON-SHRINK GROUT AT THE COMPLETION OF THE DISCHARGE OPERATION.
3. FLOAT SWITCH SHALL BE McMASTER-CARR MODEL 5128K230 OR SIMILAR.
4. FLOAT SWITCH TO BE INSTALLED AND SET AT DEPTH AS APPROPRIATE TO MONITOR SEWER OVERFLOW LEVEL.



FLOAT SWITCH

NOT TO SCALE

Title:	SANITARY SEWER CONNECTION DETAIL
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT
Drafter: KPB	Date: February 2020
Drg. Size: 11 x 17	Job No.: 60615479

URS Corporation
40 British American Boulevard
Latham, New York 12110

FIGURE 4-5

NYSEG AND RG&E

GAS CONSTRUCTION STANDARDS AND INSTALLATION MANUAL

45.04

9.0 COMMERCIAL AND INDUSTRIAL ELEVATED PRESSURE COMMITMENT LETTER

ELEVATED PRESSURE COMMITMENT LETTER

Customer Name: AECOM

Service Address: 40 JACKSONS STREET, HOLLEY NY 14470

Requested Service Pressure: ½ psig 1 psig 2 psig 3 psig 5 psig X 10 psig (check one box)

Estimated Demand (MCFH): 9.0

Service pressures in excess of 7" water column require special precautions and construction practices. Your entire gas piping system, including pressure reduction regulators, must be installed according to the requirements of the **Fuel Gas Code of New York State**, New York State regulations and other local regulations as these requirements or regulations may be amended, modified or superseded. There may also be requirements imposed by your fire insurance carrier and local building inspector. If you have any questions, please call ____________________ at ____________________.

PLEASE READ THIS SECTION CAREFULLY AND COMPLETELY

I agree, in signing below, to the following:

- I will install or cause to install all of my piping and related equipment in accordance with the most current editions of the **Fuel Gas Code of New York State**, New York State regulations and other local regulations and manufacturer's instructions.
- I will install a pressure-reducing device on any appliance that is designed to operate at a pressure less than the delivery pressure.
- I will install a vent piping system leading to the outdoors for any and all pressure regulators and pressure relief devices.
- I will notify the Company before making any changes/additions to my piping system or appliances.
- I will perform an annual inspection of my pressure regulators and relief devices. Qualified individuals should perform these inspections.
- The Company has no responsibility for my gas appliances and related gas equipment such as regulators and relief devices that I, my contractor or builder have installed or will in the future install and I agree to take full and complete responsibility for my gas appliances and related gas equipment such as regulators and relief devices.

☐	**As a new customer, I will reimburse the Company $350* for the increased cost in providing this elevated delivery pressure. *Plus appropriate sales tax.**
☐	**As an existing customer, I will be reimburse the Company for the incremental cost to provide the required pressure, meter set upgrade and any costs associated with service work.**

It is further agreed, for delivery pressures greater than 2 psig:

- I will install devices for the sole purpose of automatically taking over in an emergency to control the downstream pressure in the event of a regulator failure. This can be done by using internal relief regulators, a monitor regulator system, a separate pressure relief valve or a high-pressure shut-off switch and valve.

Authorized Representative (print): TONY, YE / AECOM

Signature: Tonye Title: ____________________

Date: 01/27/2020

DISTRIBUTE COPIES TO: Gas Meter Lab, Gas Marketing, District Engineering, and Customer NG-089 (12/24/07)

Natural Gas Notification #: #1030-0582-182

NYSEG Commitment Letter for Nonresidential Natural Gas Service

Dear Applicant,

Thank you for starting the process of obtaining natural gas service from NYSEG. To bring natural gas to your building, piping is installed in a trench approximately 18 to 24 inches deep that runs from the natural gas main in the street to your building. Upon completion, NYSEG restores the excavation by filling the trench with existing soil and raking. Final restoration of the trench from the property line to your structure, including paving, seeding, landscaping, additional raking, watering and any additional fill is your responsibility. Final restoration of the trench from the property line to the natural gas main in the public right of way is done by NYSEG. For new construction, the areas where piping will be located need to be within 6 inches of the final grade before the natural gas service can be installed.

(A) EQUIPMENT INSTALLATION

Please list the equipment you intend to convert or connect to natural gas and whether it will be within 3 months of gas service being installed at the address below or if you plan on installing the equipment in 1 to 3 years.

Equipment Description	Input Rating	Number of Units	Estimated Annual Therms	Estimated Installation Date
In-Situ Thermal Remediation System	180 Therm/hr	1	6.5×10^5 Therms	☒ within 3 months ❍ 1-3 years
	OR 4,320 Therm/day			❍ within 3 months ❍ 1-3 years
				❍ within 3 months ❍ 1-3 years
				❍ within 3 months ❍ 1-3 years
				❍ within 3 months ❍ 1-3 years

(B) SERVICE INSTALLATION

Please check the box that applies:

❍ I am ready for natural gas service and wish to have the service installed as soon as possible once all other requirements, permits, etc. have been satisfied. (This form must be received before NYSEG can apply for any necessary permits.)

☒ I am not ready for service now but would like to schedule the natural gas service to be installed on or before 08/01/2020.
(Date service desired)

PLEASE READ THIS SECTION CAREFULLY AND COMPLETELY

I agree in signing below to the following:

- I will complete installation/conversion of my equipment, listed in section A (above) within 3 months from the date said service is installed by NYSEG. I understand that if I do not, I will pay the full cost incurred by NYSEG for the installation of this service.
- NYSEG has no responsibility for my natural gas appliances and related natural gas equipment such as interior piping and fittings that I, my contractor or builder have installed or will install in the future, and I agree to take full and complete responsibility for my natural gas appliances and other natural gas equipment such as interior piping and fittings.
- I will install/cause to install and test all natural gas appliances and related natural gas equipment in accordance with the latest editions of all applicable codes and manufacturer's requirements.
- NYSEG will only walk through and visually inspect my premises for the following non-standard conditions that appear in plain view: (1) improper use of piping materials, (2) missing or improper venting system, (3) inadequate appliance air supply and (4) inadequate clearances to combustibles. NYSEG will not perform any other inspection activity or test or light pilot lights on my appliances. I agree I will cause my contractor to perform an air pressure test on the gas lines to ensure the lines are completely sealed and to otherwise make the premises ready and able to take natural gas service in accordance with all applicable codes.

Applicant Signature TONY, YE *Tonye* Date 01/27/2020

Service Address (Please Print) 40 JACKSON STREET, HOLLEY NY 14470

Telephone tony.ye@aecom.com / 716-923-1232

Please email an electronic copy of this signed application to NYSEGESI@nyseg.com or fax to 844.515.1573 or mail to NYSEG, Attn: Energy Service Installation, Customer Relations Center, P.O. Box 5240, Binghamton, NY 13902-5240.

13-0430

Natural Gas Notification #: 1030-0582-182

NYSEG Nonresidential Natural Gas Service Request Form

CUSTOMER INFORMATION

Name AECOM

Address 257 WEST GENESEE STREET SUITE 400

City BUFFALO State NY ZIP 14202

Telephone 716-923-1232

PROJECT LOCATION > If different from address above

Address 40 JACKSON STREET

City HOLLEY State NY ZIP 14470

PROJECT INFORMATION

Request type: ☒ New Service ❍ Relocation ❍ Temporary Service

Customer type: ❍ Commercial ☒ Industrial ❍ Municipal

Building type: ❍ New Construction ❍ Addition ❍ Existing Square Feet__________

Is a an HVAC contractor, engineering firm or general contractor involved in this project? ❍ Yes (please provide information below) ❍ No

HVAC Contractor__________ Telephone __________

Address__________

City __________ State __________ ZIP __________

Engineering Firm AECOM Telephone 716-923-1232

Address 257 WEST GENESE STREET SUITE400

City BUFFALO State NY ZIP 14470

General Contractor GEOREMCO Telephone 714-312-6836

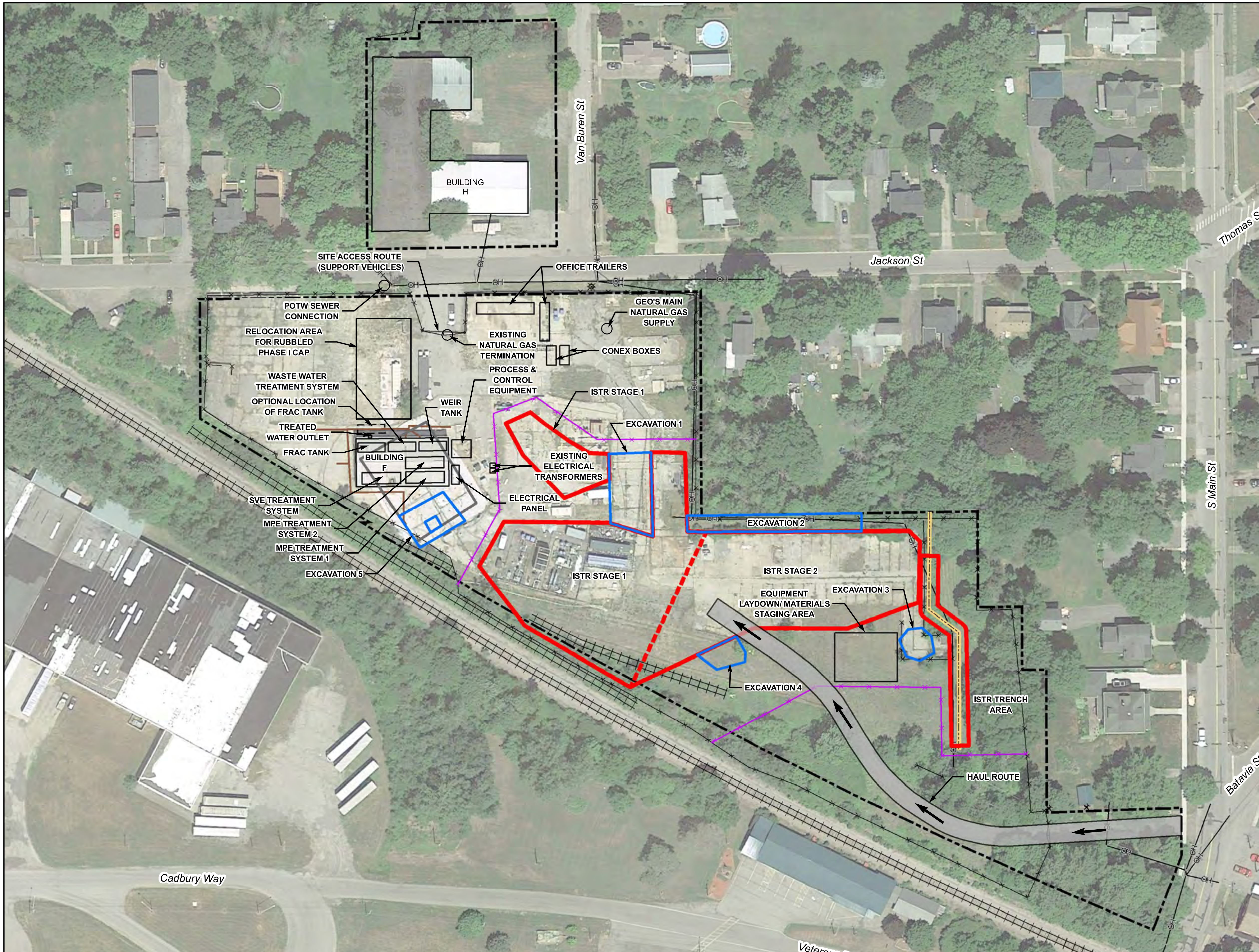
Address 1500 W. KATELLA AVE

City ORANGE State CA ZIP 92867

PLANS > Required for new construction and additions

Please attach the following construction blueprints if available: site utility plan, site grading plan, floor plan and elevations. Show desired service location on site utility plan.

continued ...



Legend

- Diaz Facility Property Boundary
- Excavation Area
- Phase I Thermal Treatment Area
- Phase 2 Thermal Treatment Zone
- Temporary Fence
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

Title:	SITE PREPARATION PLAN
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS URS Corporation 40 British American Boulevard Latham, New York 12110	Drafter: JB	Date: December 2019
	Drg. Size: 11 x17	Job No.: 60615479
		FIGURE 4-1

METER DELIVERY PRESSURE REQUESTED

❍ Standard (7 inches water column) ❍ Elevated (14 inches water column)* X Elevated pressure*__________w.c. or 10 psi

If elevated pressure is requested, please explain why.

Elevated pressure is required in order to meet system gas demand. Working pressure will be 0.5 psi Water column at 14 MCFH.

Underground fuel line: ❍ Yes (contact NYSEG for requirements) X No

METER NUMBER	STORE/SUITE INDENTIFIER*	TOTAL Btu/hr

*Fuel lines must be labeled with this identifier if more than one.

Do you intend to install sub meters at this location?

❍ No ❍ Yes - If yes, you may be required to submit a petition to the Public Service Commission and receive their approval. All approvals need to be received by the company before service can be energized.

NATURAL GAS EQUIPMENT > Please itemize the input British thermal units (Btu) for each appliance.

> SPACE HEATING	EXISTING (If applicable)	NEW	TOTAL Btu/hr
Furnaces	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
Boilers	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
Unit Heaters	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
Roof Top Units	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
Other________	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
Other________	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
> PROCESS	**EXISTING (If applicable)**	**NEW**	**TOTAL Btu/hr**
In-Situ Thermal Remediation System	____Quantity ________Btu/hr	1 Quantity 180 Btu/hr	180
	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
	____Quantity ________Btu/hr	____Quantity ________Btu/hr	
	____Quantity ________Btu/hr	____Quantity ________Btu/hr	

Continued...

NATURAL GAS EQUIPMENT (continued) > Please itemize the input British thermal units (Btu) for each appliance.

> COOKING	EXISTING (If applicable)	NEW	TOTAL Btu/hr
Ranges	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Ovens	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Fryer	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Broiler	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Other___________	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________

> OTHER	EXISTING (If applicable)	NEW	TOTAL Btu/hr
Water Heaters (with tank)	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Tankless Water Heaters	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Emergency Generator	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Other___________	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________
Other___________	____Quantity ___________Btu/hr	____Quantity ___________Btu/hr	___________

> **TOTAL CONNECTED Btu/hr** 180

Submitted by (Signature) Tony

Name (Please print) TONY, YE / AECOM Date 01/27/2020

All work must be in compliance with the National Fuel Gas Code; the New York State Fuel Gas Code; NYSEG policies; all other applicable federal, state and municipal codes and regulations; and manufacturer's instructions.

Please email an electronic copy of the signed application to NYSEGESI@nyseg.com or fax to 844.515.1573 or mail to NYSEG, Attn: Energy Service Installation, Customer Relations Center, P.O. Box 5240, Binghamton, NY 13902-5240.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Air Resources, Region 8
6274 East Avon-Lima Road, Avon, NY 14414-9516
P: (585) 226-2466 I F: (585) 226-2909
www.dec.ny.gov

March 4, 2020

VIA EMAIL to arthur.taddeo@aecom.com

Art Taddeo
URS (dba AECOM)
250 Apollo Drive
Chelmsford, MA 01824

RE: Response to Air Permit Equivalency Technical Memo
Diaz Chemical Superfund Site

Dear Mr. Taddeo:

The New York State Department of Environmental Conservation (NYSDEC), Division of Air Resources (DAR) has reviewed the URS (dba AECOM) technical memorandum, dated February 23, 2020, regarding the Diaz Chemical Superfund Site Air Permit Equivalency. Based on the supplemental information provided in the memorandum and the ambient air monitoring program described in the draft Community Air Monitoring Plan (CAMP), dated December 18, 2019, DAR agrees with the request to be exempt from conducting air dispersion monitoring and a T-BACT analysis. DAR hereby approves URS' request for an air permit equivalent for the remedial actions to be conducted at the Diaz Chemical Superfund Site provided that URS (dba AECOM) address the following comments on the draft CAMP prior to beginning the monitoring program:

1. What is the timeframe for receiving the 24-hour constituent specific sampling results?
2. The adjusted screening level for Dibromo-3-chloropropane, 1,2- (CAS No. 96-12-8) is incorrectly calculated.

Additionally, DAR notes that URS (dba AECOM) used an adjustment factor for developing screening levels for carcinogenic compounds that is based on the duration of the thermal treatment. DAR does not agree with this approach for carcinogenic compounds. Screening levels for carcinogens should not be adjusted and should be based on a one in a million excess cancer risk.

Please feel free to contact this office if you have any questions or comments regarding the above.

Sincerely,

Zachary Tennies
Assistant Engineer

AECOM
250 Apollo Drive
Chelmsford, MA 01824

978.905.2100 tel
978.905.2101 fax

Technical Memorandum

To: Zachary Tennies (Air Pollution Control Engineer; Avon Office); Jenelle Gaylord (Diaz Site Project Manager, NYSDEC Albany);

CC: Mike Niederreither (URS), Travis Young (USACE KC District), John DiMartino (USEPA Region 2)

Subject: Final Response to NYSDEC March 4, 2020 Questions pertinent to Diaz Chemical Superfund Site

From: Art Taddeo (URS/AECOM)

Date: March 25, 2020

URS (dba AECOM) has prepared this memo to provide responses to two questions NYSDEC included in their March 4, 2020 air permit equivalence approval.

1. *What is the timeframe for receiving the 24-hour constituent specific sampling results?*

Twenty-four hour integrated samples will be collected monthly during site heat-up, and then every other week once steaming temperatures have been reached until the end of each treatment stage. Samples will be analyzed as per method TO-15 modified, the details of which are provided in the Project QAPP. Data will be due back to URS within 10 business days of sample receipt. Assuming samples are shipped the day of collection, the data will be provided to URS in 11 business days from the day of sampling. Since 90% of the data will <u>not</u> be validated, some minor time will be necessary to confirm proper naming, proper lab reporting, etc. Therefore, URS will upload unvalidated data to the project website (that NYSDEC would have access to) within 15 business days. URS will validate 10% of the data. For those data, we can assume another 15 days for that effort and therefore validated results will be uploaded to the project website within 30 business days of collection.

2. *The adjusted screening level for Dibromo-3-chloropropane, 1,2- (CAS No. 96-12-8) is incorrectly calculated.*

URS has provided the attached detailed spreadsheet calculations showing details of those we prepared for Appendix C (RSLs) of the CAMP. The RSLs are included in the tab named AACs. This includes the special considerations itemized by the US EPA for TCE and Vinyl Chloride. The results in this spreadsheet are the same as those generated by the US EPA RSL Calculator. We have also attached those outputs from the EPA's RSL Calculator (App C) for comparison.

Attachments:
AECOM spreadsheet calculations for RSLs/AACs
Appendix C EPA RSL Calculator for comparison

Diaz Project
Acceptable Air Concentration (AAC) Calculations for Ambient Air Monitorir

Tab Name	Category	Description
AACs	AAC Calculations	AAC calculations for volatile organic compounds (VOCs).
USEPA ResAir	Inputs	USEPA Regional Screening Levels - Generic Table of Residential Air Screening Levels (TR=1E-06 THQ=1.0)
USEPA SubChronic	Inputs	USEPA Regional Screening Levels - Subchronic Toxicity Table, downloaded March 2020
USEPA Chem	Inputs	USEPA Regional Screening Levels - Chemical Parameters Table, downloaded March 2020
Target Organ Endpts	Inputs	Target organ endpoints used to calculate target organ-specific hazard index (TOSHI).

Calculation of Acceptable Air Concentrations (AAC)

Compound	CAS Number	Is Compound Mutagenic?	Mutagenic ADAF	Mutagenic ADAF	Chronic/ Subchronic	Inhalation Toxicity Information				Cancer-Based	Noncancer-Based	AAC (Minimum AAV)	
						Inhalation Unit Risk		RfC		AAVca / AAVca-mut	AAVnc	AAC	
			0 - 2 yr old	>2 - 6 yr old		$(ug/m^3)^{-1}$	Note*	ug/m^3	Note*	ug/m^3	ug/m^3	ug/m^3	Basis
Volatile Constituents													
Amino-4-chlorobenzotrifluoride, 3	121506	--	--	--	--	NA		NA					--
Benzene	71432	No	--	--	Subchronic	7.80E-06	I	8.00E+01	PPRTV	4.27E+00	8.00E+01	**4.27E+00**	**Cancer**
Bromo-2-chloroethane, 1-	107040	No	--	--	--	6.00E-04	X	NA		5.56E-02		**5.56E-02**	**Cancer**
Bromo-3-fluorobenzene, 1-	1073069	No	--	--	Subchronic	NA		3.00E+01	SCREEN		3.00E+01	**3.00E+01**	**Noncancer**
Bromo-2-Ethylbenzene, 1-	1585075	--	--	--	--	NA		NA					--
Bromo-4-fluorobenzene, 1-	460004	No	--	--	Subchronic	NA		3.00E+01	SCREEN		3.00E+01	**3.00E+01**	**Noncancer**
Bromoacetophenone, 3-	2142634	--	--	--	--	NA		NA					--
Bromopyridine, 2-	109046	--	--	--	--	NA		NA					--
Chlorobenzene	108907	No	--	--	Subchronic	NA		5.00E+02	PPRTV		5.00E+02	**5.00E+02**	**Noncancer**
Chlorobenzotrifluoride, 3-nitro-4-	121175	--	--	--	--	NA		NA					--
Chlorobenzotrifluoride, 4-	98566	No	--	--	Subchronic	NA		3.00E+03	PPRTV		3.00E+03	**3.00E+03**	**Noncancer**
Cumene	98828	No	--	--	Subchronic	NA		9.00E+01	HEAST		9.00E+01	**9.00E+01**	**Noncancer**
Cyclohexane	110827	No	--	--	Subchronic	NA		1.80E+04	PPRTV		1.80E+04	**1.80E+04**	**Noncancer**
Dibromo-3-chloropropane, 1,2-	96128	Yes	10	3	Subchronic	6.00E-03	P	2.00E+00	PPRTV	5.75E-04	2.00E+00	**5.75E-04**	**Cancer**
Dibromobenzene, 1,3-	108361	No	--	--	--	NA		NA					--
Dibromobenzene, 1,4-	106376	No	--	--	--	NA		NA					--
Dibromoethane, 1,2-	106934	No	--	--	Subchronic	6.00E-04	I	2.00E+00	HEAST	5.56E-02	2.00E+00	**5.56E-02**	**Cancer**
Dichlorobenzotrifluoride, 3,4-	328847	--	--	--	--	NA		NA					--
Dichloroethane, 1,1-	75343	No	--	--	--	1.60E-06	C	NA		2.08E+01		**2.08E+01**	**Cancer**
Dichloroethane, 1,2-	107062	No	--	--	Subchronic	2.60E-05	I	7.00E+01	PPRTV	1.28E+00	7.00E+01	**1.28E+00**	**Cancer**
Dichloroethylene, 1,1-	75354	No	--	--	Subchronic	NA		7.93E+01	ATSDR		7.93E+01	**7.93E+01**	**Noncancer**
Dichloroethylene, 1,2-trans-	156605	No	--	--	Subchronic	NA		7.93E+02	ATSDR		7.93E+02	**7.93E+02**	**Noncancer**
Dichloropropene, cis-1,3-	10061015	--	--	--	--	NA		NA					--
Dichloropropene, trans-1,3-	10061026	--	--	--	--	NA		NA					--
Ethylbenzene	100414	No	--	--	Subchronic	2.50E-06	C	9.00E+03	PPRTV	1.33E+01	9.00E+03	**1.33E+01**	**Cancer**
Fluorobenzene	462066	--	--	--	Subchronic	NA		3.00E+01	SCREEN		3.00E+01	**3.00E+01**	**Noncancer**
Methyl Ethyl Ketone (2-Butanone	78933	No	--	--	Subchronic	NA		1.00E+03	HEAST		1.00E+03	**1.00E+03**	**Noncancer**
Methylcyclohexane	108872	--	--	--	--	NA		NA					--
Methylene Chloride	75092	Yes	10	3	Subchronic	1.00E-08	I	1.04E+03	ATSDR	3.45E+02	1.04E+03	**3.45E+02**	**Cancer**
Styrene	100425	No	--	--	Subchronic	NA		3.00E+03	HEAST		3.00E+03	**3.00E+03**	**Noncancer**
Tetrachloroethylene	127184	No	--	--	Subchronic	2.60E-07	I	4.07E+01	ATSDR	1.28E+02	4.07E+01	**4.07E+01**	**Noncancer**
Toluene	108883	No	--	--	Subchronic	NA		5.00E+03	PPRTV		5.00E+03	**5.00E+03**	**Noncancer**
Trichloroethane, 1,1,1-	71556	No	--	--	Subchronic	NA		5.00E+03	IRIS		5.00E+03	**5.00E+03**	**Noncancer**
Trichloroethylene	79016	Yes	10	3	Subchronic	4.10E-06	I	2.15E+00	ATSDR	2.61E+00	2.15E+00	**2.15E+00**	**Noncancer**
Vinyl Chloride	75014	Yes	2	2	Subchronic	4.40E-06	I	7.67E+01	ATSDR	2.21E-01	7.67E+01	**2.21E-01**	**Cancer**
Xylene, m-	108383	No	--	--	Chronic	NA		1.00E+02	G		1.00E+02	**1.00E+02**	**Noncancer**
Xylene, o-	95476	No	--	--	Chronic	NA		1.00E+02	G		1.00E+02	**1.00E+02**	**Noncancer**
Xylene, p-	106423	No	--	--	Chronic	NA		1.00E+02	G		1.00E+02	**1.00E+02**	**Noncancer**
Xylenes	1330207	No	--	--	Subchronic	NA		4.00E+02	PPRTV		4.00E+02	**4.00E+02**	**Noncancer**

Assumptions:	**Units**	**Term**	**Value**	**Reference**
Averaging time (ATc), 70 yr	days	ATc	25,550	Recommended value for screening calculations
Averaging time (ATnc), 2.1 yr	days	ATnc	767	Averaging time covers an entire year
Exposure duration (ED)	years	ED	2.1	Based on site-specific information, See CAMP Section 2.1.3
Exposure duration (EDm 0-2)	years	EDm02	2	Based on site-specific information
Exposure duration (EDm >2-6)	years	EDm26	0.1	Based on site-specific information
Exposure frequency (EF)	day/year	EF	365	Based on site-specific information, See CAMP Section 2.1.3
Exposure time (ET)	hr/day	ET	24	Assumes daily exposure if 24 hours/day. If less than <24 hours, assumes resident is exposed during work hours only
Target Hazard Quotient (THQ)	unitless	THQ	1	USEPA recommended value for screening calculations where Hazard Index (HI) or Target-Organ-Specific HI (TOSHI) ≤ THQ is considered acceptable risk
Lifetime (LT)	years	LT	70	USEPA default screening level value
Target Risk Level (TR)	unitless	TR	1.00E-06	USEPA recommended value for screening calculations where Cancer Risk ≤ TR is considered acceptable risk

Note: To adjust Values in this sheet, please change Values on Risk Screen sheet. Those changes will be carried through to other sheets.

Where:

AAVca =	(TR x ATc) / (IURF x ED x EF) -- Used for non-mutagenic compounds
AAVca-mut =	(TR x ATc) / (IURF x EF x (ED<2 x ADAF+ED2-6 x ADAF) -- Used for mutagenic compounds
AAVnc =	(THQ x ATnc x RfC) / ((ED x EF)

Special Considerations:

AAVca-vc =	(TR/(IURF+(IURF x EF x ED x ET / AT)) -- Used for carcinogenic Vinyl Chloride
AAVca-mut-tce =	(TR x AT) / (IURF x ((ED x EF x 0.756) + (ED<2 x EF x 0.244 x ADAF) + (ED2-6 x EF x 0.244 x ADAF))) -- Used for the combined carcinogenic and mutagenic Trichloroethylene

Notes:

* Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; G = USEPA RSL user's guide Section 5 for special considerations
AAC = Acceptable Air Concentration
AAV = Acceptable Air Value
IURF - Inhalation Unit Risk Factor (cancer toxicity value)
RfC - Inhalation Reference Concentration (noncancer toxicity value) - based on Subchronic when available, otherwise Chronic value used
ATSDR - Agency for Toxic Substances and Disease Registry
HEARST - EPA Superfund program's Health Effects Assessment Summary Table
IRIS - Integrated Risk Information System toxicity database available online at: www.epa.gov/iris
PPRTV = Provisional Peer-Reviewed Toxicity Value
SCREEN - PPRTV Screening Level

References:

USEPA Regional Screening Levels (RSLs), https://www.epa.gov/risk/regional-screening-levels-rsls
USEPA Regional Screening Level Calculator for Special Considerations.

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
30560191							Acephate	30560-19-1		
75070	2.2E-06	I	9.0E-03	I	V		Acetaldehyde	75-07-0	1.3E+00	9.4E+00
34256821							Acetochlor	34256-82-1		
67641			3.1E+01	A	V		Acetone	67-64-1		3.2E+04
75865			2.0E-03	X			Acetone Cyanohydrin	75-86-5		2.1E+00
75058			6.0E-02	I	V		Acetonitrile	75-05-8		6.3E+01
98862					V		Acetophenone	98-86-2		
53963	1.3E-03	C					Acetylaminofluorene, 2-	53-96-3	2.2E-03	
107028			2.0E-05	I	V		Acrolein	107-02-8		2.1E-02
79061	1.0E-04	I	6.0E-03	I		M	Acrylamide	79-06-1	1.0E-02	6.3E+00
79107			1.0E-03	I	V		Acrylic Acid	79-10-7		1.0E+00
107131	6.8E-05	I	2.0E-03	I	V		Acrylonitrile	107-13-1	4.1E-02	2.1E+00
111693			6.0E-03	P			Adiponitrile	111-69-3		6.3E+00
15972608							Alachlor	15972-60-8		
116063							Aldicarb	116-06-3		
1646884							Aldicarb Sulfone	1646-88-4		
1646873							Aldicarb sulfoxide	1646-87-3		
309002	4.9E-03	I			V		Aldrin	309-00-2	5.7E-04	
107186			1.0E-04	X	V		Allyl Alcohol	107-18-6		1.0E-01
107051	6.0E-06	C	1.0E-03	I	V		Allyl Chloride	107-05-1	4.7E-01	1.0E+00
7429905			5.0E-03	P			Aluminum	7429-90-5		5.2E+00
20859738							Aluminum Phosphide	20859-73-8		
834128							Ametryn	834-12-8		
92671	6.0E-03	C					Aminobiphenyl, 4-	92-67-1	4.7E-04	
591275							Aminophenol, m-	591-27-5		
95556							Aminophenol, o-	95-55-6		
123308							Aminophenol, p-	123-30-8		
33089611							Amitraz	33089-61-1		
7664417			5.0E-01	I	V		Ammonia	7664-41-7		5.2E+02
7773060							Ammonium Sulfamate	7773-06-0		
75854			3.0E-03	X	V		Amyl Alcohol, tert-	75-85-4		3.1E+00
62533	1.6E-06	C	1.0E-03	I			Aniline	62-53-3	1.8E+00	1.0E+00
84651							Anthraquinone, 9,10-	84-65-1		
7440360							Antimony (metallic)	7440-36-0		
1314609							Antimony Pentoxide	1314-60-9		
1332816							Antimony Tetroxide	1332-81-6		
1309644			2.0E-04	I			Antimony Trioxide	1309-64-4		2.1E-01
7440382	4.3E-03	I	1.5E-05	C			Arsenic, Inorganic	7440-38-2	6.5E-04	1.6E-02
7784421			5.0E-05	I			Arsine	7784-42-1		5.2E-02
1332214							Asbestos (units in fibers)	1332-21-4		
3337711							Asulam	3337-71-1		
1912249							Atrazine	1912-24-9		
492808	2.5E-04	C					Auramine	492-80-8	1.1E-02	
65195553							Avermectin B1	65195-55-3		
86500			1.0E-02	A			Azinphos-methyl	86-50-0		1.0E+01
103333	3.1E-05	I			V		Azobenzene	103-33-3	9.1E-02	
123773			7.0E-06	P			Azodicarbonamide	123-77-3		7.3E-03

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC$_i$ (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
7440393			5.0E-04	H			Barium	7440-39-3		5.2E-01
1861401					V		Benfluralin	1861-40-1		
17804352							Benomyl	17804-35-2		
83055996							Bensulfuron-methyl	83055-99-6		
25057890							Bentazon	25057-89-0		
100527					V		Benzaldehyde	100-52-7		
71432	7.8E-06	I	3.0E-02	I	V		Benzene	71-43-2	3.6E-01	3.1E+01
6369591							Benzenediamine-2-methyl sulfat	6369-59-1		
108985					V		Benzenethiol	108-98-5		
92875	6.7E-02	I				M	Benzidine	92-87-5	1.5E-05	
65850							Benzoic Acid	65-85-0		
98077					V		Benzotrichloride	98-07-7		
100516							Benzyl Alcohol	100-51-6		
100447	4.9E-05	C	1.0E-03	P	V		Benzyl Chloride	100-44-7	5.7E-02	1.0E+00
7440417	2.4E-03	I	2.0E-05	I			Beryllium and compounds	7440-41-7	1.2E-03	2.1E-02
42576023							Bifenox	42576-02-3		
82657043							Biphenthrin	82657-04-3		
92524			4.0E-04	X	V		Biphenyl, 1,1'-	92-52-4		4.2E-01
108601					V		Bis(2-chloro-1-methylethyl) ethe	108-60-1		
111911							Bis(2-chloroethoxy)methane	111-91-1		
111444	3.3E-04	I			V		Bis(2-chloroethyl)ether	111-44-4	8.5E-03	
542881	6.2E-02	I			V		Bis(chloromethyl)ether	542-88-1	4.5E-05	
80057							Bisphenol A	80-05-7		
7440428			2.0E-02	H			Boron And Borates Only	7440-42-8		2.1E+01
10294345			2.0E-02	P	V		Boron Trichloride	10294-34-5		2.1E+01
7637072			1.3E-02	C	V		Boron Trifluoride	7637-07-2		1.4E+01
15541454							Bromate	15541-45-4		
107040	6.0E-04	X			V		Bromo-2-chloroethane, 1-	107-04-0	4.7E-03	
1073069					V		Bromo-3-fluorobenzene, 1-	1073-06-9		
460004					V		Bromo-4-fluorobenzene, 1-	460-00-4		
79083							Bromoacetic acid	79-08-3		
108861			6.0E-02	I	V		Bromobenzene	108-86-1		6.3E+01
74975			4.0E-02	X	V		Bromochloromethane	74-97-5		4.2E+01
75274	3.7E-05	C			V		Bromodichloromethane	75-27-4	7.6E-02	
75252	1.1E-06	I			V		Bromoform	75-25-2	2.6E+00	
74839			5.0E-03	I	V		Bromomethane	74-83-9		5.2E+00
2104963					V		Bromophos	2104-96-3		
106945			1.0E-01	A	V		Bromopropane, 1-	106-94-5		1.0E+02
1689845							Bromoxynil	1689-84-5		
1689992					V		Bromoxynil Octanoate	1689-99-2		
106990	3.0E-05	I	2.0E-03	I	V		Butadiene, 1,3-	106-99-0	9.4E-02	2.1E+00
94826							Butanoic acid, 4-(2,4-dichloroph	94-82-6		
71363					V		Butanol, N-	71-36-3		
78922			3.0E+01	P	V		Butyl alcohol, sec-	78-92-2		3.1E+04
2008415					V		Butylate	2008-41-5		
25013165	5.7E-08	C					Butylated hydroxyanisole	25013-16-5	4.9E+01	
128370							Butylated hydroxytoluene	128-37-0		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC$_i$ (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
104518					V		Butylbenzene, n-	104-51-8		
135988					V		Butylbenzene, sec-	135-98-8		
98066					V		Butylbenzene, tert-	98-06-6		
75605							Cacodylic Acid	75-60-5		
7440439	1.8E-03	I	1.0E-05	A			Cadmium (Diet)	7440-43-9		
7440439	1.8E-03	I	1.0E-05	A			Cadmium (Water)	7440-43-9	1.6E-03	1.0E-02
105602			2.2E-03	C			Caprolactam	105-60-2		2.3E+00
2425061	4.3E-05	C					Captafol	2425-06-1	6.5E-02	
133062	6.6E-07	C					Captan	133-06-2	4.3E+00	
63252							Carbaryl	63-25-2		
1563662							Carbofuran	1563-66-2		
75150			7.0E-01	I	V		Carbon Disulfide	75-15-0		7.3E+02
56235	6.0E-06	I	1.0E-01	I	V		Carbon Tetrachloride	56-23-5	4.7E-01	1.0E+02
463581			1.0E-01	P	V		Carbonyl Sulfide	463-58-1		1.0E+02
55285148							Carbosulfan	55285-14-8		
5234684							Carboxin	5234-68-4		
1306383			9.0E-04	I			Ceric oxide	1306-38-3		9.4E-01
302170					V		Chloral Hydrate	302-17-0		
133904							Chloramben	133-90-4		
E701235							Chloramines, Organic	E701235		
118752							Chloranil	118-75-2		
12789036	1.0E-04	I	7.0E-04	I	V		Chlordane	12789-03-6	2.8E-02	7.3E-01
143500	4.6E-03	C					Chlordecone (Kepone)	143-50-0	6.1E-04	
470906							Chlorfenvinphos	470-90-6		
90982324							Chlorimuron, Ethyl-	90982-32-4		
7782505			1.5E-04	A	V		Chlorine	7782-50-5		1.5E-01
10049044			2.0E-04	I	V		Chlorine Dioxide	10049-04-4		2.1E-01
7758192							Chlorite (Sodium Salt)	7758-19-2		
75683			5.0E+01	I	V		Chloro-1,1-difluoroethane, 1-	75-68-3		5.2E+04
126998	3.0E-04	I	2.0E-02	I	V		Chloro-1,3-butadiene, 2-	126-99-8	9.4E-03	2.1E+01
3165933							Chloro-2-methylaniline HCl, 4-	3165-93-3		
95692	7.7E-05	C					Chloro-2-methylaniline, 4-	95-69-2	3.6E-02	
107200					V		Chloroacetaldehyde, 2-	107-20-0		
79118							Chloroacetic Acid	79-11-8		
532274			3.0E-05	I			Chloroacetophenone, 2-	532-27-4		3.1E-02
106478							Chloroaniline, p-	106-47-8		
108907			5.0E-02	P	V		Chlorobenzene	108-90-7		5.2E+01
98668							Chlorobenzene sulfonic acid, p-	98-66-8		
510156	3.1E-05	C					Chlorobenzilate	510-15-6	9.1E-02	
74113							Chlorobenzoic Acid, p-	74-11-3		
98566			3.0E-01	P	V		Chlorobenzotrifluoride, 4-	98-56-6		3.1E+02
109693					V		Chlorobutane, 1-	109-69-3		
75456			5.0E+01	I	V		Chlorodifluoromethane	75-45-6		5.2E+04
107073					V		Chloroethanol, 2-	107-07-3		
67663	2.3E-05	I	9.8E-02	A	V		Chloroform	67-66-3	1.2E-01	1.0E+02
74873			9.0E-02	I	V		Chloromethane	74-87-3		9.4E+01
107302	6.9E-04	C			V		Chloromethyl Methyl Ether	107-30-2	4.1E-03	

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
88733			1.0E-05	X			Chloronitrobenzene, o-	88-73-3		1.0E-02
100005			2.0E-03	P			Chloronitrobenzene, p-	100-00-5		2.1E+00
95578					V		Chlorophenol, 2-	95-57-8		
76062			4.0E-04	C	V		Chloropicrin	76-06-2		4.2E-01
1897456	8.9E-07	C					Chlorothalonil	1897-45-6	3.2E+00	
95498					V		Chlorotoluene, o-	95-49-8		
106434					V		Chlorotoluene, p-	106-43-4		
54749905	6.9E-02	C					Chlorozotocin	54749-90-5	4.1E-05	
101213							Chlorpropham	101-21-3		
2921882							Chlorpyrifos	2921-88-2		
5598130							Chlorpyrifos Methyl	5598-13-0		
64902723							Chlorsulfuron	64902-72-3		
1861321							Chlorthal-dimethyl	1861-32-1		
60238564							Chlorthiophos	60238-56-4		
16065831							Chromium(III), Insoluble Salts	16065-83-1		
18540299	8.4E-02	G	1.0E-04	I		M	Chromium(VI)	18540-29-9	1.2E-05	1.0E-01
7440473							Chromium, Total	7440-47-3		
74115245							Clofentezine	74115-24-5		
7440484	9.0E-03	P	6.0E-06	P			Cobalt	7440-48-4	3.1E-04	6.3E-03
8007452	6.2E-04	I			V	M	Coke Oven Emissions	8007-45-2	1.6E-03	
7440508							Copper	7440-50-8		
108394			6.0E-01	C			Cresol, m-	108-39-4		6.3E+02
95487			6.0E-01	C			Cresol, o-	95-48-7		6.3E+02
106445			6.0E-01	C			Cresol, p-	106-44-5		6.3E+02
59507							Cresol, p-chloro-m-	59-50-7		
1319773			6.0E-01	C			Cresols	1319-77-3		6.3E+02
123739					V		Crotonaldehyde, trans-	123-73-9		
98828			4.0E-01	I	V		Cumene	98-82-8		4.2E+02
135206	6.3E-05	C					Cupferron	135-20-6	4.5E-02	
21725462							Cyanazine	21725-46-2		
							Cyanides			
592018							~Calcium Cyanide	592-01-8		
544923							~Copper Cyanide	544-92-3		
57125			8.0E-04	G	V		~Cyanide (CN-)	57-12-5		8.3E-01
460195					V		~Cyanogen	460-19-5		
506683					V		~Cyanogen Bromide	506-68-3		
506774					V		~Cyanogen Chloride	506-77-4		
74908			8.0E-04	I	V		~Hydrogen Cyanide	74-90-8		8.3E-01
151508							~Potassium Cyanide	151-50-8		
506616							~Potassium Silver Cyanide	506-61-6		
506649							~Silver Cyanide	506-64-9		
143339							~Sodium Cyanide	143-33-9		
E1790664							~Thiocyanates	E1790664		
463569					V		~Thiocyanic Acid	463-56-9		
557211							~Zinc Cyanide	557-21-1		
110827			6.0E+00	I	V		Cyclohexane	110-82-7		6.3E+03
87843							Cyclohexane, 1,2,3,4,5-pentabroı	87-84-3		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
108941			7.0E-01	P	V		Cyclohexanone	108-94-1		7.3E+02
110838			1.0E+00	X	V		Cyclohexene	110-83-8		1.0E+03
108918					V		Cyclohexylamine	108-91-8		
68359375							Cyfluthrin	68359-37-5		
68085858							Cyhalothrin	68085-85-8		
66215278							Cyromazine	66215-27-8		
72548	6.9E-05	C					DDD, p,p`- (DDD)	72-54-8	4.1E-02	
72559	9.7E-05	C			V		DDE, p,p'-	72-55-9	2.9E-02	
50293	9.7E-05	I					DDT	50-29-3	2.9E-02	
75990							Dalapon	75-99-0		
1596845	5.1E-06	C					Daminozide	1596-84-5	5.5E-01	
1163195							Decabromodiphenyl ether, 2,2',3	1163-19-5		
8065483							Demeton	8065-48-3		
103231							Di(2-ethylhexyl)adipate	103-23-1		
2303164							Diallate	2303-16-4		
333415							Diazinon	333-41-5		
132650					V		Dibenzothiophene	132-65-0		
96128	6.0E-03	P	2.0E-04	I	V	M	Dibromo-3-chloropropane, 1,2-	96-12-8	1.7E-04	2.1E-01
631641							Dibromoacetic acid	631-64-1		
108361					V		Dibromobenzene, 1,3-	108-36-1		
106376					V		Dibromobenzene, 1,4-	106-37-6		
124481					V		Dibromochloromethane	124-48-1		
106934	6.0E-04	I	9.0E-03	I	V		Dibromoethane, 1,2-	106-93-4	4.7E-03	9.4E+00
74953			4.0E-03	X	V		Dibromomethane (Methylene Br	74-95-3		4.2E+00
E1790660							Dibutyltin Compounds	E1790660		
1918009							Dicamba	1918-00-9		
3400097							Dichloramine	3400-09-7		
764410	4.2E-03	P			V		Dichloro-2-butene, 1,4-	764-41-0	6.7E-04	
1476115	4.2E-03	P			V		Dichloro-2-butene, cis-1,4-	1476-11-5	6.7E-04	
110576	4.2E-03	P			V		Dichloro-2-butene, trans-1,4-	110-57-6	6.7E-04	
79436							Dichloroacetic Acid	79-43-6		
95501			2.0E-01	H	V		Dichlorobenzene, 1,2-	95-50-1		2.1E+02
106467	1.1E-05	C	8.0E-01	I	V		Dichlorobenzene, 1,4-	106-46-7	2.6E-01	8.3E+02
91941	3.4E-04	C					Dichlorobenzidine, 3,3'-	91-94-1	8.3E-03	
90982							Dichlorobenzophenone, 4,4'-	90-98-2		
75718			1.0E-01	X	V		Dichlorodifluoromethane	75-71-8		1.0E+02
75343	1.6E-06	C			V		Dichloroethane, 1,1-	75-34-3	1.8E+00	
107062	2.6E-05	I	7.0E-03	P	V		Dichloroethane, 1,2-	107-06-2	1.1E-01	7.3E+00
75354			2.0E-01	I	V		Dichloroethylene, 1,1-	75-35-4		2.1E+02
156592					V		Dichloroethylene, 1,2-cis-	156-59-2		
156605					V		Dichloroethylene, 1,2-trans-	156-60-5		
120832							Dichlorophenol, 2,4-	120-83-2		
94757							Dichlorophenoxy Acetic Acid, 2,4	94-75-7		
78875	3.7E-06	P	4.0E-03	I	V		Dichloropropane, 1,2-	78-87-5	7.6E-01	4.2E+00
142289					V		Dichloropropane, 1,3-	142-28-9		
616239							Dichloropropanol, 2,3-	616-23-9		
542756	4.0E-06	I	2.0E-02	I	V		Dichloropropene, 1,3-	542-75-6	7.0E-01	2.1E+01

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10	11
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
62737	8.3E-05	C	5.0E-04	I			Dichlorvos	62-73-7	3.4E-02	5.2E-01
141662							Dicrotophos	141-66-2		
77736			3.0E-04	X	V		Dicyclopentadiene	77-73-6		3.1E-01
60571	4.6E-03	I					Dieldrin	60-57-1	6.1E-04	
E17136615	3.0E-04	C	5.0E-03	I			Diesel Engine Exhaust	E17136615	9.4E-03	5.2E+00
111422			2.0E-04	P			Diethanolamine	111-42-2		2.1E-01
112345			1.0E-04	P			Diethylene Glycol Monobutyl Eth	112-34-5		1.0E-01
111900			3.0E-04	P			Diethylene Glycol Monoethyl Eth	111-90-0		3.1E-01
617845					V		Diethylformamide	617-84-5		
56531	1.0E-01	C					Diethylstilbestrol	56-53-1	2.8E-05	
43222486							Difenzoquat	43222-48-6		
35367385							Diflubenzuron	35367-38-5		
75376			4.0E+01	I	V		Difluoroethane, 1,1-	75-37-6		4.2E+04
420451			3.0E+01	X	V		Difluoropropane, 2,2-	420-45-1		3.1E+04
94586	1.3E-05	C			V		Dihydrosafrole	94-58-6	2.2E-01	
108203			7.0E-01	P	V		Diisopropyl Ether	108-20-3		7.3E+02
1445756					V		Diisopropyl Methylphosphonate	1445-75-6		
55290647							Dimethipin	55290-64-7		
60515							Dimethoate	60-51-5		
119904							Dimethoxybenzidine, 3,3'-	119-90-4		
756796							Dimethyl methylphosphonate	756-79-6		
60117	1.3E-03	C					Dimethylamino azobenzene [p-]	60-11-7	2.2E-03	
21436964							Dimethylaniline HCl, 2,4-	21436-96-4		
95681							Dimethylaniline, 2,4-	95-68-1		
121697					V		Dimethylaniline, N,N-	121-69-7		
119937							Dimethylbenzidine, 3,3'-	119-93-7		
68122			3.0E-02	I	V		Dimethylformamide	68-12-2		3.1E+01
57147			2.0E-06	X	V		Dimethylhydrazine, 1,1-	57-14-7		2.1E-03
540738	1.6E-01	C			V		Dimethylhydrazine, 1,2-	540-73-8	1.8E-05	
105679							Dimethylphenol, 2,4-	105-67-9		
576261							Dimethylphenol, 2,6-	576-26-1		
95658							Dimethylphenol, 3,4-	95-65-8		
513371	1.3E-05	C			V		Dimethylvinylchloride	513-37-1	2.2E-01	
534521							Dinitro-o-cresol, 4,6-	534-52-1		
131895							Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5		
528290							Dinitrobenzene, 1,2-	528-29-0		
99650							Dinitrobenzene, 1,3-	99-65-0		
100254							Dinitrobenzene, 1,4-	100-25-4		
51285							Dinitrophenol, 2,4-	51-28-5		
E1615210							Dinitrotoluene Mixture, 2,4/2,6-	E1615210		
121142	8.9E-05	C					Dinitrotoluene, 2,4-	121-14-2	3.2E-02	
606202							Dinitrotoluene, 2,6-	606-20-2		
35572782							Dinitrotoluene, 2-Amino-4,6-	35572-78-2		
19406510							Dinitrotoluene, 4-Amino-2,6-	19406-51-0		
25321146							Dinitrotoluene, Technical grade	25321-14-6		
88857							Dinoseb	88-85-7		
123911	5.0E-06	I	3.0E-02	I	V		Dioxane, 1,4-	123-91-1	5.6E-01	3.1E+01

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

1	2	3	4	5	6	7		8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
							Dioxins			
34465468	1.3E+00	I					~Hexachlorodibenzo-p-dioxin, M	34465-46-8	2.2E-06	
1746016	3.8E+01	C	4.0E-08	C	V		~TCDD, 2,3,7,8-	1746-01-6	7.4E-08	4.2E-05
957517							Diphenamid	957-51-7		
101848			4.0E-04	X	V		Diphenyl Ether	101-84-8		4.2E-01
127639							Diphenyl Sulfone	127-63-9		
122394							Diphenylamine	122-39-4		
122667	2.2E-04	I					Diphenylhydrazine, 1,2-	122-66-7	1.3E-02	
85007							Diquat	85-00-7		
1937377	1.4E-01	C					Direct Black 38	1937-37-7	2.0E-05	
2602462	1.4E-01	C					Direct Blue 6	2602-46-2	2.0E-05	
16071866	1.4E-01	C					Direct Brown 95	16071-86-6	2.0E-05	
298044							Disulfoton	298-04-4		
505293					V		Dithiane, 1,4-	505-29-3		
330541							Diuron	330-54-1		
2439103							Dodine	2439-10-3		
759944					V		EPTC	759-94-4		
115297					V		Endosulfan	115-29-7		
1031078							Endosulfan Sulfate	1031-07-8		
145733							Endothall	145-73-3		
72208							Endrin	72-20-8		
106898	1.2E-06	I	1.0E-03	I	V		Epichlorohydrin	106-89-8	2.3E+00	1.0E+00
106887			2.0E-02	I	V		Epoxybutane, 1,2-	106-88-7		2.1E+01
111773							Ethanol, 2-(2-methoxyethoxy)-	111-77-3		
16672870							Ethephon	16672-87-0		
563122							Ethion	563-12-2		
111159			6.0E-02	P	V		Ethoxyethanol Acetate, 2-	111-15-9		6.3E+01
110805			2.0E-01	I	V		Ethoxyethanol, 2-	110-80-5		2.1E+02
141786			7.0E-02	P	V		Ethyl Acetate	141-78-6		7.3E+01
140885			8.0E-03	P	V		Ethyl Acrylate	140-88-5		8.3E+00
75003			1.0E+01	I	V		Ethyl Chloride (Chloroethane)	75-00-3		1.0E+04
60297					V		Ethyl Ether	60-29-7		
97632			3.0E-01	P	V		Ethyl Methacrylate	97-63-2		3.1E+02
2104645							Ethyl-p-nitrophenyl Phosphonate	2104-64-5		
100414	2.5E-06	C	1.0E+00	I	V		Ethylbenzene	100-41-4	1.1E+00	1.0E+03
109784							Ethylene Cyanohydrin	109-78-4		
107153					V		Ethylene Diamine	107-15-3		
107211			4.0E-01	C			Ethylene Glycol	107-21-1		4.2E+02
111762			1.6E+00	I			Ethylene Glycol Monobutyl Ether	111-76-2		1.7E+03
75218	3.0E-03	I	3.0E-02	C	V	M	Ethylene Oxide	75-21-8	3.4E-04	3.1E+01
96457	1.3E-05	C					Ethylene Thiourea	96-45-7	2.2E-01	
151564	1.9E-02	C			V		Ethyleneimine	151-56-4	1.5E-04	
84720							Ethylphthalyl Ethyl Glycolate	84-72-0		
22224926							Fenamiphos	22224-92-6		
39515418							Fenpropathrin	39515-41-8		
51630581							Fenvalerate	51630-58-1		
2164172							Fluometuron	2164-17-2		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10	11
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
16984488			1.3E-02	C			Fluoride	16984-48-8		1.4E+01
7782414			1.3E-02	C			Fluorine (Soluble Fluoride)	7782-41-4		1.4E+01
59756604							Fluridone	59756-60-4		
56425913							Flurprimidol	56425-91-3		
85509199							Flusilazole	85509-19-9		
66332965							Flutolanil	66332-96-5		
69409945							Fluvalinate	69409-94-5		
133073							Folpet	133-07-3		
72178020							Fomesafen	72178-02-0		
944229							Fonofos	944-22-9		
50000	1.3E-05	I	9.8E-03	A	V		Formaldehyde	50-00-0	2.2E-01	1.0E+01
64186			3.0E-04	X	V		Formic Acid	64-18-6		3.1E-01
39148248							Fosetyl-AL	39148-24-8		
							Furans			
132649					V		~Dibenzofuran	132-64-9		
110009					V		~Furan	110-00-9		
109999			2.0E+00	I	V		~Tetrahydrofuran	109-99-9		2.1E+03
67458							Furazolidone	67-45-8		
98011			5.0E-02	H	V		Furfural	98-01-1		5.2E+01
531828	4.3E-04	C					Furium	531-82-8	6.5E-03	
60568050	8.6E-06	C					Furmecyclox	60568-05-0	3.3E-01	
77182822							Glufosinate, Ammonium	77182-82-2		
111308			8.0E-05	C			Glutaraldehyde	111-30-8		8.3E-02
765344			1.0E-03	H	V		Glycidyl	765-34-4		1.0E+00
1071836							Glyphosate	1071-83-6		
113008					V		Guanidine	113-00-8		
50011							Guanidine Chloride	50-01-1		
506934							Guanidine Nitrate	506-93-4		
69806402							Haloxyfop, Methyl	69806-40-2		
76448	1.3E-03	I			V		Heptachlor	76-44-8	2.2E-03	
1024573	2.6E-03	I			V		Heptachlor Epoxide	1024-57-3	1.1E-03	
111717			3.0E-03	X	V		Heptanal, n-	111-71-7		3.1E+00
142825			4.0E-01	P	V		Heptane, N-	142-82-5		4.2E+02
87821					V		Hexabromobenzene	87-82-1		
68631492							Hexabromodiphenyl ether, 2,2',4,	68631-49-2		
118741	4.6E-04	I			V		Hexachlorobenzene	118-74-1	6.1E-03	
87683	2.2E-05	I			V		Hexachlorobutadiene	87-68-3	1.3E-01	
319846	1.8E-03	I					Hexachlorocyclohexane, Alpha-	319-84-6	1.6E-03	
319857	5.3E-04	I					Hexachlorocyclohexane, Beta-	319-85-7	5.3E-03	
58899	3.1E-04	C					Hexachlorocyclohexane, Gamma	58-89-9	9.1E-03	
608731	5.1E-04	I					Hexachlorocyclohexane, Technic	608-73-1	5.5E-03	
77474			2.0E-04	I	V		Hexachlorocyclopentadiene	77-47-4		2.1E-01
67721	1.1E-05	C	3.0E-02	I	V		Hexachloroethane	67-72-1	2.6E-01	3.1E+01
70304							Hexachlorophene	70-30-4		
121824							Hexahydro-1,3,5-trinitro-1,3,5-tri	121-82-4		
822060			1.0E-05	I	V		Hexamethylene Diisocyanate, 1,6	822-06-0		1.0E-02
680319							Hexamethylphosphoramide	680-31-9		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
110543			7.0E-01	I	V		Hexane, N-	110-54-3		7.3E+02
124049							Hexanedioic Acid	124-04-9		
104767			4.0E-04	P	V		Hexanol, 1-,2-ethyl- (2-Ethyl-1-h	104-76-7		4.2E-01
591786			3.0E-02	I	V		Hexanone, 2-	591-78-6		3.1E+01
51235042							Hexazinone	51235-04-2		
78587050							Hexythiazox	78587-05-0		
67485294							Hydramethylnon	67485-29-4		
302012	4.9E-03	I	3.0E-05	P	V		Hydrazine	302-01-2	5.7E-04	3.1E-02
10034932	4.9E-03	I					Hydrazine Sulfate	10034-93-2	5.7E-04	
7647010			2.0E-02	I	V		Hydrogen Chloride	7647-01-0		2.1E+01
7664393			1.4E-02	C	V		Hydrogen Fluoride	7664-39-3		1.5E+01
7783064			2.0E-03	I	V		Hydrogen Sulfide	7783-06-4		2.1E+00
123319							Hydroquinone	123-31-9		
35554440							Imazalil	35554-44-0		
81335377							Imazaquin	81335-37-7		
81335775							Imazethapyr	81335-77-5		
7553562							Iodine	7553-56-2		
36734197							Iprodione	36734-19-7		
7439896							Iron	7439-89-6		
78831					V		Isobutyl Alcohol	78-83-1		
78591			2.0E+00	C			Isophorone	78-59-1		2.1E+03
33820530					V		Isopropalin	33820-53-0		
67630			2.0E-01	P	V		Isopropanol	67-63-0		2.1E+02
1832548							Isopropyl Methyl Phosphonic Aci	1832-54-8		
82558507							Isoxaben	82558-50-7		
E1737665			3.0E-01	A	V		JP-7	E1737665		3.1E+02
77501634							Lactofen	77501-63-4		
78977							Lactonitrile	78-97-7		
7439910							Lanthanum	7439-91-0		
100587904							Lanthanum Acetate Hydrate	100587-90-4		
10025840							Lanthanum Chloride Heptahydra	10025-84-0		
10099588							Lanthanum Chloride, Anhydrous	10099-58-8		
10277437							Lanthanum Nitrate Hexahydrate	10277-43-7		
							Lead Compounds			
7446277	1.2E-05	C					~Lead Phosphate	7446-27-7	2.3E-01	
301042	1.2E-05	C					~Lead acetate	301-04-2	2.3E-01	
7439921							~Lead and Compounds	7439-92-1		1.5E-01
1335326	1.2E-05	C					~Lead subacetate	1335-32-6	2.3E-01	
78002					V		~Tetraethyl Lead	78-00-2		
541253					V		Lewisite	541-25-3		
330552							Linuron	330-55-2		
7439932							Lithium	7439-93-2		
94746							MCPA	94-74-6		
94815							MCPB	94-81-5		
93652							MCPP	93-65-2		
121755							Malathion	121-75-5		
108316			7.0E-04	C			Maleic Anhydride	108-31-6		7.3E-01

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC$_i$ (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
123331							Maleic Hydrazide	123-33-1		
109773							Malononitrile	109-77-3		
8018017							Mancozeb	8018-01-7		
12427382							Maneb	12427-38-2		
7439965			5.0E-05	I			Manganese (Diet)	7439-96-5		
7439965			5.0E-05	I			Manganese (Non-diet)	7439-96-5		5.2E-02
950107							Mephosfolan	950-10-7		
24307264							Mepiquat Chloride	24307-26-4		
149304							Mercaptobenzothiazole, 2-	149-30-4		
							Mercury Compounds			
7487947			3.0E-04	G			~Mercuric Chloride (and other M	7487-94-7		3.1E-01
7439976			3.0E-04	I	V		~Mercury (elemental)	7439-97-6		3.1E-01
22967926							~Methyl Mercury	22967-92-6		
62384							~Phenylmercuric Acetate	62-38-4		
150505					V		Merphos	150-50-5		
78488							Merphos Oxide	78-48-8		
57837191							Metalaxyl	57837-19-1		
126987			3.0E-02	P	V		Methacrylonitrile	126-98-7		3.1E+01
10265926							Methamidophos	10265-92-6		
67561			2.0E+01	I	V		Methanol	67-56-1		2.1E+04
950378							Methidathion	950-37-8		
16752775							Methomyl	16752-77-5		
99592	1.4E-05	C					Methoxy-5-nitroaniline, 2-	99-59-2	2.0E-01	
72435							Methoxychlor	72-43-5		
110496			1.0E-03	P	V		Methoxyethanol Acetate, 2-	110-49-6		1.0E+00
109864			2.0E-02	I	V		Methoxyethanol, 2-	109-86-4		2.1E+01
79209					V		Methyl Acetate	79-20-9		
96333			2.0E-02	P	V		Methyl Acrylate	96-33-3		2.1E+01
78933			5.0E+00	I	V		Methyl Ethyl Ketone (2-Butanone	78-93-3		5.2E+03
60344	1.0E-03	X	2.0E-05	X	V		Methyl Hydrazine	60-34-4	2.8E-03	2.1E-02
108101			3.0E+00	I	V		Methyl Isobutyl Ketone (4-methyl	108-10-1		3.1E+03
624839			1.0E-03	C	V		Methyl Isocyanate	624-83-9		1.0E+00
80626			7.0E-01	I	V		Methyl Methacrylate	80-62-6		7.3E+02
298000							Methyl Parathion	298-00-0		
993135							Methyl Phosphonic Acid	993-13-5		
25013154			4.0E-02	H	V		Methyl Styrene (Mixed Isomers)	25013-15-4		4.2E+01
66273	2.8E-05	C					Methyl methanesulfonate	66-27-3	1.0E-01	
1634044	2.6E-07	C	3.0E+00	I	V		Methyl tert-Butyl Ether (MTBE)	1634-04-4	1.1E+01	3.1E+03
615452							Methyl-1,4-benzenediamine dihy	615-45-2		
108112			3.0E+00	X	V		Methyl-2-Pentanol, 4-	108-11-2		3.1E+03
99558							Methyl-5-Nitroaniline, 2-	99-55-8		
70257	2.4E-03	C					Methyl-N-nitro-N-nitrosoguanid	70-25-7	1.2E-03	
636215	3.7E-05	C					Methylaniline Hydrochloride, 2-	636-21-5	7.6E-02	
124583							Methylarsonic acid	124-58-3		
74612127							Methylbenzene,1-4-diamine mor	74612-12-7		
615509							Methylbenzene-1,4-diamine sulf	615-50-9		
56495	6.3E-03	C				M	Methylcholanthrene, 3-	56-49-5	1.6E-04	

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7		8	9	10	11
	Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.										
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1	
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)	
75092	1.0E-08	I	6.0E-01	I	V	M	Methylene Chloride	75-09-2	1.0E+02	6.3E+02	
101144	4.3E-04	C				M	Methylene-bis(2-chloroaniline),	101-14-4	2.4E-03		
101611	1.3E-05	C					Methylene-bis(N,N-dimethyl) Ar	101-61-1	2.2E-01		
101779	4.6E-04	C	2.0E-02	C			Methylenebisbenzenamine, 4,4'-	101-77-9	6.1E-03	2.1E+01	
101688			6.0E-04	I			Methylenediphenyl Diisocyanate	101-68-8		6.3E-01	
98839					V		Methylstyrene, Alpha-	98-83-9			
51218452							Metolachlor	51218-45-2			
21087649							Metribuzin	21087-64-9			
74223646							Metsulfuron-methyl	74223-64-6			
8012951					V		Mineral oils	8012-95-1			
2385855	5.1E-03	C			V		Mirex	2385-85-5	5.5E-04		
2212671							Molinate	2212-67-1			
7439987							Molybdenum	7439-98-7			
10599903							Monochloramine	10599-90-3			
100618							Monomethylaniline	100-61-8			
88671890							Myclobutanil	88671-89-0			
74317							N,N'-Diphenyl-1,4-benzenediam	74-31-7			
300765					V		Naled	300-76-5			
64742956			1.0E-01	P	V		Naphtha, High Flash Aromatic (	64742-95-6		1.0E+02	
91598	0.0E+00	C					Naphthylamine, 2-	91-59-8			
15299997							Napropamide	15299-99-7			
373024	2.6E-04	C	1.4E-05	C			Nickel Acetate	373-02-4	1.1E-02	1.5E-02	
3333673	2.6E-04	C	1.4E-05	C			Nickel Carbonate	3333-67-3	1.1E-02	1.5E-02	
13463393	2.6E-04	C	1.4E-05	C	V		Nickel Carbonyl	13463-39-3	1.1E-02	1.5E-02	
12054487	2.6E-04	C	1.4E-05	C			Nickel Hydroxide	12054-48-7	1.1E-02	1.5E-02	
1313991	2.6E-04	C	2.0E-05	C			Nickel Oxide	1313-99-1	1.1E-02	2.1E-02	
E715532	2.4E-04	I	1.4E-05	C			Nickel Refinery Dust	E715532	1.2E-02	1.5E-02	
7440020	2.6E-04	C	9.0E-05	A			Nickel Soluble Salts	7440-02-0	1.1E-02	9.4E-02	
12035722	4.8E-04	I	1.4E-05	C			Nickel Subsulfide	12035-72-2	5.8E-03	1.5E-02	
1271289	2.6E-04	C	1.4E-05	C			Nickelocene	1271-28-9	1.1E-02	1.5E-02	
14797558							Nitrate (measured as nitrogen)	14797-55-8			
E701177							Nitrate + Nitrite (measured as n	E701177			
14797650							Nitrite (measured as nitrogen)	14797-65-0			
88744			5.0E-05	X			Nitroaniline, 2-	88-74-4		5.2E-02	
100016			6.0E-03	P			Nitroaniline, 4-	100-01-6		6.3E+00	
98953	4.0E-05	I	9.0E-03	I	V		Nitrobenzene	98-95-3	7.0E-02	9.4E+00	
9004700							Nitrocellulose	9004-70-0			
67209							Nitrofurantoin	67-20-9			
59870	3.7E-04	C					Nitrofurazone	59-87-0	7.6E-03		
55630							Nitroglycerin	55-63-0			
556887							Nitroguanidine	556-88-7			
75525	8.8E-06	P	5.0E-03	P	V		Nitromethane	75-52-5	3.2E-01	5.2E+00	
79469	5.8E-04	X	2.0E-02	I	V		Nitropropane, 2-	79-46-9	4.8E-03	2.1E+01	
759739	7.7E-03	C				M	Nitroso-N-ethylurea, N-	759-73-9	1.3E-04		
684935	3.4E-02	C				M	Nitroso-N-methylurea, N-	684-93-5	3.0E-05		
924163	1.6E-03	I			V		Nitroso-di-N-butylamine, N-	924-16-3	1.8E-03		
621647	2.0E-03	C					Nitroso-di-N-propylamine, N-	621-64-7	1.4E-03		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10	11
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
1116547	8.0E-04	C					Nitrosodiethanolamine, N-	1116-54-7	3.5E-03	
55185	4.3E-02	I				M	Nitrosodiethylamine, N-	55-18-5	2.4E-05	
62759	1.4E-02	I	4.0E-05	X	V	M	Nitrosodimethylamine, N-	62-75-9	7.2E-05	4.2E-02
86306	2.6E-06	C					Nitrosodiphenylamine, N-	86-30-6	1.1E+00	
10595956	6.3E-03	C			V		Nitrosomethylethylamine, N-	10595-95-6	4.5E-04	
59892	1.9E-03	C					Nitrosomorpholine [N-]	59-89-2	1.5E-03	
100754	2.7E-03	C					Nitrosopiperidine [N-]	100-75-4	1.0E-03	
930552	6.1E-04	I					Nitrosopyrrolidine, N-	930-55-2	4.6E-03	
99081							Nitrotoluene, m-	99-08-1		
88722					V		Nitrotoluene, o-	88-72-2		
99990							Nitrotoluene, p-	99-99-0		
111842			2.0E-02	P	V		Nonane, n-	111-84-2		2.1E+01
27314132							Norflurazon	27314-13-2		
32536520							Octabromodiphenyl Ether	32536-52-0		
2691410							Octahydro-1,3,5,7-tetranitro-1,3,	2691-41-0		
152169							Octamethylpyrophosphoramide	152-16-9		
19044883							Oryzalin	19044-88-3		
19666309							Oxadiazon	19666-30-9		
23135220							Oxamyl	23135-22-0		
42874033							Oxyfluorfen	42874-03-3		
76738620							Paclobutrazol	76738-62-0		
1910425							Paraquat Dichloride	1910-42-5		
56382							Parathion	56-38-2		
1114712					V		Pebulate	1114-71-2		
40487421							Pendimethalin	40487-42-1		
32534819					V		Pentabromodiphenyl Ether	32534-81-9		
60348609							Pentabromodiphenyl ether, 2,2',4	60348-60-9		
608935					V		Pentachlorobenzene	608-93-5		
76017					V		Pentachloroethane	76-01-7		
82688					V		Pentachloronitrobenzene	82-68-8		
87865	5.1E-06	C					Pentachlorophenol	87-86-5	5.5E-01	
78115							Pentaerythritol tetranitrate (PETI	78-11-5		
109660			1.0E+00	P	V		Pentane, n-	109-66-0		1.0E+03
							Perchlorates			
7790989							~Ammonium Perchlorate	7790-98-9		
7791039							~Lithium Perchlorate	7791-03-9		
14797730							~Perchlorate and Perchlorate Sa	14797-73-0		
7778747							~Potassium Perchlorate	7778-74-7		
7601890							~Sodium Perchlorate	7601-89-0		
375735							Perfluorobutane sulfonic acid (P	375-73-5		
45187153							Perfluorobutanesulfonate	45187-15-3		
52645531							Permethrin	52645-53-1		
62442	6.3E-07	C					Phenacetin	62-44-2	4.5E+00	
13684634							Phenmedipham	13684-63-4		
108952			2.0E-01	C			Phenol	108-95-2		2.1E+02
114261							Phenol, 2-(1-methylethoxy)-, met	114-26-1		
92842							Phenothiazine	92-84-2		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
103720					V		Phenyl Isothiocyanate	103-72-0		
108452							Phenylenediamine, m-	108-45-2		
95545							Phenylenediamine, o-	95-54-5		
106503							Phenylenediamine, p-	106-50-3		
90437							Phenylphenol, 2-	90-43-7		
298022							Phorate	298-02-2		
75445			3.0E-04	I	V		Phosgene	75-44-5		3.1E-01
732116							Phosmet	732-11-6		
							Phosphates, Inorganic			
13776880							~Aluminum metaphosphate	13776-88-0		
68333799							~Ammonium polyphosphate	68333-79-9		
7790763							~Calcium pyrophosphate	7790-76-3		
7783280							~Diammonium phosphate	7783-28-0		
7757939							~Dicalcium phosphate	7757-93-9		
7782754							~Dimagnesium phosphate	7782-75-4		
7758114							~Dipotassium phosphate	7758-11-4		
7558794							~Disodium phosphate	7558-79-4		
13530502							~Monoaluminum phosphate	13530-50-2		
7722761							~Monoammonium phosphate	7722-76-1		
7758238							~Monocalcium phosphate	7758-23-8		
7757860							~Monomagnesium phosphate	7757-86-0		
7778770							~Monopotassium phosphate	7778-77-0		
7558807							~Monosodium phosphate	7558-80-7		
8017161							~Polyphosphoric acid	8017-16-1		
13845368							~Potassium tripolyphosphate	13845-36-8		
7758169							~Sodium acid pyrophosphate	7758-16-9		
7785888							~Sodium aluminum phosphate (a	7785-88-8		
10279591							~Sodium aluminum phosphate (a	10279-59-1		
10305767							~Sodium aluminum phosphate (t	10305-76-7		
10124568							~Sodium hexametaphosphate	10124-56-8		
68915311							~Sodium polyphosphate	68915-31-1		
7785844							~Sodium trimetaphosphate	7785-84-4		
7758294							~Sodium tripolyphosphate	7758-29-4		
7320345							~Tetrapotassium phosphate	7320-34-5		
7722885							~Tetrasodium pyrophosphate	7722-88-5		
15136875							~Trialuminum sodium tetra deca	15136-87-5		
7758874							~Tricalcium phosphate	7758-87-4		
7757871							~Trimagnesium phosphate	7757-87-1		
7778532							~Tripotassium phosphate	7778-53-2		
7601549							~Trisodium phosphate	7601-54-9		
7803512			3.0E-04	I	V		Phosphine	7803-51-2		3.1E-01
7664382			1.0E-02	I			Phosphoric Acid	7664-38-2		1.0E+01
7723140					V		Phosphorus, White	7723-14-0		
							Phthalates			
117817	2.4E-06	C					~Bis(2-ethylhexyl)phthalate	117-81-7	1.2E+00	
85687							~Butyl Benzyl Phthalate	85-68-7		
85701							~Butylphthalyl Butylglycolate	85-70-1		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10	11
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
84742							~Dibutyl Phthalate	84-74-2		
84662							~Diethyl Phthalate	84-66-2		
120616					V		~Dimethylterephthalate	120-61-6		
117840							~Octyl Phthalate, di-N-	117-84-0		
100210							~Phthalic Acid, P-	100-21-0		
85449			2.0E-02	C			~Phthalic Anhydride	85-44-9		2.1E+01
1918021							Picloram	1918-02-1		
96913							Picramic Acid (2-Amino-4,6-dini	96-91-3		
88891							Picric Acid (2,4,6-Trinitrophenol	88-89-1		
29232937							Pirimiphos, Methyl	29232-93-7		
59536651	8.6E-03	C					Polybrominated Biphenyls	59536-65-1	3.3E-04	
							Polychlorinated Biphenyls (PCBs			
12674112	2.0E-05	G			V		~Aroclor 1016	12674-11-2	1.4E-01	
11104282	5.7E-04	G			V		~Aroclor 1221	11104-28-2	4.9E-03	
11141165	5.7E-04	G			V		~Aroclor 1232	11141-16-5	4.9E-03	
53469219	5.7E-04	G			V		~Aroclor 1242	53469-21-9	4.9E-03	
12672296	5.7E-04	G			V		~Aroclor 1248	12672-29-6	4.9E-03	
11097691	5.7E-04	G			V		~Aroclor 1254	11097-69-1	4.9E-03	
11096825	5.7E-04	G			V		~Aroclor 1260	11096-82-5	4.9E-03	
11126424					V		~Aroclor 5460	11126-42-4		
39635319	1.1E-03	W	1.3E-03	W	V		~Heptachlorobiphenyl, 2,3,3',4,4	39635-31-9	2.5E-03	1.4E+00
52663726	1.1E-03	W	1.3E-03	W	V		~Hexachlorobiphenyl, 2,3',4,4',5,	52663-72-6	2.5E-03	1.4E+00
69782907	1.1E-03	W	1.3E-03	W	V		~Hexachlorobiphenyl, 2,3,3',4,4',	69782-90-7	2.5E-03	1.4E+00
38380084	1.1E-03	W	1.3E-03	W	V		~Hexachlorobiphenyl, 2,3,3',4,4',	38380-08-4	2.5E-03	1.4E+00
32774166	1.1E+00	W	1.3E-06	W	V		~Hexachlorobiphenyl, 3,3',4,4',5,	32774-16-6	2.5E-06	1.4E-03
65510443	1.1E-03	W	1.3E-03	W	V		~Pentachlorobiphenyl, 2',3,4,4',5	65510-44-3	2.5E-03	1.4E+00
31508006	1.1E-03	W	1.3E-03	W	V		~Pentachlorobiphenyl, 2,3',4,4',5	31508-00-6	2.5E-03	1.4E+00
32598144	1.1E-03	W	1.3E-03	W	V		~Pentachlorobiphenyl, 2,3,3',4,4'	32598-14-4	2.5E-03	1.4E+00
74472370	1.1E-03	W	1.3E-03	W	V		~Pentachlorobiphenyl, 2,3,4,4',5-	74472-37-0	2.5E-03	1.4E+00
57465288	3.8E+00	W	4.0E-07	W	V		~Pentachlorobiphenyl, 3,3',4,4',5	57465-28-8	7.4E-07	4.2E-04
1336363	5.7E-04	I			V		~Polychlorinated Biphenyls (higl	1336-36-3	4.9E-03	
1336363	1.0E-04	I			V		~Polychlorinated Biphenyls (low	1336-36-3	2.8E-02	
1336363	2.0E-05	I			V		~Polychlorinated Biphenyls (low	1336-36-3	1.4E-01	
32598133	3.8E-03	W	4.0E-04	W			~Tetrachlorobiphenyl, 3,3',4,4'- (	32598-13-3	7.4E-04	4.2E-01
70362504	1.1E-02	W	1.3E-04	W	V		~Tetrachlorobiphenyl, 3,4,4',5- (	70362-50-4	2.5E-04	1.4E-01
9016879			6.0E-04	I			Polymeric Methylene Diphenyl D	9016-87-9		6.3E-01
							Polynuclear Aromatic Hydrocarb			
83329					V		~Acenaphthene	83-32-9		
120127					V		~Anthracene	120-12-7		
56553	6.0E-05	E			V	M	~Benz[a]anthracene	56-55-3	1.7E-02	
205823	1.1E-04	C					~Benzo(j)fluoranthene	205-82-3	2.6E-02	
50328	6.0E-04	I	2.0E-06	I		M	~Benzo[a]pyrene	50-32-8	1.7E-03	2.1E-03
205992	6.0E-05	E				M	~Benzo[b]fluoranthene	205-99-2	1.7E-02	
207089	6.0E-06	E				M	~Benzo[k]fluoranthene	207-08-9	1.7E-01	
91587					V		~Chloronaphthalene, Beta-	91-58-7		
218019	6.0E-07	E				M	~Chrysene	218-01-9	1.7E+00	
53703	6.0E-04	E				M	~Dibenz[a,h]anthracene	53-70-3	1.7E-03	

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10	11
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
192654	1.1E-03	C					~Dibenzo(a,e)pyrene	192-65-4	2.6E-03	
57976	7.1E-02	C				M	~Dimethylbenz(a)anthracene, 7,	57-97-6	1.4E-05	
206440							~Fluoranthene	206-44-0		
86737					V		~Fluorene	86-73-7		
193395	6.0E-05	E				M	~Indeno[1,2,3-cd]pyrene	193-39-5	1.7E-02	
90120					V		~Methylnaphthalene, 1-	90-12-0		
91576					V		~Methylnaphthalene, 2-	91-57-6		
91203	3.4E-05	C	3.0E-03	I	V		~Naphthalene	91-20-3	8.3E-02	3.1E+00
57835924	1.1E-04	C					~Nitropyrene, 4-	57835-92-4	2.6E-02	
129000					V		~Pyrene	129-00-0		
29420493							Potassium Perfluorobutane Sulfo	29420-49-3		
67747095							Prochloraz	67747-09-5		
26399360					V		Profluralin	26399-36-0		
1610180							Prometon	1610-18-0		
7287196							Prometryn	7287-19-6		
23950585							Pronamide	23950-58-5		
1918167							Propachlor	1918-16-7		
709988							Propanil	709-98-8		
2312358							Propargite	2312-35-8		
107197					V		Propargyl Alcohol	107-19-7		
139402							Propazine	139-40-2		
122429							Propham	122-42-9		
60207901							Propiconazole	60207-90-1		
123386			8.0E-03	I	V		Propionaldehyde	123-38-6		8.3E+00
103651			1.0E+00	X	V		Propyl benzene	103-65-1		1.0E+03
115071			3.0E+00	C	V		Propylene	115-07-1		3.1E+03
57556							Propylene Glycol	57-55-6		
6423434			2.7E-04	A			Propylene Glycol Dinitrate	6423-43-4		2.8E-01
107982			2.0E+00	I	V		Propylene Glycol Monomethyl Et	107-98-2		2.1E+03
75569	3.7E-06	I	3.0E-02	I	V		Propylene Oxide	75-56-9	7.6E-01	3.1E+01
110861					V		Pyridine	110-86-1		
13593038							Quinalphos	13593-03-8		
91225							Quinoline	91-22-5		
76578148							Quizalofop-ethyl	76578-14-8		
E715557			3.0E+04	A			Refractory Ceramic Fibers (unit	E715557		3.1E+04
10453868							Resmethrin	10453-86-8		
299843					V		Ronnel	299-84-3		
83794							Rotenone	83-79-4		
94597	6.3E-05	C				M	Safrole	94-59-7	1.6E-02	
7783008							Selenious Acid	7783-00-8		
7782492			2.0E-02	C			Selenium	7782-49-2		2.1E+01
7446346			2.0E-02	C			Selenium Sulfide	7446-34-6		2.1E+01
74051802							Sethoxydim	74051-80-2		
7631869			3.0E-03	C			Silica (crystalline, respirable)	7631-86-9		3.1E+00
7440224							Silver	7440-22-4		
122349							Simazine	122-34-9		
62476599							Sodium Acifluorfen	62476-59-9		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
26628228							Sodium Azide	26628-22-8		
148185							Sodium Diethyldithiocarbamate	148-18-5		
7681494			1.3E-02	C			Sodium Fluoride	7681-49-4		1.4E+01
62748							Sodium Fluoroacetate	62-74-8		
13718268							Sodium Metavanadate	13718-26-8		
13472452							Sodium Tungstate	13472-45-2		
10213102							Sodium Tungstate Dihydrate	10213-10-2		
961115							Stirofos (Tetrachlorovinphos)	961-11-5		
7440246							Strontium, Stable	7440-24-6		
57249							Strychnine	57-24-9		
100425			1.0E+00	I	V		Styrene	100-42-5		1.0E+03
57964393							Styrene-Acrylonitrile (SAN) Trin	57964-39-3		
57964406							Styrene-Acrylonitrile (SAN) Trin	57964-40-6		
126330			2.0E-03	X			Sulfolane	126-33-0		2.1E+00
80079							Sulfonylbis(4-chlorobenzene), 1,	80-07-9		
7446119			1.0E-03	C	V		Sulfur Trioxide	7446-11-9		1.0E+00
7664939			1.0E-03	C			Sulfuric Acid	7664-93-9		1.0E+00
140578	7.1E-06	I					Sulfurous acid, 2-chloroethyl 2-[4	140-57-8	4.0E-01	
21564170							TCMTB	21564-17-0		
34014181							Tebuthiuron	34014-18-1		
3383968							Temephos	3383-96-8		
5902512							Terbacil	5902-51-2		
13071799					V		Terbufos	13071-79-9		
886500							Terbutryn	886-50-0		
540885	1.3E-06	C			V		Tert-Butyl Acetate	540-88-5	2.2E+00	
5436431							Tetrabromodiphenyl ether, 2,2',4	5436-43-1		
95943					V		Tetrachlorobenzene, 1,2,4,5-	95-94-3		
630206	7.4E-06	I			V		Tetrachloroethane, 1,1,1,2-	630-20-6	3.8E-01	
79345	5.8E-05	C			V		Tetrachloroethane, 1,1,2,2-	79-34-5	4.8E-02	
127184	2.6E-07	I	4.0E-02	I	V		Tetrachloroethylene	127-18-4	1.1E+01	4.2E+01
58902							Tetrachlorophenol, 2,3,4,6-	58-90-2		
5216251					V		Tetrachlorotoluene, p- alpha, alp	5216-25-1		
3689245							Tetraethyl Dithiopyrophosphate	3689-24-5		
811972			8.0E+01	I	V		Tetrafluoroethane, 1,1,1,2-	811-97-2		8.3E+04
479458							Tetryl (Trinitrophenylmethylnitrar	479-45-8		
1314325							Thallic Oxide	1314-32-5		
10102451							Thallium (I) Nitrate	10102-45-1		
7440280							Thallium (Soluble Salts)	7440-28-0		
563688					V		Thallium Acetate	563-68-8		
6533739					V		Thallium Carbonate	6533-73-9		
7791120							Thallium Chloride	7791-12-0		
12039520							Thallium Selenite	12039-52-0		
7446186							Thallium Sulfate	7446-18-6		
79277273							Thifensulfuron-methyl	79277-27-3		
28249776							Thiobencarb	28249-77-6		
111488							Thiodiglycol	111-48-8		
39196184							Thiofanox	39196-18-4		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
23564058							Thiophanate, Methyl	23564-05-8		
137268							Thiram	137-26-8		
7440315							Tin	7440-31-5		
7550450			1.0E-04	A	V		Titanium Tetrachloride	7550-45-0		1.0E-01
108883			5.0E+00	I	V		Toluene	108-88-3		5.2E+03
584849	1.1E-05	C	8.0E-06	C	V		Toluene-2,4-diisocyanate	584-84-9	2.6E-01	8.3E-03
95705							Toluene-2,5-diamine	95-70-5		
91087	1.1E-05	C	8.0E-06	C	V		Toluene-2,6-diisocyanate	91-08-7	2.6E-01	8.3E-03
99945							Toluic Acid, p-	99-94-5		
95534	5.1E-05	C					Toluidine, o- (Methylaniline, 2-)	95-53-4	5.5E-02	
106490							Toluidine, p-	106-49-0		
E1790670					V		Total Petroleum Hydrocarbons (	E1790670		
E1790666			6.0E-01	P	V		Total Petroleum Hydrocarbons (	E1790666		6.3E+02
E1790668			1.0E-01	P	V		Total Petroleum Hydrocarbons (	E1790668		1.0E+02
E1790676							Total Petroleum Hydrocarbons (	E1790676		
E1790672			3.0E-02	P	V		Total Petroleum Hydrocarbons (	E1790672		3.1E+01
E1790674			3.0E-03	P	V		Total Petroleum Hydrocarbons (	E1790674		3.1E+00
8001352	3.2E-04	I					Toxaphene	8001-35-2	8.8E-03	
E1841606							Toxaphene, Weathered	E1841606		
66841256							Tralomethrin	66841-25-6		
688733					V		Tri-n-butyltin	688-73-3		
102761							Triacetin	102-76-1		
43121433							Triadimefon	43121-43-3		
2303175					V		Triallate	2303-17-5		
82097505							Triasulfuron	82097-50-5		
101200480							Tribenuron-methyl	101200-48-0		
615543					V		Tribromobenzene, 1,2,4-	615-54-3		
118796							Tribromophenol, 2,4,6-	118-79-6		
126738							Tributyl Phosphate	126-73-8		
E1790678							Tributyltin Compounds	E1790678		
56359							Tributyltin Oxide	56-35-9		
10025851							Trichloramine	10025-85-1		
76131			5.0E+00	P	V		Trichloro-1,2,2-trifluoroethane, 1	76-13-1		5.2E+03
76039							Trichloroacetic Acid	76-03-9		
33663502							Trichloroaniline HCl, 2,4,6-	33663-50-2		
634935							Trichloroaniline, 2,4,6-	634-93-5		
87616					V		Trichlorobenzene, 1,2,3-	87-61-6		
120821			2.0E-03	P	V		Trichlorobenzene, 1,2,4-	120-82-1		2.1E+00
71556			5.0E+00	I	V		Trichloroethane, 1,1,1-	71-55-6		5.2E+03
79005	1.6E-05	I	2.0E-04	X	V		Trichloroethane, 1,1,2-	79-00-5	1.8E-01	2.1E-01
79016	4.1E-06	I	2.0E-03	I	V	M	Trichloroethylene	79-01-6	4.8E-01	2.1E+00
75694					V		Trichlorofluoromethane	75-69-4		
95954							Trichlorophenol, 2,4,5-	95-95-4		
88062	3.1E-06	I					Trichlorophenol, 2,4,6-	88-06-2	9.1E-01	
93765							Trichlorophenoxyacetic Acid, 2,4	93-76-5		
93721							Trichlorophenoxypropionic acid,	93-72-1		
598776					V		Trichloropropane, 1,1,2-	598-77-6		

Source: USEPA RSL, Generic Tables - Screening Levels (TR=1E-06THQ=1.0) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

	1	2	3	4	5	6	7	8	9	10
	Toxicity and Chemical-specific Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
CAS No. (Trimmed)	IUR $(ug/m^3)^{-1}$	key	RfC_i (mg/m^3)	key	vol	mutagen	Analyte	CAS No.	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)
96184			3.0E-04	I	V	M	Trichloropropane, 1,2,3-	96-18-4		3.1E-01
96195			3.0E-04	P	V		Trichloropropene, 1,2,3-	96-19-5		3.1E-01
1330785							Tricresyl Phosphate (TCP)	1330-78-5		
58138082							Tridiphane	58138-08-2		
121448			7.0E-03	I	V		Triethylamine	121-44-8		7.3E+00
112276							Triethylene Glycol	112-27-6		
420462			2.0E+01	P	V		Trifluoroethane, 1,1,1-	420-46-2		2.1E+04
1582098					V		Trifluralin	1582-09-8		
512561							Trimethyl Phosphate	512-56-1		
526738			6.0E-02	I	V		Trimethylbenzene, 1,2,3-	526-73-8		6.3E+01
95636			6.0E-02	I	V		Trimethylbenzene, 1,2,4-	95-63-6		6.3E+01
108678			6.0E-02	I	V		Trimethylbenzene, 1,3,5-	108-67-8		6.3E+01
25167708					V		Trimethylpentene, 2,4,4-	25167-70-8		
99354							Trinitrobenzene, 1,3,5-	99-35-4		
118967							Trinitrotoluene, 2,4,6-	118-96-7		
791286							Triphenylphosphine Oxide	791-28-6		
13674878							Tris(1,3-Dichloro-2-propyl) Pho	13674-87-8		
13674845							Tris(1-chloro-2-propyl)phosphat	13674-84-5		
126727	6.6E-04	C			V		Tris(2,3-dibromopropyl)phospha	126-72-7	4.3E-03	
115968							Tris(2-chloroethyl)phosphate	115-96-8		
78422							Tris(2-ethylhexyl)phosphate	78-42-2		
7440337							Tungsten	7440-33-7		
7440611			4.0E-05	A			Uranium	7440-61-1		4.2E-02
51796	2.9E-04	C				M	Urethane	51-79-6	3.5E-03	
1314621	8.3E-03	P	7.0E-06	P			Vanadium Pentoxide	1314-62-1	3.4E-04	7.3E-03
7440622			1.0E-04	A			Vanadium and Compounds	7440-62-2		1.0E-01
1929777					V		Vernolate	1929-77-7		
50471448							Vinclozolin	50471-44-8		
108054			2.0E-01	I	V		Vinyl Acetate	108-05-4		2.1E+02
593602	3.2E-05	H	3.0E-03	I	V		Vinyl Bromide	593-60-2	8.8E-02	3.1E+00
75014	4.4E-06	I	1.0E-01	I	V	M	Vinyl Chloride	75-01-4	1.7E-01	1.0E+02
81812							Warfarin	81-81-2		
108383			1.0E-01	G	V		Xylene, m-	108-38-3		1.0E+02
95476			1.0E-01	G	V		Xylene, o-	95-47-6		1.0E+02
106423			1.0E-01	G	V		Xylene, p-	106-42-3		1.0E+02
1330207			1.0E-01	I	V		Xylenes	1330-20-7		1.0E+02
1314847							Zinc Phosphide	1314-84-7		
7440666							Zinc and Compounds	7440-66-6		
12122677							Zineb	12122-67-7		
7440677							Zirconium	7440-67-7		

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison								
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m^3)	RfCReference	$SRfC_i$ (mg/m^3)	SRfCReference
30560191	Acephate	30560-19-1	1.2E-03	OPP	4.0E-03	HEAST				
67641	Acetone	67-64-1	9.0E-01	IRIS	2.0E+00	ATSDR	3.1E+01	ATSDR	3.1E+01	ATSDR
75865	Acetone Cyanohydrin	75-86-5					2.0E-03	SCREEN	2.0E-02	SCREEN
75058	Acetonitrile	75-05-8			6.0E-02	HEAST	6.0E-02	IRIS	5.0E-01	HEAST
98862	Acetophenone	98-86-2	1.0E-01	IRIS	8.0E-01	SCREEN				
107028	Acrolein	107-02-8	5.0E-04	IRIS	4.0E-03	ATSDR	2.0E-05	IRIS	9.2E-05	ATSDR
79061	Acrylamide	79-06-1	2.0E-03	IRIS	1.0E-03	ATSDR	6.0E-03	IRIS		
79107	Acrylic Acid	79-10-7	5.0E-01	IRIS	2.0E-01	PPRTV	1.0E-03	IRIS	2.0E-04	PPRTV
107131	Acrylonitrile	107-13-1	4.0E-02	ATSDR	1.0E-02	ATSDR	2.0E-03	IRIS		
111693	Adiponitrile	111-69-3					6.0E-03	PPRTV	6.0E-02	PPRTV
15972608	Alachlor	15972-60-8	1.0E-02	IRIS	1.0E-02	HEAST				
116063	Aldicarb	116-06-3	1.0E-03	IRIS	1.0E-03	HEAST				
309002	Aldrin	309-00-2	3.0E-05	IRIS	4.0E-05	PPRTV				
107186	Allyl Alcohol	107-18-6	5.0E-03	IRIS	4.0E-03	PPRTV	1.0E-04	SCREEN	1.0E-03	PPRTV
107051	Allyl Chloride	107-05-1					1.0E-03	IRIS	1.0E-02	HEAST
7429905	Aluminum	7429-90-5	1.0E+00	PPRTV	1.0E+00	ATSDR	5.0E-03	PPRTV		
20859738	Aluminum Phosphide	20859-73-8	4.0E-04	IRIS	4.0E-04	HEAST				
834128	Ametryn	834-12-8	9.0E-03	IRIS	9.0E-02	HEAST				
591275	Aminophenol, m-	591-27-5	8.0E-02	PPRTV	3.0E-01	PPRTV				
95556	Aminophenol, o-	95-55-6	4.0E-03	SCREEN	4.0E-02	SCREEN				
123308	Aminophenol, p-	123-30-8	2.0E-02	PPRTV	2.0E-01	PPRTV				
7664417	Ammonia	7664-41-7					5.0E-01	IRIS	1.0E-01	PPRTV
75854	Amyl Alcohol, tert-	75-85-4					3.0E-03	SCREEN	3.0E-02	SCREEN
62533	Aniline	62-53-3	7.0E-03	PPRTV			1.0E-03	IRIS	1.0E-02	HEAST
84651	Anthraquinone, 9,10-	84-65-1	2.0E-03	SCREEN	1.0E-02	SCREEN				
7440360	Antimony (metallic)	7440-36-0	4.0E-04	IRIS	4.0E-04	PPRTV				
1314609	Antimony Pentoxide	1314-60-9	5.0E-04	HEAST	5.0E-04	HEAST				
11071151	Antimony Potassium Tartrate	11071-15-1			4.0E-04	PPRTV				
1332816	Antimony Tetroxide	1332-81-6	4.0E-04	HEAST	4.0E-04	HEAST				
1309644	Antimony Trioxide	1309-64-4			5.0E-01	PPRTV	2.0E-04	IRIS	2.0E-04	PPRTV
10025919	Antimony Trichloride	10025-91-9			4.0E-04	PPRTV				
140578	Sulfurous acid, 2-chloroethyl 2-[4-	140-57-8	5.0E-02	HEAST	1.0E-01	HEAST				
1912249	Atrazine	1912-24-9	3.5E-02	IRIS	3.0E-03	ATSDR				
123773	Azodicarbonamide	123-77-3	1.0E+00	PPRTV	1.0E+00	PPRTV	7.0E-06	PPRTV	7.0E-06	PPRTV
7440393	Barium	7440-39-3	2.0E-01	IRIS	2.0E-01	ATSDR	5.0E-04	HEAST	5.0E-03	HEAST
1861401	Benfluralin	1861-40-1	5.0E-03	OPP	3.0E-01	HEAST				
100527	Benzaldehyde	100-52-7	1.0E-01	IRIS	2.0E-01	PPRTV				
71432	Benzene	71-43-2	4.0E-03	IRIS	1.0E-02	PPRTV	3.0E-02	IRIS	8.0E-02	PPRTV
6369591	Benzenediamine-2-methyl sulfate	6369-59-1	3.0E-04	SCREEN	3.0E-03	SCREEN				
108985	Benzenethiol	108-98-5	1.0E-03	PPRTV	1.0E-02	PPRTV				
92875	Benzidine	92-87-5	3.0E-03	IRIS	3.0E-03	HEAST				
65850	Benzoic Acid	65-85-0	4.0E+00	IRIS	4.0E+00	PPRTV			2.0E-03	PPRTV
98077	Benzotrichloride	98-07-7			5.0E-05	PPRTV			5.0E-03	SCREEN
100516	Benzyl Alcohol	100-51-6	1.0E-01	PPRTV	3.0E-01	PPRTV				
100447	Benzyl Chloride	100-44-7	2.0E-03	PPRTV	2.0E-03	PPRTV	1.0E-03	PPRTV	4.0E-03	PPRTV
7440417	Beryllium and compounds	7440-41-7	2.0E-03	IRIS	5.0E-03	HEAST	2.0E-05	IRIS		
42576023	Bifenox	42576-02-3	9.0E-03	PPRTV	1.0E+00	PPRTV				
92524	Biphenyl, 1,1'-	92-52-4	5.0E-01	IRIS	1.0E-01	PPRTV	4.0E-04	SCREEN	4.0E-03	SCREEN
111911	Bis(2-chloroethoxy)methane	111-91-1	3.0E-03	PPRTV	3.0E-02	PPRTV				
111444	Bis(2-chloroethyl)ether	111-44-4							1.2E-01	ATSDR
108601	Bis(2-chloro-1-methylethyl) ether	108-60-1	4.0E-02	IRIS	1.0E-03	SCREEN				
542881	Bis(chloromethyl)ether	542-88-1							1.4E-03	ATSDR

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison								
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference	
80057	Bisphenol A	80-05-7	5.0E-02	IRIS	6.0E-01	HEAST					
7440428	Boron And Borates Only	7440-42-8	2.0E-01	IRIS	2.0E-01	ATSDR	2.0E-02	HEAST	2.0E-02	HEAST	
7637072	Boron Trifluoride	7637-07-2	4.0E-02	CALEPA			1.3E-02	CALEPA	7.0E-03	HEAST	
10294345	Boron Trichloride	10294-34-5	2.0E+00	PPRTV	2.0E+00	PPRTV	2.0E-02	PPRTV	2.0E-02	PPRTV	
1073069	Bromo-3-fluorobenzene, 1-	1073-06-9	3.0E-04	SCREEN	3.0E-03	SCREEN			3.0E-02	SCREEN	
108861	Bromobenzene	108-86-1	8.0E-03	IRIS	2.0E-02	IRIS	6.0E-02	IRIS	2.0E-01	IRIS	
74975	Bromochloromethane	74-97-5					4.0E-02	SCREEN	1.0E-01	PPRTV	
75274	Bromodichloromethane	75-27-4	2.0E-02	IRIS	8.0E-03	PPRTV			2.0E-02	PPRTV	
460004	Bromo-4-fluorobenzene, 1-	460-00-4	3.0E-04	SCREEN	3.0E-03	SCREEN			3.0E-02	SCREEN	
75252	Bromoform	75-25-2	2.0E-02	IRIS	3.0E-02	PPRTV					
74839	Bromomethane	74-83-9	1.4E-03	IRIS	5.0E-03	PPRTV	5.0E-03	IRIS	1.0E-01	PPRTV	
2104963	Bromophos	2104-96-3	5.0E-03	HEAST	5.0E-02	HEAST					
106945	Bromopropane, 1-	106-94-5					1.0E-01	ATSDR	5.0E-01	ATSDR	
1689845	Bromoxynil	1689-84-5	1.5E-02	OPP	2.0E-02	HEAST					
1689992	Bromoxynil Octanoate	1689-99-2	1.5E-02	OPP	2.0E-02	HEAST					
71363	Butanol, N-	71-36-3	1.0E-01	IRIS	1.0E+00	HEAST					
78922	Butyl alcohol, sec-	78-92-2	2.0E+00	PPRTV	2.0E+00	PPRTV	3.0E+01	PPRTV	3.0E+01	PPRTV	
762754	Butyl Formate, tert-	762-75-4			8.0E-03	SCREEN					
2008415	Butylate	2008-41-5	5.0E-02	IRIS	5.0E-02	HEAST					
128370	Butylated hydroxytoluene	128-37-0	3.0E-01	PPRTV	1.0E+00	PPRTV					
104518	Butylbenzene, n-	104-51-8	5.0E-02	PPRTV	1.0E-01	PPRTV					
135988	Butylbenzene, sec-	135-98-8	1.0E-01	SCREEN	1.0E-01	SCREEN					
98066	Butylbenzene, tert-	98-06-6	1.0E-01	SCREEN	1.0E-01	SCREEN					
7440439	Cadmium (Diet)	7440-43-9	1.0E-03	IRIS	5.0E-04	ATSDR	1.0E-05	ATSDR			
7440439	Cadmium (Water)	7440-43-9	5.0E-04	IRIS	5.0E-04	ATSDR	1.0E-05	ATSDR			
105602	Caprolactam	105-60-2	5.0E-01	IRIS	5.0E-01	HEAST	2.2E-03	CALEPA			
2425061	Captafol	2425-06-1	2.0E-03	IRIS	2.0E-03	HEAST					
133062	Captan	133-06-2	1.3E-01	IRIS	1.3E-01	HEAST					
63252	Carbaryl	63-25-2	1.0E-01	IRIS	1.0E-01	HEAST					
1563662	Carbofuran	1563-66-2	5.0E-03	IRIS	5.0E-03	HEAST					
75150	Carbon Disulfide	75-15-0	1.0E-01	IRIS	1.0E-01	HEAST	7.0E-01	IRIS	7.0E-01	HEAST	
56235	Carbon Tetrachloride	56-23-5	4.0E-03	IRIS	7.0E-03	ATSDR	1.0E-01	IRIS	1.9E-01	ATSDR	
463581	Carbonyl Sulfide	463-58-1					1.0E-01	PPRTV	1.0E+00	PPRTV	
75876	Chloral	75-87-6			2.0E-02	HEAST					
12789036	Chlordane	12789-03-6	5.0E-04	IRIS	6.0E-04	ATSDR	7.0E-04	IRIS	2.0E-04	ATSDR	
470906	Chlorfenvinphos	470-90-6	7.0E-04	ATSDR	2.0E-03	ATSDR					
7782505	Chlorine	7782-50-5	1.0E-01	IRIS			1.5E-04	ATSDR	5.8E-03	ATSDR	
10049044	Chlorine Dioxide	10049-04-4	3.0E-02	IRIS			2.0E-04	IRIS	2.8E-03	ATSDR	
7758192	Chlorite (Sodium Salt)	7758-19-2	3.0E-02	IRIS	1.0E-01	ATSDR					
126998	Chloro-1,3-butadiene, 2-	126-99-8	2.0E-02	HEAST	2.0E-02	HEAST	2.0E-02	IRIS	7.0E-02	HEAST	
95692	Chloro-2-methylaniline, 4-	95-69-2	3.0E-03	SCREEN	5.0E-01	PPRTV					
106478	Chloroaniline, p-	106-47-8	4.0E-03	IRIS	5.0E-04	PPRTV					
108907	Chlorobenzene	108-90-7	2.0E-02	IRIS	7.0E-02	PPRTV	5.0E-02	PPRTV	5.0E-01	PPRTV	
98668	Chlorobenzene sulfonic acid, p-	98-66-8	1.0E-01	SCREEN	1.0E+00	SCREEN					
510156	Chlorobenzilate	510-15-6	2.0E-02	IRIS	2.0E-02	HEAST					
74113	Chlorobenzoic Acid, p-	74-11-3	3.0E-02	SCREEN	8.0E-02	SCREEN					
121175	Chlorobenzotrifluoride, 3-nitro-4-	121-17-5			1.0E-04	SCREEN					
98566	Chlorobenzotrifluoride, 4-	98-56-6	3.0E-03	PPRTV	3.0E-02	PPRTV	3.0E-01	PPRTV	3.0E+00	PPRTV	
109693	Chlorobutane, 1-	109-69-3	4.0E-02	PPRTV	7.0E-02	PPRTV					
107073	Chloroethanol, 2-	107-07-3	2.0E-02	PPRTV	2.0E-01	PPRTV					
67663	Chloroform	67-66-3	1.0E-02	IRIS	1.0E-01	ATSDR	9.8E-02	ATSDR	2.4E-01	ATSDR	
74873	Chloromethane	74-87-3					9.0E-02	IRIS	3.0E+00	PPRTV	

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
	Subchronic Toxicity with Chronic Values for Comparison										
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
88733	Chloronitrobenzene, o-	88-73-3	3.0E-03	PPRTV	2.0E-02	PPRTV	1.0E-05	SCREEN	1.0E-04	PPRTV
100005	Chloronitrobenzene, p-	100-00-5	7.0E-04	PPRTV	7.0E-04	PPRTV	2.0E-03	PPRTV	6.0E-03	PPRTV
95578	Chlorophenol, 2-	95-57-8	5.0E-03	IRIS	8.0E-03	PPRTV				
1897456	Chlorothalonil	1897-45-6	1.5E-02	IRIS	1.5E-02	HEAST				
95498	Chlorotoluene, o-	95-49-8	2.0E-02	IRIS	2.0E-02	PPRTV			8.0E-01	SCREEN
106434	Chlorotoluene, p-	106-43-4	2.0E-02	SCREEN	2.0E-01	PPRTV				
2921882	Chlorpyrifos	2921-88-2	1.0E-03	ATSDR	3.0E-03	ATSDR				
5598130	Chlorpyrifos Methyl	5598-13-0	1.0E-02	HEAST	1.0E-02	HEAST				
60238564	Chlorthiophos	60238-56-4	8.0E-04	HEAST	8.0E-04	HEAST				
16065831	Chromium(III), Insoluble Salts	16065-83-1	1.5E+00	IRIS	1.5E+00	HEAST			5.0E-03	ATSDR
18540299	Chromium(VI)	18540-29-9	3.0E-03	IRIS	5.0E-03	ATSDR	1.0E-04	IRIS	3.0E-04	ATSDR
7440484	Cobalt	7440-48-4	3.0E-04	PPRTV	3.0E-03	PPRTV	6.0E-06	PPRTV	2.0E-05	PPRTV
7440508	Copper	7440-50-8	4.0E-02	HEAST	1.0E-02	ATSDR				
108394	Cresol, m-	108-39-4	5.0E-02	IRIS	4.0E-01	PPRTV	6.0E-01	CALEPA		
95487	Cresol, o-	95-48-7	5.0E-02	IRIS	2.0E-01	PPRTV	6.0E-01	CALEPA		
106445	Cresol, p-	106-44-5	1.0E-01	ATSDR	2.0E-02	PPRTV	6.0E-01	CALEPA		
59507	Cresol, p-chloro-m-	59-50-7	1.0E-01	ATSDR	1.0E-01	SCREEN				
1319773	Cresols	1319-77-3	1.0E-01	ATSDR	1.0E-01	ATSDR	6.0E-01	CALEPA		
123739	Crotonaldehyde, trans-	123-73-9	1.0E-03	PPRTV	1.0E-02	PPRTV				
98828	Cumene	98-82-8	1.0E-01	IRIS	4.0E-01	HEAST	4.0E-01	IRIS	9.0E-02	HEAST
21725462	Cyanazine	21725-46-2	2.0E-03	HEAST	2.0E-03	HEAST				
110827	Cyclohexane	110-82-7					6.0E+00	IRIS	1.8E+01	PPRTV
87843	Cyclohexane, 1,2,3,4,5-pentabrom	87-84-3	2.0E-02	SCREEN	2.0E-02	SCREEN				
108941	Cyclohexanone	108-94-1	5.0E+00	IRIS	2.0E+00	PPRTV	7.0E-01	PPRTV	7.0E+00	PPRTV
110838	Cyclohexene	110-83-8	5.0E-03	PPRTV	5.0E-02	PPRTV	1.0E+00	SCREEN		
108918	Cyclohexylamine	108-91-8	2.0E-01	IRIS	3.0E-01	HEAST				
542927	Cyclopentadiene	542-92-7							3.0E+00	HEAST
68085858	Cyhalothrin	68085-85-8	1.0E-03	OPP	1.0E-02	ATSDR				
592018	~Calcium Cyanide	592-01-8	1.0E-03	IRIS	4.0E-02	HEAST				
544923	~Copper Cyanide	544-92-3	5.0E-03	IRIS	5.0E-02	HEAST				
57125	~Cyanide (CN-)	57-12-5	6.0E-04	IRIS	2.0E-02	HEAST	8.0E-04	SURROGATE		
460195	~Cyanogen	460-19-5	1.0E-03	IRIS	4.0E-02	HEAST				
506774	~Cyanogen Chloride	506-77-4	5.0E-02	IRIS	5.0E-02	HEAST				
151508	~Potassium Cyanide	151-50-8	2.0E-03	IRIS	5.0E-02	HEAST				
506616	~Potassium Silver Cyanide	506-61-6	5.0E-03	IRIS	2.0E-01	HEAST				
506649	~Silver Cyanide	506-64-9	1.0E-01	IRIS	1.0E-01	HEAST				
143339	~Sodium Cyanide	143-33-9	1.0E-03	IRIS	5.0E-02	ATSDR				
E1790664	~Thiocyanates	E1790664	2.0E-04	PPRTV	6.0E-04	PPRTV				
463569	~Thiocyanic Acid	463-56-9	2.0E-04	SCREEN	6.0E-04	SCREEN				
557211	~Zinc Cyanide	557-21-1	5.0E-02	IRIS	5.0E-02	HEAST				
	Cyanides									
1861321	Chlorthal-dimethyl	1861-32-1	1.0E-02	IRIS	1.0E-02	HEAST				
75990	Dalapon	75-99-0	3.0E-02	IRIS	3.0E-02	HEAST				
72548	DDD, p,p`- (DDD)	72-54-8	3.0E-05	SCREEN	3.0E-05	SCREEN				
72559	DDE, p,p'-	72-55-9	3.0E-04	SCREEN	3.0E-04	PPRTV				
50293	DDT	50-29-3	5.0E-04	IRIS	5.0E-04	ATSDR				
1163195	Decabromodiphenyl ether, 2,2',3,3	1163-19-5	7.0E-03	IRIS	2.0E-04	ATSDR				
124185	Decane	124-18-5			1.0E+00	SCREEN				
333415	Diazinon	333-41-5	7.0E-04	ATSDR	2.0E-03	ATSDR			1.0E-02	ATSDR
96128	Dibromo-3-chloropropane, 1,2-	96-12-8	2.0E-04	PPRTV	2.0E-03	PPRTV	2.0E-04	IRIS	2.0E-03	PPRTV
108361	Dibromobenzene, 1,3-	108-36-1	4.0E-04	SCREEN	4.0E-03	SCREEN				
106376	Dibromobenzene, 1,4-	106-37-6	1.0E-02	IRIS	1.0E-01	HEAST				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
				Subchronic Toxicity with Chronic Values for Comparison							
	Contaminant			Oral				Inhalation			
CAS No. (Trimmed)	Analyte	CAS No.		RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
124481	Dibromochloromethane	124-48-1		2.0E-02	IRIS	7.0E-02	PPRTV				
106934	Dibromoethane, 1,2-	106-93-4		9.0E-03	IRIS			9.0E-03	IRIS	2.0E-03	HEAST
74953	Dibromomethane (Methylene Bron	74-95-3				9.0E-03	PPRTV	4.0E-03	SCREEN	4.0E-02	SCREEN
E1790660	Dibutyltin Compounds	E1790660		3.0E-04	PPRTV	3.0E-04	PPRTV				
683181	Dibutyltin dichloride	683-18-1				5.0E-03	ATSDR				
1918009	Dicamba	1918-00-9		3.0E-02	IRIS	3.0E-02	HEAST				
95501	Dichlorobenzene, 1,2-	95-50-1		9.0E-02	IRIS	6.0E-01	ATSDR	2.0E-01	HEAST	2.0E+00	HEAST
541731	Dichlorobenzene, 1,3-	541-73-1				2.0E-02	ATSDR				
106467	Dichlorobenzene, 1,4-	106-46-7		7.0E-02	ATSDR	7.0E-02	ATSDR	8.0E-01	IRIS	1.2E+00	ATSDR
90982	Dichlorobenzophenone, 4,4'-	90-98-2		9.0E-03	SCREEN	9.0E-02	SCREEN				
328847	Dichlorobenzotrifluoride, 3,4-	328-84-7				5.0E-02	SCREEN				
75718	Dichlorodifluoromethane	75-71-8		2.0E-01	IRIS	5.0E-02	SCREEN	1.0E-01	SCREEN	1.0E+00	PPRTV
39638329	Dichlorodiisopropyl ether, 2,2'-	39638-32-9				4.0E-02	HEAST				
75343	Dichloroethane, 1,1-	75-34-3		2.0E-01	PPRTV	2.0E+00	PPRTV				
107062	Dichloroethane, 1,2-	107-06-2		6.0E-03	SCREEN	2.0E-02	PPRTV	7.0E-03	PPRTV	7.0E-02	PPRTV
75354	Dichloroethylene, 1,1-	75-35-4		5.0E-02	IRIS	9.0E-03	HEAST	2.0E-01	IRIS	7.9E-02	ATSDR
156592	Dichloroethylene, 1,2-cis-	156-59-2		2.0E-03	IRIS	2.0E-02	PPRTV				
156605	Dichloroethylene, 1,2-trans-	156-60-5		2.0E-02	IRIS	2.0E-01	ATSDR			7.9E-01	ATSDR
120832	Dichlorophenol, 2,4-	120-83-2		3.0E-03	IRIS	2.0E-02	PPRTV				
94757	Dichlorophenoxy Acetic Acid, 2,4	94-75-7		1.0E-02	IRIS	1.0E-02	HEAST				
94826	Butanoic acid, 4-(2,4-dichlorophe	94-82-6		3.0E-02	OPP	8.0E-02	HEAST				
78875	Dichloropropane, 1,2-	78-87-5		4.0E-02	PPRTV	4.0E-02	PPRTV	4.0E-03	IRIS	3.2E-02	ATSDR
142289	Dichloropropane, 1,3-	142-28-9		2.0E-02	PPRTV	2.0E-01	PPRTV				
542756	Dichloropropene, 1,3-	542-75-6		3.0E-02	IRIS	4.0E-02	ATSDR	2.0E-02	IRIS	3.6E-02	ATSDR
62737	Dichlorvos	62-73-7		5.0E-04	IRIS	3.0E-03	ATSDR	5.0E-04	IRIS	2.7E-03	ATSDR
77736	Dicyclopentadiene	77-73-6		8.0E-02	PPRTV	2.0E-01	PPRTV	3.0E-04	SCREEN	3.0E-03	SCREEN
60571	Dieldrin	60-57-1		5.0E-05	IRIS	1.0E-04	ATSDR				
111422	Diethanolamine	111-42-2		2.0E-03	PPRTV	2.0E-02	PPRTV	2.0E-04	PPRTV	2.0E-03	PPRTV
134623	Diethyl-meta-Toluamide, N,N (DE	134-62-3				1.0E+00	ATSDR				
112345	Diethylene Glycol Monobutyl Ethe	112-34-5		3.0E-02	PPRTV	3.0E-01	PPRTV	1.0E-04	PPRTV	1.0E-03	PPRTV
111900	Diethylene Glycol Monoethyl Ethe	111-90-0		6.0E-02	PPRTV	6.0E-01	PPRTV	3.0E-04	PPRTV	3.0E-03	PPRTV
617845	Diethylformamide	617-84-5		1.0E-03	PPRTV	1.0E-03	PPRTV				
420451	Difluoropropane, 2,2-	420-45-1						3.0E+01	SCREEN	3.0E+01	SCREEN
108203	Diisopropyl Ether	108-20-3						7.0E-01	PPRTV	7.0E-01	PPRTV
1445756	Diisopropyl Methylphosphonate	1445-75-6		8.0E-02	IRIS	1.0E+00	PPRTV				
60515	Dimethoate	60-51-5		2.2E-03	OPP	2.0E-04	HEAST				
119904	Dimethoxybenzidine, 3,3'-	119-90-4				1.0E-03	SCREEN				
756796	Dimethyl methylphosphonate	756-79-6		6.0E-02	PPRTV	6.0E-02	PPRTV				
95681	Dimethylaniline, 2,4-	95-68-1		2.0E-03	SCREEN	2.0E-03	SCREEN				
121697	Dimethylaniline, N,N-	121-69-7		2.0E-03	IRIS	2.0E-03	PPRTV				
68122	Dimethylformamide	68-12-2		1.0E-01	PPRTV	3.0E-01	PPRTV	3.0E-02	IRIS	7.0E-02	PPRTV
57147	Dimethylhydrazine, 1,1-	57-14-7		1.0E-04	SCREEN			2.0E-06	SCREEN	8.0E-06	PPRTV
540738	Dimethylhydrazine, 1,2-	540-73-8				8.0E-04	ATSDR				
105679	Dimethylphenol, 2,4-	105-67-9		2.0E-02	IRIS	5.0E-02	PPRTV				
576261	Dimethylphenol, 2,6-	576-26-1		6.0E-04	IRIS	6.0E-03	HEAST				
95658	Dimethylphenol, 3,4-	95-65-8		1.0E-03	IRIS	1.0E-02	HEAST				
534521	Dinitro-o-cresol, 4,6-	534-52-1		8.0E-05	SCREEN	8.0E-04	PPRTV				
528290	Dinitrobenzene, 1,2-	528-29-0		1.0E-04	PPRTV	1.0E-03	PPRTV				
99650	Dinitrobenzene, 1,3-	99-65-0		1.0E-04	IRIS	5.0E-04	ATSDR				
100254	Dinitrobenzene, 1,4-	100-25-4		1.0E-04	PPRTV	1.0E-03	PPRTV				
51285	Dinitrophenol, 2,4-	51-28-5		2.0E-03	IRIS	2.0E-02	PPRTV				
121142	Dinitrotoluene, 2,4-	121-14-2		2.0E-03	IRIS	7.0E-03	ATSDR				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison							
	Contaminant		Oral				Inhalation			
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
606202	Dinitrotoluene, 2,6-	606-20-2	3.0E-04	SCREEN	4.0E-03	ATSDR				
25321146	Dinitrotoluene, Technical grade	25321-14-6	9.0E-04	SCREEN	5.0E-03	SCREEN				
88857	Dinoseb	88-85-7	1.0E-03	IRIS	1.0E-03	HEAST				
123911	Dioxane, 1,4-	123-91-1	3.0E-02	IRIS	5.0E-01	ATSDR	3.0E-02	IRIS	7.2E-01	ATSDR
101848	Diphenyl Ether	101-84-8					4.0E-04	SCREEN	4.0E-03	SCREEN
127639	Diphenyl Sulfone	127-63-9	8.0E-04	SCREEN	8.0E-03	SCREEN				
122394	Diphenylamine	122-39-4	1.0E-01	OPP	2.0E-02	SCREEN				
298044	Disulfoton	298-04-4	4.0E-05	IRIS	9.0E-05	ATSDR			2.0E-04	ATSDR
3648202	Diundecyl Phthalate	3648-20-2			3.0E-02	PPRTV				
1746016	~TCDD, 2,3,7,8-	1746-01-6	7.0E-10	IRIS	2.0E-08	ATSDR	4.0E-08	CALEPA		
	Dioxins									
115297	Endosulfan	115-29-7	6.0E-03	IRIS	5.0E-03	ATSDR				
1031078	Endosulfan Sulfate	1031-07-8	6.0E-03	PPRTV	3.0E-03	SCREEN				
145733	Endothall	145-73-3	2.0E-02	IRIS	2.0E-02	HEAST				
72208	Endrin	72-20-8	3.0E-04	IRIS	3.0E-04	HEAST				
106898	Epichlorohydrin	106-89-8	6.0E-03	PPRTV	6.0E-03	PPRTV	1.0E-03	IRIS	1.0E-02	PPRTV
759944	EPTC	759-94-4	5.0E-02	OPP	2.5E-02	HEAST				
111773	Ethanol, 2-(2-methoxyethoxy)-	111-77-3	4.0E-02	PPRTV	4.0E-02	PPRTV				
563122	Ethion	563-12-2	5.0E-04	IRIS	2.0E-03	ATSDR				
111159	Ethoxyethanol Acetate, 2-	111-15-9	1.0E-01	PPRTV	1.0E+00	PPRTV	6.0E-02	PPRTV	6.0E-02	PPRTV
110805	Ethoxyethanol, 2-	110-80-5	9.0E-02	PPRTV	1.0E-01	PPRTV	2.0E-01	IRIS	4.0E-02	PPRTV
141786	Ethyl Acetate	141-78-6	9.0E-01	IRIS	7.0E-01	PPRTV	7.0E-02	PPRTV	7.0E-01	PPRTV
140885	Ethyl Acrylate	140-88-5	5.0E-03	PPRTV	6.0E-02	SCREEN	8.0E-03	PPRTV	8.0E-03	PPRTV
75003	Ethyl Chloride (Chloroethane)	75-00-3			1.0E-01	PPRTV	1.0E+01	IRIS	4.0E+00	PPRTV
60297	Ethyl Ether	60-29-7	2.0E-01	IRIS	5.0E-01	PPRTV			3.0E+00	PPRTV
97632	Ethyl Methacrylate	97-63-2			1.0E-02	SCREEN	3.0E-01	PPRTV	3.0E+00	PPRTV
100414	Ethylbenzene	100-41-4	1.0E-01	IRIS	5.0E-02	PPRTV	1.0E+00	IRIS	9.0E+00	PPRTV
109784	Ethylene Cyanohydrin	109-78-4	7.0E-02	PPRTV	3.0E-01	PPRTV				
107153	Ethylene Diamine	107-15-3	9.0E-02	PPRTV	2.0E-01	PPRTV				
107211	Ethylene Glycol	107-21-1	2.0E+00	IRIS	8.0E-01	ATSDR	4.0E-01	CALEPA		
111762	Ethylene Glycol Monobutyl Ether	111-76-2	1.0E-01	IRIS	7.0E-02	ATSDR	1.6E+00	IRIS	1.5E+01	ATSDR
75218	Ethylene Oxide	75-21-8					3.0E-02	CALEPA	1.6E-01	ATSDR
96457	Ethylene Thiourea	96-45-7	8.0E-05	IRIS	8.0E-05	HEAST				
7782414	Fluorine (Soluble Fluoride)	7782-41-4	6.0E-02	IRIS	6.0E-02	HEAST	1.3E-02	CALEPA		
462066	Fluorobenzene	462-06-6							3.0E-02	SCREEN
59756604	Fluridone	59756-60-4	8.0E-02	IRIS	8.0E-02	HEAST				
133073	Folpet	133-07-3	9.0E-02	OPP	1.0E-01	HEAST				
50000	Formaldehyde	50-00-0	2.0E-01	IRIS	3.0E-01	ATSDR	9.8E-03	ATSDR	3.7E-02	ATSDR
64186	Formic Acid	64-18-6	9.0E-01	PPRTV	9.0E-01	PPRTV	3.0E-04	SCREEN	9.0E-04	PPRTV
98011	Furfural	98-01-1	3.0E-03	IRIS	3.0E-02	HEAST	5.0E-02	HEAST	5.0E-01	HEAST
132649	~Dibenzofuran	132-64-9	1.0E-03	SCREEN	4.0E-03	PPRTV				
110009	~Furan	110-00-9	1.0E-03	IRIS	1.0E-02	HEAST				
57117314	~PeCDF, 2,3,4,7,8-	57117-31-4	2.3E-09	WHO/TEF	3.0E-08	ATSDR	1.3E-07	WHO/TEF		
	Furans									
7440542	Gadolinium	7440-54-2			4.0E-02	SCREEN				
111308	Glutaraldehyde	111-30-8	1.0E-01	ATSDR			8.0E-05	CALEPA	1.2E-04	ATSDR
765344	Glycidyl	765-34-4	4.0E-04	IRIS	4.0E-03	HEAST	1.0E-03	HEAST	1.0E-02	HEAST
50011	Guanidine Chloride	50-01-1	2.0E-02	PPRTV	2.0E-02	PPRTV				
113008	Guanidine	113-00-8	1.0E-02	SCREEN	1.0E-02	SCREEN				
506934	Guanidine Nitrate	506-93-4	3.0E-02	SCREEN	3.0E-02	SCREEN				
86500	Azinphos-methyl	86-50-0	3.0E-03	ATSDR	3.0E-03	ATSDR	1.0E-02	ATSDR	1.0E-02	ATSDR
76448	Heptachlor	76-44-8	5.0E-04	IRIS	1.0E-04	ATSDR				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11
	Subchronic Toxicity with Chronic Values for Comparison									
	Contaminant		Oral				Inhalation			
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m^3)	RfCReference	$SRfC_i$ (mg/m^3)	SRfCReference
1024573	Heptachlor Epoxide	1024-57-3	1.3E-05	IRIS	1.3E-05	HEAST				
111717	Heptanal, n-	111-71-7					3.0E-03	SCREEN	3.0E-02	SCREEN
142825	Heptane, N-	142-82-5	3.0E-04	SCREEN	3.0E-03	SCREEN	4.0E-01	PPRTV	4.0E+00	PPRTV
87821	Hexabromobenzene	87-82-1	2.0E-03	IRIS	2.0E-02	HEAST				
118741	Hexachlorobenzene	118-74-1	8.0E-04	IRIS	1.0E-05	PPRTV				
87683	Hexachlorobutadiene	87-68-3	1.0E-03	PPRTV	1.0E-03	PPRTV				
319857	Hexachlorocyclohexane, Beta-	319-85-7			6.0E-04	ATSDR				
58899	Hexachlorocyclohexane, Gamma-	58-89-9	3.0E-04	IRIS	1.0E-05	ATSDR				
77474	Hexachlorocyclopentadiene	77-47-4	6.0E-03	IRIS	1.0E-01	ATSDR	2.0E-04	IRIS	1.1E-01	ATSDR
67721	Hexachloroethane	67-72-1	7.0E-04	IRIS	1.0E-02	ATSDR	3.0E-02	IRIS	5.8E+01	ATSDR
70304	Hexachlorophene	70-30-4	3.0E-04	IRIS	3.0E-03	HEAST				
121824	Hexahydro-1,3,5-trinitro-1,3,5-triazi	121-82-4	4.0E-03	IRIS	1.0E-01	ATSDR				
822060	Hexamethylene Diisocyanate, 1,6	822-06-0					1.0E-05	IRIS	2.1E-04	ATSDR
680319	Hexamethylphosphoramide	680-31-9	4.0E-04	PPRTV	4.0E-03	PPRTV				
110543	Hexane, N-	110-54-3			3.0E-01	PPRTV	7.0E-01	IRIS	2.0E+00	PPRTV
124049	Hexanedioic Acid	124-04-9	2.0E+00	PPRTV	2.0E+00	PPRTV				
104767	Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexa	104-76-7	7.0E-02	PPRTV	7.0E-02	PPRTV	4.0E-04	PPRTV	4.0E-03	PPRTV
302012	Hydrazine	302-01-2			9.0E-04	SCREEN	3.0E-05	PPRTV	9.0E-05	PPRTV
7783064	Hydrogen Sulfide	7783-06-4			3.0E-02	HEAST	2.0E-03	IRIS	2.8E-02	ATSDR
123319	Hydroquinone	123-31-9	4.0E-02	PPRTV	4.0E-01	PPRTV				
7439896	Iron	7439-89-6	7.0E-01	PPRTV	7.0E-01	PPRTV				
78831	Isobutyl Alcohol	78-83-1	3.0E-01	IRIS	3.0E+00	HEAST				
78591	Isophorone	78-59-1	2.0E-01	IRIS	3.0E+00	ATSDR	2.0E+00	CALEPA		
33820530	Isopropalin	33820-53-0	1.5E-02	IRIS	1.5E-01	HEAST				
67630	Isopropanol	67-63-0	2.0E+00	PPRTV	2.0E+00	PPRTV	2.0E-01	PPRTV	7.0E+00	PPRTV
50815004	JP-4	50815-00-4							9.0E+00	ATSDR
E1833915	JP-5	E1833915							2.0E+00	ATSDR
E1833916	JP-8	E1833916			3.0E-01	ATSDR			3.0E+00	ATSDR
23950585	Pronamide	23950-58-5	7.5E-02	IRIS	7.5E-02	HEAST				
8008206	Kerosene	8008-20-6							1.0E-02	ATSDR
78977	Lactonitrile	78-97-7	2.0E-04	SCREEN	2.0E-03	SCREEN				
7439910	Lanthanum	7439-91-0	5.0E-05	PPRTV	5.0E-05	PPRTV				
100587904	Lanthanum Acetate Hydrate	100587-90-4	2.1E-05	PPRTV	2.1E-05	PPRTV				
10025840	Lanthanum Chloride Heptahydrate	10025-84-0	1.9E-05	PPRTV	1.9E-05	PPRTV				
10099588	Lanthanum Chloride, Anhydrous	10099-58-8	2.8E-05	PPRTV	2.8E-05	PPRTV				
10277437	Lanthanum Nitrate Hexahydrate	10277-43-7	1.6E-05	PPRTV	1.6E-05	PPRTV				
541253	Lewisite	541-25-3	5.0E-06	PPRTV	5.0E-06	PPRTV				
330552	Linuron	330-55-2	7.7E-03	OPP	2.0E-03	HEAST				
7439932	Lithium	7439-93-2	2.0E-03	PPRTV	2.0E-03	PPRTV				
7439943	Lutetium	7439-94-3			4.0E-01	PPRTV				
121755	Malathion	121-75-5	2.0E-02	IRIS	2.0E-02	ATSDR			2.0E-02	ATSDR
108316	Maleic Anhydride	108-31-6	1.0E-01	IRIS	1.0E-01	HEAST	7.0E-04	CALEPA		
123331	Maleic Hydrazide	123-33-1	5.0E-01	IRIS	5.0E-01	HEAST				
109773	Malononitrile	109-77-3	1.0E-04	PPRTV	1.0E-03	PPRTV				
8018017	Mancozeb	8018-01-7	3.0E-02	HEAST	3.0E-02	HEAST				
12427382	Maneb	12427-38-2	5.0E-03	IRIS	5.0E-02	HEAST				
7439965	Manganese (Diet)	7439-96-5	1.4E-01	IRIS	1.4E-01	HEAST	5.0E-05	IRIS		
94746	MCPA	94-74-6	5.0E-04	IRIS	5.0E-04	HEAST				
94815	MCPB	94-81-5	4.4E-03	OPP	1.0E-01	HEAST				
93652	MCPP	93-65-2	1.0E-03	IRIS	1.0E-02	HEAST				
950107	Mephosfolan	950-10-7	9.0E-05	HEAST	9.0E-04	HEAST				
149304	Mercaptobenzothiazole, 2-	149-30-4	4.0E-03	PPRTV	4.0E-02	PPRTV				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
	Contaminant		Subchronic Toxicity with Chronic Values for Comparison								
			Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
150505	Merphos	150-50-5	3.0E-05	IRIS	3.0E-04	HEAST				
78488	Merphos Oxide	78-48-8	1.0E-04	OPP	3.0E-04	HEAST				
126987	Methacrylonitrile	126-98-7	1.0E-04	IRIS	5.0E-02	PPRTV	3.0E-02	PPRTV	3.0E-01	PPRTV
67561	Methanol	67-56-1	2.0E+00	IRIS	5.0E+00	HEAST	2.0E+01	IRIS		
16752775	Methomyl	16752-77-5	2.5E-02	IRIS	2.5E-02	HEAST				
72435	Methoxychlor	72-43-5	5.0E-03	IRIS	5.0E-03	ATSDR				
110496	Methoxyethanol Acetate, 2-	110-49-6	8.0E-03	PPRTV	3.0E-02	PPRTV	1.0E-03	PPRTV	1.0E-02	PPRTV
109864	Methoxyethanol, 2-	109-86-4	5.0E-03	PPRTV	2.0E-02	PPRTV	2.0E-02	IRIS	7.0E-03	PPRTV
79209	Methyl Acetate	79-20-9	1.0E+00	SCREEN					1.0E-01	SCREEN
96333	Methyl Acrylate	96-33-3					2.0E-02	PPRTV	2.0E-02	PPRTV
78933	Methyl Ethyl Ketone (2-Butanone)	78-93-3	6.0E-01	IRIS	2.0E+00	HEAST	5.0E+00	IRIS	1.0E+00	HEAST
60344	Methyl Hydrazine	60-34-4	1.0E-03	PPRTV	1.0E-03	PPRTV	2.0E-05	SCREEN	3.0E-04	SCREEN
108101	Methyl Isobutyl Ketone (4-methyl-2	108-10-1			8.0E-01	HEAST	3.0E+00	IRIS	8.0E-01	HEAST
80626	Methyl Methacrylate	80-62-6	1.4E+00	IRIS	8.0E-02	HEAST	7.0E-01	IRIS		
298000	Methyl Parathion	298-00-0	2.5E-04	IRIS	7.0E-04	ATSDR				
993135	Methyl Phosphonic Acid	993-13-5	6.0E-02	SCREEN	6.0E-02	SCREEN				
25013154	Methyl Styrene (Mixed Isomers)	25013-15-4	6.0E-03	HEAST	6.0E-03	HEAST	4.0E-02	HEAST	4.0E-02	HEAST
1634044	Methyl tert-Butyl Ether (MTBE)	1634-04-4			3.0E-01	ATSDR	3.0E+00	IRIS	2.5E+00	ATSDR
615452	Methyl-1,4-benzenediamine dihydr	615-45-2	3.0E-04	SCREEN	3.0E-03	SCREEN				
108112	Methyl-2-Pentanol, 4-	108-11-2					3.0E+00	SCREEN	3.0E+00	SCREEN
124583	Methylarsonic acid	124-58-3	1.0E-02	ATSDR	1.0E-01	ATSDR				
74612127	Methylbenzene,1-4-diamine mono	74612-12-7	2.0E-04	SCREEN	2.0E-03	SCREEN				
615509	Methylbenzene-1,4-diamine sulfat	615-50-9	3.0E-04	SCREEN	3.0E-03	SCREEN				
96377	Methylcyclopentane	96-37-7			4.0E-01	PPRTV				
75092	Methylene Chloride	75-09-2	6.0E-03	IRIS	6.0E-02	HEAST	6.0E-01	IRIS	1.0E+00	ATSDR
101144	Methylene-bis(2-chloroaniline), 4,4	101-14-4	2.0E-03	PPRTV	2.0E-03	PPRTV				
101779	Methylenebisbenzenamine, 4,4'-	101-77-9			8.0E-02	ATSDR	2.0E-02	CALEPA		
101688	Methylenediphenyl Diisocyanate	101-68-8					6.0E-04	IRIS	2.0E-05	HEAST
98839	Methylstyrene, Alpha-	98-83-9	7.0E-02	HEAST	7.0E-01	HEAST				
51218452	Metolachlor	51218-45-2	1.5E-01	IRIS	1.5E-01	HEAST				
8012951	Mineral oils	8012-95-1	3.0E+00	PPRTV	3.0E+01	PPRTV				
2385855	Mirex	2385-85-5	2.0E-04	IRIS	2.0E-04	HEAST				
2212671	Molinate	2212-67-1	2.0E-03	IRIS	2.0E-03	HEAST				
7439987	Molybdenum	7439-98-7	5.0E-03	IRIS	5.0E-03	HEAST				
E1790662	Monobutyltin Compounds	E1790662							4.0E-04	PPRTV
10599903	Monochloramine	10599-90-3	1.0E-01	IRIS	1.0E-01	HEAST				
100618	Monomethylaniline	100-61-8	2.0E-03	PPRTV	2.0E-02	PPRTV				
7487947	~Mercuric Chloride (and other Mer	7487-94-7	3.0E-04	IRIS	2.0E-03	ATSDR	3.0E-04	SURROGATE		
7439976	~Mercury (elemental)	7439-97-6					3.0E-04	IRIS	3.0E-04	HEAST
22967926	~Methyl Mercury	22967-92-6	1.0E-04	IRIS	1.5E+00	HEAST				
62384	~Phenylmercuric Acetate	62-38-4	8.0E-05	IRIS	8.0E-05	HEAST				
	Mercury Compounds									
74317	N,N'-Diphenyl-1,4-benzenediamin	74-31-7	3.0E-04	SCREEN	3.0E-04	SCREEN				
64742956	Naphtha, High Flash Aromatic (HI	64742-95-6	3.0E-02	SCREEN	3.0E-01	SCREEN	1.0E-01	PPRTV	1.0E+00	PPRTV
10024938	Neodymium Chloride (Stable, Nor	10024-93-8			8.0E-01	PPRTV				
7440020	Nickel Soluble Salts	7440-02-0	2.0E-02	IRIS	2.0E-02	HEAST	9.0E-05	ATSDR	2.0E-04	ATSDR
14797558	Nitrate (measured as nitrogen)	14797-55-8	1.6E+00	IRIS	4.0E+00	ATSDR				
14797650	Nitrite (measured as nitrogen)	14797-65-0	1.0E-01	IRIS	1.0E-01	ATSDR				
88744	Nitroaniline, 2-	88-74-4	1.0E-02	SCREEN	1.0E-01	SCREEN	5.0E-05	SCREEN	4.0E-04	PPRTV
99092	Nitroaniline, 3-	99-09-2			1.0E-03	SCREEN				
100016	Nitroaniline, 4-	100-01-6	4.0E-03	PPRTV	1.0E-02	PPRTV	6.0E-03	PPRTV	2.0E-02	PPRTV
98953	Nitrobenzene	98-95-3	2.0E-03	IRIS	5.0E-03	HEAST	9.0E-03	IRIS	2.0E-02	HEAST

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11
	Contaminant		Subchronic Toxicity with Chronic Values for Comparison								
			Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
9004700	Nitrocellulose	9004-70-0	3.0E+03	PPRTV	3.0E+03	PPRTV				
67209	Nitrofurantoin	67-20-9	7.0E-02	HEAST	7.0E-01	HEAST				
55630	Nitroglycerin	55-63-0	1.0E-04	PPRTV	1.0E-04	PPRTV				
556887	Nitroguanidine	556-88-7	1.0E-01	IRIS	1.0E-01	PPRTV				
75525	Nitromethane	75-52-5					5.0E-03	PPRTV	4.0E-03	PPRTV
88755	Nitrophenol, 2-	88-75-5							5.0E-04	PPRTV
79469	Nitropropane, 2-	79-46-9			1.0E-03	SCREEN	2.0E-02	IRIS	7.0E-02	PPRTV
62759	Nitrosodimethylamine, N-	62-75-9	8.0E-06	PPRTV	8.0E-06	PPRTV	4.0E-05	SCREEN		
99081	Nitrotoluene, m-	99-08-1	1.0E-04	SCREEN	1.0E-03	PPRTV				
88722	Nitrotoluene, o-	88-72-2	9.0E-04	PPRTV	1.0E-02	PPRTV				
99990	Nitrotoluene, p-	99-99-0	4.0E-03	PPRTV	4.0E-03	PPRTV				
111842	Nonane, n-	111-84-2	3.0E-04	SCREEN	3.0E-03	PPRTV	2.0E-02	PPRTV	2.0E-01	PPRTV
32536520	Octabromodiphenyl Ether	32536-52-0	3.0E-03	IRIS	3.0E-06	ATSDR				
2691410	Octahydro-1,3,5,7-tetranitro-1,3,5,7	2691-41-0	5.0E-02	IRIS	5.0E-02	ATSDR				
152169	Octamethylpyrophosphoramide	152-16-9	2.0E-03	HEAST	2.0E-03	HEAST				
56382	Parathion	56-38-2	6.0E-03	HEAST	9.0E-03	ATSDR			2.0E-05	ATSDR
1114712	Pebulate	1114-71-2	5.0E-02	HEAST	5.0E-02	HEAST				
40487421	Pendimethalin	40487-42-1	3.0E-01	OPP	4.0E-02	HEAST				
32534819	Pentabromodiphenyl Ether	32534-81-9	2.0E-03	IRIS	2.0E-02	HEAST			6.0E-03	ATSDR
608935	Pentachlorobenzene	608-93-5	8.0E-04	IRIS	8.0E-03	HEAST				
82688	Pentachloronitrobenzene	82-68-8	3.0E-03	IRIS	3.0E-03	HEAST				
87865	Pentachlorophenol	87-86-5	5.0E-03	IRIS	1.0E-03	ATSDR				
78115	Pentaerythritol tetranitrate (PETN)	78-11-5	2.0E-03	PPRTV	2.0E-03	PPRTV				
109660	Pentane, n-	109-66-0					1.0E+00	PPRTV	1.0E+01	PPRTV
45187153	Perfluorobutanesulfonate	45187-15-3	2.0E-02	PPRTV	2.0E-01	PPRTV				
52645531	Permethrin	52645-53-1	5.0E-02	IRIS	2.0E-01	ATSDR				
108952	Phenol	108-95-2	3.0E-01	IRIS	6.0E-01	HEAST	2.0E-01	CALEPA		
92842	Phenothiazine	92-84-2	5.0E-04	SCREEN	5.0E-03	SCREEN				
103720	Phenyl Isothiocyanate	103-72-0	2.0E-04	SCREEN	2.0E-03	PPRTV				
108452	Phenylenediamine, m-	108-45-2	6.0E-03	IRIS	6.0E-02	HEAST				
106503	Phenylenediamine, p-	106-50-3	1.0E-03	SCREEN	1.0E-02	SCREEN				
298022	Phorate	298-02-2	2.0E-04	HEAST	2.0E-04	HEAST				
7803512	Phosphine	7803-51-2	3.0E-04	IRIS	3.0E-04	HEAST	3.0E-04	IRIS	3.0E-03	HEAST
7664382	Phosphoric Acid	7664-38-2	4.9E+01	PPRTV	4.9E+01	PPRTV	1.0E-02	IRIS		
7723140	Phosphorus, White	7723-14-0	2.0E-05	IRIS	2.0E-04	ATSDR				
88891	Picric Acid (2,4,6-Trinitrophenol)	88-89-1	9.0E-04	SCREEN	1.0E-02	PPRTV				
59536651	Polybrominated Biphenyls	59536-65-1	7.0E-06	HEAST	7.0E-05	HEAST				
29420493	Potassium Perfluorobutane Sulfo	29420-49-3	2.0E-02	PPRTV	2.0E-01	PPRTV				
10361792	Praseodymium Chloride (Stable, I	10361-79-2			8.0E-01	PPRTV				
26399360	Profluralin	26399-36-0	6.0E-03	HEAST	6.0E-03	HEAST				
1918167	Propachlor	1918-16-7	1.3E-02	IRIS	1.3E-01	HEAST				
139402	Propazine	139-40-2	2.0E-02	IRIS	2.0E-02	HEAST				
103651	Propyl benzene	103-65-1	1.0E-01	SCREEN	1.0E-01	SCREEN	1.0E+00	SCREEN	1.0E+00	SCREEN
57556	Propylene Glycol	57-55-6	2.0E+01	PPRTV	2.0E+01	PPRTV			2.8E-02	ATSDR
107982	Propylene Glycol Monomethyl Eth	107-98-2	7.0E-01	HEAST	7.0E+00	HEAST	2.0E+00	IRIS		
6423434	Propylene Glycol Dinitrate	6423-43-4					2.7E-04	ATSDR	2.7E-04	ATSDR
75569	Propylene Oxide	75-56-9					3.0E-02	IRIS	3.0E-02	HEAST
110861	Pyridine	110-86-1	1.0E-03	IRIS	1.0E-02	HEAST				
375735	Perfluorobutane sulfonic acid (PF	375-73-5	2.0E-02	PPRTV	2.0E-01	PPRTV				
13776880	~Aluminum metaphosphate	13776-88-0	4.9E+01	PPRTV	4.9E+01	PPRTV				
68333799	~Ammonium polyphosphate	68333-79-9	4.9E+01	PPRTV	4.9E+01	PPRTV				
7790763	~Calcium pyrophosphate	7790-76-3	4.9E+01	PPRTV	4.9E+01	PPRTV				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

	1	2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison								
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD$_o$ (mg/kg-day)	RfDReference	SRfD$_o$ (mg/kg-day)	SRfDReference	RfC$_i$ (mg/m^3)	RfCReference	SRfC$_i$ (mg/m^3)	SRfCReference	
7783280	~Diammonium phosphate	7783-28-0	4.9E+01	PPRTV	4.9E+01	PPRTV					
7757939	~Dicalcium phosphate	7757-93-9	4.9E+01	PPRTV	4.9E+01	PPRTV					
7782754	~Dimagnesium phosphate	7782-75-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
7758114	~Dipotassium phosphate	7758-11-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
7558794	~Disodium phosphate	7558-79-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
13530502	~Monoaluminum phosphate	13530-50-2	4.9E+01	PPRTV	4.9E+01	PPRTV					
7722761	~Monoammonium phosphate	7722-76-1	4.9E+01	PPRTV	4.9E+01	PPRTV					
7758238	~Monocalcium phosphate	7758-23-8	4.9E+01	PPRTV	4.9E+01	PPRTV					
7757860	~Monomagnesium phosphate	7757-86-0	4.9E+01	PPRTV	4.9E+01	PPRTV					
7778770	~Monopotassium phosphate	7778-77-0	4.9E+01	PPRTV	4.9E+01	PPRTV					
7558807	~Monosodium phosphate	7558-80-7	4.9E+01	PPRTV	4.9E+01	PPRTV					
8017161	~Polyphosphoric acid	8017-16-1	4.9E+01	PPRTV	4.9E+01	PPRTV					
13845368	~Potassium tripolyphosphate	13845-36-8	4.9E+01	PPRTV	4.9E+01	PPRTV					
7758169	~Sodium acid pyrophosphate	7758-16-9	4.9E+01	PPRTV	4.9E+01	PPRTV					
7785888	~Sodium aluminum phosphate (a	7785-88-8	4.9E+01	PPRTV	4.9E+01	PPRTV					
10279591	~Sodium aluminum phosphate (a	10279-59-1	4.9E+01	PPRTV	4.9E+01	PPRTV					
10305767	~Sodium aluminum phosphate (te	10305-76-7	4.9E+01	PPRTV	4.9E+01	PPRTV					
10124568	~Sodium hexametaphosphate	10124-56-8	4.9E+01	PPRTV	4.9E+01	PPRTV					
68915311	~Sodium polyphosphate	68915-31-1	4.9E+01	PPRTV	4.9E+01	PPRTV					
7785844	~Sodium trimetaphosphate	7785-84-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
7758294	~Sodium tripolyphosphate	7758-29-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
7320345	~Tetrapotassium phosphate	7320-34-5	4.9E+01	PPRTV	4.9E+01	PPRTV					
7722885	~Tetrasodium pyrophosphate	7722-88-5	4.9E+01	PPRTV	4.9E+01	PPRTV					
15136875	~Trialuminum sodium tetra decal	15136-87-5	4.9E+01	PPRTV	4.9E+01	PPRTV					
7758874	~Tricalcium phosphate	7758-87-4	4.9E+01	PPRTV	4.9E+01	PPRTV					
7757871	~Trimagnesium phosphate	7757-87-1	4.9E+01	PPRTV	4.9E+01	PPRTV					
7778532	~Tripotassium phosphate	7778-53-2	4.9E+01	PPRTV	4.9E+01	PPRTV					
7601549	~Trisodium phosphate	7601-54-9	4.9E+01	PPRTV	4.9E+01	PPRTV					
	Phosphates, Inorganic										
117817	~Bis(2-ethylhexyl)phthalate	117-81-7	2.0E-02	IRIS	1.0E-01	ATSDR					
85687	~Butyl Benzyl Phthalate	85-68-7	2.0E-01	IRIS	2.0E+00	HEAST					
84742	~Dibutyl Phthalate	84-74-2	1.0E-01	IRIS	1.0E+00	HEAST					
84662	~Diethyl Phthalate	84-66-2	8.0E-01	IRIS	6.0E+00	ATSDR					
131113	~Dimethylphthalate	131-11-3			1.0E-01	SCREEN					
120616	~Dimethylterephthalate	120-61-6	1.0E-01	IRIS	1.0E-01	HEAST					
117840	~Octyl Phthalate, di-N-	117-84-0	1.0E-02	PPRTV	1.0E-01	PPRTV					
100210	~Phthalic Acid, P-	100-21-0	1.0E+00	HEAST	1.0E+00	HEAST					
85449	~Phthalic Anhydride	85-44-9	2.0E+00	IRIS	2.0E+00	HEAST	2.0E-02	CALEPA	1.2E-01	HEAST	
	Phthalates										
11097691	~Aroclor 1254	11097-69-1	2.0E-05	IRIS	3.0E-05	ATSDR					
11126424	~Aroclor 5460	11126-42-4	6.0E-04	SCREEN	6.0E-03	SCREEN					
	Polychlorinated Biphenyls (PCBs										
83329	~Acenaphthene	83-32-9	6.0E-02	IRIS	2.0E-01	PPRTV					
120127	~Anthracene	120-12-7	3.0E-01	IRIS	1.0E+00	PPRTV					
91587	~Chloronaphthalene, Beta-	91-58-7	8.0E-02	IRIS	2.0E-01	PPRTV					
206440	~Fluoranthene	206-44-0	4.0E-02	IRIS	1.0E-01	PPRTV					
86737	~Fluorene	86-73-7	4.0E-02	IRIS	4.0E-01	ATSDR					
91576	~Methylnaphthalene, 2-	91-57-6	4.0E-03	IRIS	4.0E-03	PPRTV					
91203	~Naphthalene	91-20-3	2.0E-02	IRIS	6.0E-01	ATSDR	3.0E-03	IRIS			
129000	~Pyrene	129-00-0	3.0E-02	IRIS	3.0E-01	PPRTV					
	Polynuclear Aromatic Hydrocarbo										
299843	Ronnel	299-84-3	5.0E-02	HEAST	5.0E-02	HEAST					

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

	1	2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison								
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m ^{3})	RfCReference	$SRfC_i$ (mg/m ^{3})	SRfCReference
7440177	Rubidium	7440-17-7			4.0E-03	SCREEN				
7791119	Rubidium Chloride	7791-11-9			5.0E-03	SCREEN				
1310823	Rubidium Hydroxide	1310-82-3			4.0E-03	SCREEN				
7790296	Rubidium Iodide	7790-29-6			9.0E-03	SCREEN				
10361827	Samarium Chloride (Stable, Nonra	10361-82-7			9.0E-01	PPRTV				
10361838	Samarium Nitrate (Stable, Nonrad	10361-83-8			4.0E-05	SCREEN				
7783008	Selenious Acid	7783-00-8	5.0E-03	IRIS	5.0E-03	HEAST				
7782492	Selenium	7782-49-2	5.0E-03	IRIS	5.0E-03	HEAST	2.0E-02	CALEPA		
7440224	Silver	7440-22-4	5.0E-03	IRIS	5.0E-03	HEAST				
122349	Simazine	122-34-9	5.0E-03	IRIS	5.0E-03	HEAST				
148185	Sodium Diethyldithiocarbamate	148-18-5	3.0E-02	IRIS	3.0E-01	HEAST				
13718268	Sodium Metavanadate	13718-26-8	1.0E-03	HEAST	1.0E-02	HEAST				
13472452	Sodium Tungstate	13472-45-2	8.0E-04	PPRTV	8.0E-03	PPRTV				
10213102	Sodium Tungstate Dihydrate	10213-10-2	8.0E-04	PPRTV	8.0E-03	PPRTV				
961115	Stirofos (Tetrachlorovinphos)	961-11-5	3.0E-02	IRIS	3.0E-02	HEAST				
7440246	Strontium, Stable	7440-24-6	6.0E-01	IRIS	2.0E+00	ATSDR				
57249	Strychnine	57-24-9	3.0E-04	IRIS	3.0E-03	HEAST				
100425	Styrene	100-42-5	2.0E-01	IRIS			1.0E+00	IRIS	3.0E+00	HEAST
126330	Sulfolane	126-33-0	1.0E-03	PPRTV	1.0E-02	PPRTV	2.0E-03	SCREEN	2.0E-02	PPRTV
80079	Sulfonylbis(4-chlorobenzene), 1,1	80-07-9	8.0E-04	PPRTV	4.0E-03	PPRTV				
505602	Sulfur Mustard	505-60-2			7.0E-05	ATSDR			2.0E-05	ATSDR
57964393	Styrene-Acrylonitrile (SAN) Trimer	57964-39-3	3.0E-03	PPRTV	8.0E-03	PPRTV				
57964406	Styrene-Acrylonitrile (SAN) Trimer	57964-40-6	3.0E-03	PPRTV	8.0E-03	PPRTV				
21564170	TCMTB	21564-17-0	3.0E-02	HEAST	3.0E-01	HEAST				
3383968	Temephos	3383-96-8	2.0E-02	HEAST	2.0E-01	HEAST				
13071799	Terbufos	13071-79-9	2.5E-05	HEAST	2.5E-05	HEAST				
95943	Tetrachlorobenzene, 1,2,4,5-	95-94-3	3.0E-04	IRIS	3.0E-05	PPRTV				
630206	Tetrachloroethane, 1,1,1,2-	630-20-6	3.0E-02	IRIS	9.0E-02	PPRTV				
79345	Tetrachloroethane, 1,1,2,2-	79-34-5	2.0E-02	IRIS	5.0E-02	IRIS				
127184	Tetrachloroethylene	127-18-4	6.0E-03	IRIS	8.0E-03	ATSDR	4.0E-02	IRIS	4.1E-02	ATSDR
58902	Tetrachlorophenol, 2,3,4,6-	58-90-2	3.0E-02	IRIS	3.0E-01	HEAST				
5216251	Tetrachlorotoluene, p- alpha, alph	5216-25-1	6.0E-05	SCREEN	6.0E-04	SCREEN			5.0E-05	SCREEN
3689245	Tetraethyl Dithiopyrophosphate	3689-24-5	5.0E-04	IRIS	5.0E-03	HEAST				
30501430	Tetramethylcyclohexane	30501-43-0			3.0E+00	PPRTV				
479458	Tetryl (Trinitrophenylmethylnitram	479-45-8	2.0E-03	PPRTV	2.0E-02	PPRTV				
10102451	Thallium (I) Nitrate	10102-45-1	1.0E-05	SCREEN	5.0E-05	SCREEN				
7440280	Thallium (Soluble Salts)	7440-28-0	1.0E-05	SCREEN	4.0E-05	SCREEN				
563688	Thallium Acetate	563-68-8	1.0E-05	SCREEN	5.0E-05	SCREEN				
6533739	Thallium Carbonate	6533-73-9	2.0E-05	SCREEN	5.0E-05	SCREEN				
7791120	Thallium Chloride	7791-12-0	1.0E-05	SCREEN	5.0E-05	SCREEN				
7446186	Thallium Sulfate	7446-18-6	2.0E-05	SCREEN	5.0E-05	SCREEN				
111488	Thiodiglycol	111-48-8	7.0E-02	SCREEN	7.0E-01	SCREEN				
39196184	Thiofanox	39196-18-4	3.0E-04	HEAST	3.0E-04	HEAST				
137268	Thiram	137-26-8	1.5E-02	OPP	6.0E-03	HEAST				
7440315	Tin	7440-31-5	6.0E-01	HEAST	3.0E-01	ATSDR				
7550450	Titanium Tetrachloride	7550-45-0					1.0E-04	ATSDR	1.0E-02	ATSDR
108883	Toluene	108-88-3	8.0E-02	IRIS	8.0E-01	PPRTV	5.0E+00	IRIS	5.0E+00	PPRTV
95705	Toluene-2,5-diamine	95-70-5	2.0E-04	SCREEN	2.0E-03	SCREEN				
99945	Toluic Acid, p-	99-94-5	5.0E-03	PPRTV	5.0E-02	PPRTV				
95534	Toluidine, o- (Methylaniline, 2-)	95-53-4			2.0E-02	SCREEN				
106490	Toluidine, p-	106-49-0	4.0E-03	SCREEN	4.0E-03	SCREEN				
E1790670	Total Petroleum Hydrocarbons (A	E1790670	3.0E+00	PPRTV	3.0E+01	PPRTV				

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11

			Subchronic Toxicity with Chronic Values for Comparison							
	Contaminant		Oral				Inhalation			
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m^3)	RfCReference	$SRfC_i$ (mg/m^3)	SRfCReference
E1790666	Total Petroleum Hydrocarbons (A	E1790666			3.0E-01	PPRTV	6.0E-01	PPRTV	2.0E+00	PPRTV
E1790668	Total Petroleum Hydrocarbons (A	E1790668	1.0E-02	SCREEN	1.0E-01	SCREEN	1.0E-01	PPRTV	1.0E-01	PPRTV
E1790676	Total Petroleum Hydrocarbons (A	E1790676	4.0E-02	PPRTV	4.0E-01	PPRTV				
E1790672	Total Petroleum Hydrocarbons (A	E1790672	4.0E-03	PPRTV	1.0E-02	PPRTV	3.0E-02	PPRTV	8.0E-02	PPRTV
E1790674	Total Petroleum Hydrocarbons (A	E1790674	4.0E-03	PPRTV	4.0E-03	PPRTV	3.0E-03	PPRTV	1.0E+00	PPRTV
8001352	Toxaphene	8001-35-2	9.0E-05	PPRTV	3.0E-04	PPRTV				
E1841606	Toxaphene, Weathered	E1841606	3.0E-05	SCREEN	3.0E-05	SCREEN				
688733	Tri-n-butyltin	688-73-3	3.0E-04	ATSDR	3.0E-04	ATSDR				
102761	Triacetin	102-76-1	8.0E+01	SCREEN	8.0E+01	SCREEN				
2303175	Triallate	2303-17-5	2.5E-02	OPP	1.3E-02	HEAST				
615543	Tribromobenzene, 1,2,4-	615-54-3	5.0E-03	IRIS	5.0E-02	HEAST				
118796	Tribromophenol, 2,4,6-	118-79-6	9.0E-03	SCREEN	9.0E-02	PPRTV				
126738	Tributyl Phosphate	126-73-8	1.0E-02	PPRTV	3.0E-02	PPRTV				
E1790678	Tributyltin Compounds	E1790678	3.0E-04	PPRTV	3.0E-04	PPRTV				
76131	Trichloro-1,2,2-trifluoroethane, 1,1	76-13-1	3.0E+01	IRIS			5.0E+00	PPRTV	5.0E+01	PPRTV
3380345	Trichloro-2'-hydroxydiphenylether	3380-34-5			4.0E+00	HEAST				
634935	Trichloroaniline, 2,4,6-	634-93-5	3.0E-05	SCREEN	3.0E-04	PPRTV				
87616	Trichlorobenzene, 1,2,3-	87-61-6	8.0E-04	SCREEN	8.0E-03	PPRTV				
120821	Trichlorobenzene, 1,2,4-	120-82-1	1.0E-02	IRIS	9.0E-02	PPRTV	2.0E-03	PPRTV	2.0E-02	PPRTV
71556	Trichloroethane, 1,1,1-	71-55-6	2.0E+00	IRIS	7.0E+00	IRIS	5.0E+00	IRIS	5.0E+00	IRIS
79005	Trichloroethane, 1,1,2-	79-00-5	4.0E-03	IRIS	4.0E-03	PPRTV	2.0E-04	SCREEN	2.0E-03	SCREEN
79016	Trichloroethylene	79-01-6	5.0E-04	IRIS	5.0E-04	ATSDR	2.0E-03	IRIS	2.2E-03	ATSDR
75694	Trichlorofluoromethane	75-69-4	3.0E-01	IRIS					1.0E+00	PPRTV
95954	Trichlorophenol, 2,4,5-	95-95-4	1.0E-01	IRIS	3.0E-01	PPRTV				
93721	Trichlorophenoxypropionic acid, -	93-72-1	8.0E-03	IRIS	8.0E-03	HEAST				
93765	Trichlorophenoxyacetic Acid, 2,4,	93-76-5	1.0E-02	IRIS	1.0E-01	HEAST				
598776	Trichloropropane, 1,1,2-	598-77-6	5.0E-03	IRIS	1.0E-02	PPRTV				
96184	Trichloropropane, 1,2,3-	96-18-4	4.0E-03	IRIS	6.0E-02	HEAST	3.0E-04	IRIS		
96195	Trichloropropene, 1,2,3-	96-19-5	3.0E-03	SCREEN	3.0E-02	PPRTV	3.0E-04	PPRTV	3.0E-03	PPRTV
1330785	Tricresyl Phosphate (TCP)	1330-78-5	2.0E-02	ATSDR	4.0E-02	ATSDR				
112276	Triethylene Glycol	112-27-6	2.0E+00	PPRTV	2.0E+00	PPRTV				
420462	Trifluoroethane, 1,1,1-	420-46-2					2.0E+01	PPRTV	2.0E+02	PPRTV
1582098	Trifluralin	1582-09-8	7.5E-03	IRIS	7.5E-03	HEAST				
512561	Trimethyl Phosphate	512-56-1	1.0E-02	PPRTV	1.0E-02	PPRTV				
526738	Trimethylbenzene, 1,2,3-	526-73-8	1.0E-02	IRIS	4.0E-02	IRIS	6.0E-02	IRIS	2.0E-01	IRIS
95636	Trimethylbenzene, 1,2,4-	95-63-6	1.0E-02	IRIS	4.0E-02	IRIS	6.0E-02	IRIS	2.0E-01	IRIS
108678	Trimethylbenzene, 1,3,5-	108-67-8	1.0E-02	IRIS	4.0E-02	IRIS	6.0E-02	IRIS	2.0E-01	IRIS
25167708	Trimethylpentene, 2,4,4-	25167-70-8	1.0E-02	SCREEN	1.0E-01	SCREEN				
99354	Trinitrobenzene, 1,3,5-	99-35-4	3.0E-02	IRIS	5.0E-04	HEAST				
118967	Trinitrotoluene, 2,4,6-	118-96-7	5.0E-04	IRIS	5.0E-04	ATSDR				
791286	Triphenylphosphine Oxide	791-28-6	2.0E-02	PPRTV	2.0E-02	PPRTV				
13674878	Tris(1,3-Dichloro-2-propyl) Phospl	13674-87-8	2.0E-02	ATSDR	5.0E-02	ATSDR				
13674845	Tris(1-chloro-2-propyl)phosphate	13674-84-5	1.0E-02	SCREEN	1.0E-01	SCREEN				
115968	Tris(2-chloroethyl)phosphate	115-96-8	7.0E-03	PPRTV	2.0E-02	PPRTV				
78513	Trisbutoxyethyl Phosphate	78-51-3			9.0E-02	ATSDR				
7440337	Tungsten	7440-33-7	8.0E-04	PPRTV	8.0E-03	PPRTV				
7440611	Uranium	7440-61-1	2.0E-04	ATSDR	2.0E-04	ATSDR	4.0E-05	ATSDR	1.0E-04	ATSDR
1314621	Vanadium Pentoxide	1314-62-1	9.0E-03	IRIS			7.0E-06	PPRTV	1.0E-04	PPRTV
7440622	Vanadium and Compounds	7440-62-2	5.0E-03	SURROGATE	1.0E-02	ATSDR	1.0E-04	ATSDR		
1929777	Vernolate	1929-77-7	1.0E-03	IRIS	1.0E-02	HEAST				
108054	Vinyl Acetate	108-05-4	1.0E+00	HEAST	1.0E+00	HEAST	2.0E-01	IRIS	3.5E-02	ATSDR
593602	Vinyl Bromide	593-60-2					3.0E-03	IRIS	3.0E-03	HEAST

Source: USEPA RSL, Subchronic Toxicity Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

	1	2	3	4	5	6	7	8	9	10	11
			Subchronic Toxicity with Chronic Values for Comparison								
	Contaminant		Oral				Inhalation				
CAS No. (Trimmed)	Analyte	CAS No.	RfD_o (mg/kg-day)	RfDReference	$SRfD_o$ (mg/kg-day)	SRfDReference	RfC_i (mg/m^3)	RfCReference	$SRfC_i$ (mg/m^3)	SRfCReference	
75014	Vinyl Chloride	75-01-4	3.0E-03	IRIS			1.0E-01	IRIS	7.7E-02	ATSDR	
81812	Warfarin	81-81-2	3.0E-04	IRIS	3.0E-04	HEAST					
1330207	Xylenes	1330-20-7	2.0E-01	IRIS	4.0E-01	PPRTV	1.0E-01	IRIS	4.0E-01	PPRTV	
12122677	Zineb	12122-67-7	5.0E-02	IRIS	5.0E-02	HEAST					
7440677	Zirconium	7440-67-7	8.0E-05	SCREEN	8.0E-05	SCREEN					
1314847	Zinc Phosphide	1314-84-7	3.0E-04	IRIS	3.0E-03	HEAST					
7440666	Zinc and Compounds	7440-66-6	3.0E-01	IRIS	3.0E-01	ATSDR					

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant			Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
30560191	Acephate	30560-19-1	1.8E+02	PHYSPROP	2.0E-11	5.0E-13	EPI	1.7E-06	PHYSPROP	8.8E+01	PHYSPROP
75070	Acetaldehyde	75-07-0	4.4E+01	PHYSPROP	2.7E-03	6.7E-05	PHYSPROP	9.0E+02	PHYSPROP	-1.2E+02	PHYSPROP
34256821	Acetochlor	34256-82-1	2.7E+02	PHYSPROP	9.1E-07	2.2E-08	PHYSPROP	2.8E-05	PHYSPROP	1.1E+01	PubChem
67641	Acetone	67-64-1	5.8E+01	PHYSPROP	1.4E-03	3.5E-05	PHYSPROP	2.3E+02	PHYSPROP	-9.5E+01	PHYSPROP
75865	Acetone Cyanohydrin	75-86-5	8.5E+01	PHYSPROP	8.1E-08	2.0E-09	PHYSPROP	3.4E-01	PHYSPROP	-1.9E+01	PHYSPROP
75058	Acetonitrile	75-05-8	4.1E+01	PHYSPROP	1.4E-03	3.5E-05	PHYSPROP	8.9E+01	PHYSPROP	-4.4E+01	PHYSPROP
98862	Acetophenone	98-86-2	1.2E+02	PHYSPROP	4.3E-04	1.0E-05	PHYSPROP	4.0E-01	PHYSPROP	2.0E+01	PHYSPROP
53963	Acetylaminofluorene, 2-	53-96-3	2.2E+02	PHYSPROP	7.8E-09	1.9E-10	PHYSPROP	9.4E-08	PHYSPROP	1.9E+02	PHYSPROP
107028	Acrolein	107-02-8	5.6E+01	PHYSPROP	5.0E-03	1.2E-04	PHYSPROP	2.7E+02	PHYSPROP	-8.8E+01	PHYSPROP
79061	Acrylamide	79-06-1	7.1E+01	PHYSPROP	7.0E-08	1.7E-09	EPI	7.0E-03	PHYSPROP	8.5E+01	PHYSPROP
79107	Acrylic Acid	79-10-7	7.2E+01	PHYSPROP	1.5E-05	3.7E-07	EPI	4.0E+00	PHYSPROP	1.3E+01	PHYSPROP
107131	Acrylonitrile	107-13-1	5.3E+01	PHYSPROP	5.6E-03	1.4E-04	PHYSPROP	1.1E+02	PHYSPROP	-8.4E+01	PHYSPROP
111693	Adiponitrile	111-69-3	1.1E+02	PHYSPROP	4.9E-08	1.2E-09	EPI	6.8E-04	PHYSPROP	1.0E+00	PHYSPROP
15972608	Alachlor	15972-60-8	2.7E+02	PHYSPROP	3.4E-07	8.3E-09	PHYSPROP	2.2E-05	PHYSPROP	4.0E+01	PHYSPROP
116063	Aldicarb	116-06-3	1.9E+02	PHYSPROP	5.9E-08	1.4E-09	EPI	3.5E-05	PHYSPROP	9.9E+01	PHYSPROP
1646884	Aldicarb Sulfone	1646-88-4	2.2E+02	PHYSPROP	1.4E-07	3.4E-09	EPI	9.0E-05	PHYSPROP	1.4E+02	PHYSPROP
1646873	Aldicarb sulfoxide	1646-87-3	2.1E+02	PHYSPROP	4.0E-08	9.7E-10	EPI	1.0E-04	PHYSPROP	7.8E+01	EPI
309002	Aldrin	309-00-2	3.6E+02	PHYSPROP	1.8E-03	4.4E-05	PHYSPROP	1.2E-04	PHYSPROP	1.0E+02	PHYSPROP
107186	Allyl Alcohol	107-18-6	5.8E+01	PHYSPROP	2.0E-04	5.0E-06	PHYSPROP	2.6E+01	PHYSPROP	-1.3E+02	PHYSPROP
107051	Allyl Chloride	107-05-1	7.7E+01	PHYSPROP	4.5E-01	1.1E-02	EPI	3.7E+02	PHYSPROP	-1.3E+02	PHYSPROP
7429905	Aluminum	7429-90-5	2.7E+01	CRC89				0.0E+00	NIOSH	6.6E+02	CRC89
20859738	Aluminum Phosphide	20859-73-8	5.8E+01	PHYSPROP						2.6E+03	CRC89
834128	Ametryn	834-12-8	2.3E+02	PHYSPROP	9.9E-08	2.4E-09	EPI	2.7E-06	PHYSPROP	8.8E+01	PHYSPROP
92671	Aminobiphenyl, 4-	92-67-1	1.7E+02	PHYSPROP	6.0E-06	1.5E-07	PHYSPROP	1.2E-04	PHYSPROP	5.4E+01	PHYSPROP
591275	Aminophenol, m-	591-27-5	1.1E+02	PHYSPROP	8.1E-09	2.0E-10	PHYSPROP	9.6E-03	PHYSPROP	1.2E+02	PHYSPROP
95556	Aminophenol, o-	95-55-6	1.1E+02	PHYSPROP	8.1E-09	2.0E-10	PHYSPROP	9.6E-03	PHYSPROP	1.7E+02	PHYSPROP
123308	Aminophenol, p-	123-30-8	1.1E+02	PHYSPROP	1.5E-08	3.6E-10	EPI	4.0E-05	EPI	1.9E+02	PHYSPROP
33089611	Amitraz	33089-61-1	2.9E+02	PHYSPROP	4.0E-04	9.9E-06	PHYSPROP	2.0E-06	PHYSPROP	8.6E+01	PHYSPROP
7664417	Ammonia	7664-41-7	1.7E+01	PHYSPROP	6.6E-04	1.6E-05	PHYSPROP	7.5E+03	PHYSPROP	-7.8E+01	PHYSPROP
7773060	Ammonium Sulfamate	7773-06-0	1.1E+02	CRC89				0.0E+00	NIOSH	1.3E+02	CRC89
75854	Amyl Alcohol, tert-	75-85-4	8.8E+01	PHYSPROP	5.6E-04	1.4E-05	PHYSPROP	1.7E+01	PHYSPROP	-9.1E+00	PHYSPROP
62533	Aniline	62-53-3	9.3E+01	PHYSPROP	8.3E-05	2.0E-06	PHYSPROP	6.7E-01	PHYSPROP	-6.0E+00	PHYSPROP
84651	Anthraquinone, 9,10-	84-65-1	2.1E+02	PHYSPROP	9.6E-07	2.4E-08	EPI	1.2E-07	PHYSPROP	2.9E+02	PHYSPROP
7440360	Antimony (metallic)	7440-36-0	1.2E+02	CRC89				0.0E+00	NIOSH	6.3E+02	PHYSPROP
1314609	Antimony Pentoxide	1314-60-9	3.2E+02	CRC89							
1332816	Antimony Tetroxide	1332-81-6	3.1E+02	EPI							
1309644	Antimony Trioxide	1309-64-4	2.9E+02	EPI						5.7E+02	CRC89
7440382	Arsenic, Inorganic	7440-38-2	7.5E+01	CRC89						2.7E+02	CRC89
7784421	Arsine	7784-42-1	7.8E+01	PHYSPROP						-1.2E+02	PHYSPROP
1332214	Asbestos (units in fibers)	1332-21-4						0.0E+00	NIOSH		
3337711	Asulam	3337-71-1	2.3E+02	PHYSPROP	7.0E-11	1.7E-12	PHYSPROP	1.4E-06	PHYSPROP	1.4E+02	PHYSPROP
1912249	Atrazine	1912-24-9	2.2E+02	PHYSPROP	9.6E-08	2.4E-09	EPI	2.9E-07	PHYSPROP	1.7E+02	PHYSPROP
492808	Auramine	492-80-8	2.7E+02	PHYSPROP	1.5E-07	3.6E-09	PHYSPROP	1.3E-06	PHYSPROP	1.4E+02	PHYSPROP
65195553	Avermectin B1	65195-55-3	8.8E+02	PHYSPROP	5.4E-26	1.3E-27	PHYSPROP	1.5E-30	PHYSPROP	3.5E+02	EPI
86500	Azinphos-methyl	86-50-0	3.2E+02	PHYSPROP	9.8E-07	2.4E-08	EPI	1.6E-06	PHYSPROP	7.3E+01	PHYSPROP
103333	Azobenzene	103-33-3	1.8E+02	PHYSPROP	5.5E-04	1.4E-05	EPI	3.6E-04	PHYSPROP	6.8E+01	PHYSPROP
123773	Azodicarbonamide	123-77-3	1.2E+02	PHYSPROP	3.4E-11	8.2E-13	EPI	1.9E-10	PHYSPROP	2.1E+02	EPI
7440393	Barium	7440-39-3	1.4E+02	EPI						7.1E+02	PHYSPROP
1861401	Benfluralin	1861-40-1	3.4E+02	PHYSPROP	1.2E-02	2.9E-04	EPI	6.5E-05	PHYSPROP	6.6E+01	PHYSPROP
17804352	Benomyl	17804-35-2	2.9E+02	PHYSPROP	2.0E-10	4.9E-12	PHYSPROP	3.7E-09	PHYSPROP	1.4E+02	EPI
83055996	Bensulfuron-methyl	83055-99-6	4.1E+02	PHYSPROP	1.5E-13	3.8E-15	EPI	2.1E-14	PHYSPROP	1.9E+02	PHYSPROP
25057890	Bentazon	25057-89-0	2.4E+02	PHYSPROP	8.9E-08	2.2E-09	EPI	3.5E-06	PHYSPROP	1.4E+02	PHYSPROP
100527	Benzaldehyde	100-52-7	1.1E+02	PHYSPROP	1.1E-03	2.7E-05	PHYSPROP	1.3E+00	PHYSPROP	-2.6E+01	PHYSPROP
71432	Benzene	71-43-2	7.8E+01	PHYSPROP	2.3E-01	5.6E-03	PHYSPROP	9.5E+01	PHYSPROP	5.5E+00	PHYSPROP
6369591	Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	2.2E+02	EPI	8.9E-22	2.2E-23	EPI	2.9E-14	EPI	2.4E+02	EPI
108985	Benzenethiol	108-98-5	1.1E+02	PHYSPROP	1.4E-02	3.4E-04	EPI	1.9E+00	PHYSPROP	-1.5E+01	PHYSPROP
92875	Benzidine	92-87-5	1.8E+02	PHYSPROP	2.1E-09	5.2E-11	PHYSPROP	9.0E-07	PHYSPROP	1.2E+02	PHYSPROP
65850	Benzoic Acid	65-85-0	1.2E+02	PHYSPROP	1.6E-06	3.8E-08	EPI	7.0E-04	PHYSPROP	1.2E+02	PHYSPROP
98077	Benzotrichloride	98-07-7	2.0E+02	PHYSPROP	1.1E-02	2.6E-04	PHYSPROP	4.1E-01	EPI	-5.0E+00	PHYSPROP
100516	Benzyl Alcohol	100-51-6	1.1E+02	PHYSPROP	1.4E-05	3.4E-07	PHYSPROP	9.4E-02	PHYSPROP	-1.5E+01	PHYSPROP
100447	Benzyl Chloride	100-44-7	1.3E+02	PHYSPROP	1.7E-02	4.1E-04	EPI	1.2E+00	PHYSPROP	-4.5E+01	PHYSPROP
7440417	Beryllium and compounds	7440-41-7	9.0E+00	EPI				0.0E+00	NIOSH	9.9E+02	PHYSPROP
42576023	Bifenox	42576-02-3	3.4E+02	PHYSPROP	4.4E-06	1.1E-07	EPI	1.0E-07	PHYSPROP	8.5E+01	PHYSPROP
82657043	Biphenthrin	82657-04-3	4.2E+02	PHYSPROP	4.1E-05	1.0E-06	EPI	1.8E-07	PHYSPROP	6.9E+01	PHYSPROP
92524	Biphenyl, 1,1'-	92-52-4	1.5E+02	PHYSPROP	1.3E-02	3.1E-04	PHYSPROP	8.9E-03	PHYSPROP	6.9E+01	PHYSPROP
108601	Bis(2-chloro-1-methylethyl) ether	108-60-1	1.7E+02	PHYSPROP	3.0E-03	7.4E-05	EPI	5.6E-01	PHYSPROP	-9.7E+01	PHYSPROP
111911	Bis(2-chloroethoxy)methane	111-91-1	1.7E+02	PHYSPROP	1.6E-04	3.9E-06	EPI	1.3E-01	EPI	-3.2E+01	PHYSPROP
111444	Bis(2-chloroethyl)ether	111-44-4	1.4E+02	PHYSPROP	7.0E-04	1.7E-05	EPI	1.6E+00	PHYSPROP	-5.2E+01	PHYSPROP
542881	Bis(chloromethyl)ether	542-88-1	1.1E+02	PHYSPROP	1.8E-01	4.4E-03	EPI	2.9E+01	PHYSPROP	-4.2E+01	PHYSPROP
80057	Bisphenol A	80-05-7	2.3E+02	PHYSPROP	4.1E-10	1.0E-11	PHYSPROP	3.9E-07	PHYSPROP	1.5E+02	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
7440428	Boron And Borates Only	7440-42-8	1.4E+01	EPI						2.1E+03	CRC89
10294345	Boron Trichloride	10294-34-5	1.2E+02	PHYSPROP	7.5E-01	1.8E-02	PHYSPROP	1.0E+00	PHYSPROP	-1.1E+02	PHYSPROP
7637072	Boron Trifluoride	7637-07-2	6.8E+01	PHYSPROP				3.7E+04	PHYSPROP	-1.3E+02	PHYSPROP
15541454	Bromate	15541-45-4	8.0E+01	EPI							
107040	Bromo-2-chloroethane, 1-	107-04-0	1.4E+02	PHYSPROP	3.7E-02	9.1E-04	PHYSPROP	3.3E+01	PHYSPROP	-1.7E+01	PHYSPROP
1073069	Bromo-3-fluorobenzene, 1-	1073-06-9	1.8E+02	PHYSPROP	1.0E-01	2.5E-03	PHYSPROP	2.8E+00	PHYSPROP	-1.9E+01	EPI
460004	Bromo-4-fluorobenzene, 1-	460-00-4	1.8E+02	PHYSPROP	1.0E-01	2.5E-03	PHYSPROP	2.8E+00	PHYSPROP	-1.7E+01	PHYSPROP
79083	Bromoacetic acid	79-08-3	1.4E+02	PHYSPROP	2.7E-07	6.5E-09	PHYSPROP	1.2E-01	PHYSPROP	5.0E+01	PHYSPROP
108861	Bromobenzene	108-86-1	1.6E+02	PHYSPROP	1.0E-01	2.5E-03	PHYSPROP	4.2E+00	PHYSPROP	-3.1E+01	PHYSPROP
74975	Bromochloromethane	74-97-5	1.3E+02	PHYSPROP	6.0E-02	1.5E-03	EPI	1.4E+02	PHYSPROP	-8.8E+01	PHYSPROP
75274	Bromodichloromethane	75-27-4	1.6E+02	PHYSPROP	8.7E-02	2.1E-03	PHYSPROP	5.0E+01	PHYSPROP	-5.7E+01	PHYSPROP
75252	Bromoform	75-25-2	2.5E+02	PHYSPROP	2.2E-02	5.4E-04	PHYSPROP	5.4E+00	EPI	8.0E+00	PHYSPROP
74839	Bromomethane	74-83-9	9.5E+01	PHYSPROP	3.0E-01	7.3E-03	PHYSPROP	1.6E+03	PHYSPROP	-9.4E+01	PHYSPROP
2104963	Bromophos	2104-96-3	3.7E+02	PHYSPROP	8.4E-03	2.1E-04	EPI	1.3E-04	PHYSPROP	5.4E+01	PHYSPROP
106945	Bromopropane, 1-	106-94-5	1.2E+02	EPI	3.0E-01	7.3E-03	EPI	1.1E+02	EPI	-1.1E+02	EPI
1689845	Bromoxynil	1689-84-5	2.8E+02	PHYSPROP	5.4E-09	1.3E-10	EPI	4.7E-08	PHYSPROP	1.9E+02	PHYSPROP
1689992	Bromoxynil Octanoate	1689-99-2	4.0E+02	PHYSPROP	1.3E-03	3.2E-05	EPI	4.8E-06	PHYSPROP	4.6E+01	PHYSPROP
106990	Butadiene, 1,3-	106-99-0	5.4E+01	PHYSPROP	3.0E+00	7.4E-02	EPI	2.1E+03	PHYSPROP	-1.1E+02	PHYSPROP
94826	Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6	2.5E+02	PHYSPROP	9.4E-08	2.3E-09	PHYSPROP	1.1E-05	PHYSPROP	1.2E+02	PHYSPROP
71363	Butanol, N-	71-36-3	7.4E+01	PHYSPROP	3.6E-04	8.8E-06	PHYSPROP	6.7E+00	PHYSPROP	-9.0E+01	PHYSPROP
78922	Butyl alcohol, sec-	78-92-2	7.4E+01	PHYSPROP	3.7E-04	9.1E-06	PHYSPROP	1.8E+01	PHYSPROP	-1.1E+02	PHYSPROP
2008415	Butylate	2008-41-5	2.2E+02	PHYSPROP	3.5E-03	8.5E-05	EPI	1.3E-02	PHYSPROP	6.0E+01	EPI
25013165	Butylated hydroxyanisole	25013-16-5	3.6E+02	PHYSPROP	4.8E-05	1.2E-06	PHYSPROP	2.5E-03	PHYSPROP	5.1E+01	PHYSPROP
128370	Butylated hydroxytoluene	128-37-0	2.2E+02	PHYSPROP	1.7E-04	4.1E-06	PHYSPROP	5.2E-03	EPI	7.1E+01	PHYSPROP
104518	Butylbenzene, n-	104-51-8	1.3E+02	PHYSPROP	6.5E-01	1.6E-02	EPI	1.1E+00	PHYSPROP	-8.8E+01	PHYSPROP
135988	Butylbenzene, sec-	135-98-8	1.3E+02	PHYSPROP	7.2E-01	1.8E-02	EPI	1.8E+00	PHYSPROP	-8.3E+01	PHYSPROP
98066	Butylbenzene, tert-	98-06-6	1.3E+02	PHYSPROP	5.4E-01	1.3E-02	EPI	2.2E+00	PHYSPROP	-5.8E+01	PHYSPROP
75605	Cacodylic Acid	75-60-5	1.4E+02	PHYSPROP	7.4E-13	1.8E-14	PHYSPROP	1.0E-07	PHYSPROP	2.0E+02	PHYSPROP
7440439	Cadmium (Diet)	7440-43-9	1.1E+02	PHYSPROP				0.0E+00	NIOSH	3.2E+02	PHYSPROP
7440439	Cadmium (Water)	7440-43-9	1.1E+02	PHYSPROP				0.0E+00	NIOSH	3.2E+02	PHYSPROP
105602	Caprolactam	105-60-2	1.1E+02	PHYSPROP	1.0E-06	2.5E-08	PHYSPROP	1.6E-03	EPI	6.9E+01	PHYSPROP
2425061	Captafol	2425-06-1	3.5E+02	PHYSPROP	2.0E-07	4.9E-09	EPI	1.5E-08	EPI	1.6E+02	PHYSPROP
133062	Captan	133-06-2	3.0E+02	PHYSPROP	2.9E-07	7.0E-09	EPI	9.0E-08	PHYSPROP	1.8E+02	PHYSPROP
63252	Carbaryl	63-25-2	2.0E+02	PHYSPROP	1.3E-07	3.3E-09	EPI	1.4E-06	PHYSPROP	1.5E+02	PHYSPROP
1563662	Carbofuran	1563-66-2	2.2E+02	PHYSPROP	1.3E-07	3.1E-09	EPI	4.9E-06	PHYSPROP	1.5E+02	PHYSPROP
75150	Carbon Disulfide	75-15-0	7.6E+01	PHYSPROP	5.9E-01	1.4E-02	PHYSPROP	3.6E+02	PHYSPROP	-1.1E+02	PHYSPROP
56235	Carbon Tetrachloride	56-23-5	1.5E+02	PHYSPROP	1.1E+00	2.8E-02	PHYSPROP	1.2E+02	PHYSPROP	-2.3E+01	PHYSPROP
463581	Carbonyl Sulfide	463-58-1	6.0E+01	PHYSPROP	2.5E+01	6.1E-01	EPI	9.4E+03	PHYSPROP	-1.4E+02	PHYSPROP
55285148	Carbosulfan	55285-14-8	3.8E+02	PHYSPROP	2.1E-05	5.1E-07	EPI	3.1E-07	PHYSPROP	2.5E+01	PHYSPROP
5234684	Carboxin	5234-68-4	2.4E+02	PHYSPROP	1.3E-08	3.2E-10	EPI	1.5E-07	PHYSPROP	9.2E+01	PHYSPROP
1306383	Ceric oxide	1306-38-3	1.7E+02	CRC89						2.5E+03	CRC89
302170	Chloral Hydrate	302-17-0	1.7E+02	PHYSPROP	2.3E-07	5.7E-09	PHYSPROP	1.5E+01	PHYSPROP	5.7E+01	PHYSPROP
133904	Chloramben	133-90-4	2.1E+02	PHYSPROP	1.6E-09	3.9E-11	EPI	1.0E-07	PHYSPROP	2.0E+02	PHYSPROP
E701235	Chloramines, Organic	E701235									
118752	Chloranil	118-75-2	2.5E+02	PHYSPROP	1.3E-08	3.3E-10	PHYSPROP	2.3E-06	PHYSPROP	2.9E+02	PHYSPROP
12789036	Chlordane	12789-03-6	4.1E+02	PHYSPROP	2.0E-03	4.9E-05	EPI	1.0E-05	PHYSPROP	1.1E+02	EPI
143500	Chlordecone (Kepone)	143-50-0	4.9E+02	PHYSPROP	2.2E-06	5.4E-08	EPI	2.3E-07	PHYSPROP	3.5E+02	EPI
470906	Chlorfenvinphos	470-90-6	3.6E+02	PHYSPROP	1.2E-06	2.9E-08	EPI	7.5E-06	PHYSPROP	-2.0E+01	PHYSPROP
90982324	Chlorimuron, Ethyl-	90982-32-4	4.1E+02	PHYSPROP	7.4E-14	1.8E-15	EPI	4.0E-12	PHYSPROP	1.8E+02	PHYSPROP
7782505	Chlorine	7782-50-5	7.1E+01	PHYSPROP	4.8E-01	1.2E-02	PHYSPROP	5.9E+03	PHYSPROP	-1.0E+02	PHYSPROP
10049044	Chlorine Dioxide	10049-04-4	6.7E+01	EPI	1.6E+00	4.0E-02	Toxnet HSDB	7.6E+02	Toxnet HSDB	-5.9E+01	CRC89
7758192	Chlorite (Sodium Salt)	7758-19-2	9.0E+01	EPI						1.8E+02	CRC89
75683	Chloro-1,1-difluoroethane, 1-	75-68-3	1.0E+02	PHYSPROP	2.4E+00	5.9E-02	PHYSPROP	2.5E+03	PHYSPROP	-1.3E+02	PHYSPROP
126998	Chloro-1,3-butadiene, 2-	126-99-8	8.9E+01	PHYSPROP	2.3E+00	5.6E-02	PHYSPROP	2.2E+02	PHYSPROP	-1.3E+02	PHYSPROP
3165933	Chloro-2-methylaniline HCl, 4-	3165-93-3	1.8E+02	PHYSPROP	6.4E-05	1.6E-06	PHYSPROP	4.1E-02	PHYSPROP	1.6E+02	EPI
95692	Chloro-2-methylaniline, 4-	95-69-2	1.4E+02	PHYSPROP	8.1E-05	2.0E-06	PHYSPROP	4.1E-02	PHYSPROP	3.0E+01	PHYSPROP
107200	Chloroacetaldehyde, 2-	107-20-0	7.8E+01	PHYSPROP	9.8E-04	2.4E-05	PHYSPROP	6.4E+01	PHYSPROP	-1.6E+01	PHYSPROP
79118	Chloroacetic Acid	79-11-8	9.4E+01	PHYSPROP	3.8E-07	9.3E-09	PHYSPROP	6.5E-02	PHYSPROP	6.3E+01	PHYSPROP
532274	Chloroacetophenone, 2-	532-27-4	1.5E+02	PHYSPROP	1.4E-04	3.5E-06	PHYSPROP	5.4E-03	PHYSPROP	5.7E+01	PHYSPROP
106478	Chloroaniline, p-	106-47-8	1.3E+02	PHYSPROP	4.7E-05	1.2E-06	EPI	2.7E-02	PHYSPROP	7.3E+01	PHYSPROP
108907	Chlorobenzene	108-90-7	1.1E+02	PHYSPROP	1.3E-01	3.1E-03	PHYSPROP	1.2E+01	PHYSPROP	-4.5E+01	PHYSPROP
98668	Chlorobenzene sulfonic acid, p-	98-66-8	1.9E+02	PHYSPROP	7.6E-08	1.9E-09	PHYSPROP	4.3E-06	PHYSPROP	6.7E+01	PHYSPROP
510156	Chlorobenzilate	510-15-6	3.3E+02	PHYSPROP	3.0E-06	7.2E-08	EPI	2.2E-06	PHYSPROP	3.7E+01	PHYSPROP
74113	Chlorobenzoic Acid, p-	74-11-3	1.6E+02	PHYSPROP	3.3E-06	8.0E-08	PHYSPROP	2.3E-03	PHYSPROP	2.4E+02	PHYSPROP
98566	Chlorobenzotrifluoride, 4-	98-56-6	1.8E+02	PHYSPROP	1.4E+00	3.5E-02	PHYSPROP	7.6E+00	PHYSPROP	-3.3E+01	PHYSPROP
109693	Chlorobutane, 1-	109-69-3	9.3E+01	PHYSPROP	6.8E-01	1.7E-02	PHYSPROP	1.0E+02	PHYSPROP	-1.2E+02	PHYSPROP
75456	Chlorodifluoromethane	75-45-6	8.6E+01	PHYSPROP	1.7E+00	4.1E-02	PHYSPROP	7.3E+03	PHYSPROP	-1.6E+02	PHYSPROP
107073	Chloroethanol, 2-	107-07-3	8.1E+01	PHYSPROP	3.1E-05	7.6E-07	EPI	7.2E+00	PHYSPROP	-6.8E+01	PHYSPROP
67663	Chloroform	67-66-3	1.2E+02	PHYSPROP	1.5E-01	3.7E-03	PHYSPROP	2.0E+02	PHYSPROP	-6.4E+01	PHYSPROP
74873	Chloromethane	74-87-3	5.0E+01	PHYSPROP	3.6E-01	8.8E-03	PHYSPROP	4.3E+03	PHYSPROP	-9.8E+01	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
107302	Chloromethyl Methyl Ether	107-30-2	8.1E+01	PHYSPROP	1.2E-02	3.0E-04	PHYSPROP	3.0E+01	PHYSPROP	-1.0E+02	PHYSPROP
88733	Chloronitrobenzene, o-	88-73-3	1.6E+02	PHYSPROP	3.8E-04	9.3E-06	PHYSPROP	1.8E-02	EPI	3.3E+01	PHYSPROP
100005	Chloronitrobenzene, p-	100-00-5	1.6E+02	PHYSPROP	2.0E-04	4.9E-06	PHYSPROP	2.2E-02	EPI	8.4E+01	PHYSPROP
95578	Chlorophenol, 2-	95-57-8	1.3E+02	PHYSPROP	4.6E-04	1.1E-05	PHYSPROP	2.5E+00	PHYSPROP	9.8E+00	PHYSPROP
76062	Chloropicrin	76-06-2	1.6E+02	PHYSPROP	8.4E-02	2.1E-03	PHYSPROP	2.4E+01	PHYSPROP	-6.4E+01	PHYSPROP
1897456	Chlorothalonil	1897-45-6	2.7E+02	PHYSPROP	8.2E-05	2.0E-06	PHYSPROP	5.7E-07	PHYSPROP	2.5E+02	PHYSPROP
95498	Chlorotoluene, o-	95-49-8	1.3E+02	PHYSPROP	1.5E-01	3.6E-03	PHYSPROP	3.4E+00	PHYSPROP	-3.6E+01	PHYSPROP
106434	Chlorotoluene, p-	106-43-4	1.3E+02	PHYSPROP	1.8E-01	4.4E-03	EPI	2.7E+00	PHYSPROP	7.5E+00	PHYSPROP
54749905	Chlorozotocin	54749-90-5	2.7E+02	PHYSPROP	1.5E-20	3.7E-22	PHYSPROP	4.0E-14	PHYSPROP	1.5E+02	EPI
101213	Chlorpropham	101-21-3	2.1E+02	PHYSPROP	2.3E-05	5.7E-07	EPI	1.8E-04	PHYSPROP	4.1E+01	PHYSPROP
2921882	Chlorpyrifos	2921-88-2	3.5E+02	PHYSPROP	1.2E-04	2.9E-06	PHYSPROP	2.0E-05	PHYSPROP	4.2E+01	PHYSPROP
5598130	Chlorpyrifos Methyl	5598-13-0	3.2E+02	PHYSPROP	1.5E-04	3.8E-06	EPI	4.2E-05	PHYSPROP	4.3E+01	PHYSPROP
64902723	Chlorsulfuron	64902-72-3	3.6E+02	PHYSPROP	1.4E-14	3.4E-16	EPI	2.3E-11	PHYSPROP	1.8E+02	PHYSPROP
1861321	Chlorthal-dimethyl	1861-32-1	3.3E+02	PHYSPROP	8.9E-05	2.2E-06	EPI	2.5E-06	PHYSPROP	1.6E+02	PHYSPROP
60238564	Chlorthiophos	60238-56-4	3.6E+02	PHYSPROP	4.9E-05	1.2E-06	PHYSPROP	4.0E-01	PHYSPROP	8.6E+01	EPI
16065831	Chromium(III), Insoluble Salts	16065-83-1	5.2E+01	EPI							
18540299	Chromium(VI)	18540-29-9	5.2E+01	EPI							
7440473	Chromium, Total	7440-47-3	5.2E+01	PHYSPROP						1.9E+03	PHYSPROP
74115245	Clofentezine	74115-24-5	3.0E+02	PHYSPROP	1.6E-08	3.9E-10	EPI	9.8E-10	PHYSPROP	1.8E+02	PHYSPROP
7440484	Cobalt	7440-48-4	5.9E+01	EPI				0.0E+00	NIOSH	1.5E+03	CRC89
8007452	Coke Oven Emissions	8007-45-2			4.5E-01	1.1E-02	Toxnet HSDB	9.5E+01	Toxnet HSDB		
7440508	Copper	7440-50-8	6.4E+01	PHYSPROP				0.0E+00	NIOSH	1.1E+03	PHYSPROP
108394	Cresol, m-	108-39-4	1.1E+02	PHYSPROP	3.5E-05	8.6E-07	PHYSPROP	1.1E-01	PHYSPROP	1.2E+01	PHYSPROP
95487	Cresol, o-	95-48-7	1.1E+02	PHYSPROP	4.9E-05	1.2E-06	PHYSPROP	3.0E-01	EPI	3.0E+01	PHYSPROP
106445	Cresol, p-	106-44-5	1.1E+02	PHYSPROP	4.1E-05	1.0E-06	PHYSPROP	1.1E-01	PHYSPROP	3.6E+01	PHYSPROP
59507	Cresol, p-chloro-m-	59-50-7	1.4E+02	PHYSPROP	1.0E-04	2.5E-06	EPI	5.0E-02	PHYSPROP	6.7E+01	PHYSPROP
1319773	Cresols	1319-77-3	3.2E+02	PHYSPROP	2.5E-05	6.2E-07	PHYSPROP	1.7E-01	PHYSPROP	3.0E+01	EPI
123739	Crotonaldehyde, trans-	123-73-9	7.0E+01	PHYSPROP	7.9E-04	1.9E-05	PHYSPROP	3.0E+01	PHYSPROP	-7.6E+01	PHYSPROP
98828	Cumene	98-82-8	1.2E+02	PHYSPROP	4.7E-01	1.2E-02	PHYSPROP	4.5E+00	PHYSPROP	-9.6E+01	PHYSPROP
135206	Cupferron	135-20-6	1.6E+02	PHYSPROP	1.5E-07	3.6E-09	PHYSPROP	6.3E-05	PHYSPROP	1.6E+02	PHYSPROP
21725462	Cyanazine	21725-46-2	2.4E+02	PHYSPROP	1.1E-10	2.6E-12	EPI	1.4E-07	PHYSPROP	1.7E+02	PHYSPROP
	Cyanides										
592018	~Calcium Cyanide	592-01-8	9.2E+01	PHYSPROP							
544923	~Copper Cyanide	544-92-3	9.0E+01	PHYSPROP						4.7E+02	PHYSPROP
57125	~Cyanide (CN-)	57-12-5	2.6E+01	PHYSPROP	4.2E-03	1.0E-04	Ma et al 2010	3.1E+02	PHYSPROP		
460195	~Cyanogen	460-19-5	5.2E+01	PHYSPROP	2.2E-01	5.4E-03	EPI	4.3E+03	PHYSPROP	-2.8E+01	PHYSPROP
506683	~Cyanogen Bromide	506-68-3	1.1E+02	PHYSPROP	1.0E+00	2.5E-02	EPI	1.2E+02	PHYSPROP	5.2E+01	PHYSPROP
506774	~Cyanogen Chloride	506-77-4	6.1E+01	PHYSPROP	7.9E-02	1.9E-03	YAWS	1.2E+03	PHYSPROP	-6.6E+00	PHYSPROP
74908	~Hydrogen Cyanide	74-90-8	2.7E+01	PHYSPROP	5.4E-03	1.3E-04	PHYSPROP	7.4E+02	PHYSPROP	-1.3E+01	PHYSPROP
151508	~Potassium Cyanide	151-50-8	6.5E+01	PHYSPROP				0.0E+00	NIOSH	6.3E+02	PHYSPROP
506616	~Potassium Silver Cyanide	506-61-6	2.0E+02	PHYSPROP							
506649	~Silver Cyanide	506-64-9	1.3E+02	PHYSPROP						3.2E+02	PHYSPROP
143339	~Sodium Cyanide	143-33-9	4.9E+01	PHYSPROP				0.0E+00	NIOSH	5.6E+02	PHYSPROP
E1790664	~Thiocyanates	E1790664									
463569	~Thiocyanic Acid	463-56-9	5.9E+01	PHYSPROP				4.7E+00	PPRTV	5.0E+00	PPRTV
557211	~Zinc Cyanide	557-21-1	1.2E+02	PHYSPROP						8.0E+01	PERRY
110827	Cyclohexane	110-82-7	8.4E+01	PHYSPROP	6.1E+00	1.5E-01	PHYSPROP	9.7E+01	PHYSPROP	6.6E+00	PHYSPROP
87843	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	5.1E+02	PHYSPROP	3.9E-05	9.6E-07	PHYSPROP	3.5E-06	PHYSPROP	2.0E+02	CRC89
108941	Cyclohexanone	108-94-1	9.8E+01	PHYSPROP	3.7E-04	9.0E-06	PHYSPROP	4.3E+00	PHYSPROP	-3.1E+01	PHYSPROP
110838	Cyclohexene	110-83-8	8.2E+01	PHYSPROP	1.9E+00	4.6E-02	PHYSPROP	8.9E+01	PHYSPROP	-1.0E+02	PHYSPROP
108918	Cyclohexylamine	108-91-8	9.9E+01	PHYSPROP	1.7E-04	4.2E-06	PHYSPROP	1.0E+01	PHYSPROP	-1.8E+01	PHYSPROP
68359375	Cyfluthrin	68359-37-5	4.3E+02	PHYSPROP	1.2E-06	2.9E-08	EPI	1.5E-10	PHYSPROP	6.0E+01	PHYSPROP
68085858	Cyhalothrin	68085-85-8	4.5E+02	PHYSPROP	6.1E-05	1.5E-06	EPI	1.5E-09	PHYSPROP	4.9E+01	PHYSPROP
66215278	Cyromazine	66215-27-8	1.7E+02	PHYSPROP	2.3E-12	5.7E-14	EPI	3.4E-09	PHYSPROP	2.2E+02	PHYSPROP
72548	DDD, p,p`- (DDD)	72-54-8	3.2E+02	PHYSPROP	2.7E-04	6.6E-06	PHYSPROP	1.4E-06	PHYSPROP	1.1E+02	PHYSPROP
72559	DDE, p,p'-	72-55-9	3.2E+02	PHYSPROP	1.7E-03	4.2E-05	PHYSPROP	6.0E-06	EPI	8.9E+01	PHYSPROP
50293	DDT	50-29-3	3.5E+02	PHYSPROP	3.4E-04	8.3E-06	PHYSPROP	1.6E-07	PHYSPROP	1.1E+02	PHYSPROP
75990	Dalapon	75-99-0	1.4E+02	PHYSPROP	2.3E-06	5.7E-08	EPI	1.5E-01	EPI	-5.0E+00	PHYSPROP
1596845	Daminozide	1596-84-5	1.6E+02	PHYSPROP	1.7E-08	4.2E-10	EPI	2.0E-04	PHYSPROP	1.5E+02	PHYSPROP
1163195	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	9.6E+02	PHYSPROP	4.9E-07	1.2E-08	PHYSPROP	4.7E-12	PHYSPROP	3.1E+02	PHYSPROP
8065483	Demeton	8065-48-3	5.2E+02	PHYSPROP	1.6E-04	3.8E-06	PHYSPROP	3.4E-04	PHYSPROP		
103231	Di(2-ethylhexyl)adipate	103-23-1	3.7E+02	PHYSPROP	1.8E-05	4.3E-07	PHYSPROP	8.5E-07	PHYSPROP	-6.8E+01	PHYSPROP
2303164	Diallate	2303-16-4	2.7E+02	PHYSPROP	1.6E-04	3.8E-06	EPI	1.5E-04	PHYSPROP	2.5E+01	PHYSPROP
333415	Diazinon	333-41-5	3.0E+02	PHYSPROP	4.6E-06	1.1E-07	PHYSPROP	9.0E-05	PHYSPROP	8.8E+01	EPI
132650	Dibenzothiophene	132-65-0	1.8E+02	PHYSPROP	1.4E-03	3.4E-05	EPI	2.1E-04	EPI	9.7E+01	PHYSPROP
96128	Dibromo-3-chloropropane, 1,2-	96-12-8	2.4E+02	PHYSPROP	6.0E-03	1.5E-04	EPI	5.8E-01	PHYSPROP	6.0E+00	PHYSPROP
631641	Dibromoacetic acid	631-64-1	2.2E+02	PHYSPROP	1.8E-07	4.4E-09	PHYSPROP	2.3E-02	PHYSPROP	4.9E+01	PHYSPROP
108361	Dibromobenzene, 1,3-	108-36-1	2.4E+02	PHYSPROP	5.1E-02	1.2E-03	EPI	2.7E-01	PHYSPROP	-7.0E+00	PHYSPROP
106376	Dibromobenzene, 1,4-	106-37-6	2.4E+02	PHYSPROP	3.7E-02	8.9E-04	EPI	5.8E-02	PHYSPROP	8.7E+01	PHYSPROP
124481	Dibromochloromethane	124-48-1	2.1E+02	PHYSPROP	3.2E-02	7.8E-04	PHYSPROP	5.5E+00	PHYSPROP	-2.0E+01	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

	1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point		
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref	
106934	Dibromoethane, 1,2-	106-93-4	1.9E+02	PHYSPROP	2.7E-02	6.5E-04	PHYSPROP	1.1E+01	PHYSPROP	9.9E+00	PHYSPROP	
74953	Dibromomethane (Methylene Bromide)	74-95-3	1.7E+02	PHYSPROP	3.4E-02	8.2E-04	PHYSPROP	4.4E+01	PHYSPROP	-5.3E+01	PHYSPROP	
E1790660	Dibutyltin Compounds	E1790660										
1918009	Dicamba	1918-00-9	2.2E+02	PHYSPROP	8.9E-08	2.2E-09	EPI	1.3E-05	PHYSPROP	1.2E+02	PHYSPROP	
3400097	Dichloramine	3400-09-7										
764410	Dichloro-2-butene, 1,4-	764-41-0	1.3E+02	PHYSPROP	3.5E-01	8.5E-03	PHYSPROP	3.0E+00	EPI	3.5E+00	PHYSPROP	
1476115	Dichloro-2-butene, cis-1,4-	1476-11-5	1.3E+02	PHYSPROP	2.7E-02	6.6E-04	EPI	4.1E+00	PHYSPROP	-4.8E+01	PHYSPROP	
110576	Dichloro-2-butene, trans-1,4-	110-57-6	1.3E+02	PHYSPROP	2.7E-02	6.6E-04	EPI	3.4E+00	PHYSPROP	2.0E+00	PHYSPROP	
79436	Dichloroacetic Acid	79-43-6	1.3E+02	PHYSPROP	3.4E-07	8.4E-09	PHYSPROP	1.8E-01	PHYSPROP	1.4E+01	PHYSPROP	
95501	Dichlorobenzene, 1,2-	95-50-1	1.5E+02	PHYSPROP	7.8E-02	1.9E-03	PHYSPROP	1.4E+00	PHYSPROP	-1.7E+01	PHYSPROP	
106467	Dichlorobenzene, 1,4-	106-46-7	1.5E+02	PHYSPROP	9.9E-02	2.4E-03	PHYSPROP	1.7E+00	PHYSPROP	5.2E+01	PHYSPROP	
91941	Dichlorobenzidine, 3,3'-	91-94-1	2.5E+02	PHYSPROP	1.2E-09	2.8E-11	PHYSPROP	2.6E-07	PHYSPROP	1.3E+02	PHYSPROP	
90982	Dichlorobenzophenone, 4,4'-	90-98-2	2.5E+02	PHYSPROP	4.4E-05	1.1E-06	PHYSPROP	6.4E-06	PHYSPROP	1.5E+02	PHYSPROP	
75718	Dichlorodifluoromethane	75-71-8	1.2E+02	PHYSPROP	1.4E+01	3.4E-01	PHYSPROP	4.8E+03	PHYSPROP	-1.6E+02	PHYSPROP	
75343	Dichloroethane, 1,1-	75-34-3	9.9E+01	PHYSPROP	2.3E-01	5.6E-03	PHYSPROP	2.3E+02	PHYSPROP	-9.7E+01	PHYSPROP	
107062	Dichloroethane, 1,2-	107-06-2	9.9E+01	PHYSPROP	4.8E-02	1.2E-03	PHYSPROP	7.9E+01	PHYSPROP	-3.6E+01	PHYSPROP	
75354	Dichloroethylene, 1,1-	75-35-4	9.7E+01	PHYSPROP	1.1E+00	2.6E-02	PHYSPROP	6.0E+02	PHYSPROP	-1.2E+02	PHYSPROP	
156592	Dichloroethylene, 1,2-cis-	156-59-2	9.7E+01	PHYSPROP	1.7E-01	4.1E-03	PHYSPROP	2.0E+02	PHYSPROP	-8.0E+01	PHYSPROP	
156605	Dichloroethylene, 1,2-trans-	156-60-5	9.7E+01	PHYSPROP	3.8E-01	9.4E-03	PHYSPROP	3.3E+02	EPI	-5.0E+01	PHYSPROP	
120832	Dichlorophenol, 2,4-	120-83-2	1.6E+02	PHYSPROP	1.8E-04	4.3E-06	EPI	9.0E-02	PHYSPROP	4.5E+01	PHYSPROP	
94757	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	2.2E+02	PHYSPROP	1.4E-06	3.5E-08	EPI	8.3E-05	PHYSPROP	1.4E+02	PHYSPROP	
78875	Dichloropropane, 1,2-	78-87-5	1.1E+02	PHYSPROP	1.2E-01	2.8E-03	PHYSPROP	5.3E+01	PHYSPROP	-1.0E+02	PHYSPROP	
142289	Dichloropropane, 1,3-	142-28-9	1.1E+02	PHYSPROP	4.0E-02	9.8E-04	PHYSPROP	1.8E+01	PHYSPROP	-1.0E+02	PHYSPROP	
616239	Dichloropropanol, 2,3-	616-23-9	1.3E+02	PHYSPROP	1.5E-07	3.6E-09	PHYSPROP	1.8E-01	PHYSPROP	-2.5E+01	EPI	
542756	Dichloropropene, 1,3-	542-75-6	1.1E+02	PHYSPROP	1.5E-01	3.6E-03	PHYSPROP	3.4E+01	PHYSPROP	-5.0E+01	PHYSPROP	
62737	Dichlorvos	62-73-7	2.2E+02	PHYSPROP	2.3E-05	5.7E-07	EPI	1.6E-02	PHYSPROP	-6.0E+01	PHYSPROP	
141662	Dicrotophos	141-66-2	2.4E+02	PHYSPROP	2.1E-09	5.0E-11	PHYSPROP	1.6E-04	PHYSPROP	7.9E+01	EPI	
77736	Dicyclopentadiene	77-73-6	1.3E+02	PHYSPROP	2.6E+00	6.3E-02	PHYSPROP	2.3E+00	EPI	-1.0E+00	PHYSPROP	
60571	Dieldrin	60-57-1	3.8E+02	PHYSPROP	4.1E-04	1.0E-05	PHYSPROP	5.9E-06	PHYSPROP	1.8E+02	PHYSPROP	
E17136615	Diesel Engine Exhaust	E17136615										
111422	Diethanolamine	111-42-2	1.1E+02	PHYSPROP	1.6E-09	3.9E-11	EPI	2.8E-04	PHYSPROP	2.8E+01	PHYSPROP	
112345	Diethylene Glycol Monobutyl Ether	112-34-5	1.6E+02	PHYSPROP	2.9E-07	7.2E-09	PHYSPROP	2.2E-02	PHYSPROP	-6.8E+01	PHYSPROP	
111900	Diethylene Glycol Monoethyl Ether	111-90-0	1.3E+02	PHYSPROP	9.1E-07	2.2E-08	EPI	1.3E-01	PHYSPROP	-7.6E+01	PHYSPROP	
617845	Diethylformamide	617-84-5	1.0E+02	PHYSPROP	5.3E-06	1.3E-07	PHYSPROP	1.2E+00	EPI	-7.6E+00	EPI	
56531	Diethylstilbestrol	56-53-1	2.7E+02	PHYSPROP	2.4E-10	5.8E-12	PHYSPROP	1.4E-08	PHYSPROP	1.7E+02	PHYSPROP	
43222486	Difenzoquat	43222-48-6	3.6E+02	PHYSPROP				4.1E-12	PHYSPROP	1.6E+02	PHYSPROP	
35367385	Diflubenzuron	35367-38-5	3.1E+02	PHYSPROP	1.9E-07	4.6E-09	EPI	9.0E-10	PHYSPROP	2.4E+02	PHYSPROP	
75376	Difluoroethane, 1,1-	75-37-6	6.6E+01	PHYSPROP	8.3E-01	2.0E-02	PHYSPROP	4.6E+03	PHYSPROP	-1.2E+02	PHYSPROP	
420451	Difluoropropane, 2,2-	420-45-1	8.0E+01	PHYSPROP	2.1E+01	5.1E-01	PHYSPROP	1.8E+03	PHYSPROP	-1.0E+02	PHYSPROP	
94586	Dihydrosafrole	94-58-6	1.6E+02	PHYSPROP	5.0E-04	1.2E-05	PHYSPROP	5.6E-02	PHYSPROP	4.4E+01	EPI	
108203	Diisopropyl Ether	108-20-3	1.0E+02	PHYSPROP	1.0E-01	2.6E-03	PHYSPROP	1.5E+02	PHYSPROP	-8.7E+01	PHYSPROP	
1445756	Diisopropyl Methylphosphonate	1445-75-6	1.8E+02	PHYSPROP	1.8E-03	4.4E-05	EPI	2.3E-01	PHYSPROP	-2.4E+01	EPI	
55290647	Dimethipin	55290-64-7	2.1E+02	PHYSPROP	9.4E-10	2.3E-11	EPI	3.8E-07	PHYSPROP	1.7E+02	PHYSPROP	
60515	Dimethoate	60-51-5	2.3E+02	PHYSPROP	9.9E-09	2.4E-10	EPI	1.9E-05	PHYSPROP	5.2E+01	PHYSPROP	
119904	Dimethoxybenzidine, 3,3'-	119-90-4	2.4E+02	PHYSPROP	1.9E-09	4.7E-11	PHYSPROP	1.3E-07	PHYSPROP	1.4E+02	PHYSPROP	
756796	Dimethyl methylphosphonate	756-79-6	1.2E+02	PHYSPROP	5.6E-06	1.4E-07	PHYSPROP	8.3E-01	PHYSPROP	-4.8E+01	EPI	
60117	Dimethylamino azobenzene [p-]	60-11-7	2.3E+02	PHYSPROP	1.6E-08	4.0E-10	PHYSPROP	7.0E-08	EPI	1.2E+02	PHYSPROP	
21436964	Dimethylaniline HCl, 2,4-	21436-96-4	1.2E+02	PHYSPROP	9.5E-05	2.3E-06	PHYSPROP	1.8E-01	PHYSPROP	1.6E+02	EPI	
95681	Dimethylaniline, 2,4-	95-68-1	1.2E+02	PHYSPROP	1.0E-04	2.5E-06	PHYSPROP	1.3E-01	PHYSPROP	-1.4E+01	PHYSPROP	
121697	Dimethylaniline, N,N-	121-69-7	1.2E+02	PHYSPROP	2.3E-03	5.7E-05	EPI	7.0E-01	PHYSPROP	2.5E+00	PHYSPROP	
119937	Dimethylbenzidine, 3,3'-	119-93-7	2.1E+02	PHYSPROP	2.6E-09	6.3E-11	PHYSPROP	6.9E-07	PHYSPROP	1.3E+02	PHYSPROP	
68122	Dimethylformamide	68-12-2	7.3E+01	PHYSPROP	3.0E-06	7.4E-08	PHYSPROP	3.9E+00	PHYSPROP	-6.0E+01	PHYSPROP	
57147	Dimethylhydrazine, 1,1-	57-14-7	6.0E+01	PHYSPROP	5.3E-04	1.3E-05	PHYSPROP	1.6E+02	PHYSPROP	-5.8E+01	PHYSPROP	
540738	Dimethylhydrazine, 1,2-	540-73-8	6.0E+01	PHYSPROP	2.8E-06	7.0E-08	PHYSPROP	7.0E+01	PHYSPROP	-9.0E+00	PHYSPROP	
105679	Dimethylphenol, 2,4-	105-67-9	1.2E+02	PHYSPROP	3.9E-05	9.5E-07	PHYSPROP	1.0E-01	PHYSPROP	2.5E+01	PHYSPROP	
576261	Dimethylphenol, 2,6-	576-26-1	1.2E+02	PHYSPROP	2.7E-04	6.7E-06	PHYSPROP	1.7E-01	EPI	4.6E+01	PHYSPROP	
95658	Dimethylphenol, 3,4-	95-65-8	1.2E+02	PHYSPROP	1.7E-05	4.2E-07	PHYSPROP	3.6E-02	EPI	6.1E+01	PHYSPROP	
513371	Dimethylvinylchloride	513-37-1	9.1E+01	PHYSPROP	4.8E-02	1.2E-03	CRC89	2.1E+02	PHYSPROP	-1.0E+02	EPI	
534521	Dinitro-o-cresol, 4,6-	534-52-1	2.0E+02	PHYSPROP	5.7E-05	1.4E-06	PHYSPROP	1.2E-04	PHYSPROP	8.7E+01	PHYSPROP	
131895	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	2.7E+02	PHYSPROP	2.3E-06	5.5E-08	PHYSPROP	4.2E-08	PHYSPROP	1.1E+02	PHYSPROP	
528290	Dinitrobenzene, 1,2-	528-29-0	1.7E+02	PHYSPROP	2.2E-06	5.3E-08	EPI	4.6E-05	EPI	1.2E+02	PHYSPROP	
99650	Dinitrobenzene, 1,3-	99-65-0	1.7E+02	PHYSPROP	2.0E-06	4.9E-08	PHYSPROP	9.0E-04	EPI	9.0E+01	PHYSPROP	
100254	Dinitrobenzene, 1,4-	100-25-4	1.7E+02	PHYSPROP	3.4E-06	8.4E-08	PHYSPROP	2.6E-05	PHYSPROP	1.7E+02	PHYSPROP	
51285	Dinitrophenol, 2,4-	51-28-5	1.8E+02	PHYSPROP	3.5E-06	8.6E-08	PHYSPROP	3.9E-04	PHYSPROP	1.1E+02	PHYSPROP	
E1615210	Dinitrotoluene Mixture, 2,4/2,6-	E1615210	1.8E+02	EPI	1.6E-05	4.0E-07	EPI	2.2E-03	EPI	6.0E+01	EPI	
121142	Dinitrotoluene, 2,4-	121-14-2	1.8E+02	PHYSPROP	2.2E-06	5.4E-08	PHYSPROP	1.5E-04	PHYSPROP	7.1E+01	PHYSPROP	
606202	Dinitrotoluene, 2,6-	606-20-2	1.8E+02	PHYSPROP	3.1E-05	7.5E-07	EPI	5.7E-04	PHYSPROP	6.6E+01	PHYSPROP	
35572782	Dinitrotoluene, 2-Amino-4,6-	35572-78-2	2.0E+02	PHYSPROP	1.3E-09	3.3E-11	PHYSPROP	1.1E-05	PHYSPROP	1.7E+02	PHYSPROP	
19406510	Dinitrotoluene, 4-Amino-2,6-	19406-51-0	2.0E+02	PHYSPROP	1.3E-09	3.3E-11	PHYSPROP	1.1E-05	PHYSPROP	1.7E+02	PHYSPROP	
25321146	Dinitrotoluene, Technical grade	25321-14-6	5.5E+02	PHYSPROP	3.8E-06	9.3E-08	PHYSPROP	4.0E-04	PHYSPROP	6.0E+01	EPI	

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant			Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
88857	Dinoseb	88-85-7	2.4E+02	PHYSPROP	1.9E-05	4.6E-07	EPI	7.5E-05	PHYSPROP	4.0E+01	PHYSPROP
123911	Dioxane, 1,4-	123-91-1	8.8E+01	PHYSPROP	2.0E-04	4.8E-06	PHYSPROP	3.8E+01	PHYSPROP	1.2E+01	PHYSPROP
	Dioxins										
34465468	~Hexachlorodibenzo-p-dioxin, Mixture	34465-46-8	3.9E+02	PHYSPROP	2.3E-04	5.7E-06	EPI	4.4E-11	PHYSPROP	2.5E+02	PHYSPROP
1746016	~TCDD, 2,3,7,8-	1746-01-6	3.2E+02	PHYSPROP	2.0E-03	5.0E-05	EPI	1.5E-09	PHYSPROP	3.1E+02	PHYSPROP
957517	Diphenamid	957-51-7	2.4E+02	PHYSPROP	1.5E-09	3.6E-11	EPI	3.0E-08	PHYSPROP	1.4E+02	PHYSPROP
101848	Diphenyl Ether	101-84-8	1.7E+02	EPI	1.1E-02	2.8E-04	EPI	2.3E-02	EPI	2.7E+01	EPI
127639	Diphenyl Sulfone	127-63-9	2.2E+02	PHYSPROP	1.0E-05	2.5E-07	PHYSPROP	1.5E-05	PHYSPROP	1.3E+02	PHYSPROP
122394	Diphenylamine	122-39-4	1.7E+02	PHYSPROP	1.1E-04	2.7E-06	EPI	6.7E-04	PHYSPROP	5.3E+01	PHYSPROP
122667	Diphenylhydrazine, 1,2-	122-66-7	1.8E+02	PHYSPROP	2.0E-05	4.8E-07	EPI	4.4E-04	EPI	1.3E+02	PHYSPROP
85007	Diquat	85-00-7	3.4E+02	PHYSPROP	5.8E-12	1.4E-13	PHYSPROP	1.8E-06	PHYSPROP	3.4E+02	PHYSPROP
1937377	Direct Black 38	1937-37-7	7.8E+02	PHYSPROP	3.4E-38	8.2E-40	PHYSPROP	1.5E-36	PHYSPROP	3.5E+02	EPI
2602462	Direct Blue 6	2602-46-2	9.3E+02	PHYSPROP	3.7E-42	9.1E-44	PHYSPROP	9.5E-39	PHYSPROP	3.5E+02	EPI
16071866	Direct Brown 95	16071-86-6	7.6E+02	PHYSPROP				1.4E-41	PHYSPROP	3.5E+02	EPI
298044	Disulfoton	298-04-4	2.7E+02	PHYSPROP	8.8E-05	2.2E-06	EPI	9.8E-05	PHYSPROP	-2.5E+01	PHYSPROP
505293	Dithiane, 1,4-	505-29-3	1.2E+02	PHYSPROP	1.7E-03	4.2E-05	EPI	8.0E-02	PHYSPROP	1.1E+02	PHYSPROP
330541	Diuron	330-54-1	2.3E+02	PHYSPROP	2.1E-08	5.0E-10	EPI	6.9E-08	PHYSPROP	1.6E+02	PHYSPROP
2439103	Dodine	2439-10-3	2.9E+02	PHYSPROP	3.7E-09	9.0E-11	EPI	1.5E-07	PHYSPROP	1.4E+02	PHYSPROP
759944	EPTC	759-94-4	1.9E+02	PHYSPROP	6.5E-04	1.6E-05	EPI	2.4E-02	PHYSPROP	6.1E+01	EPI
115297	Endosulfan	115-29-7	4.1E+02	PHYSPROP	2.7E-03	6.5E-05	PHYSPROP	1.7E-07	PHYSPROP	1.1E+02	PHYSPROP
1031078	Endosulfan Sulfate	1031-07-8	4.2E+02	PHYSPROP	1.3E-05	3.3E-07	EPI	2.8E-07	EPI	1.8E+02	PHYSPROP
145733	Endothall	145-73-3	1.9E+02	PHYSPROP	1.6E-14	3.9E-16	EPI	1.6E-10	PHYSPROP	1.4E+02	PHYSPROP
72208	Endrin	72-20-8	3.8E+02	PHYSPROP	2.6E-04	6.4E-06	PHYSPROP	3.0E-06	PHYSPROP	2.3E+02	PHYSPROP
106898	Epichlorohydrin	106-89-8	9.3E+01	PHYSPROP	1.2E-03	3.0E-05	EPI	1.6E+01	PHYSPROP	-5.7E+01	PHYSPROP
106887	Epoxybutane, 1,2-	106-88-7	7.2E+01	PHYSPROP	7.4E-03	1.8E-04	EPI	1.8E+02	PHYSPROP	-1.5E+02	PHYSPROP
111773	Ethanol, 2-(2-methoxyethoxy)-	111-77-3	1.2E+02	PHYSPROP	6.7E-10	1.7E-11	PHYSPROP	2.5E-01	PHYSPROP	-1.5E+01	EPI
16672870	Ethephon	16672-87-0	1.4E+02	PHYSPROP	2.3E-10	5.7E-12	PHYSPROP	9.8E-08	PHYSPROP	7.4E+01	PHYSPROP
563122	Ethion	563-12-2	3.8E+02	PHYSPROP	1.5E-05	3.8E-07	EPI	1.5E-06	PHYSPROP	-1.3E+01	PHYSPROP
111159	Ethoxyethanol Acetate, 2-	111-15-9	1.3E+02	PHYSPROP	1.3E-04	3.2E-06	PHYSPROP	2.0E+00	PHYSPROP	-6.2E+01	PHYSPROP
110805	Ethoxyethanol, 2-	110-80-5	9.0E+01	PHYSPROP	1.9E-05	4.7E-07	PHYSPROP	5.3E+00	PHYSPROP	-7.0E+01	PHYSPROP
141786	Ethyl Acetate	141-78-6	8.8E+01	PHYSPROP	5.5E-03	1.3E-04	PHYSPROP	9.3E+01	PHYSPROP	-8.4E+01	PHYSPROP
140885	Ethyl Acrylate	140-88-5	1.0E+02	PHYSPROP	1.4E-02	3.4E-04	EPI	3.9E+01	PHYSPROP	-7.1E+01	PHYSPROP
75003	Ethyl Chloride (Chloroethane)	75-00-3	6.5E+01	PHYSPROP	4.5E-01	1.1E-02	PHYSPROP	1.0E+03	PHYSPROP	-1.4E+02	PHYSPROP
60297	Ethyl Ether	60-29-7	7.4E+01	PHYSPROP	5.0E-02	1.2E-03	PHYSPROP	5.4E+02	PHYSPROP	-1.2E+02	PHYSPROP
97632	Ethyl Methacrylate	97-63-2	1.1E+02	PHYSPROP	2.3E-02	5.7E-04	EPI	2.1E+01	PHYSPROP	-7.5E+01	PHYSPROP
2104645	Ethyl-p-nitrophenyl Phosphonate	2104-64-5	3.2E+02	PHYSPROP	1.8E-05	4.4E-07	EPI	9.5E-07	PHYSPROP	3.6E+01	PHYSPROP
100414	Ethylbenzene	100-41-4	1.1E+02	PHYSPROP	3.2E-01	7.9E-03	PHYSPROP	9.6E+00	PHYSPROP	-9.5E+01	PHYSPROP
109784	Ethylene Cyanohydrin	109-78-4	7.1E+01	PHYSPROP	3.1E-07	7.5E-09	EPI	8.0E-02	PHYSPROP	-4.6E+01	PHYSPROP
107153	Ethylene Diamine	107-15-3	6.0E+01	PHYSPROP	7.1E-08	1.7E-09	PHYSPROP	1.2E+01	PHYSPROP	1.1E+01	PHYSPROP
107211	Ethylene Glycol	107-21-1	6.2E+01	PHYSPROP	2.5E-06	6.0E-08	PHYSPROP	9.2E-02	PHYSPROP	-1.3E+01	PHYSPROP
111762	Ethylene Glycol Monobutyl Ether	111-76-2	1.2E+02	PHYSPROP	6.5E-05	1.6E-06	PHYSPROP	8.8E-01	PHYSPROP	-7.5E+01	PHYSPROP
75218	Ethylene Oxide	75-21-8	4.4E+01	PHYSPROP	6.1E-03	1.5E-04	PHYSPROP	1.3E+03	PHYSPROP	-1.1E+02	PHYSPROP
96457	Ethylene Thiourea	96-45-7	1.0E+02	PHYSPROP	5.6E-10	1.4E-11	PHYSPROP	2.0E-06	PHYSPROP	2.0E+02	PHYSPROP
151564	Ethyleneimine	151-56-4	4.3E+01	PHYSPROP	4.9E-04	1.2E-05	EPI	2.1E+02	PHYSPROP	-7.8E+01	PHYSPROP
84720	Ethylphthalyl Ethyl Glycolate	84-72-0	2.8E+02	PHYSPROP	2.7E-07	6.6E-09	PHYSPROP	2.2E-04	PHYSPROP	2.3E+01	EPI
22224926	Fenamiphos	22224-92-6	3.0E+02	PHYSPROP	4.9E-08	1.2E-09	EPI	1.0E-06	PHYSPROP	4.9E+01	PHYSPROP
39515418	Fenpropathrin	39515-41-8	3.5E+02	PHYSPROP	3.1E-04	7.6E-06	EPI	5.5E-06	PHYSPROP	4.7E+01	PHYSPROP
51630581	Fenvalerate	51630-58-1	4.2E+02	PHYSPROP	1.4E-06	3.5E-08	EPI	1.5E-09	PHYSPROP	4.0E+01	PHYSPROP
2164172	Fluometuron	2164-17-2	2.3E+02	PHYSPROP	1.1E-07	2.6E-09	EPI	9.4E-07	PHYSPROP	1.6E+02	PHYSPROP
16984488	Fluoride	16984-48-8	3.8E+01	EPI						-2.2E+02	EPI
7782414	Fluorine (Soluble Fluoride)	7782-41-4	3.8E+01	PHYSPROP						-2.2E+02	PHYSPROP
59756604	Fluridone	59756-60-4	3.3E+02	PHYSPROP	3.3E-07	8.1E-09	EPI	9.8E-08	PHYSPROP	1.5E+02	PHYSPROP
56425913	Flurprimidol	56425-91-3	3.1E+02	PHYSPROP	5.4E-08	1.3E-09	EPI	3.6E-07	PHYSPROP	9.5E+01	PHYSPROP
85509199	Flusilazole	85509-19-9	3.2E+02	PHYSPROP	9.2E-08	2.3E-09	PHYSPROP	2.9E-07	PHYSPROP	5.4E+01	PHYSPROP
66332965	Flutolanil	66332-96-5	3.2E+02	PHYSPROP	1.3E-07	3.2E-09	EPI	4.9E-08	PHYSPROP	1.0E+02	PHYSPROP
69409945	Fluvalinate	69409-94-5	5.0E+02	PHYSPROP	5.9E-07	1.5E-08	PHYSPROP	1.0E-07	PHYSPROP	1.6E+02	EPI
133073	Folpet	133-07-3	3.0E+02	PHYSPROP	3.1E-06	7.7E-08	EPI	1.6E-07	PHYSPROP	1.8E+02	EPI
72178020	Fomesafen	72178-02-0	4.4E+02	PHYSPROP	3.1E-11	7.5E-13	PHYSPROP	7.5E-07	EPI	2.2E+02	PHYSPROP
944229	Fonofos	944-22-9	2.5E+02	PHYSPROP	2.9E-04	7.0E-06	EPI	3.4E-04	PHYSPROP	6.6E-01	EPI
50000	Formaldehyde	50-00-0	3.0E+01	PHYSPROP	1.4E-05	3.4E-07	PHYSPROP	3.9E+03	EPI	-9.2E+01	PHYSPROP
64186	Formic Acid	64-18-6	4.6E+01	PHYSPROP	6.8E-06	1.7E-07	PHYSPROP	4.3E+01	PHYSPROP	8.3E+00	PHYSPROP
39148248	Fosetyl-AL	39148-24-8	3.5E+02	PHYSPROP	1.3E-12	3.2E-14	PHYSPROP	7.5E-11	PHYSPROP	2.2E+02	PHYSPROP
	Furans										
132649	~Dibenzofuran	132-64-9	1.7E+02	PHYSPROP	8.7E-03	2.1E-04	EPI	2.5E-03	PHYSPROP	8.7E+01	PHYSPROP
110009	~Furan	110-00-9	6.8E+01	PHYSPROP	2.2E-01	5.4E-03	EPI	6.0E+02	PHYSPROP	-8.6E+01	PHYSPROP
109999	~Tetrahydrofuran	109-99-9	7.2E+01	PHYSPROP	2.9E-03	7.1E-05	PHYSPROP	1.6E+02	PHYSPROP	-1.1E+02	PHYSPROP
67458	Furazolidone	67-45-8	2.3E+02	PHYSPROP	1.3E-09	3.3E-11	PHYSPROP	2.6E-06	PHYSPROP	2.6E+02	PHYSPROP
98011	Furfural	98-01-1	9.6E+01	PHYSPROP	1.5E-04	3.8E-06	EPI	2.2E+00	PHYSPROP	-3.8E+01	PHYSPROP
531828	Furium	531-82-8	2.5E+02	EPI	5.4E-14	1.3E-15	EPI	8.8E-09	EPI	1.9E+02	EPI
60568050	Furmecyclox	60568-05-0	2.5E+02	PHYSPROP	2.8E-07	6.9E-09	PHYSPROP	8.4E-05	PHYSPROP	3.3E+01	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
77182822	Glufosinate, Ammonium	77182-82-2	2.0E+02	PHYSPROP	1.8E-12	4.4E-14	PHYSPROP	9.1E-12	PHYSPROP	2.2E+02	PHYSPROP
111308	Glutaraldehyde	111-30-8	1.0E+02	PHYSPROP	1.3E-06	3.3E-08	PHYSPROP	6.0E-01	PHYSPROP	-3.0E+01	EPI
765344	Glycidyl	765-34-4	7.2E+01	PHYSPROP	2.1E-05	5.1E-07	PHYSPROP	4.5E+01	PHYSPROP	-6.2E+01	PHYSPROP
1071836	Glyphosate	1071-83-6	1.7E+02	PHYSPROP	8.6E-11	2.1E-12	EPI	9.8E-08	PHYSPROP	1.9E+02	PHYSPROP
113008	Guanidine	113-00-8	5.9E+01	PHYSPROP	9.6E-10	2.3E-11	PHYSPROP	2.2E+00	PHYSPROP	5.0E+01	PHYSPROP
50011	Guanidine Chloride	50-01-1	9.6E+01	PHYSPROP	8.9E-17	2.2E-18	PHYSPROP	1.8E-06	PHYSPROP	1.8E+02	PHYSPROP
506934	Guanidine Nitrate	506-93-4	1.2E+02	PHYSPROP	3.7E-17	9.0E-19	PHYSPROP	1.3E-07	PHYSPROP	2.1E+02	PHYSPROP
69806402	Haloxyfop, Methyl	69806-40-2	3.8E+02	PHYSPROP	1.3E-05	3.2E-07	EPI	6.0E-06	PHYSPROP	5.6E+01	PHYSPROP
76448	Heptachlor	76-44-8	3.7E+02	PHYSPROP	1.2E-02	2.9E-04	PHYSPROP	4.0E-04	PHYSPROP	9.6E+01	PHYSPROP
1024573	Heptachlor Epoxide	1024-57-3	3.9E+02	PHYSPROP	8.6E-04	2.1E-05	PHYSPROP	2.0E-05	PHYSPROP	1.6E+02	PHYSPROP
111717	Heptanal, n-	111-71-7	1.1E+02	PHYSPROP	1.1E-02	2.7E-04	PHYSPROP	3.5E+00	PHYSPROP	-4.3E+01	PHYSPROP
142825	Heptane, N-	142-82-5	1.0E+02	PHYSPROP	8.2E+01	2.0E+00	EPI	4.6E+01	PHYSPROP	-9.1E+01	PHYSPROP
87821	Hexabromobenzene	87-82-1	5.5E+02	PHYSPROP	1.1E-03	2.8E-05	PHYSPROP	1.6E-08	PHYSPROP	3.3E+02	PHYSPROP
68631492	Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	6.4E+02	PubChem				5.8E-06	IRIS Profile		
118741	Hexachlorobenzene	118-74-1	2.8E+02	PHYSPROP	7.0E-02	1.7E-03	PHYSPROP	1.8E-05	PHYSPROP	2.3E+02	PHYSPROP
87683	Hexachlorobutadiene	87-68-3	2.6E+02	PHYSPROP	4.2E-01	1.0E-02	PHYSPROP	2.2E-01	PHYSPROP	-2.1E+01	PHYSPROP
319846	Hexachlorocyclohexane, Alpha-	319-84-6	2.9E+02	PHYSPROP	2.7E-04	6.7E-06	PHYSPROP	3.5E-05	EPI	1.6E+02	PHYSPROP
319857	Hexachlorocyclohexane, Beta-	319-85-7	2.9E+02	PHYSPROP	1.8E-05	4.4E-07	PHYSPROP	3.6E-07	PHYSPROP	3.1E+02	PHYSPROP
58899	Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	2.9E+02	PHYSPROP	2.1E-04	5.1E-06	PHYSPROP	4.2E-05	PHYSPROP	1.1E+02	PHYSPROP
608731	Hexachlorocyclohexane, Technical	608-73-1	2.9E+02	PHYSPROP	2.1E-04	5.1E-06	EPI	3.5E-05	EPI	1.1E+02	EPI
77474	Hexachlorocyclopentadiene	77-47-4	2.7E+02	PHYSPROP	1.1E+00	2.7E-02	PHYSPROP	6.0E-02	PHYSPROP	-9.0E+00	PHYSPROP
67721	Hexachloroethane	67-72-1	2.4E+02	PHYSPROP	1.6E-01	3.9E-03	PHYSPROP	2.1E-01	PHYSPROP	1.9E+02	PHYSPROP
70304	Hexachlorophene	70-30-4	4.1E+02	PHYSPROP	2.2E-11	5.5E-13	PHYSPROP	1.0E-10	PHYSPROP	1.7E+02	PHYSPROP
121824	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	2.2E+02	PHYSPROP	8.2E-10	2.0E-11	EPI	4.1E-09	EPI	2.1E+02	PHYSPROP
822060	Hexamethylene Diisocyanate, 1,6-	822-06-0	1.7E+02	PHYSPROP	2.0E-03	4.8E-05	PHYSPROP	3.0E-02	PHYSPROP	-6.7E+01	PHYSPROP
680319	Hexamethylphosphoramide	680-31-9	1.8E+02	PHYSPROP	8.2E-07	2.0E-08	PHYSPROP	4.6E-02	PHYSPROP	7.2E+00	PHYSPROP
110543	Hexane, N-	110-54-3	8.6E+01	PHYSPROP	7.4E+01	1.8E+00	EPI	1.5E+02	PHYSPROP	-9.5E+01	PHYSPROP
124049	Hexanedioic Acid	124-04-9	1.5E+02	PHYSPROP	1.9E-10	4.7E-12	EPI	3.2E-07	EPI	1.5E+02	PHYSPROP
104767	Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7	1.3E+02	EPI	1.1E-03	2.7E-05	EPI	1.4E-01	EPI	-7.0E+01	EPI
591786	Hexanone, 2-	591-78-6	1.0E+02	PHYSPROP	3.8E-03	9.3E-05	EPI	1.2E+01	PHYSPROP	-5.6E+01	PHYSPROP
51235042	Hexazinone	51235-04-2	2.5E+02	PHYSPROP	9.2E-11	2.3E-12	EPI	2.3E-07	EPI	1.2E+02	PHYSPROP
78587050	Hexythiazox	78587-05-0	3.5E+02	PHYSPROP	9.7E-07	2.4E-08	EPI	2.6E-08	PHYSPROP	1.1E+02	PHYSPROP
67485294	Hydramethylnon	67485-29-4	4.9E+02	PHYSPROP	9.0E-05	2.2E-06	EPI	2.0E-08	PHYSPROP	1.9E+02	PHYSPROP
302012	Hydrazine	302-01-2	3.2E+01	PHYSPROP	2.5E-05	6.1E-07	PHYSPROP	1.4E+01	PHYSPROP	2.0E+00	PHYSPROP
10034932	Hydrazine Sulfate	10034-93-2	1.3E+02	EPI						2.5E+02	CRC89
7647010	Hydrogen Chloride	7647-01-0	3.5E+01	EPI	2.0E-08	4.9E-10	HSDB	3.5E+04	HSDB	-1.1E+02	CRC89
7664393	Hydrogen Fluoride	7664-39-3	2.0E+01	PHYSPROP	4.3E-03	1.0E-04	PHYSPROP	9.2E+02	PHYSPROP	-8.4E+01	PHYSPROP
7783064	Hydrogen Sulfide	7783-06-4	3.4E+01	PHYSPROP	3.5E-01	8.6E-03	PHYSPROP	1.6E+04	PHYSPROP	-8.5E+01	PHYSPROP
123319	Hydroquinone	123-31-9	1.1E+02	PHYSPROP	1.9E-09	4.7E-11	EPI	2.4E-05	EPI	1.7E+02	PHYSPROP
35554440	Imazalil	35554-44-0	3.0E+02	PHYSPROP	1.1E-07	2.6E-09	EPI	1.2E-06	PHYSPROP	5.3E+01	PHYSPROP
81335377	Imazaquin	81335-37-7	3.1E+02	PHYSPROP	2.8E-16	6.9E-18	PHYSPROP	1.0E-13	PHYSPROP	2.2E+02	PHYSPROP
81335775	Imazethapyr	81335-77-5	2.9E+02	PHYSPROP	4.3E-15	1.0E-16	PHYSPROP	2.2E-11	PHYSPROP	1.7E+02	PHYSPROP
7553562	Iodine	7553-56-2	2.5E+02	PHYSPROP				2.3E-01	PHYSPROP	1.1E+02	PHYSPROP
36734197	Iprodione	36734-19-7	3.3E+02	PHYSPROP	1.3E-07	3.1E-09	PHYSPROP	3.8E-09	PHYSPROP	1.4E+02	PHYSPROP
7439896	Iron	7439-89-6	5.6E+01	PHYSPROP				0.0E+00	NIOSH	1.5E+03	CRC89
78831	Isobutyl Alcohol	78-83-1	7.4E+01	PHYSPROP	4.0E-04	9.8E-06	PHYSPROP	1.0E+01	PHYSPROP	-1.1E+02	PHYSPROP
78591	Isophorone	78-59-1	1.4E+02	PHYSPROP	2.7E-04	6.6E-06	EPI	4.4E-01	PHYSPROP	-8.1E+00	PHYSPROP
33820530	Isopropalin	33820-53-0	3.1E+02	PHYSPROP	4.5E-03	1.1E-04	EPI	3.0E-05	PHYSPROP	1.5E+02	EPI
67630	Isopropanol	67-63-0	6.0E+01	PHYSPROP	3.3E-04	8.1E-06	PHYSPROP	4.5E+01	PHYSPROP	-9.0E+01	PHYSPROP
1832548	Isopropyl Methyl Phosphonic Acid	1832-54-8	1.4E+02	PHYSPROP	2.8E-07	6.9E-09	PHYSPROP	1.2E-02	PHYSPROP	-8.1E+00	EPI
82558507	Isoxaben	82558-50-7	3.3E+02	PHYSPROP	5.2E-08	1.3E-09	EPI	4.1E-09	PHYSPROP	1.8E+02	PHYSPROP
E1737665	JP-7	E1737665			4.1E-01	1.0E-02	EPAHCD	1.1E+01	EPAHCD	-5.5E+01	EPAHCD
77501634	Lactofen	77501-63-4	4.6E+02	PHYSPROP	1.9E-05	4.7E-07	EPI	7.0E-08	PHYSPROP	4.5E+01	PHYSPROP
78977	Lactonitrile	78-97-7	7.1E+01	PHYSPROP	4.0E-04	9.8E-06	PHYSPROP	1.2E-01	PHYSPROP	-4.0E+01	PHYSPROP
7439910	Lanthanum	7439-91-0	1.4E+02	EPI						9.2E+02	CRC89
100587904	Lanthanum Acetate Hydrate	100587-90-4	3.3E+02	PPRTV							
10025840	Lanthanum Chloride Heptahydrate	10025-84-0	3.7E+02	CRC89						9.1E+01	CRC89
10099588	Lanthanum Chloride, Anhydrous	10099-58-8	2.5E+02	EPI						8.6E+02	CRC89
10277437	Lanthanum Nitrate Hexahydrate	10277-43-7	4.3E+02	CRC89						4.0E+01	CRC89
	Lead Compounds										
7446277	~Lead Phosphate	7446-27-7	8.1E+02	PHYSPROP						1.0E+03	PHYSPROP
301042	~Lead acetate	301-04-2	3.3E+02	PHYSPROP				7.2E-04	PHYSPROP	3.3E+02	PHYSPROP
7439921	~Lead and Compounds	7439-92-1	2.1E+02	EPI				0.0E+00	NIOSH	3.3E+02	EPI
1335326	~Lead subacetate	1335-32-6	8.1E+02	PHYSPROP				3.0E-10	PHYSPROP	1.6E+02	EPI
78002	~Tetraethyl Lead	78-00-2	3.2E+02	PHYSPROP	2.3E+01	5.7E-01	PHYSPROP	2.6E-01	PHYSPROP	-1.3E+02	PHYSPROP
541253	Lewisite	541-25-3	2.1E+02	PHYSPROP	8.9E-03	2.2E-04	EPI	5.8E-01	PHYSPROP	1.0E-01	PHYSPROP
330552	Linuron	330-55-2	2.5E+02	PHYSPROP	2.6E-07	6.3E-09	EPI	1.4E-06	PHYSPROP	9.3E+01	PHYSPROP
7439932	Lithium	7439-93-2	6.9E+00	EPI						1.8E+02	CRC89
94746	MCPA	94-74-6	2.0E+02	PHYSPROP	5.4E-08	1.3E-09	EPI	5.9E-06	PHYSPROP	1.2E+02	PHYSPROP
94815	MCPB	94-81-5	2.3E+02	PHYSPROP	1.1E-07	2.7E-09	EPI	4.3E-07	PHYSPROP	1.0E+02	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant			Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte		CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
93652	MCPP		93-65-2	2.1E+02	PHYSPROP	7.4E-07	1.8E-08	PHYSPROP	7.5E-07	PHYSPROP	9.5E+01	PHYSPROP
121755	Malathion		121-75-5	3.3E+02	PHYSPROP	2.0E-07	4.9E-09	PHYSPROP	3.4E-06	PHYSPROP	2.8E+00	PHYSPROP
108316	Maleic Anhydride		108-31-6	9.8E+01	PHYSPROP	1.6E-04	3.9E-06	PHYSPROP	2.5E-01	EPI	5.3E+01	PHYSPROP
123331	Maleic Hydrazide		123-33-1	1.1E+02	PHYSPROP	1.1E-09	2.7E-11	PHYSPROP	2.8E-06	PHYSPROP	3.1E+02	PHYSPROP
109773	Malononitrile		109-77-3	6.6E+01	PHYSPROP	5.4E-06	1.3E-07	EPI	2.0E-01	EPI	3.2E+01	PHYSPROP
8018017	Mancozeb		8018-01-7	5.4E+02	PHYSPROP	6.2E-10	1.5E-11	PHYSPROP	1.3E-10	PHYSPROP	1.7E+02	PhysProp
12427382	Maneb		12427-38-2	3.0E+02	PHYSPROP	2.0E-07	4.9E-09	PHYSPROP	7.5E-08	PHYSPROP	2.0E+02	EPI
7439965	Manganese (Diet)		7439-96-5	5.5E+01	PHYSPROP				0.0E+00	NIOSH	1.2E+03	PHYSPROP
7439965	Manganese (Non-diet)		7439-96-5	5.5E+01	PHYSPROP				0.0E+00	NIOSH	1.2E+03	PHYSPROP
950107	Mephosfolan		950-10-7	2.7E+02	PHYSPROP	4.9E-09	1.2E-10	PHYSPROP	3.2E-05	PHYSPROP	8.4E+01	EPI
24307264	Mepiquat Chloride		24307-26-4	1.5E+02	PHYSPROP	1.8E-10	4.3E-12	PHYSPROP	3.7E-07	PHYSPROP	2.2E+02	PHYSPROP
149304	Mercaptobenzothiazole, 2-		149-30-4	1.7E+02	EPI	1.5E-06	3.6E-08	EPI	4.6E-04	EPI	1.8E+02	EPI
	Mercury Compounds											
7487947	~Mercuric Chloride (and other Mercury salts)		7487-94-7	2.7E+02	PHYSPROP						2.8E+02	PHYSPROP
7439976	~Mercury (elemental)		7439-97-6	2.0E+02	PHYSPROP	3.5E-01	8.6E-03	PHYSPROP VP/S	2.0E-03	PHYSPROP	-3.9E+01	PHYSPROP
22967926	~Methyl Mercury		22967-92-6	2.2E+02	ChemID							
62384	~Phenylmercuric Acetate		62-38-4	3.4E+02	PHYSPROP	2.3E-08	5.7E-10	EPI	6.0E-06	PHYSPROP	1.5E+02	PHYSPROP
150505	Merphos		150-50-5	3.0E+02	PHYSPROP	9.3E-04	2.3E-05	PHYSPROP	2.0E-05	PHYSPROP	1.0E+02	PHYSPROP
78488	Merphos Oxide		78-48-8	3.1E+02	PHYSPROP	1.2E-05	2.9E-07	PHYSPROP	5.3E-06	PHYSPROP	-2.5E+01	CRC89
57837191	Metalaxyl		57837-19-1	2.8E+02	PHYSPROP	1.2E-07	3.0E-09	EPI	5.6E-06	PHYSPROP	7.1E+01	PHYSPROP
126987	Methacrylonitrile		126-98-7	6.7E+01	PHYSPROP	1.0E-02	2.5E-04	EPI	7.1E+01	PHYSPROP	-3.6E+01	PHYSPROP
10265926	Methamidophos		10265-92-6	1.4E+02	PHYSPROP	3.5E-08	8.7E-10	PHYSPROP	3.5E-05	PHYSPROP	4.6E+01	PHYSPROP
67561	Methanol		67-56-1	3.2E+01	PHYSPROP	1.9E-04	4.6E-06	PHYSPROP	1.3E+02	PHYSPROP	-9.8E+01	PHYSPROP
950378	Methidathion		950-37-8	3.0E+02	PHYSPROP	2.9E-07	7.2E-09	EPI	3.4E-06	PHYSPROP	3.9E+01	PHYSPROP
16752775	Methomyl		16752-77-5	1.6E+02	PHYSPROP	8.1E-10	2.0E-11	EPI	5.4E-06	PHYSPROP	7.8E+01	PHYSPROP
99592	Methoxy-5-nitroaniline, 2-		99-59-2	1.7E+02	PHYSPROP	5.1E-07	1.3E-08	PHYSPROP	3.2E-04	PHYSPROP	1.2E+02	PHYSPROP
72435	Methoxychlor		72-43-5	3.5E+02	PHYSPROP	8.3E-06	2.0E-07	PHYSPROP	2.6E-06	PHYSPROP	8.7E+01	PHYSPROP
110496	Methoxyethanol Acetate, 2-		110-49-6	1.2E+02	PHYSPROP	1.3E-05	3.1E-07	EPI	7.0E+00	PHYSPROP	-6.5E+01	PHYSPROP
109864	Methoxyethanol, 2-		109-86-4	7.6E+01	PHYSPROP	1.3E-05	3.3E-07	PHYSPROP	9.5E+00	PHYSPROP	-8.5E+01	PHYSPROP
79209	Methyl Acetate		79-20-9	7.4E+01	PHYSPROP	4.7E-03	1.2E-04	PHYSPROP	2.2E+02	PHYSPROP	-9.8E+01	PHYSPROP
96333	Methyl Acrylate		96-33-3	8.6E+01	PHYSPROP	8.1E-03	2.0E-04	EPI	8.7E+01	PHYSPROP	-7.7E+01	PHYSPROP
78933	Methyl Ethyl Ketone (2-Butanone)		78-93-3	7.2E+01	PHYSPROP	2.3E-03	5.7E-05	PHYSPROP	9.1E+01	PHYSPROP	-8.7E+01	PHYSPROP
60344	Methyl Hydrazine		60-34-4	4.6E+01	PHYSPROP	1.2E-04	3.0E-06	PHYSPROP	5.0E+01	PHYSPROP	-5.2E+01	PHYSPROP
108101	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		108-10-1	1.0E+02	PHYSPROP	5.6E-03	1.4E-04	EPI	2.0E+01	PHYSPROP	-8.4E+01	PHYSPROP
624839	Methyl Isocyanate		624-83-9	5.7E+01	PHYSPROP	3.8E-02	9.3E-04	PHYSPROP	3.5E+02	PHYSPROP	-4.5E+01	PHYSPROP
80626	Methyl Methacrylate		80-62-6	1.0E+02	PHYSPROP	1.3E-02	3.2E-04	EPI	3.9E+01	PHYSPROP	-4.8E+01	PHYSPROP
298000	Methyl Parathion		298-00-0	2.6E+02	PHYSPROP	4.1E-06	1.0E-07	PHYSPROP	3.5E-06	PHYSPROP	3.6E+01	PHYSPROP
993135	Methyl Phosphonic Acid		993-13-5	9.6E+01	PHYSPROP	5.0E-10	1.2E-11	PHYSPROP	3.3E-04	EPI	1.1E+02	PHYSPROP
25013154	Methyl Styrene (Mixed Isomers)		25013-15-4	3.5E+02	PHYSPROP	1.1E-01	2.6E-03	PHYSPROP	1.5E+00	PHYSPROP	-8.6E+01	EPI
66273	Methyl methanesulfonate		66-27-3	1.1E+02	PHYSPROP	1.6E-04	4.0E-06	PHYSPROP	3.1E-01	PHYSPROP	2.0E+01	PHYSPROP
1634044	Methyl tert-Butyl Ether (MTBE)		1634-04-4	8.8E+01	PHYSPROP	2.4E-02	5.9E-04	PHYSPROP	2.5E+02	PHYSPROP	-1.1E+02	PHYSPROP
615452	Methyl-1,4-benzenediamine dihydrochloride, 2-		615-45-2	2.0E+02	PHYSPROP	2.6E-16	6.4E-18	PHYSPROP	4.1E-12	PHYSPROP	2.4E+02	EPI
108112	Methyl-2-Pentanol, 4-		108-11-2	1.0E+02	PHYSPROP	1.8E-03	4.5E-05	PHYSPROP	5.3E+00	PHYSPROP	-9.0E+01	PHYSPROP
99558	Methyl-5-Nitroaniline, 2-		99-55-8	1.5E+02	PHYSPROP	3.4E-07	8.3E-09	PHYSPROP	9.8E-04	PHYSPROP	1.1E+02	PHYSPROP
70257	Methyl-N-nitro-N-nitrosoguanidine, N-		70-25-7	1.5E+02	PHYSPROP	5.0E-11	1.2E-12	PHYSPROP	1.2E-04	PHYSPROP	1.2E+02	EPI
636215	Methylaniline Hydrochloride, 2-		636-21-5	1.4E+02	PHYSPROP	8.6E-05	2.1E-06	PHYSPROP	2.9E-01	PHYSPROP	2.2E+02	PHYSPROP
124583	Methylarsonic acid		124-58-3	1.4E+02	PHYSPROP				1.6E-03	PHYSPROP	1.6E+02	PHYSPROP
74612127	Methylbenzene,1-4-diamine monohydrochloride, 2-		74612-12-7	1.6E+02	PubChem							
615509	Methylbenzene-1,4-diamine sulfate, 2-		615-50-9	2.2E+02	ChemicalBook							
56495	Methylcholanthrene, 3-		56-49-5	2.7E+02	PHYSPROP	2.1E-04	5.2E-06	EPI	4.3E-08	EPI	1.8E+02	PHYSPROP
75092	Methylene Chloride		75-09-2	8.5E+01	PHYSPROP	1.3E-01	3.3E-03	PHYSPROP	4.4E+02	PHYSPROP	-9.5E+01	PHYSPROP
101144	Methylene-bis(2-chloroaniline), 4,4'-		101-14-4	2.7E+02	PHYSPROP	1.7E-09	4.1E-11	PHYSPROP	2.9E-07	PHYSPROP	1.1E+02	PHYSPROP
101611	Methylene-bis(N,N-dimethyl) Aniline, 4,4'-		101-61-1	2.5E+02	PHYSPROP	4.4E-08	1.1E-09	PHYSPROP	1.8E-05	PHYSPROP	9.2E+01	PHYSPROP
101779	Methylenebisbenzenamine, 4,4'-		101-77-9	2.0E+02	PHYSPROP	2.2E-09	5.3E-11	PHYSPROP	2.0E-07	PHYSPROP	9.3E+01	PHYSPROP
101688	Methylenediphenyl Diisocyanate		101-68-8	2.5E+02	PHYSPROP	3.7E-05	9.0E-07	PHYSPROP	5.0E-06	PHYSPROP	3.8E+01	PHYSPROP
98839	Methylstyrene, Alpha-		98-83-9	1.2E+02	PHYSPROP	1.0E-01	2.6E-03	EPI	1.9E+00	EPI	-2.3E+01	PHYSPROP
51218452	Metolachlor		51218-45-2	2.8E+02	PHYSPROP	3.7E-07	9.0E-09	PHYSPROP	3.1E-05	PHYSPROP	-6.2E+01	PHYSPROP
21087649	Metribuzin		21087-64-9	2.1E+02	PHYSPROP	4.8E-09	1.2E-10	EPI	4.4E-07	PHYSPROP	1.3E+02	PHYSPROP
74223646	Metsulfuron-methyl		74223-64-6	3.8E+02	PHYSPROP	5.4E-15	1.3E-16	EPI	2.5E-12	PHYSPROP	1.6E+02	PHYSPROP
8012951	Mineral oils		8012-95-1	1.7E+02	EPI	3.3E+02	8.2E+00	EPI	1.4E-01	EPI	-9.6E+00	EPI
2385855	Mirex		2385-85-5	5.5E+02	PHYSPROP	3.3E-02	8.1E-04	PHYSPROP	8.0E-07	PHYSPROP	4.9E+02	CRC89
2212671	Molinate		2212-67-1	1.9E+02	PHYSPROP	1.7E-04	4.1E-06	PHYSPROP	5.6E-03	PHYSPROP	7.0E+01	EPI
7439987	Molybdenum		7439-98-7	9.6E+01	PHYSPROP				0.0E+00	NIOSH	2.6E+03	PHYSPROP
10599903	Monochloramine		10599-90-3	5.1E+01	EPI						-6.6E+01	CRC89
100618	Monomethylaniline		100-61-8	1.1E+02	PHYSPROP	3.6E-04	8.9E-06	PHYSPROP	4.5E-01	PHYSPROP	-5.7E+01	PHYSPROP
88671890	Myclobutanil		88671-89-0	2.7E+02	PHYSPROP	1.7E-07	4.3E-09	EPI	1.6E-06	PHYSPROP	6.6E+01	PHYSPROP
74317	N,N'-Diphenyl-1,4-benzenediamine		74-31-7	2.6E+02	PHYSPROP	8.4E-09	2.1E-10	PHYSPROP	6.4E-09	EPI	1.4E+02	PHYSPROP
300765	Naled		300-76-5	3.8E+02	PHYSPROP	2.7E-03	6.5E-05	EPI	2.0E-04	PHYSPROP	2.7E+01	PHYSPROP
64742956	Naphtha, High Flash Aromatic (HFAN)		64742-95-6			1.8E-02	4.4E-04	EPI	8.5E-02	EPI		
91598	Naphthylamine, 2-		91-59-8	1.4E+02	PHYSPROP	3.3E-06	8.1E-08	PHYSPROP	2.6E-04	PHYSPROP	1.1E+02	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant			Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
15299997	Napropamide	15299-99-7	2.7E+02	PHYSPROP	3.4E-08	8.4E-10	EPI	1.7E-07	PHYSPROP	7.5E+01	PHYSPROP
373024	Nickel Acetate	373-02-4	1.8E+02	PHYSPROP				1.8E-05	PHYSPROP		
3333673	Nickel Carbonate	3333-67-3	1.2E+02	PHYSPROP				3.6E-06	PHYSPROP		
13463393	Nickel Carbonyl	13463-39-3	1.7E+02	CRC89	2.0E+01	5.0E-01	Matheson Gas MSDS	3.2E+02	NIOSH	-1.9E+01	CRC89
12054487	Nickel Hydroxide	12054-48-7	9.3E+01	WebBook							
1313991	Nickel Oxide	1313-99-1	7.5E+01	EPI						2.0E+03	CRC89
E715532	Nickel Refinery Dust	E715532									
7440020	Nickel Soluble Salts	7440-02-0	5.9E+01	PHYSPROP				0.0E+00	NIOSH	1.5E+03	CRC89
12035722	Nickel Subsulfide	12035-72-2	2.4E+02	CRC89						7.9E+02	CRC89
1271289	Nickelocene	1271-28-9	1.9E+02	CRC89						1.7E+02	CRC89
14797558	Nitrate (measured as nitrogen)	14797-55-8	6.2E+01	EPI							
E701177	Nitrate + Nitrite (measured as nitrogen)	E701177									
14797650	Nitrite (measured as nitrogen)	14797-65-0	4.7E+01	EPI							
88744	Nitroaniline, 2-	88-74-4	1.4E+02	PHYSPROP	2.4E-06	5.9E-08	PHYSPROP	2.8E-03	PHYSPROP	7.1E+01	PHYSPROP
100016	Nitroaniline, 4-	100-01-6	1.4E+02	PHYSPROP	5.2E-08	1.3E-09	PHYSPROP	3.2E-06	EPI	1.5E+02	PHYSPROP
98953	Nitrobenzene	98-95-3	1.2E+02	PHYSPROP	9.8E-04	2.4E-05	PHYSPROP	2.5E-01	PHYSPROP	5.7E+00	PHYSPROP
9004700	Nitrocellulose	9004-70-0	3.9E+02	PHYSPROP	1.3E-21	3.3E-23	PHYSPROP	1.4E-17	PHYSPROP	2.6E+02	EPI
67209	Nitrofurantoin	67-20-9	2.4E+02	PHYSPROP	5.4E-11	1.3E-12	PHYSPROP	2.8E-10	PHYSPROP	2.6E+02	PHYSPROP
59870	Nitrofurazone	59-87-0	2.0E+02	PHYSPROP	1.3E-11	3.1E-13	PHYSPROP	4.3E-06	PHYSPROP	2.4E+02	EPI
55630	Nitroglycerin	55-63-0	2.3E+02	PHYSPROP	3.5E-06	8.7E-08	EPI	4.0E-04	EPI	1.4E+01	PHYSPROP
556887	Nitroguanidine	556-88-7	1.0E+02	PHYSPROP	1.8E-14	4.5E-16	PHYSPROP	1.4E-11	PHYSPROP	2.4E+02	EPI
75525	Nitromethane	75-52-5	6.1E+01	PHYSPROP	1.2E-03	2.9E-05	PHYSPROP	3.6E+01	PHYSPROP	-2.9E+01	PHYSPROP
79469	Nitropropane, 2-	79-46-9	8.9E+01	PHYSPROP	4.9E-03	1.2E-04	EPI	1.7E+01	PHYSPROP	-9.1E+01	PHYSPROP
759739	Nitroso-N-ethylurea, N-	759-73-9	1.2E+02	PHYSPROP	5.4E-09	1.3E-10	PHYSPROP	1.8E-02	PHYSPROP	9.9E+01	EPI
684935	Nitroso-N-methylurea, N-	684-93-5	1.0E+02	PHYSPROP	4.1E-09	9.9E-11	PHYSPROP	2.9E-02	PHYSPROP	1.2E+02	EPI
924163	Nitroso-di-N-butylamine, N-	924-16-3	1.6E+02	PHYSPROP	5.4E-04	1.3E-05	PHYSPROP	4.7E-02	EPI	2.8E+01	EPI
621647	Nitroso-di-N-propylamine, N-	621-64-7	1.3E+02	PHYSPROP	2.2E-04	5.4E-06	PHYSPROP	8.6E-02	PHYSPROP	6.8E+00	EPI
1116547	Nitrosodiethanolamine, N-	1116-54-7	1.3E+02	PHYSPROP	2.0E-10	4.9E-12	PHYSPROP	5.0E-04	PHYSPROP	8.2E+01	EPI
55185	Nitrosodiethylamine, N-	55-18-5	1.0E+02	PHYSPROP	1.5E-04	3.6E-06	PHYSPROP	8.6E-01	PHYSPROP	-1.6E+01	EPI
62759	Nitrosodimethylamine, N-	62-75-9	7.4E+01	PHYSPROP	7.4E-05	1.8E-06	PHYSPROP	2.7E+00	PHYSPROP	-3.9E+01	EPI
86306	Nitrosodiphenylamine, N-	86-30-6	2.0E+02	PHYSPROP	4.9E-05	1.2E-06	PHYSPROP	1.0E-01	PHYSPROP	6.7E+01	PHYSPROP
10595956	Nitrosomethylethylamine, N-	10595-95-6	8.8E+01	PHYSPROP	5.9E-05	1.4E-06	PHYSPROP	1.1E+00	PHYSPROP	-2.7E+01	EPI
59892	Nitrosomorpholine [N-]	59-89-2	1.2E+02	PHYSPROP	1.0E-06	2.5E-08	PHYSPROP	3.6E-02	PHYSPROP	2.9E+01	PHYSPROP
100754	Nitrosopiperidine [N-]	100-75-4	1.1E+02	PHYSPROP	3.5E-05	8.4E-07	PHYSPROP	9.2E-02	PHYSPROP	6.8E+00	EPI
930552	Nitrosopyrrolidine, N-	930-55-2	1.0E+02	PHYSPROP	2.0E-06	4.9E-08	PHYSPROP	6.0E-02	PHYSPROP	-3.1E+00	EPI
99081	Nitrotoluene, m-	99-08-1	1.4E+02	PHYSPROP	3.8E-04	9.3E-06	PHYSPROP	2.1E-01	EPI	1.6E+01	PHYSPROP
88722	Nitrotoluene, o-	88-72-2	1.4E+02	PHYSPROP	5.1E-04	1.3E-05	PHYSPROP	1.9E-01	EPI	-1.0E+01	PHYSPROP
99990	Nitrotoluene, p-	99-99-0	1.4E+02	PHYSPROP	2.3E-04	5.6E-06	PHYSPROP	1.6E-02	EPI	5.2E+01	PHYSPROP
111842	Nonane, n-	111-84-2	1.3E+02	PHYSPROP	1.4E+02	3.4E+00	EPI	4.5E+00	PHYSPROP	-5.4E+01	PHYSPROP
27314132	Norflurazon	27314-13-2	3.0E+02	PHYSPROP	1.4E-08	3.4E-10	EPI	2.9E-08	PHYSPROP	1.8E+02	PHYSPROP
32536520	Octabromodiphenyl Ether	32536-52-0	8.0E+02	PHYSPROP	3.1E-06	7.5E-08	PHYSPROP	1.3E-02	EPI	2.0E+02	PHYSPROP
2691410	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	3.0E+02	PHYSPROP	3.5E-08	8.7E-10	PHYSPROP	3.3E-14	PHYSPROP	2.9E+02	CRC89
152169	Octamethylpyrophosphoramide	152-16-9	2.9E+02	PHYSPROP	1.5E-08	3.8E-10	PHYSPROP	1.0E-03	PHYSPROP	1.7E+01	PHYSPROP
19044883	Oryzalin	19044-88-3	3.5E+02	PHYSPROP	7.8E-08	1.9E-09	PHYSPROP	9.8E-09	PHYSPROP	1.4E+02	PHYSPROP
19666309	Oxadiazon	19666-30-9	3.5E+02	PHYSPROP	3.0E-06	7.3E-08	EPI	1.1E-07	PHYSPROP	9.0E+01	PHYSPROP
23135220	Oxamyl	23135-22-0	2.2E+02	PHYSPROP	9.7E-09	2.4E-10	EPI	2.3E-04	PHYSPROP	1.0E+02	PHYSPROP
42874033	Oxyfluorfen	42874-03-3	3.6E+02	PHYSPROP	3.4E-05	8.2E-07	EPI	2.0E-07	PHYSPROP	8.4E+01	PHYSPROP
76738620	Paclobutrazol	76738-62-0	2.9E+02	PHYSPROP	3.4E-09	8.3E-11	EPI	7.5E-09	PHYSPROP	1.7E+02	PHYSPROP
1910425	Paraquat Dichloride	1910-42-5	2.6E+02	PHYSPROP	1.3E-11	3.2E-13	PHYSPROP	7.5E-08	PHYSPROP	3.0E+02	EPI
56382	Parathion	56-38-2	2.9E+02	PHYSPROP	1.2E-05	3.0E-07	PHYSPROP	6.7E-06	PHYSPROP	6.1E+00	PHYSPROP
1114712	Pebulate	1114-71-2	2.0E+02	PHYSPROP	9.7E-03	2.4E-04	EPI	8.9E-02	PHYSPROP	7.1E+01	EPI
40487421	Pendimethalin	40487-42-1	2.8E+02	PHYSPROP	3.5E-05	8.6E-07	EPI	1.5E-05	PHYSPROP	5.6E+01	PHYSPROP
32534819	Pentabromodiphenyl Ether	32534-81-9	5.6E+02	PHYSPROP	4.4E-03	1.1E-04	PHYSPROP	3.1E-08	EPI	-5.0E+00	PHYSPROP
60348609	Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9	5.6E+02	PHYSPROP	4.8E-05	1.2E-06	PHYSPROP	3.1E-08	EPI	-5.0E+00	EPI
608935	Pentachlorobenzene	608-93-5	2.5E+02	PHYSPROP	2.9E-02	7.0E-04	PHYSPROP	1.0E-03	EPI	8.6E+01	PHYSPROP
76017	Pentachloroethane	76-01-7	2.0E+02	PHYSPROP	7.9E-02	1.9E-03	EPI	3.5E+00	PHYSPROP	-2.9E+01	PHYSPROP
82688	Pentachloronitrobenzene	82-68-8	3.0E+02	PHYSPROP	1.8E-03	4.4E-05	EPI	5.0E-05	PHYSPROP	1.4E+02	PHYSPROP
87865	Pentachlorophenol	87-86-5	2.7E+02	PHYSPROP	1.0E-06	2.5E-08	PHYSPROP	1.1E-04	PHYSPROP	1.7E+02	PHYSPROP
78115	Pentaerythritol tetranitrate (PETN)	78-11-5	3.2E+02	PHYSPROP	5.4E-08	1.3E-09	PHYSPROP	5.5E-09	EPI	1.4E+02	PHYSPROP
109660	Pentane, n-	109-66-0	7.2E+01	PHYSPROP	5.1E+01	1.3E+00	PHYSPROP	5.1E+02	PHYSPROP	-1.3E+02	PHYSPROP
	Perchlorates										
7790989	~Ammonium Perchlorate	7790-98-9	1.2E+02	PHYSPROP							
7791039	~Lithium Perchlorate	7791-03-9	1.1E+02	CRC89						2.4E+02	CRC89
14797730	~Perchlorate and Perchlorate Salts	14797-73-0	1.2E+02	CRC89							
7778747	~Potassium Perchlorate	7778-74-7	1.4E+02	PHYSPROP						5.3E+02	PHYSPROP
7601890	~Sodium Perchlorate	7601-89-0	1.2E+02	PHYSPROP						4.8E+02	EPI
375735	Perfluorobutane sulfonic acid (PFBS)	375-73-5	3.0E+02	PHYSPROP							
45187153	Perfluorobutanesulfonate	45187-15-3	3.0E+02	EPA SRS							
52645531	Permethrin	52645-53-1	3.9E+02	PHYSPROP	7.6E-05	1.9E-06	EPI	2.2E-08	PHYSPROP	3.4E+01	PHYSPROP
62442	Phenacetin	62-44-2	1.8E+02	PHYSPROP	8.7E-09	2.1E-10	EPI	6.9E-07	PHYSPROP	1.4E+02	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m³/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
13684634	Phenmedipham	13684-63-4	3.0E+02	PHYSPROP	3.4E-11	8.4E-13	EPI	1.0E-11	PHYSPROP	1.4E+02	PHYSPROP
108952	Phenol	108-95-2	9.4E+01	PHYSPROP	1.4E-05	3.3E-07	PHYSPROP	3.5E-01	PHYSPROP	4.1E+01	PHYSPROP
114261	Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	2.1E+02	PHYSPROP	5.8E-08	1.4E-09	EPI	2.1E-05	PHYSPROP	9.0E+01	PHYSPROP
92842	Phenothiazine	92-84-2	2.0E+02	PHYSPROP	1.1E-06	2.8E-08	PHYSPROP	8.9E-07	PHYSPROP	1.9E+02	PHYSPROP
103720	Phenyl Isothiocyanate	103-72-0	1.4E+02	PHYSPROP	1.2E-01	3.0E-03	EPI	1.5E+00	PHYSPROP	-2.1E+01	PHYSPROP
108452	Phenylenediamine, m-	108-45-2	1.1E+02	PHYSPROP	5.1E-08	1.3E-09	EPI	2.1E-03	EPI	6.4E+01	PHYSPROP
95545	Phenylenediamine, o-	95-54-5	1.1E+02	PHYSPROP	2.9E-07	7.2E-09	EPI	2.1E-03	EPI	1.0E+02	PHYSPROP
106503	Phenylenediamine, p-	106-50-3	1.1E+02	PHYSPROP	2.8E-08	6.7E-10	PHYSPROP	5.0E-03	PHYSPROP	1.5E+02	PHYSPROP
90437	Phenylphenol, 2-	90-43-7	1.7E+02	PHYSPROP	4.3E-05	1.1E-06	EPI	2.0E-03	EPI	5.9E+01	PHYSPROP
298022	Phorate	298-02-2	2.6E+02	PHYSPROP	1.8E-04	4.4E-06	EPI	6.4E-04	PHYSPROP	-1.5E+01	CRC89
75445	Phosgene	75-44-5	9.9E+01	PHYSPROP	6.8E-01	1.7E-02	PHYSPROP	1.4E+03	PHYSPROP	-1.2E+02	PHYSPROP
732116	Phosmet	732-11-6	3.2E+02	PHYSPROP	3.4E-07	8.4E-09	EPI	4.9E-07	PHYSPROP	7.2E+01	PHYSPROP
	Phosphates, Inorganic										
13776880	~Aluminum metaphosphate	13776-88-0	2.6E+02	CRC89							
68333799	~Ammonium polyphosphate	68333-79-9									
7790763	~Calcium pyrophosphate	7790-76-3	2.5E+02	CRC89						1.2E+03	CRC89
7783280	~Diammonium phosphate	7783-28-0	1.3E+02	EPI							
7757939	~Dicalcium phosphate	7757-93-9	1.4E+02	EPI							
7782754	~Dimagnesium phosphate	7782-75-4	1.7E+02	CRC89							
7758114	~Dipotassium phosphate	7758-11-4	1.7E+02	EPI							
7558794	~Disodium phosphate	7558-79-4	1.4E+02	EPI							
13530502	~Monoaluminum phosphate	13530-50-2	3.2E+02	CRC89							
7722761	~Monoammonium phosphate	7722-76-1	1.2E+02	EPI							
7758238	~Monocalcium phosphate	7758-23-8	2.3E+02	EPI							
7757860	~Monomagnesium phosphate	7757-86-0	1.2E+02	CRC89							
7778770	~Monopotassium phosphate	7778-77-0	1.4E+02	EPI							
7558807	~Monosodium phosphate	7558-80-7	1.2E+02	PHYSPROP						6.0E+01	PHYSPROP
8017161	~Polyphosphoric acid	8017-16-1	2.6E+02	EPI							
13845368	~Potassium tripolyphosphate	13845-36-8	4.5E+02	PubChem							
7758169	~Sodium acid pyrophosphate	7758-16-9	2.2E+02	EPI							
7785888	~Sodium aluminum phosphate (acidic)	7785-88-8	1.4E+02	PubChem							
10279591	~Sodium aluminum phosphate (anhydrous)	10279-59-1									
10305767	~Sodium aluminum phosphate (tetrahydrate)	10305-76-7	9.5E+02	ectrum Chemi							
10124568	~Sodium hexametaphosphate	10124-56-8	6.1E+02	CRC89							
68915311	~Sodium polyphosphate	68915-31-1	3.6E+02	EPI							
7785844	~Sodium trimetaphosphate	7785-84-4	3.1E+02	EPI							
7758294	~Sodium tripolyphosphate	7758-29-4	3.7E+02	EPI							
7320345	~Tetrapotassium phosphate	7320-34-5	3.3E+02	PHYSPROP							
7722885	~Tetrasodium pyrophosphate	7722-88-5	2.7E+02	PHYSPROP						8.0E+01	PHYSPROP
15136875	~Trialuminum sodium tetra decahydrogenoctaorthophospha	15136-87-5	8.9E+02	PubChem							
7758874	~Tricalcium phosphate	7758-87-4	3.1E+02	CRC89						1.7E+03	CRC89
7757871	~Trimagnesium phosphate	7757-87-1	2.6E+02	CRC89						1.2E+03	CRC89
7778532	~Tripotassium phosphate	7778-53-2	2.1E+02	EPI							
7601549	~Trisodium phosphate	7601-54-9	1.6E+02	PHYSPROP						7.5E+01	PHYSPROP
7803512	Phosphine	7803-51-2	3.4E+01	PHYSPROP	1.0E+00	2.4E-02	PHYSPROP	2.9E+04	PHYSPROP	-1.3E+02	PHYSPROP
7664382	Phosphoric Acid	7664-38-2	9.8E+01	PHYSPROP				3.0E-02	NIOSH	4.2E+01	PHYSPROP
7723140	Phosphorus, White	7723-14-0	3.1E+01	YAWS	8.6E-02	2.1E-03	ATSDR Profile	2.5E-02	ATSDR Profile	4.4E+01	ATSDR Profile
	Phthalates										
117817	~Bis(2-ethylhexyl)phthalate	117-81-7	3.9E+02	PHYSPROP	1.1E-05	2.7E-07	EPI	1.4E-07	PHYSPROP	-5.5E+01	PHYSPROP
85687	~Butyl Benzyl Phthalate	85-68-7	3.1E+02	PHYSPROP	5.2E-05	1.3E-06	EPI	8.3E-06	PHYSPROP	-3.5E+01	PubChem
85701	~Butylphthalyl Butylglycolate	85-70-1	3.4E+02	PHYSPROP	8.4E-07	2.1E-08	PHYSPROP	7.1E-06	PHYSPROP	-3.5E+01	PHYSPROP
84742	~Dibutyl Phthalate	84-74-2	2.8E+02	PHYSPROP	7.4E-05	1.8E-06	PHYSPROP	2.0E-05	PHYSPROP	-3.5E+01	PHYSPROP
84662	~Diethyl Phthalate	84-66-2	2.2E+02	PHYSPROP	2.5E-05	6.1E-07	EPI	2.1E-03	PHYSPROP	-4.1E+01	PHYSPROP
120616	~Dimethylterephthalate	120-61-6	1.9E+02	PHYSPROP	5.5E-03	1.3E-04	EPI	1.0E-02	PHYSPROP	1.4E+02	PHYSPROP
117840	~Octyl Phthalate, di-N-	117-84-0	3.9E+02	PHYSPROP	1.1E-04	2.6E-06	EPI	1.0E-07	PHYSPROP	2.5E+01	PHYSPROP
100210	~Phthalic Acid, P-	100-21-0	1.7E+02	PHYSPROP	1.6E-11	3.9E-13	PHYSPROP	9.2E-06	EPI	4.0E+02	LANGE
85449	~Phthalic Anhydride	85-44-9	1.5E+02	PHYSPROP	6.7E-07	1.6E-08	EPI	5.2E-04	EPI	1.3E+02	PHYSPROP
1918021	Picloram	1918-02-1	2.4E+02	PHYSPROP	2.2E-12	5.3E-14	EPI	7.2E-11	PHYSPROP	2.2E+02	PHYSPROP
96913	Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	2.0E+02	PHYSPROP	4.0E-10	9.8E-12	PHYSPROP	4.2E-07	PHYSPROP	1.7E+02	PHYSPROP
88891	Picric Acid (2,4,6-Trinitrophenol)	88-89-1	2.3E+02	PHYSPROP	7.0E-10	1.7E-11	EPI	7.5E-07	PHYSPROP	1.2E+02	PHYSPROP
29232937	Pirimiphos, Methyl	29232-93-7	3.1E+02	PHYSPROP	2.9E-05	7.0E-07	EPI	1.5E-05	PHYSPROP	1.5E+01	PHYSPROP
59536651	Polybrominated Biphenyls	59536-65-1									
	Polychlorinated Biphenyls (PCBs)										
12674112	~Aroclor 1016	12674-11-2	2.6E+02	EPI	8.2E-03	2.0E-04	EPI	4.0E-04	PHYSPROP	1.0E+02	EPI
11104282	~Aroclor 1221	11104-28-2	1.9E+02	PHYSPROP	9.3E-03	2.3E-04	PHYSPROP	6.7E-03	PHYSPROP	3.4E+01	EPI
11141165	~Aroclor 1232	11141-16-5	1.9E+02	PHYSPROP	3.0E-02	7.4E-04	EPI	4.1E-03	PHYSPROP	3.4E+01	EPI
53469219	~Aroclor 1242	53469-21-9	2.9E+02	PHYSPROP	1.4E-02	3.4E-04	PHYSPROP	8.6E-05	EPI	1.2E+02	EPI
12672296	~Aroclor 1248	12672-29-6	2.9E+02	EPI	1.8E-02	4.4E-04	PHYSPROP	4.9E-04	PHYSPROP	1.2E+02	EPI
11097691	~Aroclor 1254	11097-69-1	3.3E+02	PHYSPROP	1.2E-02	2.8E-04	PHYSPROP	7.7E-05	PHYSPROP	1.3E+02	EPI
11096825	~Aroclor 1260	11096-82-5	4.0E+02	PHYSPROP	1.4E-02	3.4E-04	PHYSPROP	4.1E-05	PHYSPROP	1.6E+02	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1		2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
11126424	~Aroclor 5460	11126-42-4	5.4E+02	PubChem	5.1E-03	1.3E-04	PHYSPROP	8.5E-06	PHYSPROP	1.2E+02	EPI
39635319	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	4.0E+02	PHYSPROP	2.1E-03	5.1E-05	PHYSPROP	1.3E-07	PHYSPROP	1.6E+02	EPI
52663726	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	3.6E+02	PHYSPROP	2.8E-03	6.9E-05	PHYSPROP	5.8E-07	PHYSPROP	1.5E+02	EPI
69782907	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	3.6E+02	PHYSPROP	6.6E-03	1.6E-04	EPI	5.8E-07	EPI	1.5E+02	EPI
38380084	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	3.6E+02	PHYSPROP	5.8E-03	1.4E-04	EPI	1.6E-06	PHYSPROP	1.5E+02	EPI
32774166	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	3.6E+02	PHYSPROP	2.8E-03	6.9E-05	PHYSPROP	5.8E-07	PHYSPROP	1.5E+02	EPI
65510443	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	3.3E+02	EPI	7.8E-03	1.9E-04	EPI	5.5E-06	EPI	9.8E+01	EPI
31508006	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	3.3E+02	PHYSPROP	1.2E-02	2.9E-04	EPI	9.0E-06	PHYSPROP	1.3E+02	EPI
32598144	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	3.3E+02	PHYSPROP	1.2E-02	2.8E-04	EPI	6.5E-06	PHYSPROP	1.3E+02	EPI
74472370	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	3.3E+02	PHYSPROP	3.8E-03	9.2E-05	PHYSPROP	5.5E-06	PHYSPROP	9.8E+01	PHYSPROP
57465288	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	3.3E+02	EPI	7.8E-03	1.9E-04	EPI	2.2E-06	EPI	1.3E+02	EPI
1336363	~Polychlorinated Biphenyls (high risk)	1336-36-3	2.9E+02	PHYSPROP	1.7E-02	4.2E-04	PHYSPROP	4.9E-04	PHYSPROP	1.2E+02	EPI
1336363	~Polychlorinated Biphenyls (low risk)	1336-36-3	2.9E+02	PHYSPROP	1.7E-02	4.2E-04	PHYSPROP	4.9E-04	PHYSPROP	1.2E+02	EPI
1336363	~Polychlorinated Biphenyls (lowest risk)	1336-36-3	2.9E+02	PHYSPROP	1.7E-02	4.2E-04	PHYSPROP	4.9E-04	PHYSPROP	1.2E+02	EPI
32598133	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	2.9E+02	PHYSPROP	3.8E-04	9.4E-06	PHYSPROP	1.6E-05	PHYSPROP	1.8E+02	CRC89
70362504	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	2.9E+02	EPI	9.1E-03	2.2E-04	EPI	8.5E-06	EPI	1.2E+02	EPI
9016879	Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	5.1E+02	EPI	5.4E-10	1.3E-11	EPI	5.4E-13	EPI	2.5E+02	EPI
	Polynuclear Aromatic Hydrocarbons (PAHs)										
83329	~Acenaphthene	83-32-9	1.5E+02	PHYSPROP	7.5E-03	1.8E-04	PHYSPROP	2.2E-03	PHYSPROP	9.3E+01	PHYSPROP
120127	~Anthracene	120-12-7	1.8E+02	PHYSPROP	2.3E-03	5.6E-05	PHYSPROP	6.5E-06	EPI	2.2E+02	PHYSPROP
56553	~Benz[a]anthracene	56-55-3	2.3E+02	PHYSPROP	4.9E-04	1.2E-05	PHYSPROP	2.1E-07	PHYSPROP	8.4E+01	PHYSPROP
205823	~Benzo(j)fluoranthene	205-82-3	2.5E+02	PHYSPROP	8.3E-06	2.0E-07	PHYSPROP	2.6E-08	PHYSPROP	1.7E+02	PHYSPROP
50328	~Benzo[a]pyrene	50-32-8	2.5E+02	PHYSPROP	1.9E-05	4.6E-07	PHYSPROP	5.5E-09	EPI	1.8E+02	PHYSPROP
205992	~Benzo[b]fluoranthene	205-99-2	2.5E+02	PHYSPROP	2.7E-05	6.6E-07	PHYSPROP	5.0E-07	PHYSPROP	1.7E+02	PHYSPROP
207089	~Benzo[k]fluoranthene	207-08-9	2.5E+02	PHYSPROP	2.4E-05	5.8E-07	PHYSPROP	9.7E-10	EPI	2.2E+02	PHYSPROP
91587	~Chloronaphthalene, Beta-	91-58-7	1.6E+02	PHYSPROP	1.3E-02	3.2E-04	PHYSPROP	1.2E-02	EPI	6.1E+01	PHYSPROP
218019	~Chrysene	218-01-9	2.3E+02	PHYSPROP	2.1E-04	5.2E-06	PHYSPROP	6.2E-09	PHYSPROP	2.6E+02	PHYSPROP
53703	~Dibenz[a,h]anthracene	53-70-3	2.8E+02	PHYSPROP	5.8E-06	1.4E-07	EPI	9.6E-10	EPI	2.7E+02	PHYSPROP
192654	~Dibenzo(a,e)pyrene	192-65-4	3.0E+02	PHYSPROP	5.8E-07	1.4E-08	PHYSPROP	7.0E-11	PHYSPROP	2.3E+02	PHYSPROP
57976	~Dimethylbenz(a)anthracene, 7,12-	57-97-6	2.6E+02	PHYSPROP	1.5E-04	3.8E-06	EPI	6.8E-07	PHYSPROP	1.2E+02	PHYSPROP
206440	~Fluoranthene	206-44-0	2.0E+02	PHYSPROP	3.6E-04	8.9E-06	PHYSPROP	9.2E-06	PHYSPROP	1.1E+02	PHYSPROP
86737	~Fluorene	86-73-7	1.7E+02	PHYSPROP	3.9E-03	9.6E-05	PHYSPROP	6.0E-04	PHYSPROP	1.1E+02	PHYSPROP
193395	~Indeno[1,2,3-cd]pyrene	193-39-5	2.8E+02	PHYSPROP	1.4E-05	3.5E-07	PHYSPROP	1.3E-10	PHYSPROP	1.6E+02	PHYSPROP
90120	~Methylnaphthalene, 1-	90-12-0	1.4E+02	PHYSPROP	2.1E-02	5.1E-04	PHYSPROP	6.7E-02	PHYSPROP	-3.0E+01	PHYSPROP
91576	~Methylnaphthalene, 2-	91-57-6	1.4E+02	PHYSPROP	2.1E-02	5.2E-04	PHYSPROP	5.5E-02	PHYSPROP	3.4E+01	PHYSPROP
91203	~Naphthalene	91-20-3	1.3E+02	PHYSPROP	1.8E-02	4.4E-04	PHYSPROP	8.5E-02	PHYSPROP	8.0E+01	PHYSPROP
57835924	~Nitropyrene, 4-	57835-92-4	2.5E+02	PHYSPROP	1.0E-06	2.5E-08	PHYSPROP	5.5E-08	PHYSPROP	1.9E+02	PHYSPROP
129000	~Pyrene	129-00-0	2.0E+02	PHYSPROP	4.9E-04	1.2E-05	PHYSPROP	4.5E-06	PHYSPROP	1.5E+02	PHYSPROP
29420493	Potassium Perfluorobutane Sulfonate	29420-49-3	3.4E+02	EPI	3.6E-11	8.8E-13	Australian CHR	9.2E-08	Australian CHR	2.7E+02	ustralian CH
67747095	Prochloraz	67747-09-5	3.8E+02	PHYSPROP	6.7E-07	1.6E-08	EPI	1.1E-06	PHYSPROP	4.8E+01	PHYSPROP
26399360	Profluralin	26399-36-0	3.5E+02	PHYSPROP	1.2E-02	2.9E-04	EPI	6.3E-05	PHYSPROP	3.2E+01	PHYSPROP
1610180	Prometon	1610-18-0	2.3E+02	PHYSPROP	3.7E-08	9.1E-10	EPI	2.3E-06	PHYSPROP	9.1E+01	PHYSPROP
7287196	Prometryn	7287-19-6	2.4E+02	PHYSPROP	4.9E-07	1.2E-08	EPI	1.2E-06	PHYSPROP	1.2E+02	PHYSPROP
23950585	Pronamide	23950-58-5	2.6E+02	PHYSPROP	4.0E-07	9.8E-09	EPI	4.4E-07	PHYSPROP	1.6E+02	PHYSPROP
1918167	Propachlor	1918-16-7	2.1E+02	PHYSPROP	1.5E-05	3.6E-07	EPI	2.3E-04	PHYSPROP	7.7E+01	PHYSPROP
709988	Propanil	709-98-8	2.2E+02	PHYSPROP	7.0E-08	1.7E-09	EPI	9.1E-07	PHYSPROP	9.2E+01	PHYSPROP
2312358	Propargite	2312-35-8	3.5E+02	PHYSPROP	2.6E-05	6.4E-07	EPI	3.0E-07	PHYSPROP	1.7E+02	EPI
107197	Propargyl Alcohol	107-19-7	5.6E+01	PHYSPROP	4.7E-05	1.2E-06	EPI	1.6E+01	PHYSPROP	-5.0E+01	PHYSPROP
139402	Propazine	139-40-2	2.3E+02	PHYSPROP	1.9E-07	4.6E-09	EPI	1.3E-07	PHYSPROP	2.1E+02	PHYSPROP
122429	Propham	122-42-9	1.8E+02	PHYSPROP	7.5E-06	1.8E-07	EPI	1.4E-04	PHYSPROP	8.7E+01	PHYSPROP
60207901	Propiconazole	60207-90-1	3.4E+02	PHYSPROP	7.0E-08	1.7E-09	EPI	4.2E-07	PHYSPROP	1.7E+02	EPI
123386	Propionaldehyde	123-38-6	5.8E+01	PHYSPROP	3.0E-03	7.3E-05	PHYSPROP	3.2E+02	PHYSPROP	-8.0E+01	PHYSPROP
103651	Propyl benzene	103-65-1	1.2E+02	PHYSPROP	4.3E-01	1.1E-02	PHYSPROP	3.4E+00	PHYSPROP	-1.0E+02	PHYSPROP
115071	Propylene	115-07-1	4.2E+01	PHYSPROP	8.0E+00	2.0E-01	PHYSPROP	8.7E+03	PHYSPROP	-1.9E+02	PHYSPROP
57556	Propylene Glycol	57-55-6	7.6E+01	PHYSPROP	5.3E-07	1.3E-08	EPI	1.3E-01	PHYSPROP	-6.0E+01	PHYSPROP
6423434	Propylene Glycol Dinitrate	6423-43-4	1.7E+02	PHYSPROP	3.9E-05	9.4E-07	PHYSPROP	3.8E-01	PHYSPROP	-9.6E+00	EPI
107982	Propylene Glycol Monomethyl Ether	107-98-2	9.0E+01	PHYSPROP	3.8E-05	9.2E-07	PHYSPROP	1.3E+01	PHYSPROP	-9.5E+01	PHYSPROP
75569	Propylene Oxide	75-56-9	5.8E+01	PHYSPROP	2.8E-03	7.0E-05	EPI	5.4E+02	PHYSPROP	-1.1E+02	PHYSPROP
110861	Pyridine	110-86-1	7.9E+01	PHYSPROP	4.5E-04	1.1E-05	PHYSPROP	2.1E+01	PHYSPROP	-4.2E+01	PHYSPROP
13593038	Quinalphos	13593-03-8	3.0E+02	PHYSPROP	1.9E-06	4.6E-08	EPI	2.6E-06	PHYSPROP	3.2E+01	PHYSPROP
91225	Quinoline	91-22-5	1.3E+02	PHYSPROP	6.8E-05	1.7E-06	EPI	6.0E-02	PHYSPROP	-1.5E+01	PHYSPROP
76578148	Quizalofop-ethyl	76578-14-8	3.7E+02	PHYSPROP	4.3E-07	1.1E-08	EPI	6.5E-09	PHYSPROP	9.2E+01	PHYSPROP
E715557	Refractory Ceramic Fibers (units in fibers)	E715557									
10453868	Resmethrin	10453-86-8	3.4E+02	PHYSPROP	5.4E-06	1.3E-07	EPI	1.1E-08	PHYSPROP	5.7E+01	PHYSPROP
299843	Ronnel	299-84-3	3.2E+02	PHYSPROP	1.3E-03	3.2E-05	EPI	7.5E-05	PHYSPROP	4.1E+01	PHYSPROP
83794	Rotenone	83-79-4	3.9E+02	PHYSPROP	4.6E-12	1.1E-13	PHYSPROP	6.9E-10	PHYSPROP	1.8E+02	PHYSPROP
94597	Safrole	94-59-7	1.6E+02	PHYSPROP	3.7E-04	9.1E-06	PHYSPROP	6.2E-02	PHYSPROP	1.1E+01	PHYSPROP
7783008	Selenious Acid	7783-00-8	1.3E+02	PHYSPROP						7.0E+01	EPI
7782492	Selenium	7782-49-2	7.9E+01	PHYSPROP				1.4E-10	EPI	2.2E+02	PHYSPROP
7446346	Selenium Sulfide	7446-34-6	1.1E+02	EPI							

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

	1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant			Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m^3/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
74051802	Sethoxydim	74051-80-2	3.3E+02	PHYSPROP	8.8E-10	2.2E-11	PHYSPROP	1.6E-07	PHYSPROP	1.6E+02	EPI
7631869	Silica (crystalline, respirable)	7631-86-9	6.0E+01	EPI						1.7E+03	PERRY
7440224	Silver	7440-22-4	1.1E+02	PHYSPROP				0.0E+00	NIOSH	9.6E+02	PHYSPROP
122349	Simazine	122-34-9	2.0E+02	PHYSPROP	3.9E-08	9.4E-10	EPI	2.2E-08	PHYSPROP	2.3E+02	PHYSPROP
62476599	Sodium Acifluorfen	62476-59-9	3.8E+02	PHYSPROP	2.5E-09	6.1E-11	PHYSPROP	9.8E-09	EPI	2.8E+02	EPI
26628228	Sodium Azide	26628-22-8	6.5E+01	EPI						3.0E+02	CRC89
148185	Sodium Diethyldithiocarbamate	148-18-5	1.7E+02	PHYSPROP				8.2E-10	PHYSPROP	9.4E+01	PHYSPROP
7681494	Sodium Fluoride	7681-49-4	4.2E+01	PHYSPROP				0.0E+00	NIOSH	9.9E+02	PHYSPROP
62748	Sodium Fluoroacetate	62-74-8	1.0E+02	PHYSPROP	4.5E-05	1.1E-06	PHYSPROP	6.5E-07	PHYSPROP	2.0E+02	PHYSPROP
13718268	Sodium Metavanadate	13718-26-8	1.2E+02	CRC89						6.3E+02	CRC89
13472452	Sodium Tungstate	13472-45-2	2.9E+02	CRC89						7.0E+02	CRC89
10213102	Sodium Tungstate Dihydrate	10213-10-2	3.3E+02	CRC89						1.0E+02	CRC89
961115	Stirofos (Tetrachlorovinphos)	961-11-5	3.7E+02	PHYSPROP	7.5E-08	1.8E-09	EPI	4.2E-08	PHYSPROP	9.8E+01	PHYSPROP
7440246	Strontium, Stable	7440-24-6	8.8E+01	PHYSPROP						7.8E+02	PHYSPROP
57249	Strychnine	57-24-9	3.3E+02	PHYSPROP	3.1E-12	7.6E-14	PHYSPROP	2.9E-09	PHYSPROP	2.9E+02	PHYSPROP
100425	Styrene	100-42-5	1.0E+02	PHYSPROP	1.1E-01	2.8E-03	PHYSPROP	6.4E+00	PHYSPROP	-3.1E+01	PHYSPROP
57964393	Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3	2.1E+02	PPRTV							
57964406	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6	2.1E+02	PPRTV							
126330	Sulfolane	126-33-0	1.2E+02	PHYSPROP	2.0E-04	4.9E-06	PHYSPROP	4.1E-03	EPI	2.8E+01	PHYSPROP
80079	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	2.9E+02	PHYSPROP	5.6E-06	1.4E-07	PHYSPROP	8.1E-07	PHYSPROP	1.5E+02	PHYSPROP
7446119	Sulfur Trioxide	7446-11-9	8.0E+01	PHYSPROP				2.6E+02	PHYSPROP	1.7E+01	PHYSPROP
7664939	Sulfuric Acid	7664-93-9	9.8E+01	PHYSPROP				5.9E-05	PHYSPROP	1.0E+01	PHYSPROP
140578	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenox	140-57-8	3.3E+02	PHYSPROP	7.8E-06	1.9E-07	PHYSPROP	2.2E-07	PHYSPROP	-3.2E+01	PHYSPROP
21564170	TCMTB	21564-17-0	2.4E+02	PHYSPROP	2.7E-10	6.5E-12	PHYSPROP	3.1E-07	PHYSPROP	1.5E+02	EPI
34014181	Tebuthiuron	34014-18-1	2.3E+02	PHYSPROP	4.9E-09	1.2E-10	PHYSPROP	3.0E-07	PHYSPROP	1.6E+02	PHYSPROP
3383968	Temephos	3383-96-8	4.7E+02	PHYSPROP	8.0E-08	2.0E-09	PHYSPROP	7.9E-08	PHYSPROP	3.0E+01	PHYSPROP
5902512	Terbacil	5902-51-2	2.2E+02	PHYSPROP	4.9E-09	1.2E-10	EPI	4.7E-07	PHYSPROP	1.8E+02	PHYSPROP
13071799	Terbufos	13071-79-9	2.9E+02	PHYSPROP	9.8E-04	2.4E-05	EPI	3.2E-04	PHYSPROP	-2.9E+01	PHYSPROP
886500	Terbutryn	886-50-0	2.4E+02	PHYSPROP	8.8E-07	2.2E-08	EPI	1.7E-06	PHYSPROP	1.0E+02	PHYSPROP
540885	Tert-Butyl Acetate	540-88-5	1.2E+02	EPI	3.5E-02	8.6E-04	EPI	4.7E+01	EPI	2.5E+01	EPI
5436431	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1	4.9E+02	PHYSPROP	1.2E-04	3.0E-06	PHYSPROP	7.0E-08	EPI	1.6E+02	EPI
95943	Tetrachlorobenzene, 1,2,4,5-	95-94-3	2.2E+02	PHYSPROP	4.1E-02	1.0E-03	PHYSPROP	5.4E-03	EPI	1.4E+02	PHYSPROP
630206	Tetrachloroethane, 1,1,1,2-	630-20-6	1.7E+02	PHYSPROP	1.0E-01	2.5E-03	PHYSPROP	1.2E+01	PHYSPROP	-7.0E+01	PHYSPROP
79345	Tetrachloroethane, 1,1,2,2-	79-34-5	1.7E+02	PHYSPROP	1.5E-02	3.7E-04	PHYSPROP	4.6E+00	PHYSPROP	-4.4E+01	PHYSPROP
127184	Tetrachloroethylene	127-18-4	1.7E+02	PHYSPROP	7.2E-01	1.8E-02	PHYSPROP	1.9E+01	PHYSPROP	-2.2E+01	PHYSPROP
58902	Tetrachlorophenol, 2,3,4,6-	58-90-2	2.3E+02	PHYSPROP	3.6E-04	8.8E-06	EPI	6.7E-04	EPI	7.0E+01	PHYSPROP
5216251	Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	2.3E+02	PHYSPROP	7.9E-03	1.9E-04	PHYSPROP	3.8E-02	PHYSPROP	4.0E+01	EPI
3689245	Tetraethyl Dithiopyrophosphate	3689-24-5	3.2E+02	PHYSPROP	1.8E-04	4.5E-06	EPI	1.1E-04	PHYSPROP	-3.2E+01	EPI
811972	Tetrafluoroethane, 1,1,1,2-	811-97-2	1.0E+02	PHYSPROP	2.0E+00	5.0E-02	PHYSPROP	5.0E+03	PHYSPROP	-1.0E+02	PHYSPROP
479458	Tetryl (Trinitrophenylmethylnitramine)	479-45-8	2.9E+02	PHYSPROP	1.1E-07	2.7E-09	PHYSPROP	5.7E-08	PHYSPROP	1.3E+02	PHYSPROP
1314325	Thallic Oxide	1314-32-5	4.6E+02	CRC89						8.3E+02	CRC89
10102451	Thallium (I) Nitrate	10102-45-1	2.7E+02	PHYSPROP						2.1E+02	PHYSPROP
7440280	Thallium (Soluble Salts)	7440-28-0	2.0E+02	EPI						3.0E+02	PHYSPROP
563688	Thallium Acetate	563-68-8	2.6E+02	PHYSPROP				1.5E+01	PHYSPROP	1.3E+02	CRC89
6533739	Thallium Carbonate	6533-73-9	4.7E+02	PHYSPROP				5.8E+00	PHYSPROP	2.7E+02	PHYSPROP
7791120	Thallium Chloride	7791-12-0	2.4E+02	PHYSPROP						4.3E+02	PHYSPROP
12039520	Thallium Selenite	12039-52-0	2.8E+02	EPI						3.3E+02	CRC89
7446186	Thallium Sulfate	7446-18-6	5.0E+02	PHYSPROP						6.3E+02	PHYSPROP
79277273	Thifensulfuron-methyl	79277-27-3	3.9E+02	PHYSPROP	1.7E-12	4.1E-14	PHYSPROP	1.3E-10	PHYSPROP	1.8E+02	PHYSPROP
28249776	Thiobencarb	28249-77-6	2.6E+02	PHYSPROP	1.1E-05	2.7E-07	EPI	2.2E-05	PHYSPROP	3.3E+00	PHYSPROP
111488	Thiodiglycol	111-48-8	1.2E+02	PHYSPROP	7.6E-08	1.9E-09	PHYSPROP	3.2E-03	PHYSPROP	-1.0E+01	PHYSPROP
39196184	Thiofanox	39196-18-4	2.2E+02	PHYSPROP	3.8E-07	9.4E-09	EPI	1.7E-04	PHYSPROP	5.7E+01	PHYSPROP
23564058	Thiophanate, Methyl	23564-05-8	3.4E+02	PHYSPROP	4.9E-08	1.2E-09	EPI	7.1E-08	PHYSPROP	1.7E+02	EPI
137268	Thiram	137-26-8	2.4E+02	PHYSPROP	7.4E-06	1.8E-07	EPI	1.7E-05	PHYSPROP	1.6E+02	PHYSPROP
7440315	Tin	7440-31-5	1.2E+02	CRC89				0.0E+00	NIOSH	1.3E+01	CRC89
7550450	Titanium Tetrachloride	7550-45-0	1.9E+02	CRC89				1.0E+01	ATSDR Profile	-2.4E+01	CRC89
108883	Toluene	108-88-3	9.2E+01	PHYSPROP	2.7E-01	6.6E-03	PHYSPROP	2.8E+01	PHYSPROP	-9.5E+01	PHYSPROP
584849	Toluene-2,4-diisocyanate	584-84-9	1.7E+02	EPI	4.5E-04	1.1E-05	EPI	8.0E-03	EPI	2.1E+01	EPI
95705	Toluene-2,5-diamine	95-70-5	1.2E+02	PHYSPROP	3.0E-07	7.4E-09	PHYSPROP	3.4E-03	PHYSPROP	6.4E+01	PHYSPROP
91087	Toluene-2,6-diisocyanate	91-08-7	1.7E+02	EPI	4.5E-04	1.1E-05	EPI	2.1E-02	EPI	1.8E+01	EPI
99945	Toluic Acid, p-	99-94-5	1.4E+02	EPI	1.1E-05	2.8E-07	YAWS	5.1E-05	EPI	1.8E+02	EPI
95534	Toluidine, o- (Methylaniline, 2-)	95-53-4	1.1E+02	PHYSPROP	8.1E-05	2.0E-06	PHYSPROP	2.6E-01	PHYSPROP	-1.4E+01	PHYSPROP
106490	Toluidine, p-	106-49-0	1.1E+02	PHYSPROP	8.3E-05	2.0E-06	PHYSPROP	2.9E-01	PHYSPROP	4.4E+01	PHYSPROP
E1790670	Total Petroleum Hydrocarbons (Aliphatic High)	E1790670	1.7E+02	EPI	3.3E+02	8.2E+00	EPI	1.4E-01	EPI	-9.6E+00	EPI
E1790666	Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666	8.6E+01	SURROGATE	7.4E+01	1.8E+00	EPI	1.5E+02	SURROGATE	-9.5E+01	SURROGATE
E1790668	Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668	1.3E+02	SURROGATE	1.4E+02	3.4E+00	EPI	4.5E+00	SURROGATE	-5.4E+01	SURROGATE
E1790676	Total Petroleum Hydrocarbons (Aromatic High)	E1790676	2.0E+02	SURROGATE	3.6E-04	8.9E-06	SURROGATE	9.2E-06	SURROGATE	1.1E+02	SURROGATE
E1790672	Total Petroleum Hydrocarbons (Aromatic Low)	E1790672	7.8E+01	SURROGATE	2.3E-01	5.6E-03	SURROGATE	9.5E+01	SURROGATE	5.5E+00	SURROGATE
E1790674	Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674	1.4E+02	SURROGATE	2.0E-02	4.8E-04	SURROGATE	7.0E-02	SURROGATE	5.7E+01	SURROGATE
8001352	Toxaphene	8001-35-2	4.5E+02	PHYSPROP	2.5E-04	6.0E-06	PHYSPROP	6.7E-06	PHYSPROP	7.7E+01	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

1	2	3	4	5	6	7	8	9	10	11	12
	Contaminant		Molecular Weight		Volatility Parameters					Melting Point	
CAS No. (Trimmed)	Analyte	CAS No.	MW (g/mol)	MW Ref	H` (unitless)	HLC (atm-m³/mole)	H` and HLC Ref	VP (mmHg)	VP Ref	MP C	MP Ref
E1841606	Toxaphene, Weathered	E1841606	4.5E+02	PHYSPROP	2.5E-04	6.0E-06	PHYSPROP	6.7E-06	PHYSPROP	7.7E+01	PHYSPROP
66841256	Tralomethrin	66841-25-6	6.7E+02	PHYSPROP	1.6E-08	3.9E-10	EPI	3.6E-11	PHYSPROP	1.4E+02	PHYSPROP
688733	Tri-n-butyltin	688-73-3	2.9E+02	PHYSPROP	6.2E+01	1.5E+00	PHYSPROP	4.0E-02	PHYSPROP	2.9E+01	EPI
102761	Triacetin	102-76-1	2.2E+02	PHYSPROP	5.0E-07	1.2E-08	EPI	2.5E-03	PHYSPROP	7.8E+01	PHYSPROP
43121433	Triadimefon	43121-43-3	2.9E+02	PHYSPROP	3.3E-09	8.1E-11	EPI	1.5E-08	PHYSPROP	8.2E+01	PHYSPROP
2303175	Triallate	2303-17-5	3.0E+02	PHYSPROP	4.9E-04	1.2E-05	EPI	1.2E-04	PHYSPROP	2.9E+01	PHYSPROP
82097505	Triasulfuron	82097-50-5	4.0E+02	PHYSPROP	1.3E-11	3.2E-13	PHYSPROP	5.5E-12	PHYSPROP	1.9E+02	PHYSPROP
101200480	Tribenuron-methyl	101200-48-0	4.0E+02	PHYSPROP	4.2E-12	1.0E-13	PHYSPROP	3.9E-10	PHYSPROP	1.4E+02	PHYSPROP
615543	Tribromobenzene, 1,2,4-	615-54-3	3.1E+02	PHYSPROP	1.4E-02	3.4E-04	PHYSPROP	5.5E-03	PHYSPROP	4.5E+01	PHYSPROP
118796	Tribromophenol, 2,4,6-	118-79-6	3.3E+02	PHYSPROP	1.5E-06	3.6E-08	PHYSPROP	3.0E-04	PHYSPROP	9.6E+01	PHYSPROP
126738	Tributyl Phosphate	126-73-8	2.7E+02	PHYSPROP	5.8E-05	1.4E-06	EPI	1.1E-03	PHYSPROP	-7.9E+01	PHYSPROP
E1790678	Tributyltin Compounds	E1790678									
56359	Tributyltin Oxide	56-35-9	6.0E+02	PHYSPROP	1.2E-05	3.0E-07	EPI	7.5E-06	PHYSPROP	-4.5E+01	PHYSPROP
10025851	Trichloramine	10025-85-1									
76131	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.9E+02	PHYSPROP	2.2E+01	5.3E-01	EPI	3.6E+02	PHYSPROP	-3.5E+01	PHYSPROP
76039	Trichloroacetic Acid	76-03-9	1.6E+02	PHYSPROP	5.5E-07	1.4E-08	PHYSPROP	6.0E-02	EPI	5.8E+01	PHYSPROP
33663502	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.3E+02	EPI	2.9E-12	7.2E-14	EPI	6.1E-08	EPI	1.8E+02	EPI
634935	Trichloroaniline, 2,4,6-	634-93-5	2.0E+02	PHYSPROP	5.5E-05	1.3E-06	PHYSPROP	4.4E-03	PHYSPROP	7.9E+01	PHYSPROP
87616	Trichlorobenzene, 1,2,3-	87-61-6	1.8E+02	PHYSPROP	5.1E-02	1.3E-03	PHYSPROP	2.1E-01	PHYSPROP	5.4E+01	PHYSPROP
120821	Trichlorobenzene, 1,2,4-	120-82-1	1.8E+02	PHYSPROP	5.8E-02	1.4E-03	PHYSPROP	4.6E-01	PHYSPROP	1.7E+01	PHYSPROP
71556	Trichloroethane, 1,1,1-	71-55-6	1.3E+02	PHYSPROP	7.0E-01	1.7E-02	PHYSPROP	1.2E+02	PHYSPROP	-3.0E+01	PHYSPROP
79005	Trichloroethane, 1,1,2-	79-00-5	1.3E+02	PHYSPROP	3.4E-02	8.2E-04	PHYSPROP	2.3E+01	PHYSPROP	-3.7E+01	PHYSPROP
79016	Trichloroethylene	79-01-6	1.3E+02	PHYSPROP	4.0E-01	9.9E-03	PHYSPROP	6.9E+01	PHYSPROP	-8.5E+01	PHYSPROP
75694	Trichlorofluoromethane	75-69-4	1.4E+02	PHYSPROP	4.0E+00	9.7E-02	PHYSPROP	8.0E+02	PHYSPROP	-1.1E+02	PHYSPROP
95954	Trichlorophenol, 2,4,5-	95-95-4	2.0E+02	PHYSPROP	6.6E-05	1.6E-06	EPI	7.5E-03	EPI	6.9E+01	PHYSPROP
88062	Trichlorophenol, 2,4,6-	88-06-2	2.0E+02	PHYSPROP	1.1E-04	2.6E-06	EPI	8.0E-03	EPI	6.9E+01	PHYSPROP
93765	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	2.6E+02	PHYSPROP	3.5E-07	8.7E-09	PHYSPROP	3.8E-05	EPI	1.5E+02	PHYSPROP
93721	Trichlorophenoxypropionic acid, -2,4,5	93-72-1	2.7E+02	PHYSPROP	3.7E-07	9.1E-09	PHYSPROP	1.0E-05	PHYSPROP	1.8E+02	PHYSPROP
598776	Trichloropropane, 1,1,2-	598-77-6	1.5E+02	PHYSPROP	1.3E-02	3.2E-04	EPI	3.1E+00	PHYSPROP	-6.5E+01	EPI
96184	Trichloropropane, 1,2,3-	96-18-4	1.5E+02	PHYSPROP	1.4E-02	3.4E-04	PHYSPROP	3.7E+00	PHYSPROP	-1.5E+01	PHYSPROP
96195	Trichloropropene, 1,2,3-	96-19-5	1.5E+02	PHYSPROP	7.2E-01	1.8E-02	PHYSPROP	4.4E+00	PHYSPROP	-5.6E+01	EPI
1330785	Tricresyl Phosphate (TCP)	1330-78-5	3.7E+02	PHYSPROP	3.3E-05	8.1E-07	EPI	6.0E-07	EPI	-3.3E+01	PHYSPROP
58138082	Tridiphane	58138-08-2	3.2E+02	PHYSPROP	1.7E-05	4.1E-07	PHYSPROP	3.9E-04	PHYSPROP	4.3E+01	PHYSPROP
121448	Triethylamine	121-44-8	1.0E+02	PHYSPROP	6.1E-03	1.5E-04	PHYSPROP	5.7E+01	PHYSPROP	-1.1E+02	PHYSPROP
112276	Triethylene Glycol	112-27-6	1.5E+02	PHYSPROP	1.3E-09	3.2E-11	PHYSPROP	1.3E-03	PHYSPROP	-7.0E+00	PHYSPROP
420462	Trifluoroethane, 1,1,1-	420-46-2	8.4E+01	PHYSPROP	3.1E+01	7.7E-01	PHYSPROP	9.5E+03	PHYSPROP	-1.1E+02	PHYSPROP
1582098	Trifluralin	1582-09-8	3.4E+02	PHYSPROP	4.2E-03	1.0E-04	PHYSPROP	4.6E-05	PHYSPROP	4.9E+01	PHYSPROP
512561	Trimethyl Phosphate	512-56-1	1.4E+02	PHYSPROP	2.9E-07	7.2E-09	PHYSPROP	8.5E-01	EPI	-4.6E+01	PHYSPROP
526738	Trimethylbenzene, 1,2,3-	526-73-8	1.2E+02	PHYSPROP	1.8E-01	4.4E-03	PHYSPROP	1.7E+00	PHYSPROP	-2.5E+01	PHYSPROP
95636	Trimethylbenzene, 1,2,4-	95-63-6	1.2E+02	PHYSPROP	2.5E-01	6.2E-03	PHYSPROP	2.1E+00	PHYSPROP	-4.4E+01	PHYSPROP
108678	Trimethylbenzene, 1,3,5-	108-67-8	1.2E+02	PHYSPROP	3.6E-01	8.8E-03	PHYSPROP	2.5E+00	PHYSPROP	-4.5E+01	PHYSPROP
25167708	Trimethylpentene, 2,4,4-	25167-70-8	1.1E+02	PHYSPROP	3.0E+01	7.5E-01	PHYSPROP	7.1E+01	PHYSPROP	-8.4E+01	EPI
99354	Trinitrobenzene, 1,3,5-	99-35-4	2.1E+02	PHYSPROP	2.7E-07	6.5E-09	EPI	6.4E-06	EPI	1.2E+02	PHYSPROP
118967	Trinitrotoluene, 2,4,6-	118-96-7	2.3E+02	PHYSPROP	8.5E-07	2.1E-08	EPI	8.0E-06	PHYSPROP	8.0E+01	PHYSPROP
791286	Triphenylphosphine Oxide	791-28-6	2.8E+02	PHYSPROP	2.2E-08	5.3E-10	PHYSPROP	2.6E-09	EPI	1.6E+02	PHYSPROP
13674878	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	4.3E+02	PHYSPROP	1.1E-07	2.6E-09	PHYSPROP	7.4E-08	PHYSPROP	2.7E+01	PHYSPROP
13674845	Tris(1-chloro-2-propyl)phosphate	13674-84-5	3.3E+02	PHYSPROP	2.4E-06	6.0E-08	PHYSPROP	2.0E-05	PHYSPROP	-4.0E+01	PHYSPROP
126727	Tris(2,3-dibromopropyl)phosphate	126-72-7	7.0E+02	PHYSPROP	8.9E-04	2.2E-05	EPI	1.9E-04	PHYSPROP	5.5E+00	PHYSPROP
115968	Tris(2-chloroethyl)phosphate	115-96-8	2.9E+02	PHYSPROP	1.3E-04	3.3E-06	EPI	6.1E-02	PHYSPROP	-5.5E+01	PHYSPROP
78422	Tris(2-ethylhexyl)phosphate	78-42-2	4.3E+02	PHYSPROP	3.2E-06	7.9E-08	EPI	8.3E-08	PHYSPROP	-7.4E+01	PHYSPROP
7440337	Tungsten	7440-33-7	1.8E+02	PHYSPROP				0.0E+00	NIOSH	3.4E+03	PHYSPROP
7440611	Uranium	7440-61-1	2.4E+02	CRC89				0.0E+00	NIOSH	1.1E+03	CRC89
51796	Urethane	51-79-6	8.9E+01	PHYSPROP	2.6E-06	6.4E-08	EPI	2.6E-01	EPI	4.9E+01	PHYSPROP
1314621	Vanadium Pentoxide	1314-62-1	1.8E+02	EPI				0.0E+00	NIOSH	6.8E+02	CRC89
7440622	Vanadium and Compounds	7440-62-2	5.1E+01	EPI						1.9E+03	CRC89
1929777	Vernolate	1929-77-7	2.0E+02	PHYSPROP	1.3E-03	3.1E-05	EPI	1.0E-02	PHYSPROP	7.1E+01	EPI
50471448	Vinclozolin	50471-44-8	2.9E+02	PHYSPROP	7.1E-07	1.7E-08	EPI	1.2E-07	PHYSPROP	1.1E+02	PHYSPROP
108054	Vinyl Acetate	108-05-4	8.6E+01	PHYSPROP	2.1E-02	5.1E-04	EPI	9.0E+01	PHYSPROP	-9.3E+01	PHYSPROP
593602	Vinyl Bromide	593-60-2	1.1E+02	PHYSPROP	5.0E-01	1.2E-02	PHYSPROP	1.0E+03	PHYSPROP	-1.4E+02	PHYSPROP
75014	Vinyl Chloride	75-01-4	6.2E+01	PHYSPROP	1.1E+00	2.8E-02	PHYSPROP	3.0E+03	EPI	-1.5E+02	PHYSPROP
81812	Warfarin	81-81-2	3.1E+02	PHYSPROP	1.1E-07	2.8E-09	EPI	1.2E-07	PHYSPROP	1.6E+02	PHYSPROP
108383	Xylene, m-	108-38-3	1.1E+02	PHYSPROP	2.9E-01	7.2E-03	PHYSPROP	8.3E+00	PHYSPROP	-4.8E+01	PHYSPROP
95476	Xylene, o-	95-47-6	1.1E+02	PHYSPROP	2.1E-01	5.2E-03	PHYSPROP	6.6E+00	PHYSPROP	-2.5E+01	PHYSPROP
106423	Xylene, p-	106-42-3	1.1E+02	PHYSPROP	2.8E-01	6.9E-03	PHYSPROP	8.8E+00	PHYSPROP	1.3E+01	PHYSPROP
1330207	Xylenes	1330-20-7	1.1E+02	PHYSPROP	2.7E-01	6.6E-03	PHYSPROP	8.0E+00	PHYSPROP	-2.5E+01	EPI
1314847	Zinc Phosphide	1314-84-7	2.6E+02	CRC89						1.2E+03	CRC89
7440666	Zinc and Compounds	7440-66-6	6.5E+01	PHYSPROP						4.2E+02	PHYSPROP
12122677	Zineb	12122-67-7	2.8E+02	PHYSPROP	1.1E-07	2.7E-09	PHYSPROP	7.5E-08	PHYSPROP	1.6E+02	EPI
7440677	Zirconium	7440-67-7	9.1E+01	EPI				0.0E+00	NIOSH	1.9E+03	CRC89

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte		CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
30560191	Acephate		30560-19-1	1.4E+00	CRC89	3.7E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-8.5E-01	PHYSPROP
75070	Acetaldehyde		75-07-0	7.8E-01	CRC89	1.3E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-3.4E-01	PHYSPROP
34256821	Acetochlor		34256-82-1	1.1E+00	PubChem	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	3.0E+00	PHYSPROP
67641	Acetone		67-64-1	7.8E-01	CRC89	1.1E-01	1.1E-05	WATER9 (U.S. EPA, 2001)			2.4E+00	EPI	-2.4E-01	PHYSPROP
75865	Acetone Cyanohydrin		75-86-5	9.3E-01	CRC89	8.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-3.0E-02	PHYSPROP
75058	Acetonitrile		75-05-8	7.9E-01	CRC89	1.3E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			4.7E+00	EPI	-3.4E-01	PHYSPROP
98862	Acetophenone		98-86-2	1.0E+00	CRC89	6.5E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			5.2E+01	EPI	1.6E+00	PHYSPROP
53963	Acetylaminofluorene, 2-		53-96-3			5.2E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			2.2E+03	EPI	3.1E+00	PHYSPROP
107028	Acrolein		107-02-8	8.4E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.0E-02	PHYSPROP
79061	Acrylamide		79-06-1	1.2E+00	LANGE	1.1E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			5.7E+00	EPI	-6.7E-01	PHYSPROP
79107	Acrylic Acid		79-10-7	1.1E+00	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.4E+00	EPI	3.5E-01	PHYSPROP
107131	Acrylonitrile		107-13-1	8.0E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			8.5E+00	EPI	2.5E-01	PHYSPROP
111693	Adiponitrile		111-69-3	9.7E-01	CRC89	7.1E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			2.0E+01	EPI	-3.2E-01	PHYSPROP
15972608	Alachlor		15972-60-8	1.1E+00	CRC89	2.3E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			3.1E+02	EPI	3.5E+00	PHYSPROP
116063	Aldicarb		116-06-3	1.2E+00	CRC89	3.2E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			2.5E+01	EPI	1.1E+00	PHYSPROP
1646884	Aldicarb Sulfone		1646-88-4			5.2E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-5.7E-01	PHYSPROP
1646873	Aldicarb sulfoxide		1646-87-3			5.4E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-7.8E-01	PHYSPROP
309002	Aldrin		309-00-2	1.6E+00	PubChem	2.3E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			8.2E+04	EPI	6.5E+00	PHYSPROP
107186	Allyl Alcohol		107-18-6	8.5E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.9E+00	EPI	1.7E-01	PHYSPROP
107051	Allyl Chloride		107-05-1	9.4E-01	CRC89	9.4E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	1.9E+00	PHYSPROP
7429905	Aluminum		7429-90-5	2.7E+00	CRC89				1.5E+03	BAES				
20859738	Aluminum Phosphide		20859-73-8	2.4E+00	CRC89									
834128	Ametryn		834-12-8			5.1E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			4.3E+02	EPI	3.0E+00	PHYSPROP
92671	Aminobiphenyl, 4-		92-67-1			6.2E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	2.9E+00	PHYSPROP
591275	Aminophenol, m-		591-27-5			8.3E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			9.0E+01	EPI	2.1E-01	PHYSPROP
95556	Aminophenol, o-		95-55-6	1.3E+00	CRC89	8.0E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			9.2E+01	EPI	6.2E-01	PHYSPROP
123308	Aminophenol, p-		123-30-8			8.3E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			9.0E+01	EPI	4.0E-02	PHYSPROP
33089611	Amitraz		33089-61-1	1.1E+00	CRC89	2.2E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			2.6E+05	EPI	5.5E+00	PHYSPROP
7664417	Ammonia		7664-41-7	7.0E-01	CRC89	2.3E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					2.3E-01	PHYSPROP
7773060	Ammonium Sulfamate		7773-06-0	1.8E+00	PubChem									
75854	Amyl Alcohol, tert-		75-85-4	8.1E-01	CRC89	7.9E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			4.1E+00	EPI	8.9E-01	PHYSPROP
62533	Aniline		62-53-3	1.0E+00	CRC89	8.3E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			7.0E+01	EPI	9.0E-01	PHYSPROP
84651	Anthraquinone, 9,10-		84-65-1			5.4E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			5.0E+03	EPI	3.4E+00	PHYSPROP
7440360	Antimony (metallic)		7440-36-0	6.7E+00	CRC89				4.5E+01	SSL				
1314609	Antimony Pentoxide		1314-60-9	3.8E+00	CRC89									
1332816	Antimony Tetroxide		1332-81-6	6.6E+00	CRC89									
1309644	Antimony Trioxide		1309-64-4	5.6E+00	CRC89									
7440382	Arsenic, Inorganic		7440-38-2	4.9E+00	CRC89				2.9E+01	SSL				
7784421	Arsine		7784-42-1	3.2E+00	CRC89									
1332214	Asbestos (units in fibers)		1332-21-4											
3337711	Asulam		3337-71-1			5.1E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.8E+01	EPI	-2.7E-01	PHYSPROP
1912249	Atrazine		1912-24-9	1.2E+00	PubChem	2.6E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			2.2E+02	EPI	2.6E+00	PHYSPROP
492808	Auramine		492-80-8			4.6E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			4.5E+03	EPI	3.0E+00	PHYSPROP
65195553	Avermectin B1		65195-55-3			2.1E-02	2.4E-06	WATER9 (U.S. EPA, 2001)			8.8E+05	EPI	4.5E+00	PHYSPROP
86500	Azinphos-methyl		86-50-0	1.4E+00	CRC89	2.3E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			5.2E+01	EPI	2.8E+00	PHYSPROP
103333	Azobenzene		103-33-3	1.2E+00	PERRY	3.6E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			3.8E+03	EPI	3.8E+00	PHYSPROP
123773	Azodicarbonamide		123-77-3	1.7E+00	GuideChem	8.3E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			7.0E+01	EPI	-1.7E+00	PHYSPROP
7440393	Barium		7440-39-3	3.6E+00	CRC89				4.1E+01	SSL				
1861401	Benfluralin		1861-40-1	1.3E+00	ChemNet	2.2E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			1.6E+04	EPI	5.3E+00	PHYSPROP
17804352	Benomyl		17804-35-2			4.3E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			3.4E+02	EPI	2.1E+00	PHYSPROP
83055996	Bensulfuron-methyl		83055-99-6			3.4E-02	4.0E-06	WATER9 (U.S. EPA, 2001)			2.8E+01	EPI	2.2E+00	PHYSPROP
25057890	Bentazon		25057-89-0			4.9E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	2.3E+00	PHYSPROP
100527	Benzaldehyde		100-52-7	1.0E+00	CRC89	7.4E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	1.5E+00	PHYSPROP
71432	Benzene		71-43-2	8.8E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	2.1E+00	PHYSPROP
6369591	Benzenediamine-2-methyl sulfate, 1,4-		6369-59-1			5.2E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			3.8E+01	EPI	-3.7E+00	EPI
108985	Benzenethiol		108-98-5	1.1E+00	CRC89	7.3E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	2.5E+00	PHYSPROP
92875	Benzidine		92-87-5	1.2E+00	Yaws 2008	3.5E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			1.2E+03	EPI	1.3E+00	PHYSPROP
65850	Benzoic Acid		65-85-0	1.3E+00	CRC89	7.0E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			6.0E-01	SSL	1.9E+00	PHYSPROP
98077	Benzotrichloride		98-07-7	1.4E+00	CRC89	3.1E-02	7.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	3.9E+00	PHYSPROP
100516	Benzyl Alcohol		100-51-6	1.0E+00	CRC89	7.3E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			2.1E+01	EPI	1.1E+00	PHYSPROP
100447	Benzyl Chloride		100-44-7	1.1E+00	CRC89	6.3E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			4.5E+02	EPI	2.3E+00	PHYSPROP
7440417	Beryllium and compounds		7440-41-7	1.9E+00	CRC89				7.9E+02	SSL				
42576023	Bifenox		42576-02-3	1.2E+00	PubChem	2.0E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			3.7E+03	EPI	4.5E+00	PHYSPROP
82657043	Biphenthrin		82657-04-3	1.2E+00	CRC89	1.8E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			2.3E+06	EPI	6.0E+00	PHYSPROP
92524	Biphenyl, 1,1'-		92-52-4	1.0E+00	CRC89	4.7E-02	7.6E-06	WATER9 (U.S. EPA, 2001)			5.1E+03	EPI	4.0E+00	PHYSPROP
108601	Bis(2-chloro-1-methylethyl) ether		108-60-1	1.1E+00	CRC89	4.0E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			8.3E+01	EPI	2.5E+00	PHYSPROP
111911	Bis(2-chloroethoxy)methane		111-91-1			6.1E-02	7.1E-06	WATER9 (U.S. EPA, 2001)			1.4E+01	EPI	1.3E+00	PHYSPROP
111444	Bis(2-chloroethyl)ether		111-44-4	1.2E+00	CRC89	5.7E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	1.3E+00	PHYSPROP
542881	Bis(chloromethyl)ether		542-88-1	1.3E+00	CRC89	7.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			9.7E+00	EPI	5.7E-01	PHYSPROP
80057	Bisphenol A		80-05-7	1.2E+00	PubChem	2.5E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			3.8E+04	EPI	3.3E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)		Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
7440428		Boron And Borates Only	7440-42-8	2.3E+00	CRC89				3.0E+00	BAES				
10294345		Boron Trichloride	10294-34-5	4.8E-03	CRC89	1.2E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					1.2E+00	PHYSPROP
7637072		Boron Trifluoride	7637-07-2	2.8E+00	CRC89	1.6E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					2.2E-01	PHYSPROP
15541454		Bromate	15541-45-4						7.5E+00	BAES				
107040		Bromo-2-chloroethane, 1-	107-04-0	1.7E+00	CRC89	6.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	1.9E+00	PHYSPROP
1073069		Bromo-3-fluorobenzene, 1-	1073-06-9	1.7E+00	CRC89	4.6E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	2.9E+00	PHYSPROP
460004		Bromo-4-fluorobenzene, 1-	460-00-4	1.6E+00	CRC89	4.5E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.1E+00	PHYSPROP
79083		Bromoacetic acid	79-08-3	1.9E+00	CRC89	7.2E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			1.4E+00	EPI	4.1E-01	PHYSPROP
108861		Bromobenzene	108-86-1	1.5E+00	CRC89	5.4E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	3.0E+00	PHYSPROP
74975		Bromochloromethane	74-97-5	1.9E+00	CRC89	7.9E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.4E+00	PHYSPROP
75274		Bromodichloromethane	75-27-4	2.0E+00	CRC89	5.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	2.0E+00	PHYSPROP
75252		Bromoform	75-25-2	2.9E+00	CRC89	3.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	2.4E+00	PHYSPROP
74839		Bromomethane	74-83-9	1.7E+00	CRC89	1.0E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	1.2E+00	PHYSPROP
2104963		Bromophos	2104-96-3	1.7E+00	LookChem	2.3E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			2.0E+03	EPI	5.2E+00	PHYSPROP
106945		Bromopropane, 1-	106-94-5	1.4E+00	CRC89	7.2E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	2.1E+00	EPI
1689845		Bromoxynil	1689-84-5			4.5E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			3.3E+02	EPI	2.8E+00	PHYSPROP
1689992		Bromoxynil Octanoate	1689-99-2	1.5E+00	LookChem	2.1E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			4.3E+03	EPI	5.4E+00	PHYSPROP
106990		Butadiene, 1,3-	106-99-0	6.1E-01	CRC89	1.0E-01	1.0E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	2.0E+00	PHYSPROP
94826		Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6	1.4E+00	ChemNet	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			3.7E+02	PubChem	3.5E+00	PHYSPROP
71363		Butanol, N-	71-36-3	8.1E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			3.5E+00	EPI	8.8E-01	PHYSPROP
78922		Butyl alcohol, sec-	78-92-2	8.1E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			2.9E+00	EPI	6.1E-01	PHYSPROP
2008415		Butylate	2008-41-5	9.4E-01	CRC89	2.3E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			3.9E+02	EPI	4.2E+00	PHYSPROP
25013165		Butylated hydroxyanisole	25013-16-5			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			8.4E+02	EPI	3.5E+00	PHYSPROP
128370		Butylated hydroxytoluene	128-37-0	8.9E-01	CRC89	2.3E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			1.5E+04	EPI	5.1E+00	PHYSPROP
104518		Butylbenzene, n-	104-51-8	8.6E-01	CRC89	5.3E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	4.4E+00	PHYSPROP
135988		Butylbenzene, sec-	135-98-8	8.6E-01	LANGE	5.3E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+03	EPI	4.6E+00	PHYSPROP
98066		Butylbenzene, tert-	98-06-6	8.7E-01	CRC89	5.3E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	4.1E+00	PHYSPROP
75605		Cacodylic Acid	75-60-5			7.1E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	3.6E-01	PHYSPROP
7440439		Cadmium (Diet)	7440-43-9	8.7E+00	CRC89				7.5E+01	SSL				
7440439		Cadmium (Water)	7440-43-9	8.7E+00	CRC89				7.5E+01	SSL				
105602		Caprolactam	105-60-2	1.0E+00	LANGE	6.9E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			2.5E+01	EPI	-1.9E-01	YAWS
2425061		Captafol	2425-06-1			3.8E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			7.8E+02	EPI	3.8E+00	PHYSPROP
133062		Captan	133-06-2	1.7E+00	CRC89	2.6E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			2.5E+02	EPI	2.8E+00	PHYSPROP
63252		Carbaryl	63-25-2	1.2E+00	CRC89	2.7E-02	7.1E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	2.4E+00	PHYSPROP
1563662		Carbofuran	1563-66-2	1.2E+00	CRC89	2.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			9.5E+01	EPI	2.3E+00	PHYSPROP
75150		Carbon Disulfide	75-15-0	1.3E+00	CRC89	1.1E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.9E+00	PHYSPROP
56235		Carbon Tetrachloride	56-23-5	1.6E+00	CRC89	5.7E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.8E+00	PHYSPROP
463581		Carbonyl Sulfide	463-58-1	1.0E+00	CRC89	1.2E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.3E+00	PHYSPROP
55285148		Carbosulfan	55285-14-8	1.1E+00	CRC89	1.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			1.2E+04	EPI	5.6E+00	PHYSPROP
5234684		Carboxin	5234-68-4			5.0E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			1.7E+02	EPI	2.1E+00	PHYSPROP
1306383		Ceric oxide	1306-38-3	7.2E+00	CRC89									
302170		Chloral Hydrate	302-17-0	1.9E+00	CRC89	5.4E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	9.9E-01	PHYSPROP
133904		Chloramben	133-90-4			5.4E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			2.1E+01	EPI	1.9E+00	PHYSPROP
E701235		Chloramines, Organic	E701235											
118752		Chloranil	118-75-2			4.8E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			3.1E+02	EPI	2.2E+00	PHYSPROP
12789036		Chlordane	12789-03-6	1.6E+00	CRC89	2.1E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			6.8E+04	EPI	6.2E+00	EPI
143500		Chlordecone (Kepone)	143-50-0	1.6E+00	CRC89	2.0E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			1.8E+04	EPI	5.4E+00	PHYSPROP
470906		Chlorfenvinphos	470-90-6			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			1.3E+03	EPI	3.8E+00	PHYSPROP
90982324		Chlorimuron, Ethyl-	90982-32-4			3.4E-02	4.0E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	2.5E+00	PHYSPROP
7782505		Chlorine	7782-50-5	2.9E+00	CRC89	1.5E-01	2.2E-05	WATER9 (U.S. EPA, 2001)	2.5E-01	BAES			8.5E-01	PHYSPROP
10049044		Chlorine Dioxide	10049-04-4	2.8E+00	CRC89	1.6E-01	2.2E-05	WATER9 (U.S. EPA, 2001)						
7758192		Chlorite (Sodium Salt)	7758-19-2											
75683		Chloro-1,1-difluoroethane, 1-	75-68-3	1.1E+00	CRC89	8.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.1E+00	PHYSPROP
126998		Chloro-1,3-butadiene, 2-	126-99-8	9.6E-01	CRC89	8.4E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	2.5E+00	PHYSPROP
3165933		Chloro-2-methylaniline HCl, 4-	3165-93-3			6.0E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	2.3E+00	PHYSPROP
95692		Chloro-2-methylaniline, 4-	95-69-2			7.0E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	2.3E+00	PHYSPROP
107200		Chloroacetaldehyde, 2-	107-20-0	1.2E+00	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	9.0E-02	PHYSPROP
79118		Chloroacetic Acid	79-11-8	1.4E+00	CRC89	9.4E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			1.4E+00	EPI	2.2E-01	PHYSPROP
532274		Chloroacetophenone, 2-	532-27-4	1.3E+00	CRC89	5.2E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			9.9E+01	EPI	1.9E+00	PHYSPROP
106478		Chloroaniline, p-	106-47-8	1.4E+00	CRC89	7.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	1.8E+00	PHYSPROP
108907		Chlorobenzene	108-90-7	1.1E+00	CRC89	7.2E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	2.8E+00	PHYSPROP
98668		Chlorobenzene sulfonic acid, p-	98-66-8			5.7E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			1.6E+01	EPI	-5.2E-01	PHYSPROP
510156		Chlorobenzilate	510-15-6	1.3E+00	CRC89	2.2E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	4.7E+00	PHYSPROP
74113		Chlorobenzoic Acid, p-	74-11-3	1.5E+00	PERRY	5.5E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			2.7E+01	EPI	2.7E+00	PHYSPROP
98566		Chlorobenzotrifluoride, 4-	98-56-6	1.3E+00	CRC89	3.8E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	EPI	3.6E+00	PHYSPROP
109693		Chlorobutane, 1-	109-69-3	8.9E-01	CRC89	7.8E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	2.6E+00	PHYSPROP
75456		Chlorodifluoromethane	75-45-6	1.5E+00	CRC89	1.0E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	1.1E+00	PHYSPROP
107073		Chloroethanol, 2-	107-07-3	1.2E+00	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.9E+00	EPI	3.0E-02	PHYSPROP
67663		Chloroform	67-66-3	1.5E+00	CRC89	7.7E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	2.0E+00	PHYSPROP
74873		Chloromethane	74-87-3	9.1E-01	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	9.1E-01	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant		Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
107302	Chloromethyl Methyl Ether	107-30-2	1.1E+00	CRC89	9.5E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			5.3E+00	EPI	3.2E-01	PHYSPROP
88733	Chloronitrobenzene, o-	88-73-3	1.4E+00	CRC89	5.1E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			3.7E+02	EPI	2.2E+00	PHYSPROP
100005	Chloronitrobenzene, p-	100-00-5	1.3E+00	CRC89	5.0E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			3.6E+02	EPI	2.4E+00	PHYSPROP
95578	Chlorophenol, 2-	95-57-8	1.3E+00	CRC89	6.6E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			3.9E+02	SSL	2.2E+00	PHYSPROP
76062	Chloropicrin	76-06-2	1.7E+00	CRC89	5.2E-02	9.6E-06	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.1E+00	PHYSPROP
1897456	Chlorothalonil	1897-45-6	1.7E+00	CRC89	2.8E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	3.1E+00	PHYSPROP
95498	Chlorotoluene, o-	95-49-8	1.1E+00	CRC89	6.3E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.4E+00	PHYSPROP
106434	Chlorotoluene, p-	106-43-4	1.1E+00	CRC89	6.3E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.3E+00	PHYSPROP
54749905	Chlorozotocin	54749-90-5			4.6E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-1.0E+00	PHYSPROP
101213	Chlorpropham	101-21-3	1.2E+00	CRC89	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	3.5E+00	PHYSPROP
2921882	Chlorpyrifos	2921-88-2			3.8E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			7.3E+03	EPI	5.0E+00	PHYSPROP
5598130	Chlorpyrifos Methyl	5598-13-0			4.0E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			2.2E+03	EPI	4.3E+00	PHYSPROP
64902723	Chlorsulfuron	64902-72-3			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			3.2E+02	EPI	2.0E+00	PHYSPROP
1861321	Chlorthal-dimethyl	1861-32-1			4.0E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			5.1E+02	EPI	4.3E+00	PHYSPROP
60238564	Chlorthiophos	60238-56-4			3.7E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			1.3E+04	EPI	5.8E+00	PHYSPROP
16065831	Chromium(III), Insoluble Salts	16065-83-1	5.2E+00	CRC89				1.8E+06	SSL				
18540299	Chromium(VI)	18540-29-9						1.9E+01	SSL				
7440473	Chromium, Total	7440-47-3	7.2E+00	CRC89				1.8E+06	SSL				
74115245	Clofentezine	74115-24-5			4.2E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			3.0E+04	EPI	3.1E+00	PHYSPROP
7440484	Cobalt	7440-48-4	8.9E+00	CRC89				4.5E+01	BAES				
8007452	Coke Oven Emissions	8007-45-2			1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.6E+04			
7440508	Copper	7440-50-8	9.0E+00	CRC89				3.5E+01	BAES				
108394	Cresol, m-	108-39-4	1.0E+00	CRC89	7.3E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	2.0E+00	PHYSPROP
95487	Cresol, o-	95-48-7	1.0E+00	CRC89	7.3E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			3.1E+02	EPI	2.0E+00	PHYSPROP
106445	Cresol, p-	106-44-5	1.0E+00	CRC89	7.2E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	1.9E+00	PHYSPROP
59507	Cresol, p-chloro-m-	59-50-7			7.0E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			4.9E+02	EPI	3.1E+00	PHYSPROP
1319773	Cresols	1319-77-3			4.0E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			3.1E+02	EPI	2.0E+00	PHYSPROP
123739	Crotonaldehyde, trans-	123-73-9	8.5E-01	CRC89	9.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.8E+00	EPI	6.0E-01	PHYSPROP
98828	Cumene	98-82-8	8.6E-01	CRC89	6.0E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			7.0E+02	EPI	3.7E+00	PHYSPROP
135206	Cupferron	135-20-6			6.6E-02	7.7E-06	WATER9 (U.S. EPA, 2001)			7.6E+02	EPI	-1.7E+00	PHYSPROP
21725462	Cyanazine	21725-46-2			4.9E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	2.2E+00	PHYSPROP
	Cyanides												
592018	~Calcium Cyanide	592-01-8											
544923	~Copper Cyanide	544-92-3	2.9E+00	CRC89									
57125	~Cyanide (CN-)	57-12-5	7.0E-01	CHEM GUIDE	2.1E-01	2.5E-05	WATER9 (U.S. EPA, 2001)	9.9E+00	SSL				
460195	~Cyanogen	460-19-5	9.5E-01	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)					7.0E-02	PHYSPROP
506683	~Cyanogen Bromide	506-68-3	2.0E+00	CRC89	9.8E-02	1.4E-05	WATER9 (U.S. EPA, 2001)						
506774	~Cyanogen Chloride	506-77-4	1.2E+00	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)						
74908	~Hydrogen Cyanide	74-90-8	6.9E-01	CRC89	1.7E-01	1.7E-05	WATER9 (U.S. EPA, 2001)	9.9E+00	SSL			-2.5E-01	PHYSPROP
151508	~Potassium Cyanide	151-50-8	1.6E+00	CRC89									
506616	~Potassium Silver Cyanide	506-61-6											
506649	~Silver Cyanide	506-64-9	4.0E+00	CRC89									
143339	~Sodium Cyanide	143-33-9	1.6E+00	CRC89									
E1790664	~Thiocyanates	E1790664											
463569	~Thiocyanic Acid	463-56-9	1.1E+00	PPRTV	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)					5.8E-01	PubChem
557211	~Zinc Cyanide	557-21-1	1.9E+00	CRC89									
110827	Cyclohexane	110-82-7	7.7E-01	CRC89	8.0E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	3.4E+00	PHYSPROP
87843	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3			3.0E-02	3.5E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	4.7E+00	PHYSPROP
108941	Cyclohexanone	108-94-1	9.5E-01	CRC89	7.7E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			1.7E+01	EPI	8.1E-01	PHYSPROP
110838	Cyclohexene	110-83-8	8.1E-01	NIOSH	8.3E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	2.9E+00	PHYSPROP
108918	Cyclohexylamine	108-91-8	8.2E-01	CRC89	7.1E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	1.5E+00	PHYSPROP
68359375	Cyfluthrin	68359-37-5			3.3E-02	3.9E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	6.0E+00	PHYSPROP
68085858	Cyhalothrin	68085-85-8			3.2E-02	3.8E-06	WATER9 (U.S. EPA, 2001)			3.4E+05	EPI	6.9E+00	PHYSPROP
66215278	Cyromazine	66215-27-8			6.3E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			2.9E+01	EPI	-6.1E-02	PHYSPROP
72548	DDD, p,p`- (DDD)	72-54-8			4.1E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			1.2E+05	EPI	6.0E+00	PHYSPROP
72559	DDE, p,p'-	72-55-9	1.4E+00	LookChem	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.2E+05	EPI	6.5E+00	PHYSPROP
50293	DDT	50-29-3			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			1.7E+05	EPI	6.9E+00	PHYSPROP
75990	Dalapon	75-99-0	1.4E+00	CRC89	6.0E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			3.2E+00	EPI	7.8E-01	PHYSPROP
1596845	Daminozide	1596-84-5			6.4E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-1.5E+00	PHYSPROP
1163195	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	3.0E+00	IRIS Profile	1.9E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			2.8E+05	EPI	1.2E+01	PHYSPROP
8065483	Demeton	8065-48-3	1.1E+00	PubChem	1.6E-02	3.8E-06	WATER9 (U.S. EPA, 2001)					3.2E+00	PHYSPROP
103231	Di(2-ethylhexyl)adipate	103-23-1	9.2E-01	CRC89	1.7E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			3.6E+04	EPI	6.1E+00	PHYSPROP
2303164	Diallate	2303-16-4			4.5E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			6.4E+02	EPI	4.5E+00	PHYSPROP
333415	Diazinon	333-41-5	1.1E+00	CRC89	2.1E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			3.0E+03	EPI	3.8E+00	PHYSPROP
132650	Dibenzothiophene	132-65-0	1.3E+00	ChemNet	3.6E-02	7.6E-06	WATER9 (U.S. EPA, 2001)			9.2E+03	EPI	4.4E+00	PHYSPROP
96128	Dibromo-3-chloropropane, 1,2-	96-12-8	2.1E+00	CRC89	3.2E-02	8.9E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	3.0E+00	PHYSPROP
631641	Dibromoacetic acid	631-64-1			5.2E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			2.3E+00	EPI	7.0E-01	PHYSPROP
108361	Dibromobenzene, 1,3-	108-36-1	2.0E+00	CRC89	3.1E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.8E+00	PHYSPROP
106376	Dibromobenzene, 1,4-	106-37-6	2.3E+00	CRC89	3.3E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.8E+00	PHYSPROP
124481	Dibromochloromethane	124-48-1	2.5E+00	CRC89	3.7E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	2.2E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant		Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
106934	Dibromoethane, 1,2-	106-93-4	2.2E+00	CRC89	4.3E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	2.0E+00	PHYSPROP
74953	Dibromomethane (Methylene Bromide)	74-95-3	2.5E+00	CRC89	5.5E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.7E+00	PHYSPROP
E1790660	Dibutyltin Compounds	E1790660											
1918009	Dicamba	1918-00-9	1.6E+00	CRC89	2.9E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			2.9E+01	EPI	2.2E+00	PHYSPROP
3400097	Dichloramine	3400-09-7											
764410	Dichloro-2-butene, 1,4-	764-41-0	1.2E+00	LANGE	6.7E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	2.6E+00	PHYSPROP
1476115	Dichloro-2-butene, cis-1,4-	1476-11-5	1.2E+00	CRC89	6.7E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	2.6E+00	PHYSPROP
110576	Dichloro-2-butene, trans-1,4-	110-57-6	1.2E+00	CRC89	6.6E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	2.6E+00	PHYSPROP
79436	Dichloroacetic Acid	79-43-6	1.6E+00	CRC89	7.2E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			2.3E+00	EPI	9.2E-01	PHYSPROP
95501	Dichlorobenzene, 1,2-	95-50-1	1.3E+00	CRC89	5.6E-02	8.9E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.4E+00	PHYSPROP
106467	Dichlorobenzene, 1,4-	106-46-7	1.2E+00	CRC89	5.5E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.4E+00	PHYSPROP
91941	Dichlorobenzidine, 3,3'-	91-94-1			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			3.2E+03	EPI	3.5E+00	PHYSPROP
90982	Dichlorobenzophenone, 4,4'-	90-98-2	1.5E+00	CRC89	2.6E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			2.9E+03	EPI	4.4E+00	PHYSPROP
75718	Dichlorodifluoromethane	75-71-8	1.5E+00	PERRY	7.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.2E+00	PHYSPROP
75343	Dichloroethane, 1,1-	75-34-3	1.2E+00	CRC89	8.4E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	1.8E+00	PHYSPROP
107062	Dichloroethane, 1,2-	107-06-2	1.2E+00	CRC89	8.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	1.5E+00	PHYSPROP
75354	Dichloroethylene, 1,1-	75-35-4	1.2E+00	CRC89	8.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	2.1E+00	PHYSPROP
156592	Dichloroethylene, 1,2-cis-	156-59-2	1.3E+00	CRC89	8.8E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	1.9E+00	PHYSPROP
156605	Dichloroethylene, 1,2-trans-	156-60-5	1.3E+00	CRC89	8.8E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	2.1E+00	PHYSPROP
120832	Dichlorophenol, 2,4-	120-83-2	1.4E+00	PERRY	4.9E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			1.5E+02	SSL	3.1E+00	PHYSPROP
94757	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	1.4E+00	PubChem	2.8E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			3.0E+01	EPI	2.8E+00	PHYSPROP
78875	Dichloropropane, 1,2-	78-87-5	1.2E+00	PERRY	7.3E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	2.0E+00	PHYSPROP
142289	Dichloropropane, 1,3-	142-28-9	1.2E+00	CRC89	7.4E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	2.0E+00	PHYSPROP
616239	Dichloropropanol, 2,3-	616-23-9	1.4E+00	CRC89	6.8E-02	9.9E-06	WATER9 (U.S. EPA, 2001)			5.6E+00	EPI	7.8E-01	PHYSPROP
542756	Dichloropropene, 1,3-	542-75-6	1.2E+00	LANGE	7.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	2.0E+00	PHYSPROP
62737	Dichlorvos	62-73-7	1.4E+00	CRC89	2.8E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			5.4E+01	EPI	1.4E+00	PHYSPROP
141662	Dicrotophos	141-66-2	1.2E+00	CRC89	2.5E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			1.7E+01	EPI	0.0E+00	PHYSPROP
77736	Dicyclopentadiene	77-73-6	9.3E-01	LANGE	5.6E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	3.2E+00	PHYSPROP
60571	Dieldrin	60-57-1	1.8E+00	CRC89	2.3E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			2.0E+04	EPI	5.4E+00	PHYSPROP
E17136615	Diesel Engine Exhaust	E17136615											
111422	Diethanolamine	111-42-2	1.1E+00	CRC89	7.7E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.4E+00	PHYSPROP
112345	Diethylene Glycol Monobutyl Ether	112-34-5	9.6E-01	CRC89	4.1E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	5.6E-01	PHYSPROP
111900	Diethylene Glycol Monoethyl Ether	111-90-0	9.9E-01	CRC89	5.6E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-5.4E-01	PHYSPROP
617845	Diethylformamide	617-84-5	9.1E-01	CRC89	7.3E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			2.1E+00	EPI	5.0E-02	PHYSPROP
56531	Diethylstilbestrol	56-53-1			4.6E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			2.7E+05	EPI	5.1E+00	PHYSPROP
43222486	Difenzoquat	43222-48-6			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	6.5E-01	PHYSPROP
35367385	Diflubenzuron	35367-38-5			4.1E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			4.6E+02	EPI	3.9E+00	PHYSPROP
75376	Difluoroethane, 1,1-	75-37-6	9.0E-01	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			3.2E+01	EPI	7.5E-01	PHYSPROP
420451	Difluoropropane, 2,2-	420-45-1	9.2E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.3E+00	PHYSPROP
94586	Dihydrosafrole	94-58-6	1.1E+00	PubChem	4.3E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			2.1E+02	EPI	3.6E+00	PHYSPROP
108203	Diisopropyl Ether	108-20-3	7.2E-01	CRC89	6.5E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			2.3E+01	EPI	1.5E+00	PHYSPROP
1445756	Diisopropyl Methylphosphonate	1445-75-6	9.8E-01	ATSDR Profile	3.4E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			4.2E+01	EPI	1.0E+00	PHYSPROP
55290647	Dimethipin	55290-64-7			5.4E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-1.7E-01	PHYSPROP
60515	Dimethoate	60-51-5	1.3E+00	CRC89	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	7.8E-01	PHYSPROP
119904	Dimethoxybenzidine, 3,3'-	119-90-4			4.9E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			5.1E+02	EPI	1.8E+00	PHYSPROP
756796	Dimethyl methylphosphonate	756-79-6	1.2E+00	CRC89	6.7E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			5.4E+00	EPI	-6.1E-01	PHYSPROP
60117	Dimethylamino azobenzene [p-]	60-11-7			5.1E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			2.0E+03	EPI	4.6E+00	PHYSPROP
21436964	Dimethylaniline HCl, 2,4-	21436-96-4			7.8E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	2.2E+00	PHYSPROP
95681	Dimethylaniline, 2,4-	95-68-1	9.7E-01	CRC89	6.3E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	1.7E+00	PHYSPROP
121697	Dimethylaniline, N,N-	121-69-7	9.6E-01	CRC89	6.3E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			7.9E+01	EPI	2.3E+00	PHYSPROP
119937	Dimethylbenzidine, 3,3'-	119-93-7			5.3E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			3.2E+03	EPI	2.3E+00	PHYSPROP
68122	Dimethylformamide	68-12-2	9.4E-01	CRC89	9.7E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.0E+00	PHYSPROP
57147	Dimethylhydrazine, 1,1-	57-14-7	7.9E-01	CRC89	1.0E-01	1.1E-05	WATER9 (U.S. EPA, 2001)			1.2E+01	EPI	-1.2E+00	PHYSPROP
540738	Dimethylhydrazine, 1,2-	540-73-8	8.3E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.5E+01	EPI	-5.4E-01	PHYSPROP
105679	Dimethylphenol, 2,4-	105-67-9	9.7E-01	CRC89	6.2E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			4.9E+02	EPI	2.3E+00	PHYSPROP
576261	Dimethylphenol, 2,6-	576-26-1			7.7E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			5.0E+02	EPI	2.4E+00	PHYSPROP
95658	Dimethylphenol, 3,4-	95-65-8	9.8E-01	CRC89	6.3E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			4.9E+02	EPI	2.2E+00	PHYSPROP
513371	Dimethylvinylchloride	513-37-1	9.2E-01	CRC89	8.1E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	2.6E+00	PHYSPROP
534521	Dinitro-o-cresol, 4,6-	534-52-1			5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			7.5E+02	EPI	2.1E+00	PHYSPROP
131895	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5			4.6E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			1.7E+04	EPI	4.1E+00	PHYSPROP
528290	Dinitrobenzene, 1,2-	528-29-0	1.3E+00	CRC89	4.5E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			3.6E+02	EPI	1.7E+00	PHYSPROP
99650	Dinitrobenzene, 1,3-	99-65-0	1.6E+00	CRC89	4.8E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	1.5E+00	PHYSPROP
100254	Dinitrobenzene, 1,4-	100-25-4	1.6E+00	CRC89	4.9E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	1.5E+00	PHYSPROP
51285	Dinitrophenol, 2,4-	51-28-5	1.7E+00	CRC89	4.1E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			4.6E+02	EPI	1.7E+00	PHYSPROP
E1615210	Dinitrotoluene Mixture, 2,4/2,6-	E1615210			5.9E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			5.9E+02	EPI	2.2E+00	EPI
121142	Dinitrotoluene, 2,4-	121-14-2	1.3E+00	CRC89	3.8E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			5.8E+02	EPI	2.0E+00	PHYSPROP
606202	Dinitrotoluene, 2,6-	606-20-2	1.3E+00	CRC89	3.7E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			5.9E+02	EPI	2.1E+00	PHYSPROP
35572782	Dinitrotoluene, 2-Amino-4,6-	35572-78-2			5.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			2.8E+02	EPI	1.8E+00	PHYSPROP
19406510	Dinitrotoluene, 4-Amino-2,6-	19406-51-0			5.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			2.8E+02	EPI	1.8E+00	PHYSPROP
25321146	Dinitrotoluene, Technical grade	25321-14-6			2.8E-02	3.3E-06	WATER9 (U.S. EPA, 2001)			5.9E+02	EPI	2.2E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte		CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
88857	Dinoseb		88-85-7	1.3E+00	CRC89	2.5E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			4.3E+03	EPI	3.6E+00	PHYSPROP
123911	Dioxane, 1,4-		123-91-1	1.0E+00	CRC89	8.7E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			2.6E+00	EPI	-2.7E-01	PHYSPROP
	Dioxins													
34465468	~Hexachlorodibenzo-p-dioxin, Mixture		34465-46-8	1.8E+00	ChemNet	4.3E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			7.0E+05	EPI	8.2E+00	PHYSPROP
1746016	~TCDD, 2,3,7,8-		1746-01-6	1.8E+00	PubChem	4.7E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			2.5E+05	EPI	6.8E+00	PHYSPROP
957517	Diphenamid		957-51-7	1.2E+00	CRC89	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			4.8E+03	EPI	2.2E+00	PHYSPROP
101848	Diphenyl Ether		101-84-8	1.1E+00	CRC89	4.0E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			2.0E+03	PPRTV	4.2E+00	EPI
127639	Diphenyl Sulfone		127-63-9	1.3E+00	CRC89	2.7E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			1.1E+03	EPI	2.4E+00	PHYSPROP
122394	Diphenylamine		122-39-4	1.2E+00	CRC89	4.2E-02	7.6E-06	WATER9 (U.S. EPA, 2001)			8.3E+02	EPI	3.5E+00	PHYSPROP
122667	Diphenylhydrazine, 1,2-		122-66-7	1.2E+00	CRC89	3.4E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	2.9E+00	PHYSPROP
85007	Diquat		85-00-7	1.2E+00	CRC89	2.1E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			9.3E+03	EPI	-4.6E+00	PHYSPROP
1937377	Direct Black 38		1937-37-7			2.2E-02	2.6E-06	WATER9 (U.S. EPA, 2001)			2.4E+08	EPI	4.9E+00	PHYSPROP
2602462	Direct Blue 6		2602-46-2			2.0E-02	2.3E-06	WATER9 (U.S. EPA, 2001)			7.9E+08	EPI	2.6E+00	PHYSPROP
16071866	Direct Brown 95		16071-86-6			2.3E-02	2.7E-06	WATER9 (U.S. EPA, 2001)			7.0E+06	EPI	-6.5E+00	PHYSPROP
298044	Disulfoton		298-04-4	1.1E+00	CRC89	2.3E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			8.4E+02	EPI	4.0E+00	PHYSPROP
505293	Dithiane, 1,4-		505-29-3	1.1E+00	ChemNet	6.8E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	7.7E-01	PHYSPROP
330541	Diuron		330-54-1			5.0E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	2.7E+00	PHYSPROP
2439103	Dodine		2439-10-3			4.4E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	1.2E+00	PHYSPROP
759944	EPTC		759-94-4	9.5E-01	CRC89	2.9E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			1.6E+02	EPI	3.2E+00	PHYSPROP
115297	Endosulfan		115-29-7	1.7E+00	CRC89	2.2E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			6.8E+03	EPI	3.8E+00	PHYSPROP
1031078	Endosulfan Sulfate		1031-07-8			3.4E-02	3.9E-06	WATER9 (U.S. EPA, 2001)			9.8E+03	EPI	3.7E+00	PHYSPROP
145733	Endothall		145-73-3	1.4E+00	CRC89	3.7E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			1.9E+01	EPI	1.9E+00	PHYSPROP
72208	Endrin		72-20-8			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			2.0E+04	EPI	5.2E+00	PHYSPROP
106898	Epichlorohydrin		106-89-8	1.2E+00	PERRY	8.9E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			9.9E+00	EPI	4.5E-01	PHYSPROP
106887	Epoxybutane, 1,2-		106-88-7	8.3E-01	CRC89	9.3E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			9.9E+00	EPI	8.6E-01	PHYSPROP
111773	Ethanol, 2-(2-methoxyethoxy)-		111-77-3			7.8E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.2E+00	PHYSPROP
16672870	Ethephon		16672-87-0	1.2E+00	CRC89	5.5E-02	8.6E-06	WATER9 (U.S. EPA, 2001)			5.0E+00	EPI	-2.2E-01	PHYSPROP
563122	Ethion		563-12-2	1.2E+00	CRC89	1.9E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			8.8E+02	EPI	5.1E+00	PHYSPROP
111159	Ethoxyethanol Acetate, 2-		111-15-9	9.7E-01	CRC89	5.7E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			4.5E+00	EPI	5.9E-01	PHYSPROP
110805	Ethoxyethanol, 2-		110-80-5	9.3E-01	CRC89	8.2E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-3.2E-01	PHYSPROP
141786	Ethyl Acetate		141-78-6	9.0E-01	CRC89	8.2E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			5.6E+00	EPI	7.3E-01	PHYSPROP
140885	Ethyl Acrylate		140-88-5	9.2E-01	CRC89	7.5E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	1.3E+00	PHYSPROP
75003	Ethyl Chloride (Chloroethane)		75-00-3	8.9E-01	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.4E+00	PHYSPROP
60297	Ethyl Ether		60-29-7	7.1E-01	CRC89	8.5E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			9.7E+00	EPI	8.9E-01	PHYSPROP
97632	Ethyl Methacrylate		97-63-2	9.1E-01	CRC89	6.5E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.7E+01	EPI	1.9E+00	PHYSPROP
2104645	Ethyl-p-nitrophenyl Phosphonate		2104-64-5	1.3E+00	CRC89	2.2E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			1.5E+04	EPI	4.8E+00	PHYSPROP
100414	Ethylbenzene		100-41-4	8.6E-01	CRC89	6.8E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			4.5E+02	EPI	3.2E+00	PHYSPROP
109784	Ethylene Cyanohydrin		109-78-4	1.0E+00	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-9.4E-01	PHYSPROP
107153	Ethylene Diamine		107-15-3	9.0E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.5E+01	EPI	-2.0E+00	PHYSPROP
107211	Ethylene Glycol		107-21-1	1.1E+00	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.4E+00	PHYSPROP
111762	Ethylene Glycol Monobutyl Ether		111-76-2	9.0E-01	CRC89	6.3E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			2.8E+00	EPI	8.3E-01	PHYSPROP
75218	Ethylene Oxide		75-21-8	8.8E-01	CRC89	1.3E-01	1.5E-05	WATER9 (U.S. EPA, 2001)			3.2E+00	EPI	-3.0E-01	PHYSPROP
96457	Ethylene Thiourea		96-45-7			8.7E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	-6.6E-01	PHYSPROP
151564	Ethyleneimine		151-56-4	8.3E-01	CRC89	1.3E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			9.0E+00	EPI	-2.8E-01	PHYSPROP
84720	Ethylphthalyl Ethyl Glycolate		84-72-0			4.4E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	2.2E+00	PHYSPROP
22224926	Fenamiphos		22224-92-6	1.2E+00	CRC89	2.1E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			4.0E+02	EPI	3.2E+00	PHYSPROP
39515418	Fenpropathrin		39515-41-8			3.8E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			2.2E+04	EPI	5.7E+00	PHYSPROP
51630581	Fenvalerate		51630-58-1	1.2E+00	CRC89	1.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			3.2E+05	EPI	6.2E+00	PHYSPROP
2164172	Fluometuron		2164-17-2			5.0E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.9E+02	EPI	2.4E+00	PHYSPROP
16984488	Fluoride		16984-48-8						1.5E+02	BAES				
7782414	Fluorine (Soluble Fluoride)		7782-41-4	1.6E+00	CRC89				1.5E+02	BAES				
59756604	Fluridone		59756-60-4			4.0E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			5.7E+04	EPI	3.2E+00	PHYSPROP
56425913	Flurprimidol		56425-91-3			4.1E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			2.2E+03	EPI	3.3E+00	PHYSPROP
85509199	Flusilazole		85509-19-9			4.1E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			8.1E+04	EPI	3.7E+00	PHYSPROP
66332965	Flutolanil		66332-96-5			4.0E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			2.6E+03	EPI	3.7E+00	PHYSPROP
69409945	Fluvalinate		69409-94-5			3.0E-02	3.5E-06	WATER9 (U.S. EPA, 2001)			7.3E+05	EPI	6.8E+00	PHYSPROP
133073	Folpet		133-07-3			4.3E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			1.8E+01	EPI	2.9E+00	PHYSPROP
72178020	Fomesafen		72178-02-0	1.3E+00	CRC89	1.9E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	2.9E+00	PHYSPROP
944229	Fonofos		944-22-9	1.2E+00	CRC89	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			8.6E+02	EPI	3.9E+00	PHYSPROP
50000	Formaldehyde		50-00-0	8.2E-01	CRC89	1.7E-01	1.7E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	3.5E-01	PHYSPROP
64186	Formic Acid		64-18-6	1.2E+00	CRC89	1.5E-01	1.7E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-5.4E-01	PHYSPROP
39148248	Fosetyl-AL		39148-24-8			3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			6.5E+03	EPI	-2.4E+00	PHYSPROP
	Furans													
132649	~Dibenzofuran		132-64-9	1.1E+00	CRC89	6.5E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			9.2E+03	EPI	4.1E+00	PHYSPROP
110009	~Furan		110-00-9	9.5E-01	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			8.0E+01	EPI	1.3E+00	PHYSPROP
109999	~Tetrahydrofuran		109-99-9	8.8E-01	CRC89	9.9E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	4.6E-01	PHYSPROP
67458	Furazolidone		67-45-8			5.1E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			8.6E+02	EPI	-4.0E-02	PHYSPROP
98011	Furfural		98-01-1	1.2E+00	CRC89	8.5E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			6.1E+00	EPI	4.1E-01	PHYSPROP
531828	Furium		531-82-8			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			5.8E+02	EPI	1.8E+00	EPI
60568050	Furmecyclox		60568-05-0			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			4.3E+02	EPI	4.4E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.		Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
77182822	Glufosinate, Ammonium	77182-82-2				5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-4.8E+00	PHYSPROP
111308	Glutaraldehyde	111-30-8				8.8E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-3.3E-01	PHYSPROP
765344	Glycidyl	765-34-4		1.1E+00	CRC89	1.1E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.2E-01	PHYSPROP
1071836	Glyphosate	1071-83-6				6.2E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			2.1E+03	USDA ARS	-3.4E+00	PHYSPROP
113008	Guanidine	113-00-8		1.6E+00	GuideChem	1.4E-01	1.7E-05	WATER9 (U.S. EPA, 2001)			1.2E+01	EPI	-1.6E+00	PHYSPROP
50011	Guanidine Chloride	50-01-1		1.4E+00	CRC89	9.2E-02	1.2E-05	WATER9 (U.S. EPA, 2001)					-3.6E+00	PHYSPROP
506934	Guanidine Nitrate	506-93-4				7.7E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			2.3E+01	EPI	-8.4E+00	PHYSPROP
69806402	Haloxyfop, Methyl	69806-40-2				3.6E-02	4.3E-06	WATER9 (U.S. EPA, 2001)			5.5E+03	EPI	4.1E+00	PHYSPROP
76448	Heptachlor	76-44-8		1.6E+00	CRC89	2.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			4.1E+04	EPI	6.1E+00	PHYSPROP
1024573	Heptachlor Epoxide	1024-57-3		1.9E+00	LookChem	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			1.0E+04	EPI	5.0E+00	PHYSPROP
111717	Heptanal, n-	111-71-7		8.1E-01	CRC89	6.2E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	2.3E+00	PHYSPROP
142825	Heptane, N-	142-82-5		6.8E-01	CRC89	6.5E-02	7.6E-06	WATER9 (U.S. EPA, 2001)			2.4E+02	EPI	4.7E+00	PHYSPROP
87821	Hexabromobenzene	87-82-1		3.0E+00	LookChem	2.5E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	6.1E+00	PHYSPROP
68631492	Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2				2.5E-02	3.0E-06	WATER9 (U.S. EPA, 2001)						
118741	Hexachlorobenzene	118-74-1		2.0E+00	CRC89	2.9E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			6.2E+03	EPI	5.7E+00	PHYSPROP
87683	Hexachlorobutadiene	87-68-3		1.6E+00	CRC89	2.7E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			8.5E+02	EPI	4.8E+00	PHYSPROP
319846	Hexachlorocyclohexane, Alpha-	319-84-6				4.3E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	3.8E+00	PHYSPROP
319857	Hexachlorocyclohexane, Beta-	319-85-7		1.9E+00	CRC89	2.8E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	3.8E+00	PHYSPROP
58899	Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9				4.3E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	3.7E+00	PHYSPROP
608731	Hexachlorocyclohexane, Technical	608-73-1				4.3E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	4.1E+00	EPI
77474	Hexachlorocyclopentadiene	77-47-4		1.7E+00	CRC89	2.7E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			1.4E+03	EPI	5.0E+00	PHYSPROP
67721	Hexachloroethane	67-72-1		2.1E+00	CRC89	3.2E-02	8.9E-06	WATER9 (U.S. EPA, 2001)			2.0E+02	EPI	4.1E+00	PHYSPROP
70304	Hexachlorophene	70-30-4				3.5E-02	4.0E-06	WATER9 (U.S. EPA, 2001)			6.7E+05	EPI	7.5E+00	PHYSPROP
121824	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4		1.8E+00	CRC89	3.1E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			8.9E+01	EPI	8.7E-01	PHYSPROP
822060	Hexamethylene Diisocyanate, 1,6-	822-06-0		1.1E+00	CRC89	4.0E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			4.8E+03	EPI	3.2E+00	PHYSPROP
680319	Hexamethylphosphoramide	680-31-9		1.0E+00	CRC89	3.5E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	2.8E-01	PHYSPROP
110543	Hexane, N-	110-54-3		6.6E-01	CRC89	7.3E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	3.9E+00	PHYSPROP
124049	Hexanedioic Acid	124-04-9		1.4E+00	CRC89	5.8E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			2.4E+01	EPI	8.0E-02	PHYSPROP
104767	Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7		8.3E-01	CRC89	5.4E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	2.7E+00	EPI
591786	Hexanone, 2-	591-78-6		8.1E-01	CRC89	7.0E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.5E+01	EPI	1.4E+00	PHYSPROP
51235042	Hexazinone	51235-04-2		1.3E+00	CRC89	2.5E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	1.9E+00	PHYSPROP
78587050	Hexythiazox	78587-05-0				3.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			2.1E+03	EPI	5.6E+00	PHYSPROP
67485294	Hydramethylnon	67485-29-4				3.0E-02	3.6E-06	WATER9 (U.S. EPA, 2001)			1.8E+08	EPI	2.3E+00	PHYSPROP
302012	Hydrazine	302-01-2		1.0E+00	CRC89	1.7E-01	1.9E-05	WATER9 (U.S. EPA, 2001)			2.0E+00	PubChem	-2.1E+00	PHYSPROP
10034932	Hydrazine Sulfate	10034-93-2		1.4E+00	CRC89									
7647010	Hydrogen Chloride	7647-01-0		1.5E+00	CRC89	1.9E-01	2.3E-05	WATER9 (U.S. EPA, 2001)						
7664393	Hydrogen Fluoride	7664-39-3		8.2E-01	CRC89	2.2E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					2.3E-01	PHYSPROP
7783064	Hydrogen Sulfide	7783-06-4		1.4E+00	CRC89	1.9E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					2.3E-01	PhysProp
123319	Hydroquinone	123-31-9		1.3E+00	CRC89	8.0E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			2.4E+02	EPI	5.9E-01	PHYSPROP
35554440	Imazalil	35554-44-0		1.2E+00	CRC89	2.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			8.5E+03	EPI	3.8E+00	PHYSPROP
81335377	Imazaquin	81335-37-7				4.1E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			2.4E+03	EPI	1.9E+00	PHYSPROP
81335775	Imazethapyr	81335-77-5				4.3E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			3.4E+02	EPI	1.5E+00	PHYSPROP
7553562	Iodine	7553-56-2		4.9E+00	CRC89				6.0E+01	BAES			2.5E+00	PHYSPROP
36734197	Iprodione	36734-19-7				4.0E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			5.3E+01	EPI	3.0E+00	PHYSPROP
7439896	Iron	7439-89-6		7.9E+00	CRC89				2.5E+01	BAES				
78831	Isobutyl Alcohol	78-83-1		8.0E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			2.9E+00	EPI	7.6E-01	PHYSPROP
78591	Isophorone	78-59-1		9.3E-01	CRC89	5.3E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			6.5E+01	EPI	1.7E+00	PHYSPROP
33820530	Isopropalin	33820-53-0		1.2E+00	ChemNet	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			1.1E+04	EPI	5.8E+00	PHYSPROP
67630	Isopropanol	67-63-0		7.8E-01	CRC89	1.0E-01	1.1E-05	WATER9 (U.S. EPA, 2001)			1.5E+00	EPI	5.0E-02	PHYSPROP
1832548	Isopropyl Methyl Phosphonic Acid	1832-54-8				7.1E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			7.7E+00	EPI	2.7E-01	PHYSPROP
82558507	Isoxaben	82558-50-7				4.0E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			1.3E+03	EPI	3.9E+00	PHYSPROP
E1737665	JP-7	E1737665		7.8E-01	ATSDR Profile								8.0E+00	EPA HCD
77501634	Lactofen	77501-63-4				3.2E-02	3.7E-06	WATER9 (U.S. EPA, 2001)			2.3E+04	EPI	4.8E+00	PHYSPROP
78977	Lactonitrile	78-97-7		9.9E-01	CRC89	1.0E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-9.4E-01	PHYSPROP
7439910	Lanthanum	7439-91-0		6.2E+00	CRC89									
100587904	Lanthanum Acetate Hydrate	100587-90-4				3.9E-02	4.6E-06	WATER9 (U.S. EPA, 2001)						
10025840	Lanthanum Chloride Heptahydrate	10025-84-0												
10099588	Lanthanum Chloride, Anhydrous	10099-58-8		3.8E+00	CRC89									
10277437	Lanthanum Nitrate Hexahydrate	10277-43-7												
	Lead Compounds													
7446277	~Lead Phosphate	7446-27-7		7.0E+00	CRC89									
301042	~Lead acetate	301-04-2		3.3E+00	CRC89	3.3E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-8.0E-02	PHYSPROP
7439921	~Lead and Compounds	7439-92-1		1.1E+01	CRC89				9.0E+02	BAES				
1335326	~Lead subacetate	1335-32-6				2.2E-02	2.6E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-4.0E+00	PHYSPROP
78002	~Tetraethyl Lead	78-00-2		1.7E+00	CRC89	2.5E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			6.5E+02	EPI	4.2E+00	PHYSPROP
541253	Lewisite	541-25-3		1.9E+00	CRC89	3.3E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	2.6E+00	PHYSPROP
330552	Linuron	330-55-2				4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			3.4E+02	EPI	3.2E+00	PHYSPROP
7439932	Lithium	7439-93-2		5.3E-01	CRC89				3.0E+02	BAES				
94746	MCPA	94-74-6		1.6E+00	PubChem	3.1E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			3.0E+01	EPI	3.3E+00	PHYSPROP
94815	MCPB	94-81-5				5.1E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			9.8E+01	EPI	2.8E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant		Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
93652	MCPP	93-65-2	1.3E+00	PubChem	2.7E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			4.9E+01	EPI	3.1E+00	PHYSPROP
121755	Malathion	121-75-5	1.2E+00	CRC89	2.1E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			3.1E+01	EPI	2.4E+00	PHYSPROP
108316	Maleic Anhydride	108-31-6	1.3E+00	CRC89	8.8E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	1.6E+00	PHYSPROP
123331	Maleic Hydrazide	123-33-1			8.2E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			3.3E+00	EPI	-8.4E-01	PHYSPROP
109773	Malononitrile	109-77-3	1.2E+00	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			3.3E+00	EPI	-6.0E-01	PHYSPROP
8018017	Mancozeb	8018-01-7	1.9E+00	PubChem	2.0E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	1.3E+00	PHYSPROP
12427382	Maneb	12427-38-2			4.3E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	6.2E-01	PHYSPROP
7439965	Manganese (Diet)	7439-96-5	7.3E+00	CRC89				6.5E+01	BAES				
7439965	Manganese (Non-diet)	7439-96-5	7.3E+00	CRC89				6.5E+01	BAES				
950107	Mephosfolan	950-10-7			4.6E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			6.4E+02	EPI	1.0E+00	PHYSPROP
24307264	Mepiquat Chloride	24307-26-4			6.7E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			6.6E+01	EPI	-2.8E+00	PHYSPROP
149304	Mercaptobenzothiazole, 2-	149-30-4	1.4E+00	CRC89	4.7E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			1.4E+03	EPI	2.4E+00	EPI
	Mercury Compounds												
7487947	~Mercuric Chloride (and other Mercury salts)	7487-94-7	5.6E+00	CRC89								-2.2E-01	PHYSPROP
7439976	~Mercury (elemental)	7439-97-6	1.4E+01	CRC89	3.1E-02	6.3E-06	WATER9 (U.S. EPA, 2001)	5.2E+01	SSL			6.2E-01	PHYSPROP
22967926	~Methyl Mercury	22967-92-6						7.0E+03	EPA				
62384	~Phenylmercuric Acetate	62-38-4			3.9E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			5.6E+01	EPI	7.1E-01	PHYSPROP
150505	Merphos	150-50-5	1.0E+00	CRC89	2.0E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			4.9E+04	EPI	7.7E+00	PHYSPROP
78488	Merphos Oxide	78-48-8	1.1E+00	CRC89	2.0E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			2.4E+03	EPI	5.7E+00	PHYSPROP
57837191	Metalaxyl	57837-19-1			4.4E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			3.9E+01	EPI	1.7E+00	PHYSPROP
126987	Methacrylonitrile	126-98-7	8.0E-01	CRC89	9.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	6.8E-01	PHYSPROP
10265926	Methamidophos	10265-92-6	1.3E+00	CRC89	6.0E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			5.4E+00	EPI	-8.0E-01	PHYSPROP
67561	Methanol	67-56-1	7.9E-01	CRC89	1.6E-01	1.6E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-7.7E-01	PHYSPROP
950378	Methidathion	950-37-8			4.2E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			2.1E+01	EPI	2.2E+00	PHYSPROP
16752775	Methomyl	16752-77-5	1.3E+00	CRC89	4.8E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	6.0E-01	PHYSPROP
99592	Methoxy-5-nitroaniline, 2-	99-59-2	1.2E+00	CRC89	4.3E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			7.1E+01	EPI	1.5E+00	PHYSPROP
72435	Methoxychlor	72-43-5	1.4E+00	CRC89	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			2.7E+04	EPI	5.1E+00	PHYSPROP
110496	Methoxyethanol Acetate, 2-	110-49-6	1.0E+00	CRC89	6.6E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			2.5E+00	EPI	1.0E-01	PHYSPROP
109864	Methoxyethanol, 2-	109-86-4	9.6E-01	CRC89	9.5E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-7.7E-01	PHYSPROP
79209	Methyl Acetate	79-20-9	9.3E-01	CRC89	9.6E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			3.1E+00	EPI	1.8E-01	PHYSPROP
96333	Methyl Acrylate	96-33-3	9.5E-01	CRC89	8.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			5.8E+00	EPI	8.0E-01	PHYSPROP
78933	Methyl Ethyl Ketone (2-Butanone)	78-93-3	8.0E-01	CRC89	9.1E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.5E+00	EPI	2.9E-01	PHYSPROP
60344	Methyl Hydrazine	60-34-4	8.7E-01	LANGE	1.3E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	-1.1E+00	PHYSPROP
108101	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	8.0E-01	CRC89	7.0E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			1.3E+01	EPI	1.3E+00	PHYSPROP
624839	Methyl Isocyanate	624-83-9	9.6E-01	CRC89	1.2E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			4.0E+01	EPI	7.9E-01	PHYSPROP
80626	Methyl Methacrylate	80-62-6	9.4E-01	CRC89	7.5E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			9.1E+00	EPI	1.4E+00	PHYSPROP
298000	Methyl Parathion	298-00-0	1.4E+00	CRC89	2.5E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			7.3E+02	EPI	2.9E+00	PHYSPROP
993135	Methyl Phosphonic Acid	993-13-5			9.1E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			1.4E+00	EPI	-7.0E-01	PHYSPROP
25013154	Methyl Styrene (Mixed Isomers)	25013-15-4	8.9E-01	HSDB	1.7E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			7.2E+02	EPI	3.4E+00	PHYSPROP
66273	Methyl methanesulfonate	66-27-3	1.3E+00	CRC89	7.9E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			4.3E+00	EPI	-6.6E-01	PHYSPROP
1634044	Methyl tert-Butyl Ether (MTBE)	1634-04-4	7.4E-01	CRC89	7.5E-02	8.6E-06	WATER9 (U.S. EPA, 2001)			1.2E+01	EPI	9.4E-01	PHYSPROP
615452	Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2			5.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			2.0E+02	EPI	-2.1E+00	PHYSPROP
108112	Methyl-2-Pentanol, 4-	108-11-2	8.1E-01	CRC89	6.9E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			8.2E+00	EPI	1.4E+00	PHYSPROP
99558	Methyl-5-Nitroaniline, 2-	99-55-8			6.7E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	1.9E+00	PHYSPROP
70257	Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7			6.8E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	-9.2E-01	PHYSPROP
636215	Methylaniline Hydrochloride, 2-	636-21-5			6.9E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	1.6E+00	PHYSPROP
124583	Methylarsonic acid	124-58-3			7.0E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	-1.2E+00	PHYSPROP
74612127	Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7			6.5E-02	7.6E-06	WATER9 (U.S. EPA, 2001)						
615509	Methylbenzene-1,4-diamine sulfate, 2-	615-50-9			5.2E-02	6.1E-06	WATER9 (U.S. EPA, 2001)						
56495	Methylcholanthrene, 3-	56-49-5	1.3E+00	CRC89	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			9.6E+05	EPI	6.4E+00	PHYSPROP
75092	Methylene Chloride	75-09-2	1.3E+00	CRC89	1.0E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.3E+00	PHYSPROP
101144	Methylene-bis(2-chloroaniline), 4,4'-	101-14-4			4.6E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			5.7E+03	EPI	3.9E+00	PHYSPROP
101611	Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			2.7E+03	EPI	4.4E+00	PHYSPROP
101779	Methylenebisbenzenamine, 4,4'-	101-77-9			5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			2.1E+03	EPI	1.6E+00	PHYSPROP
101688	Methylenediphenyl Diisocyanate	101-68-8	1.2E+00	CRC89	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			2.8E+05	EPI	5.2E+00	PHYSPROP
98839	Methylstyrene, Alpha-	98-83-9	9.1E-01	CRC89	6.3E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			7.0E+02	EPI	3.5E+00	PHYSPROP
51218452	Metolachlor	51218-45-2	1.1E+00	CRC89	2.2E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			4.9E+02	EPI	3.1E+00	PHYSPROP
21087649	Metribuzin	21087-64-9	1.3E+00	CRC89	2.7E-02	7.1E-06	WATER9 (U.S. EPA, 2001)			5.3E+01	EPI	1.7E+00	PHYSPROP
74223646	Metsulfuron-methyl	74223-64-6			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			9.3E+01	EPI	2.2E+00	PHYSPROP
8012951	Mineral oils	8012-95-1	8.8E-01	ChemNet	3.6E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			4.8E+03	EPI	6.1E+00	EPI
2385855	Mirex	2385-85-5	2.3E+00	ChemNet	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			3.6E+05	EPI	6.9E+00	PHYSPROP
2212671	Molinate	2212-67-1	1.1E+00	CRC89	3.2E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	3.2E+00	PHYSPROP
7439987	Molybdenum	7439-98-7	1.0E+01	CRC89				2.0E+01	BAES				
10599903	Monochloramine	10599-90-3											
100618	Monomethylaniline	100-61-8	9.9E-01	CRC89	7.2E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			8.2E+01	EPI	1.7E+00	PHYSPROP
88671890	Myclobutanil	88671-89-0			4.5E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			6.1E+03	EPI	2.9E+00	PHYSPROP
74317	N,N'-Diphenyl-1,4-benzenediamine	74-31-7			4.7E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			5.2E+04	EPI	4.0E+00	PHYSPROP
300765	Naled	300-76-5	2.0E+00	CRC89	2.5E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	1.4E+00	PHYSPROP
64742956	Naphtha, High Flash Aromatic (HFAN)	64742-95-6											
91598	Naphthylamine, 2-	91-59-8	1.6E+00	CRC89	6.4E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	2.3E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte		CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
15299997	Napropamide		15299-99-7			4.5E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			3.2E+03	EPI	3.4E+00	PHYSPROP
373024	Nickel Acetate		373-02-4	1.8E+00	PERRY	4.6E-02	9.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.4E+00	PHYSPROP
3333673	Nickel Carbonate		3333-67-3			7.9E-02	9.2E-06	WATER9 (U.S. EPA, 2001)					-2.1E+00	PHYSPROP
13463393	Nickel Carbonyl		13463-39-3	1.3E+00	CRC89	4.3E-02	8.2E-06	WATER9 (U.S. EPA, 2001)						
12054487	Nickel Hydroxide		12054-48-7											
1313991	Nickel Oxide		1313-99-1	6.7E+00	CRC89									
E715532	Nickel Refinery Dust		E715532						1.5E+02	BAES				
7440020	Nickel Soluble Salts		7440-02-0	8.9E+00	CRC89				6.5E+01	SSL				
12035722	Nickel Subsulfide		12035-72-2	5.9E+00	CRC89									
1271289	Nickelocene		1271-28-9			5.8E-02	6.7E-06	WATER9 (U.S. EPA, 2001)						
14797558	Nitrate (measured as nitrogen)		14797-55-8											
E701177	Nitrate + Nitrite (measured as nitrogen)		E701177											
14797650	Nitrite (measured as nitrogen)		14797-65-0											
88744	Nitroaniline, 2-		88-74-4	9.0E-01	CRC89	5.2E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	1.9E+00	PHYSPROP
100016	Nitroaniline, 4-		100-01-6	1.4E+00	CRC89	6.4E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	1.4E+00	PHYSPROP
98953	Nitrobenzene		98-95-3	1.2E+00	CRC89	6.8E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	1.9E+00	PHYSPROP
9004700	Nitrocellulose		9004-70-0			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-4.6E+00	PHYSPROP
67209	Nitrofurantoin		67-20-9			4.9E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	-4.7E-01	PHYSPROP
59870	Nitrofurazone		59-87-0			5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			3.5E+02	EPI	2.3E-01	PHYSPROP
55630	Nitroglycerin		55-63-0	1.6E+00	CRC89	2.9E-02	7.7E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	1.6E+00	PHYSPROP
556887	Nitroguanidine		556-88-7	2.0E+00	ChemNet	1.0E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			2.1E+01	EPI	-8.9E-01	PHYSPROP
75525	Nitromethane		75-52-5	1.1E+00	CRC89	1.2E-01	1.4E-05	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-3.5E-01	PHYSPROP
79469	Nitropropane, 2-		79-46-9	9.8E-01	CRC89	8.5E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			3.1E+01	EPI	9.3E-01	PHYSPROP
759739	Nitroso-N-ethylurea, N-		759-73-9			7.9E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			2.1E+01	EPI	2.3E-01	PHYSPROP
684935	Nitroso-N-methylurea, N-		684-93-5			8.6E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	-3.0E-02	PHYSPROP
924163	Nitroso-di-N-butylamine, N-		924-16-3	9.0E-01	PubChem	4.2E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			9.1E+02	EPI	2.6E+00	PHYSPROP
621647	Nitroso-di-N-propylamine, N-		621-64-7	9.2E-01	CRC89	5.6E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			2.8E+02	EPI	1.4E+00	PHYSPROP
1116547	Nitrosodiethanolamine, N-		1116-54-7			7.3E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-1.3E+00	PHYSPROP
55185	Nitrosodiethylamine, N-		55-18-5	9.4E-01	CRC89	7.4E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			8.3E+01	EPI	4.8E-01	PHYSPROP
62759	Nitrosodimethylamine, N-		62-75-9	1.0E+00	CRC89	9.9E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			2.3E+01	EPI	-5.7E-01	PHYSPROP
86306	Nitrosodiphenylamine, N-		86-30-6			5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			2.6E+03	EPI	3.1E+00	PHYSPROP
10595956	Nitrosomethylethylamine, N-		10595-95-6	9.4E-01	PubChem	8.4E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.3E+01	EPI	4.0E-02	PHYSPROP
59892	Nitrosomorpholine [N-]		59-89-2			8.0E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			2.3E+01	EPI	-4.4E-01	PHYSPROP
100754	Nitrosopiperidine [N-]		100-75-4	1.1E+00	CRC89	7.0E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			1.7E+02	EPI	3.6E-01	PHYSPROP
930552	Nitrosopyrrolidine, N-		930-55-2	1.1E+00	CRC89	8.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			9.2E+01	EPI	-1.9E-01	PHYSPROP
99081	Nitrotoluene, m-		99-08-1	1.2E+00	CRC89	5.9E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.6E+02	EPI	2.5E+00	PHYSPROP
88722	Nitrotoluene, o-		88-72-2	1.2E+00	CRC89	5.9E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			3.7E+02	EPI	2.3E+00	PHYSPROP
99990	Nitrotoluene, p-		99-99-0	1.1E+00	CRC89	5.7E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			3.6E+02	EPI	2.4E+00	PHYSPROP
111842	Nonane, n-		111-84-2	7.2E-01	CRC89	5.1E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			8.0E+02	EPI	5.7E+00	PHYSPROP
27314132	Norflurazon		27314-13-2			4.2E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			3.1E+03	EPI	2.3E+00	PHYSPROP
32536520	Octabromodiphenyl Ether		32536-52-0			2.2E-02	2.6E-06	WATER9 (U.S. EPA, 2001)			9.9E+04	EPI	8.7E+00	PHYSPROP
2691410	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		2691-41-0			4.3E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			5.3E+02	EPI	1.6E-01	PHYSPROP
152169	Octamethylpyrophosphoramide		152-16-9	1.1E+00	CRC89	2.2E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			2.0E+01	EPI	-1.0E+00	PHYSPROP
19044883	Oryzalin		19044-88-3			3.9E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			8.3E+02	EPI	3.7E+00	PHYSPROP
19666309	Oxadiazon		19666-30-9			3.9E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			5.0E+03	EPI	4.8E+00	PHYSPROP
23135220	Oxamyl		23135-22-0	9.7E-01	CRC89	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-4.7E-01	PHYSPROP
42874033	Oxyfluorfen		42874-03-3	1.4E+00	CRC89	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			4.0E+04	EPI	4.7E+00	PHYSPROP
76738620	Paclobutrazol		76738-62-0	1.2E+00	CRC89	2.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			9.2E+02	EPI	3.2E+00	PHYSPROP
1910425	Paraquat Dichloride		1910-42-5			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			6.8E+03	EPI	-4.5E+00	PHYSPROP
56382	Parathion		56-38-2	1.3E+00	CRC89	2.3E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			2.4E+03	EPI	3.8E+00	PHYSPROP
1114712	Pebulate		1114-71-2	9.5E-01	CRC89	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	3.8E+00	PHYSPROP
40487421	Pendimethalin		40487-42-1	1.2E+00	CRC89	2.3E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			5.6E+03	EPI	5.2E+00	PHYSPROP
32534819	Pentabromodiphenyl Ether		32534-81-9			2.8E-02	3.2E-06	WATER9 (U.S. EPA, 2001)			2.2E+04	EPI	6.8E+00	PHYSPROP
60348609	Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)		60348-60-9	2.3E+00	IRIS Profile	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			2.2E+04	EPI	7.7E+00	PHYSPROP
608935	Pentachlorobenzene		608-93-5	1.8E+00	CRC89	2.9E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			3.7E+03	EPI	5.2E+00	PHYSPROP
76017	Pentachloroethane		76-01-7	1.7E+00	CRC89	3.2E-02	8.6E-06	WATER9 (U.S. EPA, 2001)			1.4E+02	EPI	3.2E+00	PHYSPROP
82688	Pentachloronitrobenzene		82-68-8	1.7E+00	CRC89	2.6E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			6.0E+03	EPI	4.6E+00	PHYSPROP
87865	Pentachlorophenol		87-86-5	2.0E+00	CRC89	3.0E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			5.9E+02	SSL	5.1E+00	PHYSPROP
78115	Pentaerythritol tetranitrate (PETN)		78-11-5	1.8E+00	CRC89	2.6E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			6.5E+02	EPI	2.4E+00	PHYSPROP
109660	Pentane, n-		109-66-0	6.3E-01	CRC89	8.2E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	3.4E+00	PHYSPROP
	Perchlorates													
7790989	~Ammonium Perchlorate		7790-98-9	2.0E+00	CRC89									
7791039	~Lithium Perchlorate		7791-03-9	2.4E+00	CRC89									
14797730	~Perchlorate and Perchlorate Salts		14797-73-0											
7778747	~Potassium Perchlorate		7778-74-7	2.5E+00	CRC89									
7601890	~Sodium Perchlorate		7601-89-0	2.5E+00	CRC89									
375735	Perfluorobutane sulfonic acid (PFBS)		375-73-5	1.8E+00	LookChem	2.7E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			6.2E+01	elfo and Higg		
45187153	Perfluorobutanesulfonate		45187-15-3	1.8E+00	LookChem	2.7E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			6.2E+01	elfo and Higg		
52645531	Permethrin		52645-53-1	1.2E+00	CRC89	1.9E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			1.2E+05	EPI	6.5E+00	PHYSPROP
62442	Phenacetin		62-44-2			6.0E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			4.1E+01	EPI	1.6E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant		Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
13684634	Phenmedipham	13684-63-4			4.2E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			2.6E+03	EPI	3.6E+00	PHYSPROP
108952	Phenol	108-95-2	1.1E+00	CRC89	8.3E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.9E+02	EPI	1.5E+00	PHYSPROP
114261	Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	1.1E+00	CRC89	2.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			6.0E+01	EPI	1.5E+00	PHYSPROP
92842	Phenothiazine	92-84-2	1.3E+00	PubChem	2.9E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	4.2E+00	PHYSPROP
103720	Phenyl Isothiocyanate	103-72-0	1.1E+00	CRC89	5.9E-02	8.6E-06	WATER9 (U.S. EPA, 2001)			2.2E+02	EPI	3.3E+00	PHYSPROP
108452	Phenylenediamine, m-	108-45-2	1.0E+00	CRC89	7.2E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			3.4E+01	EPI	-3.3E-01	PHYSPROP
95545	Phenylenediamine, o-	95-54-5			8.4E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			3.5E+01	EPI	1.5E-01	PHYSPROP
106503	Phenylenediamine, p-	106-50-3			8.4E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			3.4E+01	EPI	-3.0E-01	PHYSPROP
90437	Phenylphenol, 2-	90-43-7	1.2E+00	CRC89	4.2E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			6.7E+03	EPI	3.1E+00	PHYSPROP
298022	Phorate	298-02-2	1.2E+00	CRC89	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			4.6E+02	EPI	3.6E+00	PHYSPROP
75445	Phosgene	75-44-5	1.4E+00	CRC89	8.9E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-7.1E-01	PHYSPROP
732116	Phosmet	732-11-6			4.1E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	2.8E+00	PHYSPROP
	Phosphates, Inorganic												
13776880	~Aluminum metaphosphate	13776-88-0	2.8E+00	CRC89									
68333799	~Ammonium polyphosphate	68333-79-9											
7790763	~Calcium pyrophosphate	7790-76-3	3.1E+00	CRC89									
7783280	~Diammonium phosphate	7783-28-0											
7757939	~Dicalcium phosphate	7757-93-9											
7782754	~Dimagnesium phosphate	7782-75-4	2.1E+00	CRC89									
7758114	~Dipotassium phosphate	7758-11-4											
7558794	~Disodium phosphate	7558-79-4											
13530502	~Monoaluminum phosphate	13530-50-2											
7722761	~Monoammonium phosphate	7722-76-1											
7758238	~Monocalcium phosphate	7758-23-8											
7757860	~Monomagnesium phosphate	7757-86-0											
7778770	~Monopotassium phosphate	7778-77-0											
7558807	~Monosodium phosphate	7558-80-7											
8017161	~Polyphosphoric acid	8017-16-1											
13845368	~Potassium tripolyphosphate	13845-36-8											
7758169	~Sodium acid pyrophosphate	7758-16-9											
7785888	~Sodium aluminum phosphate (acidic)	7785-88-8											
10279591	~Sodium aluminum phosphate (anhydrous)	10279-59-1											
10305767	~Sodium aluminum phosphate (tetrahydrate)	10305-76-7											
10124568	~Sodium hexametaphosphate	10124-56-8											
68915311	~Sodium polyphosphate	68915-31-1											
7785844	~Sodium trimetaphosphate	7785-84-4											
7758294	~Sodium tripolyphosphate	7758-29-4											
7320345	~Tetrapotassium phosphate	7320-34-5											
7722885	~Tetrasodium pyrophosphate	7722-88-5											
15136875	~Trialuminum sodium tetra decahydrogenoctaorthophospha	15136-87-5											
7758874	~Tricalcium phosphate	7758-87-4	3.1E+00	CRC89									
7757871	~Trimagnesium phosphate	7757-87-1											
7778532	~Tripotassium phosphate	7778-53-2											
7601549	~Trisodium phosphate	7601-54-9											
7803512	Phosphine	7803-51-2	1.4E+00	CRC89	1.9E-01	2.2E-05	WATER9 (U.S. EPA, 2001)					-2.7E-01	PHYSPROP
7664382	Phosphoric Acid	7664-38-2	1.8E+00	PERRY									
7723140	Phosphorus, White	7723-14-0	1.8E+00	ATSDR Profile	2.2E-01	2.8E-05	WATER9 (U.S. EPA, 2001)	3.5E+00	BAES	1.1E+03	TSDR Profil	3.1E+00	TSDR Profil
	Phthalates												
117817	~Bis(2-ethylhexyl)phthalate	117-81-7	9.8E-01	CRC89	1.7E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			1.2E+05	EPI	7.6E+00	PHYSPROP
85687	~Butyl Benzyl Phthalate	85-68-7	1.1E+00	CRC89	2.1E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			7.2E+03	EPI	4.7E+00	PHYSPROP
85701	~Butylphthalyl Butylglycolate	85-70-1	1.1E+00	LANGE	2.0E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			1.1E+04	EPI	4.2E+00	PHYSPROP
84742	~Dibutyl Phthalate	84-74-2	1.0E+00	CRC89	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			1.2E+03	EPI	4.5E+00	PHYSPROP
84662	~Diethyl Phthalate	84-66-2	1.2E+00	CRC89	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+02	EPI	2.4E+00	PHYSPROP
120616	~Dimethylterephthalate	120-61-6	1.1E+00	CRC89	2.9E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			3.1E+01	EPI	2.3E+00	PHYSPROP
117840	~Octyl Phthalate, di-N-	117-84-0			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			1.4E+05	EPI	8.1E+00	PHYSPROP
100210	~Phthalic Acid, P-	100-21-0	1.5E+00	PERRY	4.9E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			7.9E+01	EPI	2.0E+00	PHYSPROP
85449	~Phthalic Anhydride	85-44-9	1.5E+00	CRC89	5.9E-02	9.8E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	1.6E+00	PHYSPROP
1918021	Picloram	1918-02-1			4.9E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			3.9E+01	EPI	1.9E+00	PHYSPROP
96913	Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3			5.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	9.3E-01	PHYSPROP
88891	Picric Acid (2,4,6-Trinitrophenol)	88-89-1	1.8E+00	PERRY	3.0E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			2.3E+03	EPI	1.4E+00	PHYSPROP
29232937	Pirimiphos, Methyl	29232-93-7	1.2E+00	CRC89	2.2E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			3.7E+02	EPI	4.2E+00	PHYSPROP
59536651	Polybrominated Biphenyls	59536-65-1											
	Polychlorinated Biphenyls (PCBs)												
12674112	~Aroclor 1016	12674-11-2	1.4E+00	ATSDR Profile	2.5E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			4.8E+04	EPI	5.7E+00	PHYSPROP
11104282	~Aroclor 1221	11104-28-2	1.2E+00	ATSDR Profile	3.2E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			8.4E+03	EPI	4.7E+00	PHYSPROP
11141165	~Aroclor 1232	11141-16-5	1.3E+00	ATSDR Profile	3.3E-02	7.5E-06	WATER9 (U.S. EPA, 2001)			8.4E+03	EPI	4.4E+00	PHYSPROP
53469219	~Aroclor 1242	53469-21-9	1.4E+00	ATSDR Profile	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	6.3E+00	PHYSPROP
12672296	~Aroclor 1248	12672-29-6	1.4E+00	HSDB	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			7.7E+04	EPI	6.2E+00	PHYSPROP
11097691	~Aroclor 1254	11097-69-1	1.5E+00	ATSDR Profile	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	6.5E+00	PHYSPROP
11096825	~Aroclor 1260	11096-82-5	1.6E+00	ATSDR Profile	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			3.5E+05	EPI	7.6E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
11126424	~Aroclor 5460	11126-42-4	1.5E+00	PPRTV	1.8E-02	4.4E-06	WATER9 (U.S. EPA, 2001)			8.1E+04	EPI	6.3E+00	PHYSPROP
39635319	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.7E+00	LookChem	4.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			3.5E+05	EPI	8.3E+00	PHYSPROP
52663726	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.6E+00	LookChem	4.4E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.1E+05	EPI	7.5E+00	PHYSPROP
69782907	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.6E+00	I	4.4E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.1E+05	EPI	7.6E+00	PHYSPROP
38380084	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.6E+00	LookChem	4.4E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.1E+05	EPI	7.6E+00	PHYSPROP
32774166	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.6E+00	LookChem	4.4E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.1E+05	EPI	7.4E+00	PHYSPROP
65510443	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.5E+00	LookChem	4.7E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	7.0E+00	EPI
31508006	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.5E+00	LookChem	4.7E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	7.1E+00	PHYSPROP
32598144	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.5E+00	LookChem	4.7E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	6.8E+00	PHYSPROP
74472370	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.5E+00	LookChem	4.7E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	7.0E+00	PHYSPROP
57465288	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	1.5E+00	LookChem	4.7E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			1.3E+05	EPI	7.0E+00	EPI
1336363	~Polychlorinated Biphenyls (high risk)	1336-36-3	1.4E+00	HSDB	2.4E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	7.1E+00	PHYSPROP
1336363	~Polychlorinated Biphenyls (low risk)	1336-36-3	1.4E+00	HSDB	2.4E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	7.1E+00	PHYSPROP
1336363	~Polychlorinated Biphenyls (lowest risk)	1336-36-3	1.4E+00	HSDB	2.4E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	7.1E+00	PHYSPROP
32598133	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3			4.9E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	6.6E+00	PHYSPROP
70362504	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.4E+00	LookChem	4.9E-02	6.3E-06	WATER9 (U.S. EPA, 2001)			7.8E+04	EPI	6.3E+00	EPI
9016879	Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9			3.0E-02	3.5E-06	WATER9 (U.S. EPA, 2001)			1.0E+10	EPI	1.0E+01	EPI
	Polynuclear Aromatic Hydrocarbons (PAHs)												
83329	~Acenaphthene	83-32-9	1.2E+00	CRC89	5.1E-02	8.3E-06	WATER9 (U.S. EPA, 2001)			5.0E+03	EPI	3.9E+00	PHYSPROP
120127	~Anthracene	120-12-7	1.3E+00	CRC89	3.9E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			1.6E+04	EPI	4.5E+00	PHYSPROP
56553	~Benz[a]anthracene	56-55-3	1.3E+00	PubChem	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			1.8E+05	EPI	5.8E+00	PHYSPROP
205823	~Benzo(j)fluoranthene	205-82-3			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			6.0E+05	EPI	6.1E+00	PHYSPROP
50328	~Benzo[a]pyrene	50-32-8			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			5.9E+05	EPI	6.1E+00	PHYSPROP
205992	~Benzo[b]fluoranthene	205-99-2			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			6.0E+05	EPI	5.8E+00	PHYSPROP
207089	~Benzo[k]fluoranthene	207-08-9			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			5.9E+05	EPI	6.1E+00	PHYSPROP
91587	~Chloronaphthalene, Beta-	91-58-7	1.1E+00	CRC89	4.5E-02	7.7E-06	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	3.9E+00	PHYSPROP
218019	~Chrysene	218-01-9	1.3E+00	CRC89	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			1.8E+05	EPI	5.8E+00	PHYSPROP
53703	~Dibenz[a,h]anthracene	53-70-3			4.5E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			1.9E+06	EPI	6.8E+00	PHYSPROP
192654	~Dibenzo(a,e)pyrene	192-65-4			4.2E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			6.5E+06	EPI	7.7E+00	EPI
57976	~Dimethylbenz(a)anthracene, 7,12-	57-97-6			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			4.9E+05	EPI	5.8E+00	PHYSPROP
206440	~Fluoranthene	206-44-0	1.3E+00	CRC89	2.8E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			5.5E+04	EPI	5.2E+00	PHYSPROP
86737	~Fluorene	86-73-7	1.2E+00	CRC89	4.4E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			9.2E+03	EPI	4.2E+00	PHYSPROP
193395	~Indeno[1,2,3-cd]pyrene	193-39-5			4.5E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			2.0E+06	EPI	6.7E+00	PHYSPROP
90120	~Methylnaphthalene, 1-	90-12-0	1.0E+00	CRC89	5.3E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	3.9E+00	PHYSPROP
91576	~Methylnaphthalene, 2-	91-57-6	1.0E+00	CRC89	5.2E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			2.5E+03	EPI	3.9E+00	PHYSPROP
91203	~Naphthalene	91-20-3	1.0E+00	CRC89	6.0E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	3.3E+00	PHYSPROP
57835924	~Nitropyrene, 4-	57835-92-4			4.8E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			8.6E+04	EPI	4.8E+00	PHYSPROP
129000	~Pyrene	129-00-0	1.3E+00	CRC89	2.8E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			5.4E+04	EPI	4.9E+00	PHYSPROP
29420493	Potassium Perfluorobutane Sulfonate	29420-49-3			3.9E-02	4.6E-06	WATER9 (U.S. EPA, 2001)						
67747095	Prochloraz	67747-09-5			3.6E-02	4.3E-06	WATER9 (U.S. EPA, 2001)			2.4E+03	EPI	4.1E+00	PHYSPROP
26399360	Profluralin	26399-36-0	1.4E+00	HSDB	2.2E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			3.1E+04	EPI	5.6E+00	PHYSPROP
1610180	Prometon	1610-18-0			5.1E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			1.4E+02	EPI	3.0E+00	PHYSPROP
7287196	Prometryn	7287-19-6	1.2E+00	CRC89	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			6.6E+02	EPI	3.5E+00	PHYSPROP
23950585	Pronamide	23950-58-5			4.7E-02	5.5E-06	WATER9 (U.S. EPA, 2001)			4.0E+02	EPI	3.4E+00	PHYSPROP
1918167	Propachlor	1918-16-7	1.2E+00	CRC89	2.7E-02	7.0E-06	WATER9 (U.S. EPA, 2001)			2.0E+02	EPI	2.2E+00	PHYSPROP
709988	Propanil	709-98-8	1.3E+00	CRC89	2.7E-02	6.9E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	3.1E+00	PHYSPROP
2312358	Propargite	2312-35-8	1.1E+00	CRC89	1.9E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			3.7E+04	EPI	5.0E+00	PHYSPROP
107197	Propargyl Alcohol	107-19-7	9.5E-01	CRC89	1.2E-01	1.3E-05	WATER9 (U.S. EPA, 2001)			1.9E+00	EPI	-3.8E-01	PHYSPROP
139402	Propazine	139-40-2	1.2E+00	CRC89	2.5E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			3.4E+02	EPI	2.9E+00	PHYSPROP
122429	Propham	122-42-9	1.1E+00	CRC89	3.6E-02	7.1E-06	WATER9 (U.S. EPA, 2001)			2.2E+02	EPI	2.6E+00	PHYSPROP
60207901	Propiconazole	60207-90-1	1.3E+00	CRC89	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	EPI	3.7E+00	PHYSPROP
123386	Propionaldehyde	123-38-6	8.7E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	5.9E-01	PHYSPROP
103651	Propyl benzene	103-65-1	8.6E-01	CRC89	6.0E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			8.1E+02	EPI	3.7E+00	PHYSPROP
115071	Propylene	115-07-1	5.1E-01	CRC89	1.1E-01	1.1E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.8E+00	PHYSPROP
57556	Propylene Glycol	57-55-6	1.0E+00	CRC89	9.8E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-9.2E-01	PHYSPROP
6423434	Propylene Glycol Dinitrate	6423-43-4			6.3E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	1.8E+00	PHYSPROP
107982	Propylene Glycol Monomethyl Ether	107-98-2	9.6E-01	CRC89	8.3E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-4.9E-01	PHYSPROP
75569	Propylene Oxide	75-56-9	8.3E-01	PERRY	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			5.2E+00	EPI	3.0E-02	PHYSPROP
110861	Pyridine	110-86-1	9.8E-01	CRC89	9.3E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	6.5E-01	PHYSPROP
13593038	Quinalphos	13593-03-8			4.3E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			4.2E+03	EPI	4.4E+00	PHYSPROP
91225	Quinoline	91-22-5	1.1E+00	CRC89	6.2E-02	8.7E-06	WATER9 (U.S. EPA, 2001)			1.5E+03	EPI	2.0E+00	PHYSPROP
76578148	Quizalofop-ethyl	76578-14-8			3.7E-02	4.3E-06	WATER9 (U.S. EPA, 2001)			7.7E+03	EPI	4.3E+00	PHYSPROP
E715557	Refractory Ceramic Fibers (units in fibers)	E715557											
10453868	Resmethrin	10453-86-8			3.9E-02	4.6E-06	WATER9 (U.S. EPA, 2001)			3.1E+05	EPI	6.1E+00	PHYSPROP
299843	Ronnel	299-84-3	1.4E+00	CRC89	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			4.5E+03	EPI	4.9E+00	PHYSPROP
83794	Rotenone	83-79-4			3.5E-02	4.1E-06	WATER9 (U.S. EPA, 2001)			2.6E+05	EPI	4.1E+00	PHYSPROP
94597	Safrole	94-59-7	1.1E+00	CRC89	4.4E-02	7.6E-06	WATER9 (U.S. EPA, 2001)			2.1E+02	EPI	3.5E+00	PHYSPROP
7783008	Selenious Acid	7783-00-8	3.0E+00	CRC89									
7782492	Selenium	7782-49-2	4.8E+00	CRC89				5.0E+00	SSL				
7446346	Selenium Sulfide	7446-34-6											

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant		Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
74051802	Sethoxydim	74051-80-2	1.0E+00	CRC89	2.0E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			4.4E+03	EPI	4.4E+00	PHYSPROP
7631869	Silica (crystalline, respirable)	7631-86-9	2.3E+00	PERRY									
7440224	Silver	7440-22-4	1.1E+01	CRC89				8.3E+00	SSL				
122349	Simazine	122-34-9	1.3E+00	CRC89	2.8E-02	7.4E-06	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	2.2E+00	PHYSPROP
62476599	Sodium Acifluorfen	62476-59-9			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			3.9E+03	EPI	3.7E-01	PHYSPROP
26628228	Sodium Azide	26628-22-8	1.8E+00	CRC89									
148185	Sodium Diethyldithiocarbamate	148-18-5			6.1E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			2.0E+02	EPI	-1.4E+00	PHYSPROP
7681494	Sodium Fluoride	7681-49-4	2.8E+00	CRC89				1.5E+02	BAES				
62748	Sodium Fluoroacetate	62-74-8			8.8E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.4E+00	EPI	-3.8E+00	PHYSPROP
13718268	Sodium Metavanadate	13718-26-8											
13472452	Sodium Tungstate	13472-45-2	4.2E+00	CRC89									
10213102	Sodium Tungstate Dihydrate	10213-10-2	3.3E+00	CRC89									
961115	Stirofos (Tetrachlorovinphos)	961-11-5			3.7E-02	4.3E-06	WATER9 (U.S. EPA, 2001)			1.4E+03	EPI	3.5E+00	PHYSPROP
7440246	Strontium, Stable	7440-24-6	2.6E+00	CRC89				3.5E+01	BAES				
57249	Strychnine	57-24-9	1.4E+00	CRC89	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			5.4E+03	EPI	1.9E+00	PHYSPROP
100425	Styrene	100-42-5	9.0E-01	CRC89	7.1E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			4.5E+02	EPI	3.0E+00	PHYSPROP
57964393	Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3	1.1E+00	PPRTV	2.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)					3.1E+00	NTP
57964406	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6	1.1E+00	PPRTV	2.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)					3.1E+00	NTP
126330	Sulfolane	126-33-0	1.3E+00	CRC89	7.2E-02	9.9E-06	WATER9 (U.S. EPA, 2001)			9.1E+00	EPI	-7.7E-01	PHYSPROP
80079	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9			4.4E-02	5.1E-06	WATER9 (U.S. EPA, 2001)			2.9E+03	EPI	3.9E+00	PHYSPROP
7446119	Sulfur Trioxide	7446-11-9	1.9E+00	CRC89	1.2E-01	1.6E-05	WATER9 (U.S. EPA, 2001)						
7664939	Sulfuric Acid	7664-93-9	1.8E+00	CRC89									
140578	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenox	140-57-8	1.1E+00	CRC89	2.0E-02	5.0E-06	WATER9 (U.S. EPA, 2001)			5.6E+03	EPI	4.8E+00	PHYSPROP
21564170	TCMTB	21564-17-0			4.9E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			3.4E+03	EPI	3.3E+00	PHYSPROP
34014181	Tebuthiuron	34014-18-1			5.1E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			4.2E+01	EPI	1.8E+00	PHYSPROP
3383968	Temephos	3383-96-8	1.3E+00	CRC89	1.8E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			9.5E+04	EPI	6.0E+00	PHYSPROP
5902512	Terbacil	5902-51-2	1.3E+00	CRC89	2.7E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			5.0E+01	EPI	1.9E+00	PHYSPROP
13071799	Terbufos	13071-79-9	1.1E+00	CRC89	2.2E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	4.5E+00	PHYSPROP
886500	Terbutryn	886-50-0	1.1E+00	CRC89	2.4E-02	6.0E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	3.7E+00	PHYSPROP
540885	Tert-Butyl Acetate	540-88-5			8.0E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			1.2E+01	EPI	1.8E+00	EPI
5436431	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1			3.1E-02	3.6E-06	WATER9 (U.S. EPA, 2001)			1.3E+04	EPI	6.8E+00	PHYSPROP
95943	Tetrachlorobenzene, 1,2,4,5-	95-94-3	1.9E+00	CRC89	3.2E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			2.2E+03	EPI	4.6E+00	PHYSPROP
630206	Tetrachloroethane, 1,1,1,2-	630-20-6	1.5E+00	CRC89	4.8E-02	9.1E-06	WATER9 (U.S. EPA, 2001)			8.6E+01	EPI	2.9E+00	PHYSPROP
79345	Tetrachloroethane, 1,1,2,2-	79-34-5	1.6E+00	CRC89	4.9E-02	9.3E-06	WATER9 (U.S. EPA, 2001)			9.5E+01	EPI	2.4E+00	PHYSPROP
127184	Tetrachloroethylene	127-18-4	1.6E+00	CRC89	5.0E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			9.5E+01	EPI	3.4E+00	PHYSPROP
58902	Tetrachlorophenol, 2,3,4,6-	58-90-2			5.0E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			2.8E+02	SSL	4.5E+00	PHYSPROP
5216251	Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	1.4E+00	CRC89	2.8E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	EPI	4.5E+00	PHYSPROP
3689245	Tetraethyl Dithiopyrophosphate	3689-24-5	1.2E+00	CRC89	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			2.7E+02	EPI	4.0E+00	PHYSPROP
811972	Tetrafluoroethane, 1,1,1,2-	811-97-2	1.2E+00	CRC89	8.2E-02	1.1E-05	WATER9 (U.S. EPA, 2001)			8.6E+01	EPI	1.7E+00	PHYSPROP
479458	Tetryl (Trinitrophenylmethylnitramine)	479-45-8	1.6E+00	CRC89	2.6E-02	6.7E-06	WATER9 (U.S. EPA, 2001)			4.6E+03	EPI	1.6E+00	PHYSPROP
1314325	Thallic Oxide	1314-32-5	1.0E+01	CRC89									
10102451	Thallium (I) Nitrate	10102-45-1	5.6E+00	CRC89									
7440280	Thallium (Soluble Salts)	7440-28-0	1.2E+01	CRC89				7.1E+01	SSL				
563688	Thallium Acetate	563-68-8	3.7E+00	CRC89	3.9E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			1.5E+00	EPI	-1.7E-01	PHYSPROP
6533739	Thallium Carbonate	6533-73-9	7.1E+00	CRC89	3.9E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			2.9E+00	EPI	-8.6E-01	PHYSPROP
7791120	Thallium Chloride	7791-12-0	7.0E+00	CRC89	5.2E-02	1.8E-05	WATER9 (U.S. EPA, 2001)						
12039520	Thallium Selenite	12039-52-0											
7446186	Thallium Sulfate	7446-18-6	6.8E+00	CRC89									
79277273	Thifensulfuron-methyl	79277-27-3			3.6E-02	4.2E-06	WATER9 (U.S. EPA, 2001)			5.1E+01	EPI	1.6E+00	PHYSPROP
28249776	Thiobencarb	28249-77-6	1.2E+00	CRC89	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	EPI	3.4E+00	PHYSPROP
111488	Thiodiglycol	111-48-8	1.2E+00	CRC89	6.8E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			1.0E+00	EPI	-6.3E-01	PHYSPROP
39196184	Thiofanox	39196-18-4			5.2E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			7.2E+01	EPI	2.2E+00	PHYSPROP
23564058	Thiophanate, Methyl	23564-05-8			3.9E-02	4.5E-06	WATER9 (U.S. EPA, 2001)			3.3E+02	EPI	1.4E+00	PHYSPROP
137268	Thiram	137-26-8	1.3E+00	PERRY	2.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	1.7E+00	PHYSPROP
7440315	Tin	7440-31-5	7.3E+00	CRC89				2.5E+02	BAES				
7550450	Titanium Tetrachloride	7550-45-0	1.7E+00	CRC89	3.8E-02	9.1E-06	WATER9 (U.S. EPA, 2001)						
108883	Toluene	108-88-3	8.6E-01	CRC89	7.8E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			2.3E+02	EPI	2.7E+00	PHYSPROP
584849	Toluene-2,4-diisocyanate	584-84-9	1.2E+00	CRC89	4.0E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			7.4E+03	EPI	3.7E+00	EPI
95705	Toluene-2,5-diamine	95-70-5			7.7E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			5.5E+01	EPI	1.6E-01	PHYSPROP
91087	Toluene-2,6-diisocyanate	91-08-7			6.1E-02	7.1E-06	WATER9 (U.S. EPA, 2001)			7.6E+03	EPI	3.7E+00	EPI
99945	Toluic Acid, p-	99-94-5	1.2E+00	PPRTV	6.1E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			2.7E+01	PPRTV	2.3E+00	EPI
95534	Toluidine, o- (Methylaniline, 2-)	95-53-4	1.0E+00	CRC89	7.2E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	1.3E+00	PHYSPROP
106490	Toluidine, p-	106-49-0	9.6E-01	CRC89	7.1E-02	9.0E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	1.4E+00	PHYSPROP
E1790670	Total Petroleum Hydrocarbons (Aliphatic High)	E1790670	8.8E-01	ChemNet	3.6E-02	6.4E-06	WATER9 (U.S. EPA, 2001)			4.8E+03	EPI	6.1E+00	EPI
E1790666	Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666	6.6E-01	CRC89	7.3E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			1.3E+02	EPI	3.9E+00	URROGAT
E1790668	Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668	7.2E-01	CRC89	5.1E-02	6.8E-06	WATER9 (U.S. EPA, 2001)			8.0E+02	EPI	5.7E+00	URROGAT
E1790676	Total Petroleum Hydrocarbons (Aromatic High)	E1790676	1.3E+00	CRC89	2.8E-02	7.2E-06	WATER9 (U.S. EPA, 2001)			5.5E+04	EPI	5.2E+00	URROGAT
E1790672	Total Petroleum Hydrocarbons (Aromatic Low)	E1790672	8.8E-01	CRC89	9.0E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.5E+02	EPI	2.1E+00	URROGAT
E1790674	Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674	1.0E+00	CRC89	5.6E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			2.0E+03	EPI	3.6E+00	URROGAT
8001352	Toxaphene	8001-35-2	1.7E+00	ATSDR Profile	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			7.7E+04	EPI	5.9E+00	PHYSPROP

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	3	13	14	15	16	17	18	19	20	21	22	23
	Contaminant			Density		Diffusivity in Air and Water			Partition Coefficients					
CAS No. (Trimmed)	Analyte	CAS No.	Density (g/cm^3)	Density Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref
E1841606	Toxaphene, Weathered	E1841606	1.7E+00	SURROGATE	2.1E-02	5.3E-06	WATER9 (U.S. EPA, 2001)			7.7E+04	EPI	5.9E+00	PHYSPROP
66841256	Tralomethrin	66841-25-6			2.5E-02	2.9E-06	WATER9 (U.S. EPA, 2001)			1.9E+05	EPI	7.6E+00	PHYSPROP
688733	Tri-n-butyltin	688-73-3	1.1E+00	CRC89	2.1E-02	5.4E-06	WATER9 (U.S. EPA, 2001)			8.1E+03	EPI	4.1E+00	PHYSPROP
102761	Triacetin	102-76-1	1.2E+00	CRC89	2.6E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			4.1E+01	EPI	2.5E-01	PHYSPROP
43121433	Triadimefon	43121-43-3	1.2E+00	CRC89	2.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	2.8E+00	PHYSPROP
2303175	Triallate	2303-17-5	1.3E+00	CRC89	2.2E-02	5.7E-06	WATER9 (U.S. EPA, 2001)			1.0E+03	EPI	4.6E+00	PHYSPROP
82097505	Triasulfuron	82097-50-5			3.5E-02	4.1E-06	WATER9 (U.S. EPA, 2001)			4.3E+02	EPI	1.1E+00	PHYSPROP
101200480	Tribenuron-methyl	101200-48-0			3.5E-02	4.1E-06	WATER9 (U.S. EPA, 2001)			9.5E+01	EPI	7.8E-01	PHYSPROP
615543	Tribromobenzene, 1,2,4-	615-54-3	2.3E+00	ChemNet	2.9E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	4.7E+00	PHYSPROP
118796	Tribromophenol, 2,4,6-	118-79-6	2.6E+00	CRC89	3.0E-02	8.2E-06	WATER9 (U.S. EPA, 2001)			8.1E+02	EPI	4.1E+00	PHYSPROP
126738	Tributyl Phosphate	126-73-8	9.7E-01	CRC89	2.1E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			2.4E+03	EPI	4.0E+00	PHYSPROP
E1790678	Tributyltin Compounds	E1790678											
56359	Tributyltin Oxide	56-35-9	1.2E+00	CRC89	1.5E-02	3.6E-06	WATER9 (U.S. EPA, 2001)			2.6E+07	EPI	4.1E+00	PHYSPROP
10025851	Trichloramine	10025-85-1											
76131	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.6E+00	CRC89	3.8E-02	8.6E-06	WATER9 (U.S. EPA, 2001)			2.0E+02	EPI	3.2E+00	PHYSPROP
76039	Trichloroacetic Acid	76-03-9	1.6E+00	CRC89	5.2E-02	9.5E-06	WATER9 (U.S. EPA, 2001)			3.2E+00	EPI	1.3E+00	PHYSPROP
33663502	Trichloroaniline HCl, 2,4,6-	33663-50-2			5.0E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.3E+03	EPI	-6.7E-01	EPI
634935	Trichloroaniline, 2,4,6-	634-93-5			5.6E-02	6.6E-06	WATER9 (U.S. EPA, 2001)			4.4E+03	EPI	3.5E+00	PHYSPROP
87616	Trichlorobenzene, 1,2,3-	87-61-6	1.5E+00	CRC89	4.0E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.4E+03	EPI	4.1E+00	PHYSPROP
120821	Trichlorobenzene, 1,2,4-	120-82-1	1.5E+00	CRC89	4.0E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			1.4E+03	EPI	4.0E+00	PHYSPROP
71556	Trichloroethane, 1,1,1-	71-55-6	1.3E+00	CRC89	6.5E-02	9.6E-06	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.5E+00	PHYSPROP
79005	Trichloroethane, 1,1,2-	79-00-5	1.4E+00	CRC89	6.7E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	1.9E+00	PHYSPROP
79016	Trichloroethylene	79-01-6	1.5E+00	CRC89	6.9E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			6.1E+01	EPI	2.4E+00	PHYSPROP
75694	Trichlorofluoromethane	75-69-4	1.5E+00	CRC89	6.5E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	2.5E+00	PHYSPROP
95954	Trichlorophenol, 2,4,5-	95-95-4	1.5E+00	PERRY	3.1E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	SSL	3.7E+00	PHYSPROP
88062	Trichlorophenol, 2,4,6-	88-06-2	1.5E+00	CRC89	3.1E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	SSL	3.7E+00	PHYSPROP
93765	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	1.8E+00	PubChem	2.9E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			1.1E+02	EPI	3.3E+00	PHYSPROP
93721	Trichlorophenoxypropionic acid, -2,4,5	93-72-1	1.2E+00	PubChem	2.3E-02	5.9E-06	WATER9 (U.S. EPA, 2001)			1.8E+02	EPI	3.8E+00	PHYSPROP
598776	Trichloropropane, 1,1,2-	598-77-6	1.4E+00	CRC89	5.7E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			9.5E+01	EPI	2.4E+00	PHYSPROP
96184	Trichloropropane, 1,2,3-	96-18-4	1.4E+00	CRC89	5.7E-02	9.2E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	2.3E+00	PHYSPROP
96195	Trichloropropene, 1,2,3-	96-19-5	1.4E+00	CRC89	5.9E-02	9.4E-06	WATER9 (U.S. EPA, 2001)			1.2E+02	EPI	2.8E+00	PHYSPROP
1330785	Tricresyl Phosphate (TCP)	1330-78-5	1.2E+00	Yaws	1.9E-02	4.8E-06	WATER9 (U.S. EPA, 2001)			4.7E+04	EPI	5.1E+00	PHYSPROP
58138082	Tridiphane	58138-08-2			4.1E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			3.4E+03	EPI	5.2E+00	PHYSPROP
121448	Triethylamine	121-44-8	7.3E-01	CRC89	6.6E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			5.1E+01	EPI	1.5E+00	PHYSPROP
112276	Triethylene Glycol	112-27-6	1.1E+00	CRC89	5.1E-02	8.1E-06	WATER9 (U.S. EPA, 2001)			1.0E+01	EPI	-1.8E+00	PHYSPROP
420462	Trifluoroethane, 1,1,1-	420-46-2			9.9E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			4.4E+01	EPI	1.7E+00	PHYSPROP
1582098	Trifluralin	1582-09-8	1.4E+00	PubChem	2.2E-02	5.6E-06	WATER9 (U.S. EPA, 2001)			1.6E+04	EPI	5.3E+00	PHYSPROP
512561	Trimethyl Phosphate	512-56-1	1.2E+00	CRC89	5.8E-02	8.8E-06	WATER9 (U.S. EPA, 2001)			1.1E+01	EPI	-6.5E-01	PHYSPROP
526738	Trimethylbenzene, 1,2,3-	526-73-8	8.9E-01	CRC89	6.1E-02	8.0E-06	WATER9 (U.S. EPA, 2001)			6.3E+02	EPI	3.7E+00	PHYSPROP
95636	Trimethylbenzene, 1,2,4-	95-63-6	8.8E-01	CRC89	6.1E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			6.1E+02	EPI	3.6E+00	PHYSPROP
108678	Trimethylbenzene, 1,3,5-	108-67-8	8.6E-01	CRC89	6.0E-02	7.8E-06	WATER9 (U.S. EPA, 2001)			6.0E+02	EPI	3.4E+00	PHYSPROP
25167708	Trimethylpentene, 2,4,4-	25167-70-8	7.2E-01	PubChem	6.0E-02	7.3E-06	WATER9 (U.S. EPA, 2001)			2.4E+02	EPI	4.1E+00	PHYSPROP
99354	Trinitrobenzene, 1,3,5-	99-35-4	1.5E+00	CRC89	2.9E-02	7.7E-06	WATER9 (U.S. EPA, 2001)			1.7E+03	EPI	1.2E+00	PHYSPROP
118967	Trinitrotoluene, 2,4,6-	118-96-7	1.7E+00	CRC89	3.0E-02	7.9E-06	WATER9 (U.S. EPA, 2001)			2.8E+03	EPI	1.6E+00	PHYSPROP
791286	Triphenylphosphine Oxide	791-28-6	1.2E+00	CRC89	2.3E-02	5.8E-06	WATER9 (U.S. EPA, 2001)			2.0E+03	EPI	2.8E+00	PHYSPROP
13674878	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8			3.3E-02	3.9E-06	WATER9 (U.S. EPA, 2001)			1.1E+04	EPI	3.7E+00	PHYSPROP
13674845	Tris(1-chloro-2-propyl)phosphate	13674-84-5			4.0E-02	4.7E-06	WATER9 (U.S. EPA, 2001)			1.6E+03	EPI	2.6E+00	PHYSPROP
126727	Tris(2,3-dibromopropyl)phosphate	126-72-7	2.3E+00	PubChem	1.9E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			9.7E+03	EPI	4.3E+00	PHYSPROP
115968	Tris(2-chloroethyl)phosphate	115-96-8	1.4E+00	CRC89	2.4E-02	6.2E-06	WATER9 (U.S. EPA, 2001)			3.9E+02	EPI	1.4E+00	PHYSPROP
78422	Tris(2-ethylhexyl)phosphate	78-42-2	9.9E-01	CRC89	1.6E-02	3.9E-06	WATER9 (U.S. EPA, 2001)			2.5E+06	EPI	9.5E+00	PHYSPROP
7440337	Tungsten	7440-33-7	1.9E+01	CRC89				1.5E+02	BAES				
7440611	Uranium	7440-61-1	1.9E+01	CRC89				4.5E+02	BAES				
51796	Urethane	51-79-6	9.9E-01	CRC89	8.5E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			1.2E+01	EPI	-1.5E-01	PHYSPROP
1314621	Vanadium Pentoxide	1314-62-1	3.4E+00	CRC89									
7440622	Vanadium and Compounds	7440-62-2	6.0E+00	CRC89				1.0E+03	SSL				
1929777	Vernolate	1929-77-7	9.5E-01	CRC89	2.4E-02	6.1E-06	WATER9 (U.S. EPA, 2001)			3.0E+02	EPI	3.8E+00	PHYSPROP
50471448	Vinclozolin	50471-44-8	1.5E+00	CRC89	2.5E-02	6.5E-06	WATER9 (U.S. EPA, 2001)			2.8E+02	EPI	3.1E+00	PHYSPROP
108054	Vinyl Acetate	108-05-4	9.3E-01	CRC89	8.5E-02	1.0E-05	WATER9 (U.S. EPA, 2001)			5.6E+00	EPI	7.3E-01	PHYSPROP
593602	Vinyl Bromide	593-60-2	1.5E+00	CRC89	8.6E-02	1.2E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.6E+00	PHYSPROP
75014	Vinyl Chloride	75-01-4	9.1E-01	CRC89	1.1E-01	1.2E-05	WATER9 (U.S. EPA, 2001)			2.2E+01	EPI	1.4E+00	CRC89
81812	Warfarin	81-81-2			4.2E-02	4.9E-06	WATER9 (U.S. EPA, 2001)			4.3E+02	EPI	2.7E+00	PHYSPROP
108383	Xylene, m-	108-38-3	8.6E-01	CRC89	6.8E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.2E+00	PHYSPROP
95476	Xylene, o-	95-47-6	8.8E-01	CRC89	6.9E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.1E+00	PHYSPROP
106423	Xylene, p-	106-42-3	8.6E-01	CRC89	6.8E-02	8.4E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.2E+00	PHYSPROP
1330207	Xylenes	1330-20-7	8.6E-01	ATSDR Profile	6.9E-02	8.5E-06	WATER9 (U.S. EPA, 2001)			3.8E+02	EPI	3.2E+00	PHYSPROP
1314847	Zinc Phosphide	1314-84-7	4.6E+00	CRC89									
7440666	Zinc and Compounds	7440-66-6	7.1E+00	CRC89				6.2E+01	SSL				
12122677	Zineb	12122-67-7			4.5E-02	5.2E-06	WATER9 (U.S. EPA, 2001)			1.3E+03	EPI	1.3E+00	PHYSPROP
7440677	Zirconium	7440-67-7	6.5E+00	CRC89				3.0E+03	BAES				

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
30560191	Acephate	30560-19-1	8.2E+05	PHYSPROP	2.1E-04	1.1E+00	2.7E+00	4.0E-05	EPI
75070	Acetaldehyde	75-07-0	1.0E+06	PHYSPROP	1.3E-03	1.9E-01	4.5E-01	5.3E-04	EPI
34256821	Acetochlor	34256-82-1	2.2E+02	PHYSPROP	3.1E-02	3.4E+00	8.2E+00	5.0E-03	EPI
67641	Acetone	67-64-1	1.0E+06	PHYSPROP	1.5E-03	2.2E-01	5.3E-01	5.1E-04	EPI
75865	Acetone Cyanohydrin	75-86-5	1.0E+06	PHYSPROP	1.8E-03	3.2E-01	7.6E-01	5.0E-04	EPI
75058	Acetonitrile	75-05-8	1.0E+06	PHYSPROP	1.4E-03	1.8E-01	4.3E-01	5.5E-04	EPI
98862	Acetophenone	98-86-2	6.1E+03	PHYSPROP	1.6E-02	5.0E-01	1.2E+00	3.7E-03	EPI
53963	Acetylaminofluorene, 2-	53-96-3	5.5E+00	PHYSPROP	6.0E-02	1.9E+00	4.5E+00	1.0E-02	EPI
107028	Acrolein	107-02-8	2.1E+05	PHYSPROP	2.2E-03	2.2E-01	5.2E-01	7.5E-04	EPI
79061	Acrylamide	79-06-1	3.9E+05	PHYSPROP	7.3E-04	2.6E-01	6.3E-01	2.2E-04	EPI
79107	Acrylic Acid	79-10-7	1.0E+06	PHYSPROP	3.4E-03	2.7E-01	6.4E-01	1.1E-03	EPI
107131	Acrylonitrile	107-13-1	7.5E+04	PHYSPROP	3.3E-03	2.1E-01	5.0E-01	1.2E-03	EPI
111693	Adiponitrile	111-69-3	8.0E+04	PHYSPROP	9.5E-04	4.2E-01	1.0E+00	2.4E-04	EPI
15972608	Alachlor	15972-60-8	2.4E+02	PHYSPROP	6.6E-02	3.4E+00	8.2E+00	1.1E-02	EPI
116063	Aldicarb	116-06-3	6.0E+03	PHYSPROP	4.0E-03	1.2E+00	2.9E+00	7.6E-04	EPI
1646884	Aldicarb Sulfone	1646-88-4	1.0E+04	PHYSPROP	2.1E-04	1.8E+00	4.4E+00	3.7E-05	EPI
1646873	Aldicarb sulfoxide	1646-87-3	2.8E+04	PHYSPROP	1.8E-04	1.5E+00	3.6E+00	3.3E-05	EPI
309002	Aldrin	309-00-2	1.7E-02	PHYSPROP	2.2E+00	1.2E+01	4.8E+01	2.9E-01	EPI
107186	Allyl Alcohol	107-18-6	1.0E+06	PHYSPROP	2.8E-03	2.2E-01	5.3E-01	9.6E-04	EPI
107051	Allyl Chloride	107-05-1	3.4E+03	PHYSPROP	3.8E-02	2.8E-01	6.8E-01	1.1E-02	EPI
7429905	Aluminum	7429-90-5			2.0E-03	1.5E-01	3.6E-01	1.0E-03	RAGSE
20859738	Aluminum Phosphide	20859-73-8			2.9E-03	2.2E-01	5.3E-01	1.0E-03	RAGSE
834128	Ametryn	834-12-8	2.1E+02	PHYSPROP	4.6E-02	2.0E+00	4.7E+00	7.9E-03	EPI
92671	Aminobiphenyl, 4-	92-67-1	2.2E+02	PHYSPROP	7.0E-02	9.3E-01	2.2E+00	1.4E-02	EPI
591275	Aminophenol, m-	591-27-5	2.7E+04	PHYSPROP	2.1E-03	4.3E-01	1.0E+00	5.3E-04	EPI
95556	Aminophenol, o-	95-55-6	2.0E+04	PHYSPROP	4.0E-03	4.3E-01	1.0E+00	9.9E-04	EPI
123308	Aminophenol, p-	123-30-8	1.6E+04	PHYSPROP	1.6E-03	4.3E-01	1.0E+00	4.1E-04	EPI
33089611	Amitraz	33089-61-1	1.0E+00	PHYSPROP	1.1E+00	4.6E+00	1.8E+01	1.6E-01	EPI
7664417	Ammonia	7664-41-7	4.8E+05	PHYSPROP	1.6E-03	1.3E-01	3.1E-01	1.0E-03	RAGSE
7773060	Ammonium Sulfamate	7773-06-0	1.3E+06	PERRY	4.1E-03	4.6E-01	1.1E+00	1.0E-03	RAGSE
75854	Amyl Alcohol, tert-	75-85-4	1.1E+05	PHYSPROP	7.1E-03	3.3E-01	7.9E-01	2.0E-03	EPI
62533	Aniline	62-53-3	3.6E+04	PHYSPROP	6.9E-03	3.5E-01	8.4E-01	1.9E-03	EPI
84651	Anthraquinone, 9,10-	84-65-1	1.4E+00	PHYSPROP	1.1E-01	1.5E+00	3.7E+00	1.9E-02	EPI
7440360	Antimony (metallic)	7440-36-0			4.2E-03	5.1E-01	1.2E+00	1.0E-03	RAGSE
1314609	Antimony Pentoxide	1314-60-9	3.0E+03	CRC89	6.9E-03	6.8E+00	1.6E+01	1.0E-03	RAGSE
1332816	Antimony Tetroxide	1332-81-6			6.7E-03	5.5E+00	1.3E+01	1.0E-03	RAGSE
1309644	Antimony Trioxide	1309-64-4			6.6E-03	4.5E+00	1.1E+01	1.0E-03	RAGSE
7440382	Arsenic, Inorganic	7440-38-2			3.3E-03	2.8E-01	6.6E-01	1.0E-03	RAGSE
7784421	Arsine	7784-42-1	2.0E+05	PERRY	3.4E-03	2.9E-01	6.9E-01	1.0E-03	RAGSE
1332214	Asbestos (units in fibers)	1332-21-4						1.0E-03	RAGSE
3337711	Asulam	3337-71-1	5.0E+03	PHYSPROP	3.1E-04	2.0E+00	4.9E+00	5.3E-05	EPI
1912249	Atrazine	1912-24-9	3.5E+01	PHYSPROP	3.0E-02	1.7E+00	4.1E+00	5.2E-03	EPI
492808	Auramine	492-80-8	5.4E+01	PHYSPROP	3.0E-02	3.3E+00	7.9E+00	4.8E-03	EPI
65195553	Avermectin B1	65195-55-3	3.5E-04	PHYSPROP	2.1E-04	8.4E+03	2.0E+04	1.8E-05	EPI
86500	Azinphos-methyl	86-50-0	2.1E+01	PHYSPROP	1.2E-02	6.3E+00	1.5E+01	1.8E-03	EPI
103333	Azobenzene	103-33-3	6.4E+00	PHYSPROP	2.7E-01	1.1E+00	2.6E+00	5.1E-02	EPI
123773	Azodicarbonamide	123-77-3	3.5E+01	PHYSPROP	1.1E-04	4.7E-01	1.1E+00	2.6E-05	EPI
7440393	Barium	7440-39-3			4.5E-03	6.2E-01	1.5E+00	1.0E-03	RAGSE
1861401	Benfluralin	1861-40-1	1.0E-01	PHYSPROP	4.8E-01	7.9E+00	1.9E+01	6.8E-02	EPI
17804352	Benomyl	17804-35-2	3.8E+00	PHYSPROP	6.2E-03	4.4E+00	1.1E+01	9.4E-04	EPI
83055996	Bensulfuron-methyl	83055-99-6	1.2E+02	PHYSPROP	1.7E-03	2.1E+01	5.0E+01	2.2E-04	EPI
25057890	Bentazon	25057-89-0	5.0E+02	PHYSPROP	1.5E-02	2.3E+00	5.6E+00	2.5E-03	EPI
100527	Benzaldehyde	100-52-7	7.0E+03	PHYSPROP	1.5E-02	4.1E-01	9.9E-01	3.8E-03	EPI
71432	Benzene	71-43-2	1.8E+03	PHYSPROP	5.1E-02	2.9E-01	6.9E-01	1.5E-02	EPI
6369591	Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	1.0E+06	EPI	1.7E-06	1.8E+00	4.3E+00	3.0E-07	EPI
108985	Benzenethiol	108-98-5	8.4E+02	PHYSPROP	7.2E-02	4.4E-01	1.0E+00	1.8E-02	EPI
92875	Benzidine	92-87-5	3.2E+02	PHYSPROP	5.9E-03	1.1E+00	2.7E+00	1.1E-03	EPI
65850	Benzoic Acid	65-85-0	3.4E+03	PHYSPROP	2.4E-02	5.1E-01	1.2E+00	5.7E-03	EPI
98077	Benzotrichloride	98-07-7	5.3E+01	PHYSPROP	2.6E-01	1.3E+00	3.1E+00	4.9E-02	EPI
100516	Benzyl Alcohol	100-51-6	4.3E+04	PHYSPROP	8.4E-03	4.2E-01	1.0E+00	2.1E-03	EPI
100447	Benzyl Chloride	100-44-7	5.3E+02	PHYSPROP	4.5E-02	5.4E-01	1.3E+00	1.0E-02	EPI
7440417	Beryllium and compounds	7440-41-7			1.2E-03	1.2E-01	2.8E-01	1.0E-03	RAGSE
42576023	Bifenox	42576-02-3	4.0E-01	PHYSPROP	1.3E-01	8.7E+00	2.1E+01	1.8E-02	EPI
82657043	Biphenthrin	82657-04-3	1.0E-03	PHYSPROP	1.4E+01	2.5E+01	1.1E+02	1.7E+00	EPI
92524	Biphenyl, 1,1'-	92-52-4	7.5E+00	PHYSPROP	4.5E-01	7.7E-01	1.8E+00	9.4E-02	EPI
108601	Bis(2-chloro-1-methylethyl) ether	108-60-1	1.7E+03	PHYSPROP	3.8E-02	9.5E-01	2.3E+00	7.6E-03	EPI
111911	Bis(2-chloroethoxy)methane	111-91-1	7.8E+03	PHYSPROP	6.2E-03	9.8E-01	2.4E+00	1.2E-03	EPI
111444	Bis(2-chloroethyl)ether	111-44-4	1.7E+04	PHYSPROP	8.2E-03	6.6E-01	1.6E+00	1.8E-03	EPI
542881	Bis(chloromethyl)ether	542-88-1	2.2E+04	PHYSPROP	3.5E-03	4.6E-01	1.1E+00	8.6E-04	EPI
80057	Bisphenol A	80-05-7	1.2E+02	PHYSPROP	7.7E-02	2.0E+00	4.8E+00	1.3E-02	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
7440428	Boron And Borates Only	7440-42-8			1.4E-03	1.3E-01	3.0E-01	1.0E-03	RAGSE
10294345	Boron Trichloride	10294-34-5			4.2E-03	4.8E-01	1.1E+00	1.0E-03	RAGSE
7637072	Boron Trifluoride	7637-07-2	3.3E+06	PHYSPROP	3.2E-03	2.5E-01	6.1E-01	1.0E-03	RAGSE
15541454	Bromate	15541-45-4			3.4E-03	2.9E-01	7.1E-01	1.0E-03	RAGSE
107040	Bromo-2-chloroethane, 1-	107-04-0	6.9E+03	PHYSPROP	2.1E-02	6.7E-01	1.6E+00	4.6E-03	EPI
1073069	Bromo-3-fluorobenzene, 1-	1073-06-9	3.8E+02	PHYSPROP	7.2E-02	1.0E+00	2.4E+00	1.4E-02	EPI
460004	Bromo-4-fluorobenzene, 1-	460-00-4	1.4E+02	PHYSPROP	9.3E-02	1.0E+00	2.4E+00	1.8E-02	EPI
79083	Bromoacetic acid	79-08-3	1.8E+06	PHYSPROP	2.2E-03	6.3E-01	1.5E+00	4.9E-04	EPI
108861	Bromobenzene	108-86-1	4.5E+02	PHYSPROP	9.6E-02	8.0E-01	1.9E+00	2.0E-02	EPI
74975	Bromochloromethane	74-97-5	1.7E+04	PHYSPROP	1.1E-02	5.6E-01	1.3E+00	2.6E-03	EPI
75274	Bromodichloromethane	75-27-4	3.0E+03	PHYSPROP	2.0E-02	8.7E-01	2.1E+00	4.0E-03	EPI
75252	Bromoform	75-25-2	3.1E+03	PHYSPROP	1.4E-02	2.7E+00	6.6E+00	2.4E-03	EPI
74839	Bromomethane	74-83-9	1.5E+04	PHYSPROP	1.1E-02	3.6E-01	8.6E-01	2.8E-03	EPI
2104963	Bromophos	2104-96-3	3.0E-01	PHYSPROP	3.0E-01	1.2E+01	2.8E+01	4.0E-02	EPI
106945	Bromopropane, 1-	106-94-5	2.5E+03	EPI	3.4E-02	5.1E-01	1.2E+00	8.0E-03	EPI
1689845	Bromoxynil	1689-84-5	1.3E+02	PHYSPROP	5.0E-02	3.7E+00	9.0E+00	7.8E-03	EPI
1689992	Bromoxynil Octanoate	1689-99-2	8.0E-02	PHYSPROP	2.6E-01	1.9E+01	4.6E+01	3.3E-02	EPI
106990	Butadiene, 1,3-	106-99-0	7.4E+02	PHYSPROP	4.6E-02	2.1E-01	5.1E-01	1.6E-02	EPI
94826	Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6	4.6E+01	PHYSPROP	8.4E-02	2.6E+00	6.3E+00	1.4E-02	EPI
71363	Butanol, N-	71-36-3	6.3E+04	PHYSPROP	7.6E-03	2.7E-01	6.6E-01	2.3E-03	EPI
78922	Butyl alcohol, sec-	78-92-2	1.8E+05	PHYSPROP	5.1E-03	2.7E-01	6.6E-01	1.5E-03	EPI
2008415	Butylate	2008-41-5	4.5E+01	PHYSPROP	3.1E-01	1.7E+00	4.2E+00	5.4E-02	EPI
25013165	Butylated hydroxyanisole	25013-16-5	2.1E+02	PHYSPROP	2.4E-01	1.1E+01	2.6E+01	3.3E-02	EPI
128370	Butylated hydroxytoluene	128-37-0	6.0E-01	PHYSPROP	1.3E+00	1.8E+00	7.1E+00	2.2E-01	EPI
104518	Butylbenzene, n-	104-51-8	1.2E+01	PHYSPROP	1.0E+00	5.9E-01	2.3E+00	2.3E-01	EPI
135988	Butylbenzene, sec-	135-98-8	1.8E+01	PHYSPROP	1.3E+00	5.9E-01	2.3E+00	3.0E-01	EPI
98066	Butylbenzene, tert-	98-06-6	3.0E+01	PHYSPROP	6.6E-01	5.9E-01	2.3E+00	1.5E-01	EPI
75605	Cacodylic Acid	75-60-5	2.0E+06	PHYSPROP	2.1E-03	6.2E-01	1.5E+00	4.6E-04	EPI
7440439	Cadmium (Diet)	7440-43-9			4.1E-03	4.5E-01	1.1E+00	1.0E-03	RAGSE
7440439	Cadmium (Water)	7440-43-9			4.1E-03	4.5E-01	1.1E+00	1.0E-03	RAGSE
105602	Caprolactam	105-60-2	7.7E+05	PHYSPROP	4.1E-03	4.5E-01	1.1E+00	1.0E-03	EPI
2425061	Captafol	2425-06-1	1.4E+00	PHYSPROP	4.1E-02	9.5E+00	2.3E+01	5.8E-03	EPI
133062	Captan	133-06-2	5.1E+00	PHYSPROP	1.6E-02	5.1E+00	1.2E+01	2.3E-03	EPI
63252	Carbaryl	63-25-2	1.1E+02	PHYSPROP	2.4E-02	1.4E+00	3.4E+00	4.3E-03	EPI
1563662	Carbofuran	1563-66-2	3.2E+02	PHYSPROP	1.8E-02	1.8E+00	4.4E+00	3.1E-03	EPI
75150	Carbon Disulfide	75-15-0	2.2E+03	PHYSPROP	3.8E-02	2.8E-01	6.7E-01	1.1E-02	EPI
56235	Carbon Tetrachloride	56-23-5	7.9E+02	PHYSPROP	7.8E-02	7.6E-01	1.8E+00	1.6E-02	EPI
463581	Carbonyl Sulfide	463-58-1	1.2E+03	PHYSPROP	2.8E-04	2.3E-01	5.5E-01	9.4E-05	EPI
55285148	Carbosulfan	55285-14-8	3.0E-01	PHYSPROP	4.3E-01	1.4E+01	3.4E+01	5.8E-02	EPI
5234684	Carboxin	5234-68-4	1.5E+02	PHYSPROP	1.2E-02	2.2E+00	5.2E+00	2.0E-03	EPI
1306383	Ceric oxide	1306-38-3			5.0E-03	9.7E-01	2.3E+00	1.0E-03	RAGSE
302170	Chloral Hydrate	302-17-0	7.9E+05	PHYSPROP	4.2E-03	8.9E-01	2.1E+00	8.4E-04	EPI
133904	Chloramben	133-90-4	7.0E+02	PHYSPROP	1.1E-02	1.5E+00	3.6E+00	2.0E-03	EPI
E701235	Chloramines, Organic	E701235							
118752	Chloranil	118-75-2	2.5E+02	PHYSPROP	1.2E-02	2.5E+00	6.0E+00	1.9E-03	EPI
12789036	Chlordane	12789-03-6	5.6E-02	EPI	8.3E-01	2.1E+01	8.0E+01	1.1E-01	EPI
143500	Chlordecone (Kepone)	143-50-0	2.7E+00	PHYSPROP	9.3E-02	5.9E+01	1.4E+02	1.1E-02	EPI
470906	Chlorfenvinphos	470-90-6	1.2E+02	PHYSPROP	3.7E-02	1.1E+01	2.6E+01	5.1E-03	EPI
90982324	Chlorimuron, Ethyl-	90982-32-4	1.2E+03	PHYSPROP	2.6E-03	2.2E+01	5.3E+01	3.4E-04	EPI
7782505	Chlorine	7782-50-5	6.3E+03	PHYSPROP	3.2E-03	2.6E-01	6.3E-01	1.0E-03	RAGSE
10049044	Chlorine Dioxide	10049-04-4			3.2E-03	2.5E-01	6.0E-01	1.0E-03	RAGSE
7758192	Chlorite (Sodium Salt)	7758-19-2	6.4E+05	CRC89	3.7E-03	3.4E-01	8.1E-01	1.0E-03	RAGSE
75683	Chloro-1,1-difluoroethane, 1-	75-68-3	1.4E+03	PHYSPROP	3.8E-02	3.8E-01	9.2E-01	9.9E-03	EPI
126998	Chloro-1,3-butadiene, 2-	126-99-8	8.7E+02	PHYSPROP	8.6E-02	3.3E-01	7.9E-01	2.4E-02	EPI
3165933	Chloro-2-methylaniline HCl, 4-	3165-93-3	9.5E+02	PHYSPROP	9.2E-05	1.0E+00	2.5E+00	1.8E-05	EPI
95692	Chloro-2-methylaniline, 4-	95-69-2	9.5E+02	PHYSPROP	3.7E-02	6.5E-01	1.6E+00	8.1E-03	EPI
107200	Chloroacetaldehyde, 2-	107-20-0	1.1E+05	PHYSPROP	2.2E-03	2.9E-01	6.9E-01	6.5E-04	EPI
79118	Chloroacetic Acid	79-11-8	8.6E+05	PHYSPROP	2.4E-03	3.6E-01	8.5E-01	6.5E-04	EPI
532274	Chloroacetophenone, 2-	532-27-4	1.1E+03	PERRY	1.9E-02	7.7E-01	1.9E+00	4.1E-03	EPI
106478	Chloroaniline, p-	106-47-8	3.9E+03	PHYSPROP	2.2E-02	5.4E-01	1.3E+00	5.0E-03	EPI
108907	Chlorobenzene	108-90-7	5.0E+02	PHYSPROP	1.2E-01	4.5E-01	1.1E+00	2.8E-02	EPI
98668	Chlorobenzene sulfonic acid, p-	98-66-8	3.1E+05	PHYSPROP	3.1E-04	1.3E+00	3.0E+00	5.9E-05	EPI
510156	Chlorobenzilate	510-15-6	1.3E+01	PHYSPROP	2.3E-01	7.0E+00	1.7E+01	3.3E-02	EPI
74113	Chlorobenzoic Acid, p-	74-11-3	7.2E+01	PHYSPROP	5.8E-02	7.9E-01	1.9E+00	1.2E-02	EPI
98566	Chlorobenzotrifluoride, 4-	98-56-6	2.9E+01	PHYSPROP	1.9E-01	1.1E+00	2.6E+00	3.8E-02	EPI
109693	Chlorobutane, 1-	109-69-3	1.1E+03	PHYSPROP	1.0E-01	3.5E-01	8.3E-01	2.7E-02	EPI
75456	Chlorodifluoromethane	75-45-6	2.8E+03	PHYSPROP	9.6E-03	3.2E-01	7.7E-01	2.7E-03	EPI
107073	Chloroethanol, 2-	107-07-3	1.0E+06	PHYSPROP	2.0E-03	3.0E-01	7.1E-01	5.8E-04	EPI
67663	Chloroform	67-66-3	8.0E+03	PHYSPROP	2.9E-02	4.9E-01	1.2E+00	6.8E-03	EPI
74873	Chloromethane	74-87-3	5.3E+03	PHYSPROP	9.0E-03	2.0E-01	4.8E-01	3.3E-03	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
107302	Chloromethyl Methyl Ether	107-30-2	6.9E+04	PHYSPROP	3.1E-03	3.0E-01	7.1E-01	9.1E-04	EPI
88733	Chloronitrobenzene, o-	88-73-3	4.4E+02	PHYSPROP	3.0E-02	8.0E-01	1.9E+00	6.3E-03	EPI
100005	Chloronitrobenzene, p-	100-00-5	2.3E+02	PHYSPROP	3.8E-02	8.0E-01	1.9E+00	7.9E-03	EPI
95578	Chlorophenol, 2-	95-57-8	1.1E+04	PHYSPROP	3.5E-02	5.5E-01	1.3E+00	8.0E-03	EPI
76062	Chloropicrin	76-06-2	1.6E+03	PHYSPROP	2.3E-02	8.8E-01	2.1E+00	4.6E-03	EPI
1897456	Chlorothalonil	1897-45-6	8.1E-01	PHYSPROP	3.4E-02	3.2E+00	7.8E+00	5.4E-03	EPI
95498	Chlorotoluene, o-	95-49-8	3.7E+02	PHYSPROP	2.5E-01	5.4E-01	1.3E+00	5.7E-02	EPI
106434	Chlorotoluene, p-	106-43-4	1.1E+02	PHYSPROP	2.2E-01	5.4E-01	1.3E+00	5.0E-02	EPI
54749905	Chlorozotocin	54749-90-5	1.8E+03	PHYSPROP	6.2E-05	3.2E+00	7.8E+00	9.9E-06	EPI
101213	Chlorpropham	101-21-3	8.9E+01	PHYSPROP	1.2E-01	1.7E+00	4.0E+00	2.1E-02	EPI
2921882	Chlorpyrifos	2921-88-2	1.1E+00	PHYSPROP	2.4E-01	9.7E+00	2.3E+01	3.3E-02	EPI
5598130	Chlorpyrifos Methyl	5598-13-0	4.8E+00	PHYSPROP	1.2E-01	6.7E+00	1.6E+01	1.8E-02	EPI
64902723	Chlorsulfuron	64902-72-3	3.1E+04	PHYSPROP	2.4E-03	1.1E+01	2.5E+01	3.3E-04	EPI
1861321	Chlorthal-dimethyl	1861-32-1	5.0E-01	PHYSPROP	1.1E-01	7.6E+00	1.8E+01	1.5E-02	EPI
60238564	Chlorthiophos	60238-56-4	3.0E-01	PHYSPROP	7.7E-01	1.1E+01	4.3E+01	1.1E-01	EPI
16065831	Chromium(III), Insoluble Salts	16065-83-1			2.8E-03	2.1E-01	4.9E-01	1.0E-03	RAGSE
18540299	Chromium(VI)	18540-29-9	1.7E+06	CRC89	5.5E-03	2.1E-01	4.9E-01	2.0E-03	RAGSE
7440473	Chromium, Total	7440-47-3			2.8E-03	2.1E-01	4.9E-01	1.0E-03	RAGSE
74115245	Clofentezine	74115-24-5	1.0E+00	PHYSPROP	2.4E-02	5.2E+00	1.3E+01	3.6E-03	EPI
7440484	Cobalt	7440-48-4			1.2E-03	2.2E-01	5.4E-01	4.0E-04	RAGSE
8007452	Coke Oven Emissions	8007-45-2							
7440508	Copper	7440-50-8			3.1E-03	2.4E-01	5.7E-01	1.0E-03	RAGSE
108394	Cresol, m-	108-39-4	2.3E+04	PHYSPROP	3.1E-02	4.2E-01	1.0E+00	7.8E-03	EPI
95487	Cresol, o-	95-48-7	2.6E+04	PHYSPROP	3.1E-02	4.2E-01	1.0E+00	7.7E-03	EPI
106445	Cresol, p-	106-44-5	2.2E+04	PHYSPROP	3.0E-02	4.2E-01	1.0E+00	7.5E-03	EPI
59507	Cresol, p-chloro-m-	59-50-7	3.8E+03	PHYSPROP	1.3E-01	6.6E-01	1.6E+00	2.9E-02	EPI
1319773	Cresols	1319-77-3	9.1E+03	PHYSPROP	5.3E-02	6.9E+00	1.7E+01	7.7E-03	EPI
123739	Crotonaldehyde, trans-	123-73-9	1.5E+05	PHYSPROP	5.1E-03	2.6E-01	6.2E-01	1.6E-03	EPI
98828	Cumene	98-82-8	6.1E+01	PHYSPROP	3.8E-01	5.0E-01	1.2E+00	9.0E-02	EPI
135206	Cupferron	135-20-6	6.1E+05	PHYSPROP	8.0E-06	7.8E-01	1.9E+00	1.7E-06	EPI
21725462	Cyanazine	21725-46-2	1.7E+02	PHYSPROP	1.2E-02	2.3E+00	5.6E+00	2.1E-03	EPI
	Cyanides								
592018	~Calcium Cyanide	592-01-8			3.7E-03	3.4E-01	8.3E-01	1.0E-03	RAGSE
544923	~Copper Cyanide	544-92-3			3.6E-03	3.3E-01	8.0E-01	1.0E-03	RAGSE
57125	~Cyanide (CN-)	57-12-5	9.5E+04	PHYSPROP	2.0E-03	1.5E-01	3.5E-01	1.0E-03	RAGSE
460195	~Cyanogen	460-19-5	8.0E+03	CRC89	2.5E-03	2.1E-01	4.9E-01	8.9E-04	RAGSE
506683	~Cyanogen Bromide	506-68-3			1.0E-03	4.1E-01	9.9E-01	2.6E-04	RAGSE
506774	~Cyanogen Chloride	506-77-4	6.0E+04	PHYSPROP	1.2E-03	2.3E-01	5.6E-01	3.9E-04	RAGSE
74908	~Hydrogen Cyanide	74-90-8	1.0E+06	PHYSPROP	2.0E-03	1.5E-01	3.6E-01	1.0E-03	RAGSE
151508	~Potassium Cyanide	151-50-8	7.2E+05	PHYSPROP	6.2E-03	2.4E-01	5.8E-01	2.0E-03	RAGSE
506616	~Potassium Silver Cyanide	506-61-6			1.1E-02	1.4E+00	3.3E+00	2.0E-03	RAGSE
506649	~Silver Cyanide	506-64-9	2.3E+01	PHYSPROP	4.5E-03	5.9E-01	1.4E+00	1.0E-03	RAGSE
143339	~Sodium Cyanide	143-33-9	5.8E+05	CRC89	2.7E-03	2.0E-01	4.7E-01	1.0E-03	RAGSE
E1790664	~Thiocyanates	E1790664						1.0E-03	RAGSE
463569	~Thiocyanic Acid	463-56-9			3.0E-03	2.3E-01	5.4E-01	1.0E-03	RAGSE
557211	~Zinc Cyanide	557-21-1	4.7E+00	CRC89	2.5E-03	4.8E-01	1.1E+00	6.0E-04	RAGSE
110827	Cyclohexane	110-82-7	5.5E+01	PHYSPROP	3.6E-01	3.1E-01	7.5E-01	1.0E-01	EPI
87843	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	5.5E-02	PHYSPROP	2.5E-02	7.9E+01	1.9E+02	2.8E-03	EPI
108941	Cyclohexanone	108-94-1	2.5E+04	PHYSPROP	5.8E-03	3.7E-01	8.9E-01	1.5E-03	EPI
110838	Cyclohexene	110-83-8	2.1E+02	PHYSPROP	1.5E-01	3.0E-01	7.3E-01	4.3E-02	EPI
108918	Cyclohexylamine	108-91-8	1.0E+06	PHYSPROP	1.6E-02	3.8E-01	9.1E-01	4.3E-03	EPI
68359375	Cyfluthrin	68359-37-5	3.0E-03	PHYSPROP	4.1E-01	2.8E+01	6.8E+01	5.2E-02	EPI
68085858	Cyhalothrin	68085-85-8	5.0E-03	PHYSPROP	1.7E+00	3.5E+01	1.4E+02	2.1E-01	EPI
66215278	Cyromazine	66215-27-8	1.3E+04	PHYSPROP	4.0E-03	9.0E-01	2.2E+00	8.0E-04	EPI
72548	DDD, p,p`- (DDD)	72-54-8	9.0E-02	PHYSPROP	1.7E+00	6.5E+00	2.6E+01	2.5E-01	EPI
72559	DDE, p,p'-	72-55-9	4.0E-02	PHYSPROP	3.7E+00	6.4E+00	2.7E+01	5.5E-01	EPI
50293	DDT	50-29-3	5.5E-03	PHYSPROP	4.5E+00	1.0E+01	4.4E+01	6.3E-01	EPI
75990	Dalapon	75-99-0	5.0E+05	PHYSPROP	3.7E-03	6.6E-01	1.6E+00	8.2E-04	EPI
1596845	Daminozide	1596-84-5	1.0E+05	PHYSPROP	9.7E-05	8.3E-01	2.0E+00	2.0E-05	EPI
1163195	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	1.0E-04	PHYSPROP	8.6E+00	2.5E+04	1.1E+05	7.3E-01	EPI
8065483	Demeton	8065-48-3	6.7E+02	PHYSPROP	6.6E-02	8.2E+01	2.0E+02	7.6E-03	RAGSE
103231	Di(2-ethylhexyl)adipate	103-23-1	7.8E-01	PHYSPROP	2.4E+01	1.3E+01	5.8E+01	3.2E+00	EPI
2303164	Diallate	2303-16-4	1.4E+01	PHYSPROP	2.9E-01	3.4E+00	8.2E+00	4.6E-02	EPI
333415	Diazinon	333-41-5	4.0E+01	PHYSPROP	7.0E-02	5.3E+00	1.3E+01	1.0E-02	EPI
132650	Dibenzothiophene	132-65-0	1.5E+00	PHYSPROP	6.2E-01	1.1E+00	4.5E+00	1.2E-01	EPI
96128	Dibromo-3-chloropropane, 1,2-	96-12-8	1.2E+03	PHYSPROP	4.1E-02	2.2E+00	5.3E+00	6.9E-03	EPI
631641	Dibromoacetic acid	631-64-1	2.1E+06	PHYSPROP	1.6E-03	1.7E+00	4.2E+00	2.7E-04	EPI
108361	Dibromobenzene, 1,3-	108-36-1	6.8E+01	PHYSPROP	1.4E-01	2.2E+00	5.3E+00	2.3E-02	EPI
106376	Dibromobenzene, 1,4-	106-37-6	2.0E+01	PHYSPROP	1.4E-01	2.2E+00	5.3E+00	2.5E-02	EPI
124481	Dibromochloromethane	124-48-1	2.7E+03	PHYSPROP	1.6E-02	1.5E+00	3.7E+00	2.9E-03	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
106934	Dibromoethane, 1,2-	106-93-4	3.9E+03	PHYSPROP	1.5E-02	1.2E+00	2.8E+00	2.8E-03	EPI
74953	Dibromomethane (Methylene Bromide)	74-95-3	1.2E+04	PHYSPROP	1.1E-02	9.9E-01	2.4E+00	2.2E-03	EPI
E1790660	Dibutyltin Compounds	E1790660							
1918009	Dicamba	1918-00-9	8.3E+03	PHYSPROP	1.5E-02	1.8E+00	4.4E+00	2.7E-03	EPI
3400097	Dichloramine	3400-09-7							
764410	Dichloro-2-butene, 1,4-	764-41-0	5.8E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
1476115	Dichloro-2-butene, cis-1,4-	1476-11-5	5.8E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
110576	Dichloro-2-butene, trans-1,4-	110-57-6	8.5E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
79436	Dichloroacetic Acid	79-43-6	1.0E+06	PHYSPROP	5.3E-03	5.5E-01	1.3E+00	1.2E-03	EPI
95501	Dichlorobenzene, 1,2-	95-50-1	1.6E+02	PHYSPROP	2.1E-01	7.0E-01	1.7E+00	4.5E-02	EPI
106467	Dichlorobenzene, 1,4-	106-46-7	8.1E+01	PHYSPROP	2.1E-01	7.0E-01	1.7E+00	4.5E-02	EPI
91941	Dichlorobenzidine, 3,3'-	91-94-1	3.1E+00	PHYSPROP	7.8E-02	2.8E+00	6.6E+00	1.3E-02	EPI
90982	Dichlorobenzophenone, 4,4'-	90-98-2	8.3E-01	PHYSPROP	3.3E-01	2.7E+00	6.4E+00	5.4E-02	EPI
75718	Dichlorodifluoromethane	75-71-8	2.8E+02	PHYSPROP	3.8E-02	5.0E-01	1.2E+00	9.0E-03	EPI
75343	Dichloroethane, 1,1-	75-34-3	5.0E+03	PHYSPROP	2.6E-02	3.8E-01	9.0E-01	6.8E-03	EPI
107062	Dichloroethane, 1,2-	107-06-2	8.6E+03	PHYSPROP	1.6E-02	3.8E-01	9.0E-01	4.2E-03	EPI
75354	Dichloroethylene, 1,1-	75-35-4	2.4E+03	PHYSPROP	4.4E-02	3.7E-01	8.8E-01	1.2E-02	EPI
156592	Dichloroethylene, 1,2-cis-	156-59-2	6.4E+03	PHYSPROP	4.2E-02	3.7E-01	8.8E-01	1.1E-02	EPI
156605	Dichloroethylene, 1,2-trans-	156-60-5	4.5E+03	PHYSPROP	4.2E-02	3.7E-01	8.8E-01	1.1E-02	EPI
120832	Dichlorophenol, 2,4-	120-83-2	5.6E+03	PHYSPROP	1.0E-01	8.6E-01	2.1E+00	2.1E-02	EPI
94757	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	6.8E+02	PHYSPROP	3.8E-02	1.8E+00	4.4E+00	6.6E-03	EPI
78875	Dichloropropane, 1,2-	78-87-5	2.8E+03	PHYSPROP	3.1E-02	4.5E-01	1.1E+00	7.5E-03	EPI
142289	Dichloropropane, 1,3-	142-28-9	2.8E+03	PHYSPROP	3.2E-02	4.5E-01	1.1E+00	7.8E-03	EPI
616239	Dichloropropanol, 2,3-	616-23-9	6.4E+04	PHYSPROP	4.3E-03	5.5E-01	1.3E+00	9.8E-04	EPI
542756	Dichloropropene, 1,3-	542-75-6	2.8E+03	PHYSPROP	3.4E-02	4.4E-01	1.1E+00	8.3E-03	EPI
62737	Dichlorvos	62-73-7	8.0E+03	PHYSPROP	4.6E-03	1.8E+00	4.4E+00	8.0E-04	EPI
141662	Dicrotophos	141-66-2	1.0E+06	PHYSPROP	4.3E-04	2.2E+00	5.4E+00	7.3E-05	EPI
77736	Dicyclopentadiene	77-73-6	2.6E+01	PHYSPROP	1.6E-01	5.8E-01	1.4E+00	3.6E-02	EPI
60571	Dieldrin	60-57-1	2.0E-01	PHYSPROP	2.4E-01	1.4E+01	3.4E+01	3.3E-02	EPI
E17136615	Diesel Engine Exhaust	E17136615							
111422	Diethanolamine	111-42-2	1.0E+06	PHYSPROP	1.8E-04	4.1E-01	9.8E-01	4.5E-05	EPI
112345	Diethylene Glycol Monobutyl Ether	112-34-5	1.0E+06	PHYSPROP	2.2E-03	8.5E-01	2.0E+00	4.5E-04	EPI
111900	Diethylene Glycol Monoethyl Ether	111-90-0	1.0E+06	PHYSPROP	5.4E-04	5.9E-01	1.4E+00	1.2E-04	EPI
617845	Diethylformamide	617-84-5	1.0E+06	PHYSPROP	1.8E-03	3.9E-01	9.3E-01	4.6E-04	EPI
56531	Diethylstilbestrol	56-53-1	1.2E+01	PHYSPROP	7.2E-01	3.3E+00	1.3E+01	1.1E-01	EPI
43222486	Difenzoquat	43222-48-6	8.2E+05	PHYSPROP	2.9E-04	1.1E+01	2.6E+01	4.0E-05	EPI
35367385	Diflubenzuron	35367-38-5	8.0E-02	PHYSPROP	7.3E-02	5.8E+00	1.4E+01	1.1E-02	EPI
75376	Difluoroethane, 1,1-	75-37-6	3.2E+03	PHYSPROP	6.6E-03	2.5E-01	5.9E-01	2.1E-03	EPI
420451	Difluoropropane, 2,2-	420-45-1	1.6E+02	PHYSPROP	6.4E-02	3.0E-01	7.1E-01	1.9E-02	EPI
94586	Dihydrosafrole	94-58-6	5.7E+01	PHYSPROP	2.2E-01	8.7E-01	2.1E+00	4.5E-02	EPI
108203	Diisopropyl Ether	108-20-3	8.8E+03	PHYSPROP	1.7E-02	3.9E-01	9.4E-01	4.3E-03	EPI
1445756	Diisopropyl Methylphosphonate	1445-75-6	1.5E+03	PHYSPROP	3.8E-03	1.1E+00	2.6E+00	7.4E-04	EPI
55290647	Dimethipin	55290-64-7	4.6E+03	PHYSPROP	4.5E-04	1.6E+00	3.8E+00	8.0E-05	EPI
60515	Dimethoate	60-51-5	2.3E+04	PHYSPROP	1.6E-03	2.0E+00	4.9E+00	2.7E-04	EPI
119904	Dimethoxybenzidine, 3,3'-	119-90-4	6.0E+01	PHYSPROP	6.4E-03	2.5E+00	5.9E+00	1.1E-03	EPI
756796	Dimethyl methylphosphonate	756-79-6	1.0E+06	PHYSPROP	5.3E-04	5.2E-01	1.2E+00	1.2E-04	EPI
60117	Dimethylamino azobenzene [p-]	60-11-7	2.3E-01	PHYSPROP	5.4E-01	1.9E+00	4.6E+00	9.4E-02	EPI
21436964	Dimethylaniline HCl, 2,4-	21436-96-4	3.7E+03	PHYSPROP	8.6E-05	5.0E-01	1.2E+00	2.0E-05	EPI
95681	Dimethylaniline, 2,4-	95-68-1	6.1E+03	PHYSPROP	1.8E-02	5.0E-01	1.2E+00	4.3E-03	EPI
121697	Dimethylaniline, N,N-	121-69-7	1.5E+03	PHYSPROP	4.7E-02	5.0E-01	1.2E+00	1.1E-02	EPI
119937	Dimethylbenzidine, 3,3'-	119-93-7	1.3E+03	PHYSPROP	2.0E-02	1.6E+00	3.9E+00	3.6E-03	EPI
68122	Dimethylformamide	68-12-2	1.0E+06	PHYSPROP	4.3E-04	2.7E-01	6.5E-01	1.3E-04	EPI
57147	Dimethylhydrazine, 1,1-	57-14-7	1.0E+06	PHYSPROP	3.5E-04	2.3E-01	5.5E-01	1.2E-04	EPI
540738	Dimethylhydrazine, 1,2-	540-73-8	1.0E+06	PHYSPROP	9.5E-04	2.3E-01	5.5E-01	3.2E-04	EPI
105679	Dimethylphenol, 2,4-	105-67-9	7.9E+03	PHYSPROP	4.6E-02	5.1E-01	1.2E+00	1.1E-02	EPI
576261	Dimethylphenol, 2,6-	576-26-1	6.1E+03	PHYSPROP	5.1E-02	5.1E-01	1.2E+00	1.2E-02	EPI
95658	Dimethylphenol, 3,4-	95-65-8	4.8E+03	PHYSPROP	4.2E-02	5.1E-01	1.2E+00	9.8E-03	EPI
513371	Dimethylvinylchloride	513-37-1	1.0E+03	PHYSPROP	9.3E-02	3.4E-01	8.1E-01	2.5E-02	EPI
534521	Dinitro-o-cresol, 4,6-	534-52-1	2.0E+02	PHYSPROP	1.7E-02	1.4E+00	3.2E+00	3.2E-03	EPI
131895	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	1.5E+01	PHYSPROP	1.7E-01	3.3E+00	7.8E+00	2.8E-02	EPI
528290	Dinitrobenzene, 1,2-	528-29-0	1.3E+02	PHYSPROP	1.2E-02	9.2E-01	2.2E+00	2.4E-03	EPI
99650	Dinitrobenzene, 1,3-	99-65-0	5.3E+02	PHYSPROP	8.7E-03	9.2E-01	2.2E+00	1.7E-03	EPI
100254	Dinitrobenzene, 1,4-	100-25-4	6.9E+01	PHYSPROP	8.3E-03	9.2E-01	2.2E+00	1.7E-03	EPI
51285	Dinitrophenol, 2,4-	51-28-5	2.8E+03	PHYSPROP	9.8E-03	1.1E+00	2.7E+00	1.9E-03	EPI
E1615210	Dinitrotoluene Mixture, 2,4/2,6-	E1615210	2.7E+02	EPI	2.2E-02	1.1E+00	2.6E+00	4.2E-03	EPI
121142	Dinitrotoluene, 2,4-	121-14-2	2.0E+02	PHYSPROP	1.6E-02	1.1E+00	2.6E+00	3.1E-03	EPI
606202	Dinitrotoluene, 2,6-	606-20-2	1.8E+02	PHYSPROP	1.9E-02	1.1E+00	2.6E+00	3.7E-03	EPI
35572782	Dinitrotoluene, 2-Amino-4,6-	35572-78-2	1.2E+03	PHYSPROP	1.1E-02	1.3E+00	3.2E+00	2.0E-03	EPI
19406510	Dinitrotoluene, 4-Amino-2,6-	19406-51-0	1.2E+03	PHYSPROP	1.1E-02	1.3E+00	3.2E+00	2.0E-03	EPI
25321146	Dinitrotoluene, Technical grade	25321-14-6	2.7E+02	PHYSPROP	3.7E-02	1.2E+02	2.9E+02	4.2E-03	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1		2	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
88857	Dinoseb	88-85-7	5.2E+01	PHYSPROP	9.7E-02	2.3E+00	5.6E+00	1.6E-02	EPI
123911	Dioxane, 1,4-	123-91-1	1.0E+06	PHYSPROP	1.2E-03	3.3E-01	7.9E-01	3.3E-04	EPI
	Dioxins								
34465468	~Hexachlorodibenzo-p-dioxin, Mixture	34465-46-8	4.0E-06	PHYSPROP	2.2E+01	1.6E+01	7.5E+01	2.9E+00	EPI
1746016	~TCDD, 2,3,7,8-	1746-01-6	2.0E-04	PHYSPROP	5.6E+00	6.7E+00	2.9E+01	8.1E-01	EPI
957517	Diphenamid	957-51-7	2.6E+02	PHYSPROP	3.3E-02	2.3E+00	5.5E+00	5.6E-03	EPI
101848	Diphenyl Ether	101-84-8	1.8E+01	EPI	5.5E-01	9.4E-01	2.3E+00	1.1E-01	EPI
127639	Diphenyl Sulfone	127-63-9	3.1E+02	PHYSPROP	2.1E-02	1.8E+00	4.2E+00	3.7E-03	EPI
122394	Diphenylamine	122-39-4	5.3E+01	PHYSPROP	1.9E-01	9.3E-01	2.2E+00	3.7E-02	EPI
122667	Diphenylhydrazine, 1,2-	122-66-7	2.2E+02	PHYSPROP	6.8E-02	1.1E+00	2.7E+00	1.3E-02	EPI
85007	Diquat	85-00-7	7.1E+05	PHYSPROP	1.7E-06	8.9E+00	2.1E+01	2.4E-07	EPI
1937377	Direct Black 38	1937-37-7	3.0E+03	PHYSPROP	2.2E-03	2.4E+03	5.9E+03	2.1E-04	EPI
2602462	Direct Blue 6	2602-46-2	1.4E-04	PHYSPROP	2.0E-08	1.8E+04	4.2E+04	1.7E-09	EPI
16071866	Direct Brown 95	16071-86-6	1.0E+06	PHYSPROP	4.1E-11	1.9E+03	4.6E+03	3.9E-12	EPI
298044	Disulfoton	298-04-4	1.6E+01	PHYSPROP	1.4E-01	3.6E+00	8.7E+00	2.1E-02	EPI
505293	Dithiane, 1,4-	505-29-3	3.0E+03	PHYSPROP	4.6E-03	5.0E-01	1.2E+00	1.1E-03	EPI
330541	Diuron	330-54-1	4.2E+01	PHYSPROP	2.7E-02	2.1E+00	5.1E+00	4.7E-03	EPI
2439103	Dodine	2439-10-3	6.3E+02	PHYSPROP	1.4E-03	4.3E+00	1.0E+01	2.2E-04	EPI
759944	EPTC	759-94-4	3.8E+02	PHYSPROP	9.7E-02	1.2E+00	2.9E+00	1.8E-02	EPI
115297	Endosulfan	115-29-7	3.3E-01	PHYSPROP	2.2E-02	2.0E+01	4.8E+01	2.9E-03	EPI
1031078	Endosulfan Sulfate	1031-07-8	4.8E-01	PHYSPROP	1.4E-02	2.5E+01	5.9E+01	1.8E-03	EPI
145733	Endothall	145-73-3	1.0E+05	PHYSPROP	1.4E-02	1.2E+00	2.8E+00	2.6E-03	EPI
72208	Endrin	72-20-8	2.5E-01	PHYSPROP	2.4E-01	1.4E+01	3.4E+01	3.3E-02	EPI
106898	Epichlorohydrin	106-89-8	6.6E+04	PHYSPROP	3.5E-03	3.5E-01	8.3E-01	9.4E-04	EPI
106887	Epoxybutane, 1,2-	106-88-7	9.5E+04	PHYSPROP	7.5E-03	2.7E-01	6.4E-01	2.3E-03	EPI
111773	Ethanol, 2-(2-methoxyethoxy)-	111-77-3	1.0E+06	PHYSPROP	2.3E-04	5.0E-01	1.2E+00	5.4E-05	EPI
16672870	Ethephon	16672-87-0	1.0E+06	PHYSPROP	8.0E-04	6.8E-01	1.6E+00	1.7E-04	EPI
563122	Ethion	563-12-2	2.0E+00	PHYSPROP	1.9E-01	1.5E+01	3.6E+01	2.6E-02	EPI
111159	Ethoxyethanol Acetate, 2-	111-15-9	1.9E+05	PHYSPROP	3.1E-03	5.8E-01	1.4E+00	7.0E-04	EPI
110805	Ethoxyethanol, 2-	110-80-5	1.0E+06	PHYSPROP	1.1E-03	3.4E-01	8.1E-01	3.0E-04	EPI
141786	Ethyl Acetate	141-78-6	8.0E+04	PHYSPROP	5.5E-03	3.3E-01	7.9E-01	1.5E-03	EPI
140885	Ethyl Acrylate	140-88-5	1.5E+04	PHYSPROP	1.2E-02	3.8E-01	9.2E-01	3.2E-03	EPI
75003	Ethyl Chloride (Chloroethane)	75-00-3	6.7E+03	PHYSPROP	1.9E-02	2.4E-01	5.8E-01	6.1E-03	EPI
60297	Ethyl Ether	60-29-7	6.0E+04	PHYSPROP	7.8E-03	2.7E-01	6.6E-01	2.4E-03	EPI
97632	Ethyl Methacrylate	97-63-2	5.4E+03	PHYSPROP	2.9E-02	4.6E-01	1.1E+00	7.0E-03	EPI
2104645	Ethyl-p-nitrophenyl Phosphonate	2104-64-5	3.1E+00	PHYSPROP	2.5E-01	6.8E+00	1.6E+01	3.6E-02	EPI
100414	Ethylbenzene	100-41-4	1.7E+02	PHYSPROP	2.0E-01	4.1E-01	9.9E-01	4.9E-02	EPI
109784	Ethylene Cyanohydrin	109-78-4	1.0E+06	PHYSPROP	4.8E-04	2.6E-01	6.3E-01	1.5E-04	EPI
107153	Ethylene Diamine	107-15-3	1.0E+06	PHYSPROP	9.5E-05	2.3E-01	5.5E-01	3.2E-05	EPI
107211	Ethylene Glycol	107-21-1	1.0E+06	PHYSPROP	2.7E-04	2.3E-01	5.6E-01	8.8E-05	EPI
111762	Ethylene Glycol Monobutyl Ether	111-76-2	1.0E+06	PHYSPROP	5.1E-03	4.8E-01	1.2E+00	1.2E-03	EPI
75218	Ethylene Oxide	75-21-8	1.0E+06	PHYSPROP	1.4E-03	1.9E-01	4.5E-01	5.6E-04	EPI
96457	Ethylene Thiourea	96-45-7	2.0E+04	PHYSPROP	5.9E-04	3.9E-01	9.4E-01	1.5E-04	EPI
151564	Ethyleneimine	151-56-4	1.0E+06	PHYSPROP	1.5E-03	1.8E-01	4.4E-01	5.8E-04	EPI
84720	Ethylphthalyl Ethyl Glycolate	84-72-0	2.2E+02	PHYSPROP	7.7E-03	3.9E+00	9.4E+00	1.2E-03	EPI
22224926	Fenamiphos	22224-92-6	3.3E+02	PHYSPROP	2.9E-02	5.3E+00	1.3E+01	4.4E-03	EPI
39515418	Fenpropathrin	39515-41-8	3.3E-01	PHYSPROP	1.2E+00	9.5E+00	3.7E+01	1.7E-01	EPI
51630581	Fenvalerate	51630-58-1	2.4E-02	PHYSPROP	7.4E-01	2.4E+01	9.1E+01	9.4E-02	EPI
2164172	Fluometuron	2164-17-2	1.1E+02	PHYSPROP	1.9E-02	2.1E+00	5.0E+00	3.2E-03	EPI
16984488	Fluoride	16984-48-8	1.7E+00	EPI	2.4E-03	1.7E-01	4.1E-01	1.0E-03	RAGSE
7782414	Fluorine (Soluble Fluoride)	7782-41-4	1.7E+00	PHYSPROP	2.4E-03	1.7E-01	4.1E-01	1.0E-03	RAGSE
59756604	Fluridone	59756-60-4	1.2E+01	PHYSPROP	2.0E-02	7.3E+00	1.8E+01	2.8E-03	EPI
56425913	Flurprimidol	56425-91-3	1.1E+02	PHYSPROP	3.1E-02	5.9E+00	1.4E+01	4.6E-03	EPI
85509199	Flusilazole	85509-19-9	5.4E+01	PHYSPROP	5.2E-02	6.1E+00	1.5E+01	7.7E-03	EPI
66332965	Flutolanil	66332-96-5	6.5E+00	PHYSPROP	4.8E-02	6.8E+00	1.6E+01	6.9E-03	EPI
69409945	Fluvalinate	69409-94-5	5.0E-03	PHYSPROP	6.8E-01	6.9E+01	2.7E+02	7.9E-02	EPI
133073	Folpet	133-07-3	8.0E-01	PHYSPROP	1.8E-02	4.8E+00	1.2E+01	2.7E-03	EPI
72178020	Fomesafen	72178-02-0	5.0E+01	PHYSPROP	3.7E-03	3.0E+01	7.2E+01	4.6E-04	EPI
944229	Fonofos	944-22-9	1.6E+01	PHYSPROP	1.6E-01	2.5E+00	6.0E+00	2.7E-02	EPI
50000	Formaldehyde	50-00-0	4.0E+05	PHYSPROP	3.8E-03	1.5E-01	3.7E-01	1.8E-03	EPI
64186	Formic Acid	64-18-6	1.0E+06	PHYSPROP	9.9E-04	1.9E-01	4.6E-01	3.8E-04	EPI
39148248	Fosetyl-AL	39148-24-8	1.1E+05	PHYSPROP	3.0E-06	1.0E+01	2.4E+01	4.1E-07	EPI
	Furans								
132649	~Dibenzofuran	132-64-9	3.1E+00	PHYSPROP	4.9E-01	9.2E-01	2.2E+00	9.8E-02	EPI
110009	~Furan	110-00-9	1.0E+04	PHYSPROP	1.6E-02	2.5E-01	6.1E-01	5.1E-03	EPI
109999	~Tetrahydrofuran	109-99-9	1.0E+06	PHYSPROP	4.1E-03	2.7E-01	6.4E-01	1.3E-03	EPI
67458	Furazolidone	67-45-8	4.0E+01	PHYSPROP	4.6E-04	1.9E+00	4.6E+00	8.0E-05	EPI
98011	Furfural	98-01-1	7.4E+04	PHYSPROP	3.2E-03	3.6E-01	8.7E-01	8.5E-04	EPI
531828	Furium	531-82-8	4.2E+03	EPI	5.7E-03	2.8E+00	6.6E+00	9.4E-04	EPI
60568050	Furmecyclox	60568-05-0	3.0E-01	PHYSPROP	3.0E-01	2.7E+00	6.4E+00	5.0E-02	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
77182822	Glufosinate, Ammonium	77182-82-2	1.4E+06	PHYSPROP	1.9E-07	1.4E+00	3.2E+00	3.4E-08	EPI
111308	Glutaraldehyde	111-30-8	2.2E+05	PHYSPROP	1.3E-03	3.8E-01	9.2E-01	3.3E-04	EPI
765344	Glycidyl	765-34-4	1.0E+06	PHYSPROP	1.7E-03	2.7E-01	6.4E-01	5.2E-04	EPI
1071836	Glyphosate	1071-83-6	1.1E+04	PHYSPROP	2.3E-07	9.3E-01	2.2E+00	4.5E-08	EPI
113008	Guanidine	113-00-8	1.8E+03	PHYSPROP	1.8E-04	2.3E-01	5.4E-01	6.0E-05	EPI
50011	Guanidine Chloride	50-01-1	1.0E+06	PHYSPROP	1.5E-07	3.6E-01	8.7E-01	3.9E-08	EPI
506934	Guanidine Nitrate	506-93-4	1.0E+06	PHYSPROP	1.1E-07	5.1E-01	1.2E+00	2.7E-08	EPI
69806402	Haloxyfop, Methyl	69806-40-2	9.3E+00	PHYSPROP	4.5E-02	1.3E+01	3.2E+01	6.0E-03	EPI
76448	Heptachlor	76-44-8	1.8E-01	PHYSPROP	1.1E+00	1.3E+01	5.0E+01	1.4E-01	EPI
1024573	Heptachlor Epoxide	1024-57-3	2.0E-01	PHYSPROP	1.6E-01	1.6E+01	3.8E+01	2.1E-02	EPI
111717	Heptanal, n-	111-71-7	1.3E+03	PHYSPROP	4.9E-02	4.6E-01	1.1E+00	1.2E-02	EPI
142825	Heptane, N-	142-82-5	3.4E+00	PHYSPROP	2.1E+00	3.8E-01	1.6E+00	5.4E-01	EPI
87821	Hexabromobenzene	87-82-1	1.6E-04	PHYSPROP	1.2E-01	1.3E+02	3.1E+02	1.4E-02	EPI
68631492	Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	9.0E-04	IRIS Profile		4.2E+02	1.0E+03		
118741	Hexachlorobenzene	118-74-1	6.2E-03	PHYSPROP	1.6E+00	4.1E+00	1.7E+01	2.5E-01	EPI
87683	Hexachlorobutadiene	87-68-3	3.2E+00	PHYSPROP	5.0E-01	3.0E+00	7.3E+00	8.1E-02	EPI
319846	Hexachlorocyclohexane, Alpha-	319-84-6	2.0E+00	PHYSPROP	1.4E-01	4.5E+00	1.1E+01	2.1E-02	EPI
319857	Hexachlorocyclohexane, Beta-	319-85-7	2.4E-01	PHYSPROP	1.4E-01	4.5E+00	1.1E+01	2.1E-02	EPI
58899	Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	7.3E+00	PHYSPROP	1.4E-01	4.5E+00	1.1E+01	2.1E-02	EPI
608731	Hexachlorocyclohexane, Technical	608-73-1	8.0E+00	PHYSPROP	1.4E-01	4.5E+00	1.1E+01	2.1E-02	EPI
77474	Hexachlorocyclopentadiene	77-47-4	1.8E+00	PHYSPROP	6.5E-01	3.5E+00	1.4E+01	1.0E-01	EPI
67721	Hexachloroethane	67-72-1	5.0E+01	PHYSPROP	2.5E-01	2.2E+00	5.3E+00	4.2E-02	EPI
70304	Hexachlorophene	70-30-4	1.4E+02	PHYSPROP	6.5E+00	2.0E+01	8.9E+01	8.4E-01	EPI
121824	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	6.0E+01	PHYSPROP	1.9E-03	1.8E+00	4.4E+00	3.4E-04	EPI
822060	Hexamethylene Diisocyanate, 1,6-	822-06-0	1.2E+02	PHYSPROP	1.2E-01	9.2E-01	2.2E+00	2.4E-02	EPI
680319	Hexamethylphosphoramide	680-31-9	1.0E+06	PHYSPROP	1.2E-03	1.1E+00	2.5E+00	2.4E-04	EPI
110543	Hexane, N-	110-54-3	9.5E+00	PHYSPROP	7.2E-01	3.2E-01	1.2E+00	2.0E-01	EPI
124049	Hexanedioic Acid	124-04-9	3.1E+04	PHYSPROP	1.2E-03	6.9E-01	1.7E+00	2.7E-04	EPI
104767	Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7	8.8E+02	EPI	8.3E-02	5.6E-01	1.4E+00	1.9E-02	EPI
591786	Hexanone, 2-	591-78-6	1.7E+04	PHYSPROP	1.4E-02	3.8E-01	9.2E-01	3.6E-03	EPI
51235042	Hexazinone	51235-04-2	3.3E+04	PHYSPROP	6.2E-03	2.7E+00	6.5E+00	1.0E-03	EPI
78587050	Hexythiazox	78587-05-0	5.0E-01	PHYSPROP	6.0E-01	1.0E+01	2.4E+01	8.3E-02	EPI
67485294	Hydramethylnon	67485-29-4	6.0E-03	PHYSPROP	7.7E-04	6.2E+01	1.5E+02	9.0E-05	EPI
302012	Hydrazine	302-01-2	1.0E+06	PHYSPROP	9.5E-05	1.6E-01	3.8E-01	4.4E-05	RAGSE
10034932	Hydrazine Sulfate	10034-93-2	3.1E+04	PERRY	4.4E-03	5.5E-01	1.3E+00	1.0E-03	RAGSE
7647010	Hydrogen Chloride	7647-01-0	6.7E+05	HSDB	2.3E-03	1.7E-01	4.0E-01	1.0E-03	RAGSE
7664393	Hydrogen Fluoride	7664-39-3	1.0E+06	PHYSPROP	1.7E-03	1.4E-01	3.3E-01	1.0E-03	RAGSE
7783064	Hydrogen Sulfide	7783-06-4	3.7E+03	PHYSPROP	2.2E-03	1.6E-01	3.9E-01	1.0E-03	RAGSE
123319	Hydroquinone	123-31-9	7.2E+04	PHYSPROP	3.8E-03	4.3E-01	1.0E+00	9.3E-04	EPI
35554440	Imazalil	35554-44-0	1.8E+02	PHYSPROP	7.7E-02	4.9E+00	1.2E+01	1.2E-02	EPI
81335377	Imazaquin	81335-37-7	9.0E+01	PHYSPROP	3.3E-03	5.8E+00	1.4E+01	4.8E-04	EPI
81335775	Imazethapyr	81335-77-5	1.4E+03	PHYSPROP	1.3E-02	4.4E+00	1.1E+01	2.0E-03	EPI
7553562	Iodine	7553-56-2	3.3E+02	PHYSPROP	6.1E-03	2.8E+00	6.7E+00	1.0E-03	RAGSE
36734197	Iprodione	36734-19-7	1.4E+01	PHYSPROP	1.5E-02	7.4E+00	1.8E+01	2.2E-03	EPI
7439896	Iron	7439-89-6			2.9E-03	2.2E-01	5.2E-01	1.0E-03	RAGSE
78831	Isobutyl Alcohol	78-83-1	8.5E+04	PHYSPROP	6.4E-03	2.7E-01	6.6E-01	1.9E-03	EPI
78591	Isophorone	78-59-1	1.2E+04	PHYSPROP	1.6E-02	6.2E-01	1.5E+00	3.5E-03	EPI
33820530	Isopropalin	33820-53-0	1.1E-01	PHYSPROP	1.4E+00	5.7E+00	2.2E+01	2.1E-01	EPI
67630	Isopropanol	67-63-0	1.0E+06	PHYSPROP	2.3E-03	2.3E-01	5.5E-01	7.8E-04	EPI
1832548	Isopropyl Methyl Phosphonic Acid	1832-54-8	5.0E+04	PHYSPROP	1.8E-03	6.2E-01	1.5E+00	4.0E-04	EPI
82558507	Isoxaben	82558-50-7	1.4E+00	PHYSPROP	6.2E-02	7.6E+00	1.8E+01	8.9E-03	EPI
E1737665	JP-7	E1737665	1.0E+01	EPA HCD					
77501634	Lactofen	77501-63-4	1.0E-01	PHYSPROP	5.2E-02	4.1E+01	9.7E+01	6.3E-03	EPI
78977	Lactonitrile	78-97-7	4.7E+05	PHYSPROP	4.8E-04	2.6E-01	6.3E-01	1.5E-04	EPI
7439910	Lanthanum	7439-91-0			4.5E-03	6.3E-01	1.5E+00	1.0E-03	RAGSE
100587904	Lanthanum Acetate Hydrate	100587-90-4				7.8E+00	1.9E+01		
10025840	Lanthanum Chloride Heptahydrate	10025-84-0	9.6E+05	CRC89	7.4E-03	1.3E+01	3.0E+01	1.0E-03	RAGSE
10099588	Lanthanum Chloride, Anhydrous	10099-58-8	9.6E+05	CRC89	6.0E-03	2.5E+00	6.0E+00	1.0E-03	RAGSE
10277437	Lanthanum Nitrate Hexahydrate	10277-43-7	2.0E+06	CRC89	8.0E-03	2.8E+01	6.7E+01	1.0E-03	RAGSE
	Lead Compounds								
7446277	~Lead Phosphate	7446-27-7	0.0E+00	CRC89	1.1E-02	3.7E+03	8.8E+03	1.0E-03	RAGSE
301042	~Lead acetate	301-04-2	1.6E+03	PHYSPROP	1.4E-04	7.2E+00	1.7E+01	2.1E-05	EPI
7439921	~Lead and Compounds	7439-92-1			5.5E-04	1.5E+00	3.7E+00	1.0E-04	RAGSE
1335326	~Lead subacetate	1335-32-6	6.3E+04	PHYSPROP	1.1E-09	3.4E+03	8.2E+03	1.0E-10	EPI
78002	~Tetraethyl Lead	78-00-2	2.9E-01	PHYSPROP	9.5E-02	6.8E+00	1.6E+01	1.4E-02	EPI
541253	Lewisite	541-25-3	5.0E+02	PHYSPROP	3.0E-02	1.5E+00	3.7E+00	5.4E-03	EPI
330552	Linuron	330-55-2	7.5E+01	PHYSPROP	5.1E-02	2.6E+00	6.3E+00	8.4E-03	EPI
7439932	Lithium	7439-93-2			1.0E-03	1.2E-01	2.8E-01	1.0E-03	RAGSE
94746	MCPA	94-74-6	6.3E+02	PHYSPROP	9.2E-02	1.4E+00	3.4E+00	1.7E-02	EPI
94815	MCPB	94-81-5	4.8E+01	PHYSPROP	1.0E-01	2.0E+00	4.8E+00	1.7E-02	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
93652	MCPP	93-65-2	6.2E+02	PHYSPROP	7.4E-02	1.7E+00	4.0E+00	1.3E-02	EPI
121755	Malathion	121-75-5	1.4E+02	PHYSPROP	5.7E-03	7.4E+00	1.8E+01	8.1E-04	EPI
108316	Maleic Anhydride	108-31-6	1.6E+05	PERRY	2.0E-02	3.7E-01	8.9E-01	5.3E-03	EPI
123331	Maleic Hydrazide	123-33-1	4.5E+03	PHYSPROP	4.2E-04	4.5E-01	1.1E+00	1.0E-04	EPI
109773	Malononitrile	109-77-3	1.3E+05	PHYSPROP	8.3E-04	2.5E-01	5.9E-01	2.7E-04	EPI
8018017	Mancozeb	8018-01-7	6.2E+00	PHYSPROP	6.9E-03	1.1E+02	2.7E+02	7.7E-04	EPI
12427382	Maneb	12427-38-2	6.0E+00	PHYSPROP	5.1E-03	4.7E+00	1.1E+01	7.7E-04	EPI
7439965	Manganese (Diet)	7439-96-5			2.9E-03	2.1E-01	5.1E-01	1.0E-03	RAGSE
7439965	Manganese (Non-diet)	7439-96-5			2.9E-03	2.1E-01	5.1E-01	1.0E-03	RAGSE
950107	Mephosfolan	950-10-7	5.7E+01	PHYSPROP	1.5E-03	3.4E+00	8.1E+00	2.4E-04	EPI
24307264	Mepiquat Chloride	24307-26-4	5.0E+05	PHYSPROP	1.4E-05	7.2E-01	1.7E+00	3.0E-06	EPI
149304	Mercaptobenzothiazole, 2-	149-30-4	1.2E+02	EPI	3.6E-02	9.1E-01	2.2E+00	7.3E-03	EPI
	Mercury Compounds								
7487947	~Mercuric Chloride (and other Mercury salts)	7487-94-7	6.9E+04	PHYSPROP	6.3E-03	3.5E+00	8.4E+00	1.0E-03	RAGSE
7439976	~Mercury (elemental)	7439-97-6	6.0E-02	PHYSPROP	5.4E-03	1.4E+00	3.4E+00	1.0E-03	RAGSE
22967926	~Methyl Mercury	22967-92-6			5.7E-03	1.7E+00	4.1E+00	1.0E-03	RAGSE
62384	~Phenylmercuric Acetate	62-38-4	4.4E+03	PHYSPROP	4.2E-04	8.1E+00	1.9E+01	6.0E-05	EPI
150505	Merphos	150-50-5	3.5E-03	PHYSPROP	2.8E+01	4.9E+00	2.3E+01	4.2E+00	EPI
78488	Merphos Oxide	78-48-8	2.3E+00	PHYSPROP	1.1E+00	6.1E+00	2.4E+01	1.7E-01	EPI
57837191	Metalaxyl	57837-19-1	8.4E+03	PHYSPROP	3.7E-03	3.9E+00	9.3E+00	5.8E-04	EPI
126987	Methacrylonitrile	126-98-7	2.5E+04	PHYSPROP	5.9E-03	2.5E-01	6.0E-01	1.9E-03	EPI
10265926	Methamidophos	10265-92-6	1.0E+06	PHYSPROP	3.4E-04	6.5E-01	1.6E+00	7.4E-05	EPI
67561	Methanol	67-56-1	1.0E+06	PHYSPROP	6.9E-04	1.6E-01	3.8E-01	3.2E-04	EPI
950378	Methidathion	950-37-8	1.9E+02	PHYSPROP	6.1E-03	5.2E+00	1.2E+01	9.1E-04	EPI
16752775	Methomyl	16752-77-5	5.8E+04	PHYSPROP	2.4E-03	8.5E-01	2.0E+00	4.8E-04	EPI
99592	Methoxy-5-nitroaniline, 2-	99-59-2	1.2E+02	PHYSPROP	8.4E-03	9.2E-01	2.2E+00	1.7E-03	EPI
72435	Methoxychlor	72-43-5	1.0E-01	PHYSPROP	3.1E-01	9.1E+00	2.2E+01	4.3E-02	EPI
110496	Methoxyethanol Acetate, 2-	110-49-6	1.0E+06	PHYSPROP	1.7E-03	4.8E-01	1.2E+00	4.0E-04	EPI
109864	Methoxyethanol, 2-	109-86-4	1.0E+06	PHYSPROP	6.0E-04	2.8E-01	6.7E-01	1.8E-04	EPI
79209	Methyl Acetate	79-20-9	2.4E+05	PHYSPROP	2.6E-03	2.7E-01	6.6E-01	7.9E-04	EPI
96333	Methyl Acrylate	96-33-3	4.9E+04	PHYSPROP	6.2E-03	3.2E-01	7.7E-01	1.8E-03	EPI
78933	Methyl Ethyl Ketone (2-Butanone)	78-93-3	2.2E+05	PHYSPROP	3.1E-03	2.7E-01	6.4E-01	9.6E-04	EPI
60344	Methyl Hydrazine	60-34-4	1.0E+06	PHYSPROP	4.5E-04	1.9E-01	4.6E-01	1.7E-04	EPI
108101	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	1.9E+04	PHYSPROP	1.2E-02	3.8E-01	9.2E-01	3.2E-03	EPI
624839	Methyl Isocyanate	624-83-9	2.9E+04	PHYSPROP	7.3E-03	2.2E-01	5.3E-01	2.5E-03	EPI
80626	Methyl Methacrylate	80-62-6	1.5E+04	PHYSPROP	1.4E-02	3.8E-01	9.2E-01	3.6E-03	EPI
298000	Methyl Parathion	298-00-0	3.8E+01	PHYSPROP	2.6E-02	3.1E+00	7.5E+00	4.2E-03	EPI
993135	Methyl Phosphonic Acid	993-13-5	2.0E+04	PHYSPROP	3.7E-04	3.6E-01	8.7E-01	9.8E-05	EPI
25013154	Methyl Styrene (Mixed Isomers)	25013-15-4	8.9E+01	PHYSPROP	4.8E-01	1.0E-01	2.4E-01	6.6E-02	EPI
66273	Methyl methanesulfonate	66-27-3	2.0E+05	LANGE	5.6E-04	4.4E-01	1.0E+00	1.4E-04	EPI
1634044	Methyl tert-Butyl Ether (MTBE)	1634-04-4	5.1E+04	PHYSPROP	7.6E-03	3.3E-01	7.9E-01	2.1E-03	EPI
615452	Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2	1.0E+06	PHYSPROP	2.9E-05	1.3E+00	3.1E+00	5.4E-06	EPI
108112	Methyl-2-Pentanol, 4-	108-11-2	1.6E+04	PHYSPROP	2.1E-02	3.9E-01	9.4E-01	5.4E-03	EPI
99558	Methyl-5-Nitroaniline, 2-	99-55-8	1.0E+04	PHYSPROP	1.8E-02	7.5E-01	1.8E+00	3.8E-03	EPI
70257	Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	2.7E+05	PHYSPROP	2.7E-04	7.0E-01	1.7E+00	5.7E-05	EPI
636215	Methylaniline Hydrochloride, 2-	636-21-5	8.3E+03	PHYSPROP	4.8E-05	6.7E-01	1.6E+00	1.1E-05	EPI
124583	Methylarsonic acid	124-58-3	2.6E+05	PHYSPROP	1.9E-04	6.4E-01	1.5E+00	4.2E-05	EPI
74612127	Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7				8.1E-01	2.0E+00		
615509	Methylbenzene-1,4-diamine sulfate, 2-	615-50-9				1.8E+00	4.3E+00		
56495	Methylcholanthrene, 3-	56-49-5	2.9E-03	PHYSPROP	5.7E+00	3.3E+00	1.5E+01	9.0E-01	EPI
75092	Methylene Chloride	75-09-2	1.3E+04	PHYSPROP	1.3E-02	3.1E-01	7.5E-01	3.5E-03	EPI
101144	Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.4E+01	PHYSPROP	1.2E-01	3.3E+00	7.9E+00	2.0E-02	EPI
101611	Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	4.1E+00	PHYSPROP	2.9E-01	2.8E+00	6.7E+00	4.7E-02	EPI
101779	Methylenebisbenzenamine, 4,4'-	101-77-9	1.0E+03	PHYSPROP	7.5E-03	1.4E+00	3.3E+00	1.4E-03	EPI
101688	Methylenediphenyl Diisocyanate	101-68-8	8.3E-01	PHYSPROP	1.1E+00	2.7E+00	1.0E+01	1.8E-01	EPI
98839	Methylstyrene, Alpha-	98-83-9	1.2E+02	PHYSPROP	2.9E-01	4.8E-01	1.2E+00	7.0E-02	EPI
51218452	Metolachlor	51218-45-2	5.3E+02	PHYSPROP	2.2E-02	4.1E+00	9.8E+00	3.4E-03	EPI
21087649	Metribuzin	21087-64-9	1.1E+03	PHYSPROP	7.4E-03	1.7E+00	4.0E+00	1.3E-03	EPI
74223646	Metsulfuron-methyl	74223-64-6	9.5E+03	PHYSPROP	2.5E-03	1.4E+01	3.4E+01	3.3E-04	EPI
8012951	Mineral oils	8012-95-1	3.7E-03	EPI	9.8E+00	9.5E-01	4.3E+00	2.0E+00	EPI
2385855	Mirex	2385-85-5	8.5E-02	PHYSPROP	4.6E-01	1.2E+02	2.9E+02	5.2E-02	EPI
2212671	Molinate	2212-67-1	9.7E+02	PHYSPROP	9.9E-02	1.2E+00	2.8E+00	1.9E-02	EPI
7439987	Molybdenum	7439-98-7			3.8E-03	3.6E-01	8.7E-01	1.0E-03	RAGSE
10599903	Monochloramine	10599-90-3			2.8E-03	2.0E-01	4.9E-01	1.0E-03	RAGSE
100618	Monomethylaniline	100-61-8	5.6E+03	PHYSPROP	2.0E-02	4.2E-01	1.0E+00	5.0E-03	EPI
88671890	Myclobutanil	88671-89-0	1.4E+02	PHYSPROP	2.1E-02	3.6E+00	8.7E+00	3.4E-03	EPI
74317	N,N'-Diphenyl-1,4-benzenediamine	74-31-7	7.4E+00	PHYSPROP	1.6E-01	3.0E+00	7.2E+00	2.6E-02	EPI
300765	Naled	300-76-5	1.5E+00	PHYSPROP	7.1E-04	1.4E+01	3.4E+01	9.4E-05	EPI
64742956	Naphtha, High Flash Aromatic (HFAN)	64742-95-6	3.1E+01	EPI					
91598	Naphthylamine, 2-	91-59-8	1.9E+02	PHYSPROP	3.7E-02	6.7E-01	1.6E+00	8.1E-03	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
15299997	Napropamide	15299-99-7	7.3E+01	PHYSPROP	5.1E-02	3.5E+00	8.3E+00	8.0E-03	EPI
373024	Nickel Acetate	373-02-4	1.7E+05	PHYSPROP	9.9E-05	1.0E+00	2.5E+00	1.9E-05	EPI
3333673	Nickel Carbonate	3333-67-3	9.3E+01	PERRY	5.5E-05	4.9E-01	1.2E+00	1.3E-05	EPI
13463393	Nickel Carbonyl	13463-39-3	1.8E+02	PERRY		9.5E-01	2.3E+00		
12054487	Nickel Hydroxide	12054-48-7			3.7E-03	3.5E-01	8.3E-01	1.0E-03	RAGSE
1313991	Nickel Oxide	1313-99-1			3.3E-03	2.8E-01	6.6E-01	1.0E-03	RAGSE
E715532	Nickel Refinery Dust	E715532						2.0E-04	RAGSE
7440020	Nickel Soluble Salts	7440-02-0			5.9E-04	2.2E-01	5.4E-01	2.0E-04	RAGSE
12035722	Nickel Subsulfide	12035-72-2			1.2E-03	2.3E+00	5.6E+00	2.0E-04	RAGSE
1271289	Nickelocene	1271-28-9				1.2E+00	2.9E+00		
14797558	Nitrate (measured as nitrogen)	14797-55-8			3.0E-03	2.3E-01	5.6E-01	1.0E-03	RAGSE
E701177	Nitrate + Nitrite (measured as nitrogen)	E701177						1.0E-03	RAGSE
14797650	Nitrite (measured as nitrogen)	14797-65-0			2.6E-03	1.9E-01	4.6E-01	1.0E-03	RAGSE
88744	Nitroaniline, 2-	88-74-4	1.5E+03	PHYSPROP	2.0E-02	6.2E-01	1.5E+00	4.5E-03	EPI
100016	Nitroaniline, 4-	100-01-6	7.3E+02	PHYSPROP	1.0E-02	6.2E-01	1.5E+00	2.2E-03	EPI
98953	Nitrobenzene	98-95-3	2.1E+03	PHYSPROP	2.3E-02	5.1E-01	1.2E+00	5.4E-03	EPI
9004700	Nitrocellulose	9004-70-0	1.0E+06	PHYSPROP	7.5E-08	1.6E+01	3.7E+01	9.9E-09	EPI
67209	Nitrofurantoin	67-20-9	8.0E+01	PHYSPROP	2.1E-04	2.3E+00	5.4E+00	3.5E-05	EPI
59870	Nitrofurazone	59-87-0	2.1E+02	PHYSPROP	9.3E-04	1.4E+00	3.2E+00	1.7E-04	EPI
55630	Nitroglycerin	55-63-0	1.4E+03	PHYSPROP	5.8E-03	2.0E+00	4.7E+00	9.9E-04	EPI
556887	Nitroguanidine	556-88-7	4.4E+03	PHYSPROP	4.1E-04	4.0E-01	9.7E-01	1.1E-04	EPI
75525	Nitromethane	75-52-5	1.1E+05	PHYSPROP	1.3E-03	2.3E-01	5.5E-01	4.2E-04	EPI
79469	Nitropropane, 2-	79-46-9	1.7E+04	PHYSPROP	7.5E-03	3.3E-01	8.0E-01	2.1E-03	EPI
759739	Nitroso-N-ethylurea, N-	759-73-9	1.3E+04	PHYSPROP	2.0E-03	4.8E-01	1.1E+00	4.9E-04	EPI
684935	Nitroso-N-methylurea, N-	684-93-5	1.4E+04	PHYSPROP	1.5E-03	4.0E-01	9.5E-01	4.0E-04	EPI
924163	Nitroso-di-N-butylamine, N-	924-16-3	1.3E+03	PHYSPROP	5.5E-02	8.1E-01	1.9E+00	1.1E-02	EPI
621647	Nitroso-di-N-propylamine, N-	621-64-7	1.3E+04	PHYSPROP	1.0E-02	5.6E-01	1.4E+00	2.3E-03	EPI
1116547	Nitrosodiethanolamine, N-	1116-54-7	1.0E+06	PHYSPROP	1.7E-04	5.9E-01	1.4E+00	3.9E-05	EPI
55185	Nitrosodiethylamine, N-	55-18-5	1.1E+05	PHYSPROP	3.4E-03	3.9E-01	9.4E-01	8.7E-04	EPI
62759	Nitrosodimethylamine, N-	62-75-9	1.0E+06	PHYSPROP	8.3E-04	2.7E-01	6.6E-01	2.5E-04	EPI
86306	Nitrosodiphenylamine, N-	86-30-6	3.5E+01	PHYSPROP	7.9E-02	1.4E+00	3.3E+00	1.5E-02	EPI
10595956	Nitrosomethylethylamine, N-	10595-95-6	3.0E+05	PHYSPROP	1.9E-03	3.3E-01	7.9E-01	5.3E-04	EPI
59892	Nitrosomorpholine [N-]	59-89-2	1.0E+06	PHYSPROP	7.4E-04	4.7E-01	1.1E+00	1.8E-04	EPI
100754	Nitrosopiperidine [N-]	100-75-4	7.7E+04	PHYSPROP	2.6E-03	4.6E-01	1.1E+00	6.2E-04	EPI
930552	Nitrosopyrrolidine, N-	930-55-2	1.0E+06	PHYSPROP	1.2E-03	3.8E-01	9.2E-01	3.2E-04	EPI
99081	Nitrotoluene, m-	99-08-1	5.0E+02	PHYSPROP	5.1E-02	6.2E-01	1.5E+00	1.1E-02	EPI
88722	Nitrotoluene, o-	88-72-2	6.5E+02	PHYSPROP	4.0E-02	6.2E-01	1.5E+00	9.0E-03	EPI
99990	Nitrotoluene, p-	99-99-0	4.4E+02	PHYSPROP	4.5E-02	6.2E-01	1.5E+00	1.0E-02	EPI
111842	Nonane, n-	111-84-2	2.2E-01	PHYSPROP	7.4E+00	5.5E-01	2.5E+00	1.7E+00	EPI
27314132	Norflurazon	27314-13-2	3.4E+01	PHYSPROP	7.0E-03	5.3E+00	1.3E+01	1.1E-03	EPI
32536520	Octabromodiphenyl Ether	32536-52-0	1.1E-08	PHYSPROP	3.3E-01	3.2E+03	7.8E+03	3.1E-02	EPI
2691410	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	5.0E+00	PHYSPROP	2.9E-04	4.8E+00	1.1E+01	4.4E-05	EPI
152169	Octamethylpyrophosphoramide	152-16-9	1.0E+06	PHYSPROP	5.4E-05	4.2E+00	1.0E+01	8.3E-06	EPI
19044883	Oryzalin	19044-88-3	2.5E+00	PHYSPROP	3.8E-02	9.2E+00	2.2E+01	5.4E-03	EPI
19666309	Oxadiazon	19666-30-9	7.0E-01	PHYSPROP	2.0E-01	9.0E+00	2.2E+01	2.8E-02	EPI
23135220	Oxamyl	23135-22-0	2.8E+05	PHYSPROP	2.6E-04	1.8E+00	4.3E+00	4.5E-05	EPI
42874033	Oxyfluorfen	42874-03-3	1.2E-01	PHYSPROP	1.5E-01	1.1E+01	2.7E+01	2.0E-02	EPI
76738620	Paclobutrazol	76738-62-0	2.6E+01	PHYSPROP	3.1E-02	4.6E+00	1.1E+01	4.7E-03	EPI
1910425	Paraquat Dichloride	1910-42-5	6.2E+05	PHYSPROP	3.6E-07	2.9E+00	7.0E+00	5.8E-08	EPI
56382	Parathion	56-38-2	1.1E+01	PHYSPROP	8.4E-02	4.5E+00	1.1E+01	1.3E-02	EPI
1114712	Pebulate	1114-71-2	1.0E+02	PHYSPROP	2.2E-01	1.4E+00	3.5E+00	4.0E-02	EPI
40487421	Pendimethalin	40487-42-1	3.3E-01	PHYSPROP	7.4E-01	4.0E+00	1.5E+01	1.2E-01	EPI
32534819	Pentabromodiphenyl Ether	32534-81-9	2.4E-03	PHYSPROP	3.4E-01	1.5E+02	3.7E+02	3.7E-02	EPI
60348609	Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9	7.9E-05	PHYSPROP	3.4E-01	1.5E+02	3.7E+02	3.7E-02	EPI
608935	Pentachlorobenzene	608-93-5	8.3E-01	PHYSPROP	1.0E+00	2.7E+00	1.0E+01	1.7E-01	EPI
76017	Pentachloroethane	76-01-7	4.9E+02	PHYSPROP	8.6E-02	1.4E+00	3.4E+00	1.6E-02	EPI
82688	Pentachloronitrobenzene	82-68-8	4.4E-01	PHYSPROP	2.8E-01	4.7E+00	1.1E+01	4.2E-02	EPI
87865	Pentachlorophenol	87-86-5	1.4E+01	PHYSPROP	8.0E-01	3.3E+00	1.3E+01	1.3E-01	EPI
78115	Pentaerythritol tetranitrate (PETN)	78-11-5	4.3E+01	PHYSPROP	6.9E-03	6.2E+00	1.5E+01	1.0E-03	EPI
109660	Pentane, n-	109-66-0	3.8E+01	PHYSPROP	3.6E-01	2.7E-01	6.4E-01	1.1E-01	EPI
	Perchlorates								
7790989	~Ammonium Perchlorate	7790-98-9	2.5E+05	PHYSPROP	4.2E-03	4.8E-01	1.1E+00	1.0E-03	RAGSE
7791039	~Lithium Perchlorate	7791-03-9	5.9E+05	CRC89	4.0E-03	4.1E-01	1.0E+00	1.0E-03	RAGSE
14797730	~Perchlorate and Perchlorate Salts	14797-73-0	2.5E+05	CRC89	4.2E-03	4.8E-01	1.1E+00	1.0E-03	RAGSE
7778747	~Potassium Perchlorate	7778-74-7	1.5E+04	PHYSPROP	9.1E-03	6.3E-01	1.5E+00	2.0E-03	RAGSE
7601890	~Sodium Perchlorate	7601-89-0	2.1E+06	PHYSPROP	4.3E-03	5.1E-01	1.2E+00	1.0E-03	RAGSE
375735	Perfluorobutane sulfonic acid (PFBS)	375-73-5	5.7E+04	Australian CHR		5.0E+00	1.2E+01		
45187153	Perfluorobutanesulfonate	45187-15-3	5.7E+04	Australian CHR		5.0E+00	1.2E+01		
52645531	Permethrin	52645-53-1	6.0E-03	PHYSPROP	1.6E+00	1.6E+01	6.5E+01	2.1E-01	EPI
62442	Phenacetin	62-44-2	7.7E+02	PHYSPROP	8.9E-03	1.1E+00	2.5E+00	1.7E-03	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
13684634	Phenmedipham	13684-63-4	4.7E+00	PHYSPROP	5.2E-02	5.1E+00	1.2E+01	7.9E-03	EPI
108952	Phenol	108-95-2	8.3E+04	PHYSPROP	1.6E-02	3.5E-01	8.5E-01	4.3E-03	EPI
114261	Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	1.9E+03	PHYSPROP	6.0E-03	1.6E+00	3.7E+00	1.1E-03	EPI
92842	Phenothiazine	92-84-2	1.6E+00	PHYSPROP	3.7E-01	1.4E+00	3.3E+00	6.8E-02	EPI
103720	Phenyl Isothiocyanate	103-72-0	9.0E+01	PHYSPROP	1.8E-01	6.0E-01	1.4E+00	4.1E-02	EPI
108452	Phenylenediamine, m-	108-45-2	2.4E+05	PHYSPROP	9.4E-04	4.2E-01	1.0E+00	2.3E-04	EPI
95545	Phenylenediamine, o-	95-54-5	4.0E+04	PHYSPROP	1.9E-03	4.2E-01	1.0E+00	4.9E-04	EPI
106503	Phenylenediamine, p-	106-50-3	3.7E+04	PHYSPROP	9.8E-04	4.2E-01	1.0E+00	2.5E-04	EPI
90437	Phenylphenol, 2-	90-43-7	7.0E+02	PHYSPROP	9.8E-02	9.4E-01	2.3E+00	2.0E-02	EPI
298022	Phorate	298-02-2	5.0E+01	PHYSPROP	7.8E-02	3.0E+00	7.2E+00	1.3E-02	EPI
75445	Phosgene	75-44-5	6.8E+03	YAWS	5.6E-04	3.8E-01	9.0E-01	1.5E-04	EPI
732116	Phosmet	732-11-6	2.4E+01	PHYSPROP	1.3E-02	6.3E+00	1.5E+01	1.8E-03	EPI
	Phosphates, Inorganic								
13776880	~Aluminum metaphosphate	13776-88-0			6.2E-03	3.2E+00	7.6E+00	1.0E-03	RAGSE
68333799	~Ammonium polyphosphate	68333-79-9						1.0E-03	RAGSE
7790763	~Calcium pyrophosphate	7790-76-3			6.1E-03	2.8E+00	6.7E+00	1.0E-03	RAGSE
7783280	~Diammonium phosphate	7783-28-0			4.4E-03	5.8E-01	1.4E+00	1.0E-03	RAGSE
7757939	~Dicalcium phosphate	7757-93-9			4.5E-03	6.1E-01	1.5E+00	1.0E-03	RAGSE
7782754	~Dimagnesium phosphate	7782-75-4			5.1E-03	1.0E+00	2.4E+00	1.0E-03	RAGSE
7758114	~Dipotassium phosphate	7758-11-4			5.1E-03	9.9E-01	2.4E+00	1.0E-03	RAGSE
7558794	~Disodium phosphate	7558-79-4			4.6E-03	6.6E-01	1.6E+00	1.0E-03	RAGSE
13530502	~Monoaluminum phosphate	13530-50-2			6.9E-03	6.3E+00	1.5E+01	1.0E-03	RAGSE
7722761	~Monoammonium phosphate	7722-76-1			4.1E-03	4.6E-01	1.1E+00	1.0E-03	RAGSE
7758238	~Monocalcium phosphate	7758-23-8			5.9E-03	2.2E+00	5.2E+00	1.0E-03	RAGSE
7757860	~Monomagnesium phosphate	7757-86-0			4.2E-03	5.0E-01	1.2E+00	1.0E-03	RAGSE
7778770	~Monopotassium phosphate	7778-77-0			4.5E-03	6.1E-01	1.5E+00	1.0E-03	RAGSE
7558807	~Monosodium phosphate	7558-80-7	4.9E+05	PHYSPROP	4.2E-03	4.9E-01	1.2E+00	1.0E-03	RAGSE
8017161	~Polyphosphoric acid	8017-16-1			6.2E-03	2.9E+00	7.0E+00	1.0E-03	RAGSE
13845368	~Potassium tripolyphosphate	13845-36-8			8.1E-03	3.4E+01	8.2E+01	1.0E-03	RAGSE
7758169	~Sodium acid pyrophosphate	7758-16-9			5.7E-03	1.8E+00	4.4E+00	1.0E-03	RAGSE
7785888	~Sodium aluminum phosphate (acidic)	7785-88-8			4.6E-03	6.8E-01	1.6E+00	1.0E-03	RAGSE
10279591	~Sodium aluminum phosphate (anhydrous)	10279-59-1						1.0E-03	RAGSE
10305767	~Sodium aluminum phosphate (tetrahydrate)	10305-76-7			1.2E-02	2.2E+04	5.3E+04	1.0E-03	RAGSE
10124568	~Sodium hexametaphosphate	10124-56-8			9.5E-03	2.8E+02	6.7E+02	1.0E-03	RAGSE
68915311	~Sodium polyphosphate	68915-31-1			7.3E-03	1.1E+01	2.6E+01	1.0E-03	RAGSE
7785844	~Sodium trimetaphosphate	7785-84-4			6.7E-03	5.4E+00	1.3E+01	1.0E-03	RAGSE
7758294	~Sodium tripolyphosphate	7758-29-4			7.4E-03	1.2E+01	2.9E+01	1.0E-03	RAGSE
7320345	~Tetrapotassium phosphate	7320-34-5			7.0E-03	7.4E+00	1.8E+01	1.0E-03	RAGSE
7722885	~Tetrasodium pyrophosphate	7722-88-5	8.1E+04	PHYSPROP	6.3E-03	3.2E+00	7.8E+00	1.0E-03	RAGSE
15136875	~Trialuminum sodium tetra decahydrogenoctaorthophospha	15136-87-5			1.1E-02	9.9E+03	2.4E+04	1.0E-03	RAGSE
7758874	~Tricalcium phosphate	7758-87-4			6.8E-03	5.7E+00	1.4E+01	1.0E-03	RAGSE
7757871	~Trimagnesium phosphate	7757-87-1			6.2E-03	3.1E+00	7.5E+00	1.0E-03	RAGSE
7778532	~Tripotassium phosphate	7778-53-2			5.6E-03	1.6E+00	3.9E+00	1.0E-03	RAGSE
7601549	~Trisodium phosphate	7601-54-9			4.9E-03	8.7E-01	2.1E+00	1.0E-03	RAGSE
7803512	Phosphine	7803-51-2	2.6E+05	PERRY	2.2E-03	1.6E-01	3.9E-01	1.0E-03	RAGSE
7664382	Phosphoric Acid	7664-38-2	5.5E+06	CRC89	3.8E-03	3.7E-01	8.9E-01	1.0E-03	RAGSE
7723140	Phosphorus, White	7723-14-0	3.0E+00	ATSDR Profile	2.1E-03	1.6E-01	3.8E-01	1.0E-03	RAGSE
	Phthalates								
117817	~Bis(2-ethylhexyl)phthalate	117-81-7	2.7E-01	PHYSPROP	8.6E+00	1.6E+01	7.3E+01	1.1E+00	EPI
85687	~Butyl Benzyl Phthalate	85-68-7	2.7E+00	PHYSPROP	2.6E-01	5.9E+00	1.4E+01	3.9E-02	EPI
85701	~Butylphthalyl Butylglycolate	85-70-1	8.8E+00	PHYSPROP	8.2E-02	8.0E+00	1.9E+01	1.2E-02	EPI
84742	~Dibutyl Phthalate	84-74-2	1.1E+01	PHYSPROP	2.7E-01	3.8E+00	9.1E+00	4.2E-02	EPI
84662	~Diethyl Phthalate	84-66-2	1.1E+03	PHYSPROP	2.1E-02	1.8E+00	4.4E+00	3.6E-03	EPI
120616	~Dimethylterephthalate	120-61-6	1.9E+01	PHYSPROP	2.1E-02	1.3E+00	3.1E+00	4.0E-03	EPI
117840	~Octyl Phthalate, di-N-	117-84-0	2.2E-02	PHYSPROP	1.8E+01	1.6E+01	7.5E+01	2.4E+00	EPI
100210	~Phthalic Acid, P-	100-21-0	1.5E+01	PHYSPROP	1.9E-02	9.0E-01	2.1E+00	3.9E-03	EPI
85449	~Phthalic Anhydride	85-44-9	6.2E+03	PHYSPROP	1.2E-02	7.1E-01	1.7E+00	2.7E-03	EPI
1918021	Picloram	1918-02-1	4.3E+02	PHYSPROP	7.6E-03	2.4E+00	5.7E+00	1.3E-03	EPI
96913	Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	1.4E+03	PHYSPROP	2.7E-03	1.4E+00	3.3E+00	5.0E-04	EPI
88891	Picric Acid (2,4,6-Trinitrophenol)	88-89-1	1.3E+04	PHYSPROP	3.6E-03	2.0E+00	4.8E+00	6.2E-04	EPI
29232937	Pirimiphos, Methyl	29232-93-7	8.6E+00	PHYSPROP	1.3E-01	5.4E+00	1.3E+01	1.9E-02	EPI
59536651	Polybrominated Biphenyls	59536-65-1							
	Polychlorinated Biphenyls (PCBs)								
12674112	~Aroclor 1016	12674-11-2	4.2E-01	PHYSPROP	1.9E+00	2.9E+00	1.2E+01	3.1E-01	EPI
11104282	~Aroclor 1221	11104-28-2	1.5E+01	PHYSPROP	8.9E-01	1.2E+00	4.6E+00	1.7E-01	EPI
11141165	~Aroclor 1232	11141-16-5	1.5E+00	PHYSPROP	8.9E-01	1.2E+00	4.6E+00	1.7E-01	EPI
53469219	~Aroclor 1242	53469-21-9	2.8E-01	PHYSPROP	3.6E+00	4.5E+00	1.9E+01	5.5E-01	EPI
12672296	~Aroclor 1248	12672-29-6	1.0E-01	PHYSPROP	3.1E+00	4.5E+00	1.9E+01	4.8E-01	EPI
11097691	~Aroclor 1254	11097-69-1	4.3E-02	PHYSPROP	5.2E+00	7.1E+00	3.1E+01	7.5E-01	EPI
11096825	~Aroclor 1260	11096-82-5	1.4E-02	PHYSPROP	7.5E+00	1.7E+01	7.7E+01	9.9E-01	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s(

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
11126424	~Aroclor 5460	11126-42-4	5.3E-02	PHYSPROP	5.2E+00	1.1E+02	4.9E+02	5.8E-01	EPI
39635319	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	7.5E-04	PHYSPROP	2.3E+01	1.7E+01	8.0E+01	3.0E+00	EPI
52663726	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	2.2E-03	PHYSPROP	1.0E+01	1.1E+01	5.0E+01	1.4E+00	EPI
69782907	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.6E-03	EPI	1.2E+01	1.1E+01	5.0E+01	1.7E+00	EPI
38380084	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	5.3E-03	PHYSPROP	1.2E+01	1.1E+01	5.0E+01	1.7E+00	EPI
32774166	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	5.1E-04	PHYSPROP	9.1E+00	1.1E+01	5.0E+01	1.2E+00	EPI
65510443	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.6E-02	EPI	6.9E+00	7.1E+00	3.2E+01	1.0E+00	EPI
31508006	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.3E-02	PHYSPROP	8.6E+00	7.1E+00	3.2E+01	1.2E+00	EPI
32598144	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	3.4E-03	PHYSPROP	5.2E+00	7.1E+00	3.1E+01	7.5E-01	EPI
74472370	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.6E-02	PHYSPROP	6.9E+00	7.1E+00	3.2E+01	1.0E+00	EPI
57465288	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	7.3E-03	EPI	6.9E+00	7.1E+00	3.2E+01	1.0E+00	EPI
1336363	~Polychlorinated Biphenyls (high risk)	1336-36-3	7.0E-01	PHYSPROP	3.6E+00	4.5E+00	1.9E+01	5.5E-01	EPI
1336363	~Polychlorinated Biphenyls (low risk)	1336-36-3	7.0E-01	PHYSPROP	3.6E+00	4.5E+00	1.9E+01	5.5E-01	EPI
1336363	~Polychlorinated Biphenyls (lowest risk)	1336-36-3	7.0E-01	PHYSPROP	3.6E+00	4.5E+00	1.9E+01	5.5E-01	EPI
32598133	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	5.7E-04	PHYSPROP	6.0E+00	4.5E+00	2.0E+01	9.2E-01	EPI
70362504	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	3.2E-02	EPI	3.8E+00	4.5E+00	2.0E+01	5.8E-01	EPI
9016879	Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	1.8E-06	EPI	1.6E+02	7.8E+01	3.7E+02	1.9E+01	EPI
	Polynuclear Aromatic Hydrocarbons (PAHs)								
83329	~Acenaphthene	83-32-9	3.9E+00	PHYSPROP	4.1E-01	7.7E-01	1.8E+00	8.6E-02	EPI
120127	~Anthracene	120-12-7	4.3E-02	PHYSPROP	7.3E-01	1.0E+00	4.1E+00	1.4E-01	EPI
56553	~Benz[a]anthracene	56-55-3	9.4E-03	PHYSPROP	3.2E+00	2.0E+00	8.5E+00	5.5E-01	EPI
205823	~Benzo(j)fluoranthene	205-82-3	2.5E-03	PHYSPROP	4.2E+00	2.7E+00	1.2E+01	6.9E-01	EPI
50328	~Benzo[a]pyrene	50-32-8	1.6E-03	PHYSPROP	4.4E+00	2.7E+00	1.2E+01	7.1E-01	EPI
205992	~Benzo[b]fluoranthene	205-99-2	1.5E-03	PHYSPROP	2.5E+00	2.7E+00	1.1E+01	4.2E-01	EPI
207089	~Benzo[k]fluoranthene	207-08-9	8.0E-04	PHYSPROP	4.2E+00	2.7E+00	1.2E+01	6.9E-01	EPI
91587	~Chloronaphthalene, Beta-	91-58-7	1.2E+01	PHYSPROP	3.7E-01	8.6E-01	2.1E+00	7.5E-02	EPI
218019	~Chrysene	218-01-9	2.0E-03	PHYSPROP	3.5E+00	2.0E+00	8.5E+00	6.0E-01	EPI
53703	~Dibenz[a,h]anthracene	53-70-3	2.5E-03	PHYSPROP	6.1E+00	3.8E+00	1.7E+01	9.5E-01	EPI
192654	~Dibenzo(a,e)pyrene	192-65-4	8.0E-05	PHYSPROP	2.8E+01	5.2E+00	2.4E+01	4.2E+00	EPI
57976	~Dimethylbenz(a)anthracene, 7,12-	57-97-6	6.1E-02	PHYSPROP	2.5E+00	2.9E+00	1.2E+01	4.1E-01	EPI
206440	~Fluoranthene	206-44-0	2.6E-01	PHYSPROP	1.7E+00	1.4E+00	5.7E+00	3.1E-01	EPI
86737	~Fluorene	86-73-7	1.7E+00	PHYSPROP	5.5E-01	9.0E-01	2.2E+00	1.1E-01	EPI
193395	~Indeno[1,2,3-cd]pyrene	193-39-5	1.9E-04	PHYSPROP	7.9E+00	3.7E+00	1.7E+01	1.2E+00	EPI
90120	~Methylnaphthalene, 1-	90-12-0	2.6E+01	PHYSPROP	4.3E-01	6.6E-01	1.6E+00	9.3E-02	EPI
91576	~Methylnaphthalene, 2-	91-57-6	2.5E+01	PHYSPROP	4.2E-01	6.6E-01	1.6E+00	9.2E-02	EPI
91203	~Naphthalene	91-20-3	3.1E+01	PHYSPROP	2.0E-01	5.5E-01	1.3E+00	4.7E-02	EPI
57835924	~Nitropyrene, 4-	57835-92-4	6.8E-02	PHYSPROP	5.6E-01	2.6E+00	6.3E+00	9.2E-02	EPI
129000	~Pyrene	129-00-0	1.4E-01	PHYSPROP	1.1E+00	1.4E+00	5.5E+00	2.0E-01	EPI
29420493	Potassium Perfluorobutane Sulfonate	29420-49-3	4.6E+04	Australian CHR		8.2E+00	2.0E+01		
67747095	Prochloraz	67747-09-5	3.4E+01	PHYSPROP	4.8E-02	1.4E+01	3.2E+01	6.4E-03	EPI
26399360	Profluralin	26399-36-0	1.0E-01	PHYSPROP	6.5E-01	9.3E+00	3.7E+01	9.0E-02	EPI
1610180	Prometon	1610-18-0	7.5E+02	PHYSPROP	4.8E-02	1.9E+00	4.6E+00	8.3E-03	EPI
7287196	Prometryn	7287-19-6	3.3E+01	PHYSPROP	8.9E-02	2.4E+00	5.7E+00	1.5E-02	EPI
23950585	Pronamide	23950-58-5	1.5E+01	PHYSPROP	6.7E-02	2.9E+00	6.9E+00	1.1E-02	EPI
1918167	Propachlor	1918-16-7	5.8E+02	PHYSPROP	1.6E-02	1.6E+00	3.9E+00	2.9E-03	EPI
709988	Propanil	709-98-8	1.5E+02	PHYSPROP	5.9E-02	1.8E+00	4.2E+00	1.0E-02	EPI
2312358	Propargite	2312-35-8	2.2E-01	PHYSPROP	2.6E-01	9.7E+00	2.3E+01	3.6E-02	EPI
107197	Propargyl Alcohol	107-19-7	1.0E+06	PHYSPROP	1.2E-03	2.2E-01	5.2E-01	4.2E-04	EPI
139402	Propazine	139-40-2	8.6E+00	PHYSPROP	4.2E-02	2.0E+00	4.9E+00	7.1E-03	EPI
122429	Propham	122-42-9	1.8E+02	PHYSPROP	4.3E-02	1.1E+00	2.5E+00	8.3E-03	EPI
60207901	Propiconazole	60207-90-1	1.1E+02	PHYSPROP	4.0E-02	8.7E+00	2.1E+01	5.6E-03	EPI
123386	Propionaldehyde	123-38-6	3.1E+05	PHYSPROP	5.3E-03	2.2E-01	5.3E-01	1.8E-03	EPI
103651	Propyl benzene	103-65-1	5.2E+01	PHYSPROP	4.0E-01	5.0E-01	1.2E+00	9.4E-02	EPI
115071	Propylene	115-07-1	2.0E+02	PHYSPROP	3.4E-02	1.8E-01	4.3E-01	1.4E-02	EPI
57556	Propylene Glycol	57-55-6	1.0E+06	PHYSPROP	4.8E-04	2.8E-01	6.7E-01	1.4E-04	EPI
6423434	Propylene Glycol Dinitrate	6423-43-4	3.3E+03	EPI	1.0E-02	9.0E-01	2.1E+00	2.1E-03	EPI
107982	Propylene Glycol Monomethyl Ether	107-98-2	1.0E+06	PHYSPROP	8.4E-04	3.4E-01	8.1E-01	2.3E-04	EPI
75569	Propylene Oxide	75-56-9	5.9E+05	PHYSPROP	2.3E-03	2.2E-01	5.3E-01	7.7E-04	EPI
110861	Pyridine	110-86-1	1.0E+06	PHYSPROP	5.2E-03	2.9E-01	7.0E-01	1.5E-03	EPI
13593038	Quinalphos	13593-03-8	2.2E+01	PHYSPROP	2.0E-01	4.9E+00	1.2E+01	3.0E-02	EPI
91225	Quinoline	91-22-5	6.1E+03	PHYSPROP	2.9E-02	5.6E-01	1.3E+00	6.6E-03	EPI
76578148	Quizalofop-ethyl	76578-14-8	3.0E-01	PHYSPROP	6.6E-02	1.3E+01	3.1E+01	8.9E-03	EPI
E715557	Refractory Ceramic Fibers (units in fibers)	E715557						1.0E-03	RAGSE
10453868	Resmethrin	10453-86-8	3.8E-02	PHYSPROP	1.7E+00	8.3E+00	3.3E+01	2.4E-01	EPI
299843	Ronnel	299-84-3	1.0E+00	PHYSPROP	3.0E-01	6.6E+00	1.6E+01	4.3E-02	EPI
83794	Rotenone	83-79-4	2.0E-01	PHYSPROP	3.9E-02	1.7E+01	4.1E+01	5.1E-03	EPI
94597	Safrole	94-59-7	1.2E+02	PHYSPROP	5.5E-02	8.5E-01	2.0E+00	1.1E-02	RAGSE
7783008	Selenious Acid	7783-00-8	9.0E+05	PERRY	4.4E-03	5.5E-01	1.3E+00	1.0E-03	RAGSE
7782492	Selenium	7782-49-2			3.4E-03	2.9E-01	7.0E-01	1.0E-03	RAGSE
7446346	Selenium Sulfide	7446-34-6			4.1E-03	4.4E-01	1.1E+00	1.0E-03	RAGSE

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2		3	24	25	26	27	28	29	30
	Contaminant			Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.		S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
74051802	Sethoxydim	74051-80-2		2.5E+01	PHYSPROP	1.3E-01	7.2E+00	1.7E+01	1.9E-02	EPI
7631869	Silica (crystalline, respirable)	7631-86-9				3.0E-03	2.3E-01	5.5E-01	1.0E-03	RAGSE
7440224	Silver	7440-22-4				2.4E-03	4.2E-01	1.0E+00	6.0E-04	RAGSE
122349	Simazine	122-34-9		6.2E+00	PHYSPROP	1.8E-02	1.4E+00	3.4E+00	3.3E-03	EPI
62476599	Sodium Acifluorfen	62476-59-9		2.5E+05	PHYSPROP	1.5E-04	1.5E+01	3.6E+01	2.0E-05	EPI
26628228	Sodium Azide	26628-22-8		4.1E+05	CRC89	3.1E-03	2.4E-01	5.8E-01	1.0E-03	RAGSE
148185	Sodium Diethyldithiocarbamate	148-18-5		3.6E+05	PHYSPROP	9.7E-05	9.7E-01	2.3E+00	1.9E-05	EPI
7681494	Sodium Fluoride	7681-49-4		4.2E+04	PHYSPROP	2.5E-03	1.8E-01	4.3E-01	1.0E-03	RAGSE
62748	Sodium Fluoroacetate	62-74-8		1.1E+06	PHYSPROP	5.1E-06	3.8E-01	9.2E-01	1.3E-06	EPI
13718268	Sodium Metavanadate	13718-26-8		2.1E+05	CRC89	4.2E-03	5.1E-01	1.2E+00	1.0E-03	RAGSE
13472452	Sodium Tungstate	13472-45-2		7.4E+05	CRC89	6.6E-03	4.6E+00	1.1E+01	1.0E-03	RAGSE
10213102	Sodium Tungstate Dihydrate	10213-10-2		7.4E+05	CRC89	7.0E-03	7.4E+00	1.8E+01	1.0E-03	RAGSE
961115	Stirofos (Tetrachlorovinphos)	961-11-5		1.1E+01	PHYSPROP	2.3E-02	1.2E+01	2.8E+01	3.1E-03	EPI
7440246	Strontium, Stable	7440-24-6				3.6E-03	3.3E-01	7.8E-01	1.0E-03	RAGSE
57249	Strychnine	57-24-9		1.6E+02	PHYSPROP	2.8E-03	7.8E+00	1.9E+01	4.0E-04	EPI
100425	Styrene	100-42-5		3.1E+02	PHYSPROP	1.5E-01	4.0E-01	9.7E-01	3.7E-02	EPI
57964393	Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3		8.5E+01	PPRTV	6.6E-02	1.6E+00	3.8E+00	1.2E-02	RAGSE
57964406	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6		8.5E+01	PPRTV	6.6E-02	1.6E+00	3.8E+00	1.2E-02	RAGSE
126330	Sulfolane	126-33-0		1.0E+06	PHYSPROP	4.3E-04	5.0E-01	1.2E+00	1.0E-04	EPI
80079	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9		2.4E+00	PHYSPROP	9.7E-02	4.3E+00	1.0E+01	1.5E-02	EPI
7446119	Sulfur Trioxide	7446-11-9				3.4E-03	3.0E-01	7.1E-01	1.0E-03	RAGSE
7664939	Sulfuric Acid	7664-93-9		1.0E+06	PHYSPROP	3.8E-03	3.7E-01	8.9E-01	1.0E-03	RAGSE
140578	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenox	140-57-8		5.9E-01	PHYSPROP	2.3E-01	7.9E+00	1.9E+01	3.3E-02	EPI
21564170	TCMTB	21564-17-0		1.3E+02	PHYSPROP	6.7E-02	2.3E+00	5.5E+00	1.1E-02	EPI
34014181	Tebuthiuron	34014-18-1		2.5E+03	PHYSPROP	7.4E-03	2.0E+00	4.8E+00	1.3E-03	EPI
3383968	Temephos	3383-96-8		2.7E-01	PHYSPROP	2.9E-01	4.3E+01	1.0E+02	3.5E-02	EPI
5902512	Terbacil	5902-51-2		7.1E+02	PHYSPROP	9.7E-03	1.7E+00	4.1E+00	1.7E-03	EPI
13071799	Terbufos	13071-79-9		5.1E+00	PHYSPROP	2.3E-01	4.3E+00	1.0E+01	3.6E-02	EPI
886500	Terbutryn	886-50-0		2.5E+01	PHYSPROP	1.3E-01	2.4E+00	5.7E+00	2.1E-02	EPI
540885	Tert-Butyl Acetate	540-88-5		8.3E+03	EPI	2.1E-02	4.7E-01	1.1E+00	5.2E-03	EPI
5436431	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1		1.5E-03	PHYSPROP	7.9E-01	5.5E+01	2.1E+02	9.3E-02	EPI
95943	Tetrachlorobenzene, 1,2,4,5-	95-94-3		6.0E-01	PHYSPROP	6.6E-01	1.7E+00	6.7E+00	1.2E-01	EPI
630206	Tetrachloroethane, 1,1,1,2-	630-20-6		1.1E+03	PHYSPROP	7.9E-02	9.2E-01	2.2E+00	1.6E-02	EPI
79345	Tetrachloroethane, 1,1,2,2-	79-34-5		2.8E+03	PHYSPROP	3.5E-02	9.2E-01	2.2E+00	6.9E-03	EPI
127184	Tetrachloroethylene	127-18-4		2.1E+02	PHYSPROP	1.7E-01	8.9E-01	2.1E+00	3.3E-02	EPI
58902	Tetrachlorophenol, 2,3,4,6-	58-90-2		2.3E+01	PHYSPROP	4.2E-01	2.1E+00	5.0E+00	7.1E-02	EPI
5216251	Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1		4.0E+00	PHYSPROP	4.9E-01	2.0E+00	4.9E+00	8.4E-02	EPI
3689245	Tetraethyl Dithiopyrophosphate	3689-24-5		3.0E+01	PHYSPROP	7.5E-02	6.7E+00	1.6E+01	1.1E-02	EPI
811972	Tetrafluoroethane, 1,1,1,2-	811-97-2		2.0E+03	PHYSPROP	2.1E-02	3.9E-01	9.4E-01	5.5E-03	EPI
479458	Tetryl (Trinitrophenylmethylnitramine)	479-45-8		7.4E+01	PHYSPROP	3.1E-03	4.3E+00	1.0E+01	4.7E-04	EPI
1314325	Thallic Oxide	1314-32-5				8.2E-03	3.8E+01	9.1E+01	1.0E-03	RAGSE
10102451	Thallium (I) Nitrate	10102-45-1		9.6E+04	PHYSPROP	6.3E-03	3.3E+00	7.9E+00	1.0E-03	RAGSE
7440280	Thallium (Soluble Salts)	7440-28-0				5.5E-03	1.5E+00	3.5E+00	1.0E-03	RAGSE
563688	Thallium Acetate	563-68-8		2.8E+04	PHYSPROP	2.5E-04	3.1E+00	7.5E+00	4.0E-05	EPI
6533739	Thallium Carbonate	6533-73-9		5.2E+04	PHYSPROP	8.2E-06	4.4E+01	1.1E+02	9.8E-07	EPI
7791120	Thallium Chloride	7791-12-0		2.9E+03	PHYSPROP	6.0E-03	2.3E+00	5.6E+00	1.0E-03	RAGSE
12039520	Thallium Selenite	12039-52-0				6.5E-03	4.1E+00	9.7E+00	1.0E-03	RAGSE
7446186	Thallium Sulfate	7446-18-6		5.5E+04	CRC89	8.6E-03	7.1E+01	1.7E+02	1.0E-03	RAGSE
79277273	Thifensulfuron-methyl	79277-27-3		2.2E+03	PHYSPROP	8.6E-04	1.6E+01	3.7E+01	1.1E-04	EPI
28249776	Thiobencarb	28249-77-6		2.8E+01	PHYSPROP	6.3E-02	2.9E+00	7.0E+00	1.0E-02	EPI
111488	Thiodiglycol	111-48-8		1.0E+06	PHYSPROP	5.2E-04	5.1E-01	1.2E+00	1.2E-04	EPI
39196184	Thiofanox	39196-18-4		5.2E+03	PHYSPROP	3.6E-02	1.8E+00	4.2E+00	6.3E-03	EPI
23564058	Thiophanate, Methyl	23564-05-8		2.7E+01	PHYSPROP	1.1E-03	8.7E+00	2.1E+01	1.6E-04	EPI
137268	Thiram	137-26-8		3.0E+01	PHYSPROP	5.9E-03	2.3E+00	5.6E+00	9.9E-04	EPI
7440315	Tin	7440-31-5				4.2E-03	4.9E-01	1.2E+00	1.0E-03	RAGSE
7550450	Titanium Tetrachloride	7550-45-0				5.3E-03	1.2E+00	2.9E+00	1.0E-03	RAGSE
108883	Toluene	108-88-3		5.3E+02	PHYSPROP	1.1E-01	3.5E-01	8.3E-01	3.1E-02	EPI
584849	Toluene-2,4-diisocyanate	584-84-9		3.8E+01	EPI	2.6E+00	9.9E-01	4.1E+00	5.1E-01	EPI
95705	Toluene-2,5-diamine	95-70-5		7.7E+04	PHYSPROP	1.7E-03	5.1E-01	1.2E+00	4.1E-04	EPI
91087	Toluene-2,6-diisocyanate	91-08-7		3.8E+01	EPI	2.6E-01	9.9E-01	2.4E+00	5.1E-02	EPI
99945	Toluic Acid, p-	99-94-5		3.4E+02	EPI	3.9E-02	6.1E-01	1.5E+00	8.7E-03	EPI
95534	Toluidine, o- (Methylaniline, 2-)	95-53-4		1.7E+04	PHYSPROP	1.2E-02	4.2E-01	1.0E+00	3.0E-03	EPI
106490	Toluidine, p-	106-49-0		6.5E+03	PHYSPROP	1.3E-02	4.2E-01	1.0E+00	3.3E-03	EPI
E1790670	Total Petroleum Hydrocarbons (Aliphatic High)	E1790670		3.7E-03	EPI	9.8E+00	9.5E-01	4.3E+00	2.0E+00	EPI
E1790666	Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666		9.5E+00	SURROGATE	7.2E-01	3.2E-01	1.2E+00	2.0E-01	EPI
E1790668	Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668		2.2E-01	SURROGATE	7.4E+00	5.5E-01	2.5E+00	1.7E+00	EPI
E1790676	Total Petroleum Hydrocarbons (Aromatic High)	E1790676		2.6E-01	SURROGATE	1.7E+00	1.4E+00	5.7E+00	3.1E-01	EPI
E1790672	Total Petroleum Hydrocarbons (Aromatic Low)	E1790672		1.8E+03	SURROGATE	5.1E-02	2.9E-01	6.9E-01	1.5E-02	EPI
E1790674	Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674		2.8E+01	SURROGATE	3.1E-01	6.0E-01	1.4E+00	6.9E-02	EPI
8001352	Toxaphene	8001-35-2		5.5E-01	PHYSPROP	4.2E-01	3.4E+01	8.2E+01	5.2E-02	EPI

Source: USEPA RSL, Chemical Specific Parameters Table (https://www.epa.gov/risk/regional-s

1	2	3	24	25	26	27	28	29	30
	Contaminant		Water Solubility		Tapwater Dermal Parameters				
CAS No. (Trimmed)	Analyte	CAS No.	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K_p Ref
E1841606	Toxaphene, Weathered	E1841606	5.5E-01	PHYSPROP	4.2E-01	3.4E+01	8.2E+01	5.2E-02	EPI
66841256	Tralomethrin	66841-25-6	8.0E-02	PHYSPROP	3.0E-01	5.6E+02	1.3E+03	3.1E-02	EPI
688733	Tri-n-butyltin	688-73-3	7.3E-03	PHYSPROP	1.3E-01	4.5E+00	1.1E+01	1.9E-02	EPI
102761	Triacetin	102-76-1	5.8E+04	PHYSPROP	7.8E-04	1.8E+00	4.2E+00	1.4E-04	EPI
43121433	Triadimefon	43121-43-3	7.2E+01	PHYSPROP	1.6E-02	4.6E+00	1.1E+01	2.4E-03	EPI
2303175	Triallate	2303-17-5	4.0E+00	PHYSPROP	2.3E-01	5.3E+00	1.3E+01	3.5E-02	EPI
82097505	Triasulfuron	82097-50-5	3.2E+01	PHYSPROP	3.6E-04	1.9E+01	4.5E+01	4.7E-05	EPI
101200480	Tribenuron-methyl	101200-48-0	5.0E+01	PHYSPROP	3.6E-03	1.7E+01	4.1E+01	4.7E-04	EPI
615543	Tribromobenzene, 1,2,4-	615-54-3	4.9E+00	PHYSPROP	2.3E-01	6.1E+00	1.5E+01	3.4E-02	EPI
118796	Tribromophenol, 2,4,6-	118-79-6	7.0E+01	PHYSPROP	8.5E-02	7.5E+00	1.8E+01	1.2E-02	EPI
126738	Tributyl Phosphate	126-73-8	2.8E+02	PHYSPROP	1.4E-01	3.3E+00	7.8E+00	2.3E-02	EPI
E1790678	Tributyltin Compounds	E1790678							
56359	Tributyltin Oxide	56-35-9	2.0E+01	PHYSPROP	2.4E-03	2.3E+02	5.5E+02	2.5E-04	EPI
10025851	Trichloramine	10025-85-1							
76131	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.7E+02	PHYSPROP	9.2E-02	1.2E+00	2.8E+00	1.8E-02	EPI
76039	Trichloroacetic Acid	76-03-9	5.5E+04	PHYSPROP	7.1E-03	8.6E-01	2.1E+00	1.5E-03	EPI
33663502	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.1E+01	EPI	1.6E-04	2.1E+00	5.1E+00	2.8E-05	EPI
634935	Trichloroaniline, 2,4,6-	634-93-5	4.0E+01	PHYSPROP	1.5E-01	1.3E+00	3.2E+00	2.7E-02	EPI
87616	Trichlorobenzene, 1,2,3-	87-61-6	1.8E+01	PHYSPROP	3.8E-01	1.1E+00	2.6E+00	7.4E-02	EPI
120821	Trichlorobenzene, 1,2,4-	120-82-1	4.9E+01	PHYSPROP	3.7E-01	1.1E+00	2.6E+00	7.1E-02	EPI
71556	Trichloroethane, 1,1,1-	71-55-6	1.3E+03	PHYSPROP	5.6E-02	5.9E-01	1.4E+00	1.3E-02	EPI
79005	Trichloroethane, 1,1,2-	79-00-5	4.6E+03	PHYSPROP	2.2E-02	5.9E-01	1.4E+00	5.0E-03	EPI
79016	Trichloroethylene	79-01-6	1.3E+03	PHYSPROP	5.1E-02	5.7E-01	1.4E+00	1.2E-02	EPI
75694	Trichlorofluoromethane	75-69-4	1.1E+03	PHYSPROP	5.7E-02	6.2E-01	1.5E+00	1.3E-02	EPI
95954	Trichlorophenol, 2,4,5-	95-95-4	1.2E+03	PHYSPROP	2.0E-01	1.3E+00	3.2E+00	3.6E-02	EPI
88062	Trichlorophenol, 2,4,6-	88-06-2	8.0E+02	PHYSPROP	1.9E-01	1.3E+00	3.2E+00	3.5E-02	EPI
93765	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	2.8E+02	PHYSPROP	5.6E-02	2.8E+00	6.8E+00	9.1E-03	EPI
93721	Trichlorophenoxypropionic acid, -2,4,5	93-72-1	7.1E+01	PHYSPROP	1.0E-01	3.4E+00	8.2E+00	1.6E-02	EPI
598776	Trichloropropane, 1,1,2-	598-77-6	1.9E+03	PHYSPROP	4.5E-02	7.0E-01	1.7E+00	9.6E-03	EPI
96184	Trichloropropane, 1,2,3-	96-18-4	1.8E+03	PHYSPROP	3.5E-02	7.0E-01	1.7E+00	7.5E-03	EPI
96195	Trichloropropene, 1,2,3-	96-19-5	3.3E+02	PHYSPROP	7.8E-02	6.9E-01	1.6E+00	1.7E-02	EPI
1330785	Tricresyl Phosphate (TCP)	1330-78-5	3.6E-01	PHYSPROP	2.5E-01	1.2E+01	2.9E+01	3.3E-02	EPI
58138082	Tridiphane	58138-08-2	1.1E+00	PHYSPROP	4.7E-01	6.6E+00	1.6E+01	6.9E-02	EPI
121448	Triethylamine	121-44-8	6.9E+04	PHYSPROP	1.5E-02	3.9E-01	9.3E-01	3.9E-03	EPI
112276	Triethylene Glycol	112-27-6	1.0E+06	PHYSPROP	7.3E-05	7.3E-01	1.8E+00	1.6E-05	EPI
420462	Trifluoroethane, 1,1,1-	420-46-2	7.6E+02	PHYSPROP	2.7E-02	3.1E-01	7.5E-01	7.6E-03	EPI
1582098	Trifluralin	1582-09-8	1.8E-01	PHYSPROP	5.1E-01	7.9E+00	1.9E+01	7.3E-02	EPI
512561	Trimethyl Phosphate	512-56-1	5.0E+05	PHYSPROP	4.3E-04	6.4E-01	1.5E+00	9.5E-05	EPI
526738	Trimethylbenzene, 1,2,3-	526-73-8	7.5E+01	PHYSPROP	3.8E-01	5.0E-01	1.2E+00	9.0E-02	EPI
95636	Trimethylbenzene, 1,2,4-	95-63-6	5.7E+01	PHYSPROP	3.6E-01	5.0E-01	1.2E+00	8.6E-02	EPI
108678	Trimethylbenzene, 1,3,5-	108-67-8	4.8E+01	PHYSPROP	2.6E-01	5.0E-01	1.2E+00	6.2E-02	EPI
25167708	Trimethylpentene, 2,4,4-	25167-70-8	4.0E+00	PHYSPROP	1.6E+00	4.5E-01	1.8E+00	3.9E-01	EPI
99354	Trinitrobenzene, 1,3,5-	99-35-4	2.8E+02	PHYSPROP	3.4E-03	1.6E+00	3.9E+00	6.1E-04	EPI
118967	Trinitrotoluene, 2,4,6-	118-96-7	1.2E+02	PHYSPROP	5.6E-03	2.0E+00	4.7E+00	9.6E-04	EPI
791286	Triphenylphosphine Oxide	791-28-6	6.3E+01	PHYSPROP	2.1E-02	3.8E+00	9.1E+00	3.3E-03	EPI
13674878	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	7.0E+00	PHYSPROP	1.3E-02	2.7E+01	6.5E+01	1.6E-03	EPI
13674845	Tris(1-chloro-2-propyl)phosphate	13674-84-5	1.2E+03	PHYSPROP	8.4E-03	7.2E+00	1.7E+01	1.2E-03	EPI
126727	Tris(2,3-dibromopropyl)phosphate	126-72-7	8.0E+00	PHYSPROP	1.4E-03	8.5E+02	2.0E+03	1.4E-04	EPI
115968	Tris(2-chloroethyl)phosphate	115-96-8	7.0E+03	PHYSPROP	2.3E-03	4.2E+00	1.0E+01	3.6E-04	EPI
78422	Tris(2-ethylhexyl)phosphate	78-42-2	6.0E-01	PHYSPROP	9.3E+01	2.9E+01	1.3E+02	1.2E+01	EPI
7440337	Tungsten	7440-33-7			5.2E-03	1.1E+00	2.7E+00	1.0E-03	RAGSE
7440611	Uranium	7440-61-1			5.9E-03	2.3E+00	5.4E+00	1.0E-03	RAGSE
51796	Urethane	51-79-6	4.8E+05	PHYSPROP	1.4E-03	3.3E-01	8.0E-01	3.9E-04	EPI
1314621	Vanadium Pentoxide	1314-62-1	7.0E+02	CRC89	5.2E-03	1.1E+00	2.6E+00	1.0E-03	RAGSE
7440622	Vanadium and Compounds	7440-62-2			2.7E-03	2.0E-01	4.9E-01	1.0E-03	RAGSE
1929777	Vernolate	1929-77-7	9.0E+01	PHYSPROP	2.2E-01	1.4E+00	3.5E+00	4.0E-02	EPI
50471448	Vinclozolin	50471-44-8	2.6E+00	PHYSPROP	2.9E-02	4.2E+00	1.0E+01	4.5E-03	EPI
108054	Vinyl Acetate	108-05-4	2.0E+04	PHYSPROP	5.6E-03	3.2E-01	7.7E-01	1.6E-03	EPI
593602	Vinyl Bromide	593-60-2	7.6E+03	PHYSPROP	1.7E-02	4.2E-01	1.0E+00	4.4E-03	EPI
75014	Vinyl Chloride	75-01-4	8.8E+03	PHYSPROP	2.5E-02	2.4E-01	5.7E-01	8.4E-03	EPI
81812	Warfarin	81-81-2	1.7E+01	PHYSPROP	1.2E-02	5.6E+00	1.3E+01	1.8E-03	EPI
108383	Xylene, m-	108-38-3	1.6E+02	PHYSPROP	2.1E-01	4.1E-01	9.9E-01	5.3E-02	EPI
95476	Xylene, o-	95-47-6	1.8E+02	PHYSPROP	1.9E-01	4.1E-01	9.9E-01	4.7E-02	EPI
106423	Xylene, p-	106-42-3	1.6E+02	PHYSPROP	2.0E-01	4.1E-01	9.9E-01	4.9E-02	EPI
1330207	Xylenes	1330-20-7	1.1E+02	PHYSPROP	2.0E-01	4.1E-01	9.9E-01	5.0E-02	EPI
1314847	Zinc Phosphide	1314-84-7			3.7E-03	2.9E+00	7.0E+00	6.0E-04	RAGSE
7440666	Zinc and Compounds	7440-66-6			1.9E-03	2.4E-01	5.9E-01	6.0E-04	RAGSE
12122677	Zineb	12122-67-7	1.0E+01	PHYSPROP	2.1E-03	3.7E+00	8.8E+00	3.3E-04	EPI
7440677	Zirconium	7440-67-7			3.7E-03	3.4E-01	8.2E-01	1.0E-03	RAGSE

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
(ETHYLENEBIS(OXYETHYLENENITRILO)) TETRAACETIC ACII	0	0	0	0	0	1	0	0	0	0
1,1,1-Trichloroethan	D	0	0	1	0	0	0	0	0	0
1,1,2-Trichloroethan	C	0	1	0	0	0	0	0	0	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dio	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,6,7,8,9-Octachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dio	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,6,7,8-Heptachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,7,8,9-Heptachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dio:	B2	0	1	0	0	0	0	0	0	0
1,2,3,4,7,8-Hexachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dio:	B2	0	1	0	0	0	0	0	0	0
1,2,3,6,7,8-Hexachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dio:	B2	0	1	0	0	0	0	0	0	0
1,2,3,7,8,9-Hexachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,3,7,8-Pentachlorodibenzo-p-dio:	B2	0	1	0	0	0	0	0	0	0
1,2,3,7,8-Pentachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
1,2,4-Trichlorobenzen	D	0	1	0	0	0	0	0	0	0
1,2-Dibromo-3-chloropropan	B2	0	0	0	0	1	0	0	0	0
1,2-Dimethoxyethar	0	0	0	0	0	1	0	0	0	0
1,2-Epoxybutar	0	1	0	0	0	0	0	0	0	0
1,3-Butadien	A	0	0	0	0	1	0	0	0	0
1,3-dichloropropen	B2	1	0	0	0	0	0	0	0	0
1,4-Dioxan	B2	1	1	0	0	0	0	0	0	0
2-(Hexyloxy)Ethan	0	0	0	0	0	1	0	0	0	0
2,3,4,6,7,8-Hexachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
2,3,4,7,8-Pentachlorodibenzofur	B2	0	1	0	0	0	0	0	0	0
2,3,7,8-Tetrachlorodibenzo-p-diox	B2	1	1	0	0	0	0	0	0	1
2,3,7,8-Tetrachlorodibenzofura	B2	0	1	0	0	0	0	0	0	0
2,4/2,6-Toluene diisocyanate mixture (Tl	0	1	0	0	0	0	0	0	0	0
2,4-Dinitrotoluen	B2	0	1	1	0	0	0	0	0	0
2,4-Toluene diisocyana	0	1	0	0	0	0	0	0	0	0
2-Butoxyethyl Aceta	0	0	0	0	0	1	0	0	0	0
2-Chloroacetophenon	0	1	0	0	0	0	0	0	0	0
2-Methyl-Propanenitril	D	0	0	1	0	0	0	0	0	0
2-Nitropropan	B2	0	1	0	0	0	0	0	0	0
2-Propoxyethyl aceta	0	0	0	0	0	1	0	0	0	0
3-Methoxy-1-Propan	0	0	0	0	0	1	0	0	0	0
4,4'-Methylenedianilin	0	0	0	0	0	0	0	1	0	0
Acetaldehyd	B2	1	0	0	0	0	0	0	0	0
Acetone Cyanohydr	D	0	0	1	0	0	0	0	0	0
Acetonitrile	D	0	0	0	0	0	0	0	0	0
Acrolein	0	1	0	0	0	0	0	0	0	0
Acrylamide	B2	0	0	1	0	0	0	0	0	0
Acrylic acic	0	1	0	0	0	0	0	0	0	0
Acrylonitrile	B1	1	0	0	0	0	0	0	0	0
Allyl chloride	C	0	0	1	0	0	0	0	0	0
alpha-Hexachlorocyclohexane (a-HCI	B2	0	1	0	0	1	1	0	0	0
Ammonium chroma	A	1	0	0	0	0	0	0	0	0
Ammonium dichroma	A	1	0	0	0	0	0	0	0	0
Aniline	B2	0	0	0	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Antimony compounc	0	1	0	0	0	0	0	0	0	0
Antimony oxic	0	1	0	0	0	0	0	0	0	0
Antimony pentafluoric		1	0	0	0	0	0	0	0	0
Antimony pentoxic		1	0	0	0	0	0	0	0	0
Antimony potassium tartra		1	0	0	0	0	0	0	0	0
Antimony tetroxic		1	0	0	0	0	0	0	0	0
Antimony trihydrid		1	0	0	0	0	0	0	0	0
Antimony trioxid	0	1	0	0	0	0	0	0	0	0
Arsenic acic	A	0	0	0	1	0	0	0	0	0
Arsenic as Lead Arsenat	A	0	0	0	1	0	0	0	0	0
Arsenic chloride		0	0	0	1	0	0	0	0	0
Arsenic compound	A	0	0	0	1	0	0	0	0	0
Arsenic oxide	A	0	0	0	1	0	0	0	0	0
Arsenic pentoxid	A	0	0	0	1	0	0	0	0	0
Arsenic trioxide	A	0	0	0	1	0	0	0	0	0
Arsine	0	0	0	0	0	0	0	0	0	1
Barium Chromate	A	1	0	0	0	0	0	0	0	0
Barium cyanid		0	0	1	0	0	0	0	0	0
Benzene	A	0	0	0	0	0	0	0	0	0
Benzidine	A	0	1	1	0	0	0	0	0	0
Benzo[a]pyren		0	0	0	1	1	0	0	0	0
Beryllium chloride		1	0	0	0	0	0	0	0	0
Beryllium compounc	B1	1	0	0	0	0	0	0	0	0
Beryllium fluoride		1	0	0	0	0	0	0	0	0
Beryllium nitrate		1	0	0	0	0	0	0	0	0
Beryllium Oxid	B1	1	0	0	0	0	0	0	0	0
beta-Hexachlorocyclohexane (b-HCI	C	0	1	0	0	1	1	0	0	0
Bis(2-ethylhexyl)phthala	B2	1	1	0	0	0	0	0	0	0
Butyl Carbitol Acetat	0	0	0	0	0	1	0	0	0	0
Cadmium acetat	B1	0	0	0	0	0	1	0	0	0
Cadmium compounc	B1	0	0	0	0	0	1	0	0	0
Cadmium as Cadmium Cyanami		0	0	0	0	0	1	0	0	0
Cadmium nitrate	B1	0	0	0	0	0	1	0	0	0
Cadmium Oxid	B1	0	0	0	0	0	1	0	0	0
Cadmium stearat		0	0	0	0	0	1	0	0	0
Calcium Chromate	A	1	0	0	0	0	0	0	0	0
Calcium cyanamid		0	0	1	0	0	0	0	0	0
Calcium cyanide		0	0	1	0	0	0	0	0	0
CARBITOL ACETATE	0	0	0	0	0	1	0	0	0	0
Carbon disulfide	0	0	0	1	0	0	0	0	0	0
Carbon tetrachloride	B2	0	1	0	0	0	0	0	0	0
Carbonyl Sulfide		0	0	1	0	0	0	0	0	0
Chlordane	B2	0	1	0	0	0	0	0	0	0
Chlorine	0	1	0	0	0	0	0	0	0	0
Chlorobenzene	D	0	1	0	0	1	1	0	0	0
Chloroform	B2	0	1	0	0	0	0	0	0	0
Chloroprene	0	1	0	0	0	0	0	0	0	0
Chromic Acid (VI	A	1	0	0	0	0	0	0	0	0
Chromic sulfuric acic	A	1	0	0	0	0	0	0	0	0
Chromium (VI) as Lead Chroma	A	1	0	0	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Chromium (VI) as Lead Chromate Oxi	A	1	0	0	0	0	0	0	0	0
Chromium (VI) compounc	A	1	0	0	0	0	0	0	0	0
Chromium (VI) trioxide, chromic acid mi	A	1	0	0	0	0	0	0	0	0
Chromium compounc	D	1	0	0	0	0	0	0	0	0
Chromium dioxid		1	0	0	0	0	0	0	0	0
Cobalt Aluminat	0	1	0	0	0	0	0	0	0	0
Cobalt bromid		1	0	0	0	0	0	0	0	0
Cobalt Carbonat	0	1	0	0	0	0	0	0	0	0
Cobalt carbony		1	0	0	0	0	0	0	0	0
Cobalt Chloride	0	1	0	0	0	0	0	0	0	0
Cobalt compound	0	1	0	0	0	0	0	0	0	0
Cobalt Hydrocarbony	0	1	0	0	0	0	0	0	0	0
Cobalt Naphth	0	1	0	0	0	0	0	0	0	0
Cobalt nitrate		1	0	0	0	0	0	0	0	0
Cobalt Oxide	0	1	0	0	0	0	0	0	0	0
Cobalt Oxide (II,III	0	1	0	0	0	0	0	0	0	0
Copper Cyanide	D	0	0	1	0	0	0	0	0	0
Cresols (mixed	C	0	0	1	0	0	0	0	0	0
Cumene	D	0	0	0	0	0	1	0	1	0
Cyanazine		0	0	1	0	0	0	0	0	0
Cyanide compounc	D	0	0	1	0	0	0	0	0	0
Cyanide as Cadmium Cyanami		0	0	1	0	0	0	0	0	0
Cyanoger		0	0	1	0	0	0	0	0	0
Cyanogen bromid		0	0	1	0	0	0	0	0	0
Cyanogen chloride		0	0	1	0	0	0	0	0	0
Cyanogen iodid		0	0	1	0	0	0	0	0	0
Cyanopho		0	0	1	0	0	0	0	0	0
Cyanuric fluoride		0	0	1	0	0	0	0	0	0
Di(ethylene glycol monobutyl ether) phthal	0	0	0	0	0	1	0	0	0	0
Dichlorvos	B2	0	0	1	0	0	0	0	0	0
Diesel engine emission	B1	1	0	0	0	0	0	0	0	0
Diethanolamin	0	1	0	0	0	0	0	0	0	0
Diethylene Glycol Dibenzoa	0	0	0	0	0	1	0	0	0	0
DIETHYLENE GLYCOL DIETHYL ETHEI	0	0	0	0	0	1	0	0	0	0
Diethylene Glycol Dimethyl Eth	0	0	0	0	0	1	0	0	0	0
Diethylene Glycol Ethyl Methyl Etł	0	0	0	0	0	1	0	0	0	0
Diethylene glycol monobutyl etł	0	0	0	0	0	1	0	0	0	0
Diethylene glycol monoethyl etł	0	0	0	0	0	1	0	0	0	0
Diethylene Glycol Monomethyl Etł	0	0	0	0	0	1	0	0	0	0
1-Methoxy-2-propan		0	0	0	0	1	0	0	0	0
Dimethyl formamid	0	0	1	0	0	0	0	0	0	0
Epichlorohydri	B2	1	0	0	0	0	0	0	0	0
ETHOXYTRIGLYCOL	0	0	0	0	0	1	0	0	0	0
Ethyl benzen	D	0	0	0	1	0	0	0	0	0
Ethyl chloride	0	0	0	0	1	0	0	0	0	0
Ethylene cyanohydr		0	0	1	0	0	0	0	0	0
Ethylene dibromid	B2	1	0	0	0	1	0	0	0	0
Ethylene dichlorid	B2	0	1	0	0	0	0	0	0	0
Ethylene glyco	0	1	0	0	0	0	0	0	0	0
Ethylene glycol 2-ethylhexyl eth	0	0	0	0	0	1	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind
(TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Ethylene glycol butyl eth	C	0	0	0	0	1	0	0	0	0
Ethylene glycol Diethyl Eth	0	0	0	0	0	1	0	0	0	0
Ethylene glycol ethyl eth	0	0	0	0	0	1	0	0	0	0
Ethylene glycol ethyl ether aceta	0	0	0	0	0	1	0	0	0	0
Ethylene glycol methyl eth	0	0	0	0	0	1	0	0	0	0
Ethylene glycol methyl ether aceta	0	0	0	0	0	1	0	0	0	0
Ethylene Glycol Mono-Sec-Butyl Eth	0	0	0	0	0	1	0	0	0	0
ETHYLENE GLYCOL MONOVINYL ETHEI	0	0	0	0	0	1	0	0	0	0
Ethylene oxid	B1	0	0	1	0	0	0	0	0	0
Ethylene thioure	B2	0	0	0	0	0	0	0	1	0
Ethylidene dichlorid	C	0	0	0	0	0	1	0	0	0
Formaldehyd	B1	1	0	0	0	0	0	0	0	0
GASEOUS DIVALENT MERCURY	C	0	0	1	0	0	0	0	0	0
Glycol Ethers	0	0	0	0	0	1	0	0	0	0
Hexachlorobenzen	B2	0	1	0	0	0	0	0	0	0
Hexachlorobutadien	C	0	0	0	0	1	0	0	0	0
Hexachlorocyclopentadier	E	1	0	0	0	0	0	0	0	0
Hexachlorodibenzo-p-diox	B2	0	1	0	0	0	0	0	0	0
Hexachloroethan	C	0	1	1	0	0	1	0	0	0
Hexamethylene-1,6-diisocyana	0	1	0	0	0	0	0	0	0	0
Hexanoic acid, 2-ethyl-, cobalt(2+) sa	0	1	0	0	0	0	0	0	0	0
Hydrazine	B2	0	1	0	0	0	0	0	0	0
Hydrochloric acid	0	1	0	0	0	0	0	0	0	0
Hydrofluoric acid	0	0	0	0	0	0	0	0	0	0
Hydrogen cyanid	D	0	0	1	0	0	0	0	0	0
Hydrogen selenide	0	0	1	1	0	0	0	0	0	1
Hydrogen Sulfide	0	1	0	0	0	0	0	0	0	0
Isophorone	C	0	1	0	1	0	0	0	0	0
Lead (II) Oxide	B2	0	0	1	1	0	0	0	0	0
Lead Acetat	B2	0	0	1	1	0	0	0	0	0
Lead as Lead Arsena	B2	0	0	1	1	0	0	0	0	0
Lead as Lead Chroma	B2	0	0	1	1	0	0	0	0	0
Lead as Lead Chromate Oxi	B2	0	0	1	1	0	0	0	0	0
Lead chloride		0	0	1	1	0	0	0	0	0
Lead compounc	B2	0	0	1	1	0	0	0	0	0
Lead Compounds (Other than inorgan	B2	0	0	1	1	0	0	0	0	0
Lead Dioxide	B2	0	0	1	1	0	0	0	0	0
Lead Nitrate	B2	0	0	1	1	0	0	0	0	0
Lead Subacetat	B2	0	0	1	1	0	0	0	0	0
Lead Sulfat	B2	0	0	1	1	0	0	0	0	0
Lindane (gamma-HCH	0	0	1	0	0	1	1	0	0	0
Maleic anhydride	0	1	0	0	0	0	0	0	0	0
Manganese chloride		0	0	1	0	0	0	0	0	0
Manganese compounc	D	0	0	1	0	0	0	0	0	0
Manganese Dioxide	D	0	0	1	0	0	0	0	0	0
Manganese Nitrate	D	0	0	1	0	0	0	0	0	0
Manganese oxid		0	0	1	0	0	0	0	0	0
Manganese Sulfat	D	0	0	1	0	0	0	0	0	0
Manganese Tetroxid	D	0	0	1	0	0	0	0	0	0
Manganese tricarbonyl (.eta.5-2,4-cyclopentadien-1-	D	0	0	1	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Manganese Trioxide	D	0	0	1	0	0	0	0	0	0
m-Cresol (3-methylpheno	C	0	0	1	0	0	0	0	0	0
MERCURIC ACETATE	C	0	0	1	0	0	0	0	0	0
Mercuric chloride	C	0	0	1	0	0	0	0	0	0
MERCURIC NITRATE	C	0	0	1	0	0	0	0	0	0
MERCURIC OXIDE	C	0	0	1	0	0	0	0	0	0
Mercury (elemental	D	0	0	1	0	0	0	0	0	0
Mercury (organic)		0	0	1	0	0	0	0	0	0
Mercury compound	C	0	0	1	0	0	0	0	0	0
Methano	0	0	0	0	1	0	0	0	0	0
Methoxychlo		0	0	0	0	0	0	0	0	0
Methoxyethylmercuric aceta		0	0	1	0	0	0	0	0	0
Methoxytriglyco	0	0	0	0	0	1	0	0	0	0
Methyl bromide	D	1	0	0	0	0	0	0	0	0
Methyl cellosolve acryla		0	0	0	0	1	0	0	0	0
Methyl chloride	D	0	0	1	0	0	0	0	0	0
Methyl ethyl keton	0	0	0	0	1	0	0	0	0	0
Methyl isobutyl keton	0	0	0	0	1	0	0	0	0	0
Methyl isocyanat	0	1	0	0	0	0	0	0	0	0
Methyl mercury		0	0	1	0	0	0	0	0	0
Methyl methacrylat	E	1	0	0	0	0	0	0	0	0
Methyl tert-butyl ethe	0	0	1	0	0	0	1	1	0	0
Methylene chlorid	B2	1	1	0	0	0	0	0	0	0
Methylene diphenyl diisocyana	D	1	0	0	0	0	0	0	0	0
Methylmercuric dicyanamic		0	0	1	0	0	0	0	0	0
m-Xylene	0	0	0	1	0	0	0	0	0	0
Naphthalene	C	1	0	0	0	0	0	0	0	0
n-Hexane	0	0	0	1	0	0	0	0	0	0
N-Hexyl Carbito	0	0	0	0	0	1	0	0	0	0
Nickel (II) Sulfate Hexahydra	A	1	0	0	0	0	0	0	0	0
Nickel Acetate	A	1	0	0	0	0	0	0	0	0
Nickel carbony		1	0	0	0	0	0	0	0	0
Nickel chloride	A	1	0	0	0	0	0	0	0	0
Nickel compound	A	1	0	0	0	0	0	0	0	0
Nickel nitrate	A	1	0	0	0	0	0	0	0	0
Nickel oxide	0	1	0	0	0	0	0	0	0	0
Nickel subsulfide	A	1	0	0	0	0	0	0	0	0
Nickel sulfamate	A	1	0	0	0	0	0	0	0	0
Nickel sulfate	A	1	0	0	0	0	0	0	0	0
Nitrobenzene	D	1	0	0	0	0	0	0	0	0
o-Cresol	C	0	0	1	0	0	0	0	0	0
o-Xylene	0	0	0	1	0	0	0	0	0	0
PARTICULATE DIVALENT MERCURY	C	0	0	1	0	0	0	0	0	0
p-Cresol (4-methy pheno	C	0	0	1	0	0	0	0	0	0
p-Dichlorobenzene	C	0	1	0	0	0	0	0	0	0
Pentachlorophen	B2	0	1	0	0	0	1	0	0	0
Pheno	D	0	1	0	0	0	0	0	0	0
Phenyl Cellosolv	0	0	0	0	0	1	0	0	0	0
Phenylmercuric acetat		0	0	1	0	0	0	0	0	0
Phosgene	0	1	0	0	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Phosphine	D	0	0	0	0	0	0	0	0	0
Phthalic anhydrid	0	1	0	0	0	0	0	1	0	0
Potassium Chromat	A	1	0	0	0	0	0	0	0	0
Potassium cyanid		0	0	1	0	0	0	0	0	0
Potassium Dichromat	A	1	0	0	0	0	0	0	0	0
Potassium selenat		0	1	1	0	0	0	0	0	1
Potassium silver cyanic		0	0	1	0	0	0	0	0	0
Potassium thiocyana		0	0	1	0	0	0	0	0	0
Propionaldehyd		1	0	0	0	0	0	0	0	0
Propyl Cellosolve	0	0	0	0	0	1	0	0	0	0
Propylene dichlorid	B2	1	0	0	0	0	0	0	0	0
Propylene oxid	B2	1	0	0	0	0	0	0	0	0
p-Xylene	0	0	0	1	0	0	0	0	0	0
Selenious aci		0	1	1	0	0	0	0	0	1
Selenium compounc	D	0	1	1	0	0	0	0	0	1
Selenium Dioxid	D	0	1	1	0	0	0	0	0	1
Selenium Disulfide	D	0	1	1	0	0	0	0	0	1
Selenium Hexafluorid	D	0	1	1	0	0	0	0	0	1
Selenium Oxid	D	0	1	1	0	0	0	0	0	1
Selenium Oxychloric	D	0	1	1	0	0	0	0	0	1
Selenium Sulfid	D	0	1	1	0	0	0	0	0	1
Selenourea		0	1	1	0	0	0	0	0	1
Silver cyanide		0	0	1	0	0	0	0	0	0
Sodium Chromat	A	1	0	0	0	0	0	0	0	0
Sodium cyanid		0	0	1	0	0	0	0	0	0
Sodium Dichromat	A	1	0	0	0	0	0	0	0	0
Sodium selenat		0	1	1	0	0	0	0	0	1
Sodium selenite		0	1	1	0	0	0	0	0	1
Strontium Chromat	A	1	0	0	0	0	0	0	0	0
Styrene	0	0	0	1	0	0	0	0	0	0
Styrene oxid	0	1	0	0	0	0	0	0	0	0
Tetrachloroethene	B2-C	0	0	1	0	0	0	0	0	0
Tetraethyl lea		0	0	1	1	0	0	0	0	0
Tetramethyl lea		0	0	1	1	0	0	0	0	0
Thiocyanic acid, 2-(benzothiazolylthio) methyl		0	0	1	0	0	0	0	0	0
Thiocyanate		0	0	1	0	0	0	0	0	0
Titanium tetrachloride	0	1	0	0	0	0	0	0	0	0
Toluene	D	0	0	1	0	0	0	0	0	0
Trichloroethylene	B2-C	0	1	1	1	1	1	0	0	0
Triethylamine	0	1	0	0	0	0	0	0	0	0
Triethylene glycol dimethyl eth	0	0	0	0	0	1	0	0	0	0
Triglycol monobutyl ethe	0	0	0	0	0	1	0	0	0	0
Uranium	0	0	0	0	0	0	1	0	0	0
Uranium Compound	0	1	0	0	0	0	1	0	0	0
Vinyl acetate	0	1	0	0	0	0	0	0	0	0
Vinyl bromide	B2	0	1	0	0	0	0	0	0	0
Vinyl chloride	A	0	1	0	0	0	0	0	0	0
Vinylidene chloride	C	0	1	0	0	0	0	0	0	0
Xylenes (mixec	0	0	0	1	0	0	0	0	0	0
Zinc Chromate	A	1	0	0	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

Data Source: USEPA, Input files for HEM-3: Target Organ Endpoints.xlsx. https://www.epa.gov/fera/download-human

pollutant	epa_woe	resp	liver	neuro	dev	reprod	kidney	ocular	endoc	hemato
Zinc Cyanide	D	0	0	1	0	0	0	0	0	0
Zinc Potassium Chromat	A	1	0	0	0	0	0	0	0	0

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-m

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
(ETHYLENEBIS(OXYETHYLENENITRILO)) TETRAACETIC ACII	0	0	0	0	0	1	reprod		
1,1,1-Trichloroethan	0	0	0	0	0	1	neurc		
1,1,2-Trichloroethan	0	0	0	0	0	1	liver		
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dio	0	0	0	0	0	1	liver		
1,2,3,4,6,7,8,9-Octachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dio	0	0	0	0	0	1	liver		
1,2,3,4,6,7,8-Heptachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,4,7,8,9-Heptachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,4,7,8-Hexachlorodibenzo-p-dio:	0	0	0	0	0	1	liver		
1,2,3,4,7,8-Hexachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,6,7,8-Hexachlorodibenzo-p-dio:	0	0	0	0	0	1	liver		
1,2,3,6,7,8-Hexachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,7,8,9-Hexachlorodibenzo-p-dio:	0	0	0	0	0	1	liver		
1,2,3,7,8,9-Hexachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,3,7,8-Pentachlorodibenzo-p-dio:	0	0	0	0	0	1	liver		
1,2,3,7,8-Pentachlorodibenzofur	0	0	0	0	0	1	liver		
1,2,4-Trichlorobenzen	0	0	0	0	0	1	liver		
1,2-Dibromo-3-chloropropan	0	0	0	0	0	1	reprod		
1,2-Dimethoxyethar	0	0	0	0	0	1	reprod		
1,2-Epoxybutar	0	0	0	0	0	1	resp		
1,3-Butadien	0	0	0	0	0	1	reprod		
1,3-dichloropropen	0	0	0	0	0	1	resp		
1,4-Dioxan	0	0	0	0	0	2	resp	liver	
2-(Hexyloxy)Ethan	0	0	0	0	0	1	reprod		
2,3,4,6,7,8-Hexachlorodibenzofur	0	0	0	0	0	1	liver		
2,3,4,7,8-Pentachlorodibenzofur	0	0	0	0	0	1	liver		
2,3,7,8-Tetrachlorodibenzo-p-diox	0	0	0	0	0	3	resp	liver	hemato
2,3,7,8-Tetrachlorodibenzofura	0	0	0	0	0	1	liver		
2,4/2,6-Toluene diisocyanate mixture (TI	0	0	0	0	0	1	resp		
2,4-Dinitrotoluen	0	0	0	0	0	2	liver	neurc	
2,4-Toluene diisocyana	0	0	0	0	0	1	resp		
2-Butoxyethyl Aceta	0	0	0	0	0	1	reprod		
2-Chloroacetophenon	0	0	0	0	0	1	resp		
2-Methyl-Propanenitril	0	0	0	1	0	2	neurc	thyroic	
2-Nitropropane	0	0	0	0	0	1	liver		
2-Propoxyethyl aceta	0	0	0	0	0	1	reprod		
3-Methoxy-1-Propan	0	0	0	0	0	1	reprod		
4,4'-Methylenedianilin	0	0	0	0	0	1	ocular		
Acetaldehyd	0	0	0	0	0	1	resp		
Acetone Cyanohydr	0	0	0	1	0	2	neurc	thyroic	
Acetonitrile	0	0	0	0	1	1	wholebo		
Acrolein	0	0	0	0	0	1	resp		
Acrylamide	0	0	0	0	0	1	neurc		
Acrylic acic	0	0	0	0	0	1	resp		
Acrylonitrile	0	0	0	0	0	1	resp		
Allyl chloride	0	0	0	0	0	1	neurc		
alpha-Hexachlorocyclohexane (a-HCI	0	0	0	0	0	3	liver	reprod	kidney
Ammonium chroma	0	0	0	0	0	1	resp		
Ammonium dichroma	0	0	0	0	0	1	resp		
Aniline	0	0	1	0	0	1	spleer		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-m

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Antimony compounc	0	0	0	0	0	1	resp		
Antimony oxic	0	0	0	0	0	1	resp		
Antimony pentafluoric	0	0	0	0	0	1	resp		
Antimony pentoxic	0	0	0	0	0	1	resp		
Antimony potassium tartra	0	0	0	0	0	1	resp		
Antimony tetroxic	0	0	0	0	0	1	resp		
Antimony trihydrid	0	0	0	0	0	1	resp		
Antimony trioxid	0	0	0	0	0	1	resp		
Arsenic acic	0	0	0	0	0	1	dev		
Arsenic as Lead Arsenat	0	0	0	0	0	1	dev		
Arsenic chloride	0	0	0	0	0	1	dev		
Arsenic compound	0	0	0	0	0	1	dev		
Arsenic oxide	0	0	0	0	0	1	dev		
Arsenic pentoxid	0	0	0	0	0	1	dev		
Arsenic trioxide	0	0	0	0	0	1	dev		
Arsine	0	0	0	0	0	1	hemato		
Barium Chromat	0	0	0	0	0	1	resp		
Barium cyanid	0	0	0	1	0	2	neuro	thyroic	
Benzene	1	0	0	0	0	1	immune		
Benzidine	0	0	0	0	0	2	liver	neuro	
Benzo[a]pyren	0	0	0	0	0	2	dev	reprod	
Beryllium chloride	0	0	0	0	0	1	resp		
Beryllium compounc	0	0	0	0	0	1	resp		
Beryllium fluoride	0	0	0	0	0	1	resp		
Beryllium nitrate	0	0	0	0	0	1	resp		
Beryllium Oxid	0	0	0	0	0	1	resp		
beta-Hexachlorocyclohexane (b-HCl	0	0	0	0	0	3	liver	reprod	kidney
Bis(2-ethylhexyl)phthala	0	0	0	0	0	2	resp	liver	
Butyl Carbitol Acetat	0	0	0	0	0	1	reprod		
Cadmium acetat	0	0	0	0	0	1	kidney		
Cadmium compounc	0	0	0	0	0	1	kidney		
Cadmium as Cadmium Cyanami	0	0	0	0	0	1	kidney		
Cadmium nitrat	0	0	0	0	0	1	kidney		
Cadmium Oxid	0	0	0	0	0	1	kidney		
Cadmium stearat	0	0	0	0	0	1	kidney		
Calcium Chromate	0	0	0	0	0	1	resp		
Calcium cyanamid	0	0	0	1	0	2	neuro	thyroic	
Calcium cyanide	0	0	0	1	0	2	neuro	thyroic	
CARBITOL ACETATE	0	0	0	0	0	1	reprod		
Carbon disulfide	0	0	0	0	0	1	neuro		
Carbon tetrachloride	0	0	0	0	0	1	liver		
Carbonyl Sulfide	0	0	0	0	0	1	neuro		
Chlordane	0	0	0	0	0	1	liver		
Chlorine	0	0	0	0	0	1	resp		
Chlorobenzene	0	0	0	0	0	3	liver	reprod	kidney
Chloroform	0	0	0	0	0	1	liver		
Chloroprene	0	0	0	0	0	1	resp		
Chromic Acid (VI	0	0	0	0	0	1	resp		
Chromic sulfuric acic	0	0	0	0	0	1	resp		
Chromium (VI) as Lead Chroma	0	0	0	0	0	1	resp		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-mı

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Chromium (VI) as Lead Chromate Oxi	0	0	0	0	0	1	resp		
Chromium (VI) compounc	0	0	0	0	0	1	resp		
Chromium (VI) trioxide, chromic acid mi	0	0	0	0	0	1	resp		
Chromium compounc	0	0	0	0	0	1	resp		
Chromium dioxid	0	0	0	0	0	1	resp		
Cobalt Aluminat	0	0	0	0	0	1	resp		
Cobalt bromid	0	0	0	0	0	1	resp		
Cobalt Carbonat	0	0	0	0	0	1	resp		
Cobalt carbony	0	0	0	0	0	1	resp		
Cobalt Chloride	0	0	0	0	0	1	resp		
Cobalt compound	0	0	0	0	0	1	resp		
Cobalt Hydrocarbon	0	0	0	0	0	1	resp		
Cobalt Naphth	0	0	0	0	0	1	resp		
Cobalt nitrate	0	0	0	0	0	1	resp		
Cobalt Oxid	0	0	0	0	0	1	resp		
Cobalt Oxide (II,II	0	0	0	0	0	1	resp		
Copper Cyanid	0	0	0	1	0	2	neurc	thyroic	
Cresols (mixed	0	0	0	0	1	2	neurc	wholebo	
Cumene	0	0	0	0	0	2	kidney	endoc	
Cyanazine	0	0	0	1	0	2	neurc	thyroic	
Cyanide compounc	0	0	0	1	0	2	neurc	thyroic	
Cyanide as Cadmium Cyanami	0	0	0	1	0	2	neurc	thyroic	
Cyanoger	0	0	0	1	0	2	neurc	thyroic	
Cyanogen bromid	0	0	0	1	0	2	neurc	thyroic	
Cyanogen chlorid	0	0	0	1	0	2	neurc	thyroic	
Cyanogen iodid	0	0	0	1	0	2	neurc	thyroic	
Cyanopho	0	0	0	1	0	2	neurc	thyroic	
Cyanuric fluoride	0	0	0	1	0	2	neurc	thyroic	
Di(ethylene glycol monobutyl ether) phthal	0	0	0	0	0	1	reprod		
Dichlorvos	0	0	0	0	0	1	neurc		
Diesel engine emission	0	0	0	0	0	1	resp		
Diethanolamin	0	0	0	0	0	1	resp		
Diethylene Glycol Dibenzoa	0	0	0	0	0	1	reprod		
DIETHYLENE GLYCOL DIETHYL ETHEI	0	0	0	0	0	1	reprod		
Diethylene Glycol Dimethyl Eth	0	0	0	0	0	1	reprod		
Diethylene Glycol Ethyl Methyl Eth	0	0	0	0	0	1	reprod		
Diethylene glycol monobutyl eth	0	0	0	0	0	1	reprod		
Diethylene glycol monoethyl eth	0	0	0	0	0	1	reprod		
Diethylene Glycol Monomethyl Eth	0	0	0	0	0	1	reprod		
1-Methoxy-2-propan	0	0	0	0	0	1	reprod		
Dimethyl formamid	0	0	0	0	0	1	liver		
Epichlorohydrii	0	0	0	0	0	1	resp		
ETHOXYTRIGLYCOL	0	0	0	0	0	1	reprod		
Ethyl benzen	0	0	0	0	0	1	dev		
Ethyl chloride	0	0	0	0	0	1	dev		
Ethylene cyanohydı	0	0	0	1	0	2	neurc	thyroic	
Ethylene dibromid	0	0	0	0	0	2	resp	reprod	
Ethylene dichlorid	0	0	0	0	0	1	liver		
Ethylene glycc	0	0	0	0	0	1	resp		
Ethylene glycol 2-ethylhexyl eth	0	0	0	0	0	1	reprod		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind -exposure-m
(TOSHI)

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Ethylene glycol butyl eth	0	0	0	0	0	1	reprod		
Ethylene glycol Diethyl Eth	0	0	0	0	0	1	reprod		
Ethylene glycol ethyl eth	0	0	0	0	0	1	reprod		
Ethylene glycol ethyl ether aceta	0	0	0	0	0	1	reprod		
Ethylene glycol methyl eth	0	0	0	0	0	1	reprod		
Ethylene glycol methyl ether acet	0	0	0	0	0	1	reprod		
Ethylene Glycol Mono-Sec-Butyl Eth	0	0	0	0	0	1	reprod		
ETHYLENE GLYCOL MONOVINYL ETHEI	0	0	0	0	0	1	reprod		
Ethylene oxid	0	0	0	0	0	1	neurc		
Ethylene thioure	0	0	0	0	0	1	endoc		
Ethylidene dichlorid	0	0	0	0	0	1	kidney		
Formaldehyd	0	0	0	0	0	1	resp		
GASEOUS DIVALENT MERCURY	0	0	0	0	0	1	neurc		
Glycol Ethers	0	0	0	0	0	1	reprod		
Hexachlorobenzen	0	0	0	0	0	1	liver		
Hexachlorobutadien	0	0	0	0	0	1	reprod		
Hexachlorocyclopentadier	0	0	0	0	0	1	resp		
Hexachlorodibenzo-p-diox	0	0	0	0	0	1	liver		
Hexachloroethan	0	0	0	0	0	3	liver	neurc	kidney
Hexamethylene-1,6-diisocyana	0	0	0	0	0	1	resp		
Hexanoic acid, 2-ethyl-, cobalt(2+) sa	0	0	0	0	0	1	resp		
Hydrazine	0	0	0	1	0	2	liver	thyroic	
Hydrochloric acic	0	0	0	0	0	1	resp		
Hydrofluoric acic	0	1	0	0	0	1	skeleta		
Hydrogen cyanid	0	0	0	1	0	2	neurc	thyroic	
Hydrogen selenid	0	0	0	0	0	3	liver	neurc	hemato
Hydrogen Sulfid	0	0	0	0	0	1	resp		
Isophorone	0	0	0	0	0	2	liver	dev	
Lead (II) Oxid	0	0	0	0	0	2	neurc	dev	
Lead Acetat	0	0	0	0	0	2	neurc	dev	
Lead as Lead Arsena	0	0	0	0	0	2	neurc	dev	
Lead as Lead Chroma	0	0	0	0	0	2	neurc	dev	
Lead as Lead Chromate Oxi	0	0	0	0	0	2	neurc	dev	
Lead chloride	0	0	0	0	0	2	neurc	dev	
Lead compounc	0	0	0	0	0	2	neurc	dev	
Lead Compounds (Other than inorgan	0	0	0	0	0	2	neurc	dev	
Lead Dioxid	0	0	0	0	0	2	neurc	dev	
Lead Nitrate	0	0	0	0	0	2	neurc	dev	
Lead Subacetat	0	0	0	0	0	2	neurc	dev	
Lead Sulfat	0	0	0	0	0	2	neurc	dev	
Lindane (gamma-HCH	0	0	0	0	0	3	liver	reprod	kidney
Maleic anhydrid	0	0	0	0	0	1	resp		
Manganese chloride	0	0	0	0	0	1	neurc		
Manganese compounc	0	0	0	0	0	1	neurc		
Manganese Dioxid	0	0	0	0	0	1	neurc		
Manganese Nitrate	0	0	0	0	0	1	neurc		
Manganese oxid	0	0	0	0	0	1	neurc		
Manganese Sulfat	0	0	0	0	0	1	neurc		
Manganese Tetroxid	0	0	0	0	0	1	neurc		
Manganese tricarbonyl (.eta.5-2,4-cyclopentadien-1-	0	0	0	0	0	1	neurc		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-m

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Manganese Trioxid	0	0	0	0	0	1	neurc		
m-Cresol (3-methylpheno	0	0	0	0	1	2	neurc	wholebo	
MERCURIC ACETATE	0	0	0	0	0	1	neurc		
Mercuric chloride	0	0	0	0	0	1	neurc		
MERCURIC NITRATE	0	0	0	0	0	1	neurc		
MERCURIC OXIDE	0	0	0	0	0	1	neurc		
Mercury (elemental	0	0	0	0	0	1	neurc		
Mercury (organic)	0	0	0	0	0	1	neurc		
Mercury compound	0	0	0	0	0	1	neurc		
Methano	0	0	0	0	0	1	dev		
Methoxychlo	0	0	0	0	0	0	#N/A		
Methoxyethylmercuric aceta	0	0	0	0	0	1	neurc		
Methoxytriglycc	0	0	0	0	0	1	reprod		
Methyl bromid	0	0	0	0	0	1	resp		
Methyl cellosolve acryla	0	0	0	0	0	1	reprod		
Methyl chloride	0	0	0	0	0	1	neurc		
Methyl ethyl ketor	0	0	0	0	0	1	dev		
Methyl isobutyl ketor	0	0	0	0	0	1	dev		
Methyl isocyanat	0	0	0	0	1	2	resp	wholebo	
Methyl mercury	0	0	0	0	0	1	neurc		
Methyl methacrylat	0	0	0	0	0	1	resp		
Methyl tert-butyl ethe	0	0	0	0	0	3	liver	kidney	ocular
Methylene chlorid	0	0	0	0	0	2	resp	liver	
Methylene diphenyl diisocyan	0	0	0	0	0	1	resp		
Methylmercuric dicyanamic	0	0	0	0	0	1	neurc		
m-Xylene	0	0	0	0	0	1	neurc		
Naphthalene	0	0	0	0	0	1	resp		
n-Hexane	0	0	0	0	0	1	neurc		
N-Hexyl Carbito	0	0	0	0	0	1	reprod		
Nickel (II) Sulfate Hexahydra	1	0	0	0	0	2	resp	immune	
Nickel Acetate	1	0	0	0	0	2	resp	immune	
Nickel carbony	1	0	0	0	0	2	resp	immune	
Nickel chloride	1	0	0	0	0	2	resp	immune	
Nickel compound	1	0	0	0	0	2	resp	immune	
Nickel nitrate	1	0	0	0	0	2	resp	immune	
Nickel oxide	0	0	0	0	0	1	resp		
Nickel subsulfide	1	0	0	0	0	2	resp	immune	
Nickel sulfamate	1	0	0	0	0	2	resp	immune	
Nickel sulfate	1	0	0	0	0	2	resp	immune	
Nitrobenzene	0	0	0	0	0	1	resp		
o-Cresol	0	0	0	0	1	2	neurc	wholebo	
o-Xylene	0	0	0	0	0	1	neurc		
PARTICULATE DIVALENT MERCURY	0	0	0	0	0	1	neurc		
p-Cresol (4-methy pheno	0	0	0	0	1	2	neurc	wholebo	
p-Dichlorobenzene	0	0	0	0	0	1	liver		
Pentachlorophenc	0	0	0	0	0	2	liver	kidney	
Pheno	0	0	0	0	0	1	liver		
Phenyl Cellosolv	0	0	0	0	0	1	reprod		
Phenylmercuric acetat	0	0	0	0	0	1	neurc		
Phosgene	0	0	0	0	0	1	resp		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-mı

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Phosphine	0	0	0	0	1	1	wholebod		
Phthalic anhydrid	0	0	0	0	0	2	resp	ocular	
Potassium Chromat	0	0	0	0	0	1	resp		
Potassium cyanid	0	0	0	1	0	2	neurc	thyroic	
Potassium Dichromat	0	0	0	0	0	1	resp		
Potassium selenat	0	0	0	0	0	3	liver	neurc	hematc
Potassium silver cyanic	0	0	0	1	0	2	neurc	thyroic	
Potassium thiocyana	0	0	0	1	0	2	neurc	thyroic	
Propionaldehyd	0	0	0	0	0	1	resp		
Propyl Cellosolv	0	0	0	0	0	1	reprod		
Propylene dichlorid	0	0	0	0	0	1	resp		
Propylene oxid	0	0	0	0	0	1	resp		
p-Xylene	0	0	0	0	0	1	neurc		
Selenious aci	0	0	0	0	0	3	liver	neurc	hematc
Selenium compounc	0	0	0	0	0	3	liver	neurc	hematc
Selenium Dioxid	0	0	0	0	0	3	liver	neurc	hematc
Selenium Disulfide	0	0	0	0	0	3	liver	neurc	hematc
Selenium Hexafluorid	0	0	0	0	0	3	liver	neurc	hematc
Selenium Oxid	0	0	0	0	0	3	liver	neurc	hematc
Selenium Oxychloric	0	0	0	0	0	3	liver	neurc	hematc
Selenium Sulfid	0	0	0	0	0	3	liver	neurc	hematc
Selenourea	0	0	0	0	0	3	liver	neurc	hematc
Silver cyanide	0	0	0	1	0	2	neurc	thyroic	
Sodium Chromat	0	0	0	0	0	1	resp		
Sodium cyanid	0	0	0	1	0	2	neurc	thyroic	
Sodium Dichromat	0	0	0	0	0	1	resp		
Sodium selenat	0	0	0	0	0	3	liver	neurc	hematc
Sodium selenit	0	0	0	0	0	3	liver	neurc	hematc
Strontium Chromat	0	0	0	0	0	1	resp		
Styrene	0	0	0	0	0	1	neurc		
Styrene oxid	0	0	0	0	0	1	resp		
Tetrachloroethene	0	0	0	0	0	1	neurc		
Tetraethyl lea	0	0	0	0	0	2	neurc	dev	
Tetramethyl lea	0	0	0	0	0	2	neurc	dev	
Thiocyanic acid, 2-(benzothiazolylthio) methyl	0	0	0	1	0	2	neurc	thyroic	
Thiocyanate	0	0	0	1	0	2	neurc	thyroic	
Titanium tetrachloride	0	0	0	0	0	1	resp		
Toluene	0	0	0	0	0	1	neurc		
Trichloroethylene	1	0	0	0	0	6	liver	neurc	dev
Triethylamine	0	0	0	0	0	1	resp		
Triethylene glycol dimethyl eth	0	0	0	0	0	1	reprod		
Triglycol monobutyl ethe	0	0	0	0	0	1	reprod		
Uranium	0	0	0	0	0	1	kidney		
Uranium Compound	0	0	0	0	0	2	resp	kidney	
Vinyl acetate	0	0	0	0	0	1	resp		
Vinyl bromide	0	0	0	0	0	1	liver		
Vinyl chloride	0	0	0	0	0	1	liver		
Vinylidene chlorid	0	0	0	0	0	1	liver		
Xylenes (mixec	0	0	0	0	0	1	neurc		
Zinc Chromate	0	0	0	0	0	1	resp		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI) ı-exposure-m

pollutant	immune	skeletal	spleen	thyroid	wholebod	# of Target Organs	Endpt 1	Endpt 2	Endpt 3
Zinc Cyanide	0	0	0	1	0	2	neurc	thyroic	
Zinc Potassium Chromat	0	0	0	0	0	1	resp		

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
(ETHYLENEBIS(OXYETHYLENENITRILO)) TETRAACETIC ACII			
1,1,1-Trichloroethan			
1,1,2-Trichloroethan			
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dio			
1,2,3,4,6,7,8,9-Octachlorodibenzofur			
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dio			
1,2,3,4,6,7,8-Heptachlorodibenzofur			
1,2,3,4,7,8,9-Heptachlorodibenzofur			
1,2,3,4,7,8-Hexachlorodibenzo-p-dio:			
1,2,3,4,7,8-Hexachlorodibenzofur			
1,2,3,6,7,8-Hexachlorodibenzo-p-dio:			
1,2,3,6,7,8-Hexachlorodibenzofur			
1,2,3,7,8,9-Hexachlorodibenzo-p-dio:			
1,2,3,7,8,9-Hexachlorodibenzofur			
1,2,3,7,8-Pentachlorodibenzo-p-dio:			
1,2,3,7,8-Pentachlorodibenzofur			
1,2,4-Trichlorobenzen			
1,2-Dibromo-3-chloropropan			
1,2-Dimethoxyethar			
1,2-Epoxybutar			
1,3-Butadien			
1,3-dichloropropen			
1,4-Dioxan			
2-(Hexyloxy)Ethan			
2,3,4,6,7,8-Hexachlorodibenzofur			
2,3,4,7,8-Pentachlorodibenzofur			
2,3,7,8-Tetrachlorodibenzo-p-diox			
2,3,7,8-Tetrachlorodibenzofur			
2,4/2,6-Toluene diisocyanate mixture (TI			
2,4-Dinitrotoluen			
2,4-Toluene diisocyana			
2-Butoxyethyl Aceta			
2-Chloroacetophenon			
2-Methyl-Propanenitril			
2-Nitropropane			
2-Propoxyethyl aceta			
3-Methoxy-1-Propan			
4,4'-Methylenedianilin			
Acetaldehyd			
Acetone Cyanohydr			
Acetonitrile			
Acrolein			
Acrylamide			
Acrylic acic			
Acrylonitrile			
Allyl chloride			
alpha-Hexachlorocyclohexane (a-HCI			
Ammonium chroma			
Ammonium dichroma			
Aniline			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Antimony compounc			
Antimony oxic			
Antimony pentafluoric			
Antimony pentoxic			
Antimony potassium tartra			
Antimony tetroxic			
Antimony trihydrid			
Antimony trioxid			
Arsenic acic			
Arsenic as Lead Arsenat			
Arsenic chloride			
Arsenic compound			
Arsenic oxide			
Arsenic pentoxid			
Arsenic trioxide			
Arsine			
Barium Chromate			
Barium cyanid			
Benzene			
Benzidine			
Benzo[a]pyren			
Beryllium chloride			
Beryllium compounc			
Beryllium fluoride			
Beryllium nitrate			
Beryllium Oxid			
beta-Hexachlorocyclohexane (b-HCI			
Bis(2-ethylhexyl)phthala			
Butyl Carbitol Acetat			
Cadmium acetat			
Cadmium compounc			
Cadmium as Cadmium Cyanami			
Cadmium nitrate			
Cadmium Oxid			
Cadmium stearat			
Calcium Chromate			
Calcium cyanamid			
Calcium cyanide			
CARBITOL ACETATE			
Carbon disulfide			
Carbon tetrachloride			
Carbonyl Sulfide			
Chlordane			
Chlorine			
Chlorobenzene			
Chloroform			
Chloroprene			
Chromic Acid (VI			
Chromic sulfuric acic			
Chromium (VI) as Lead Chroma			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Chromium (VI) as Lead Chromate Oxi			
Chromium (VI) compounc			
Chromium (VI) trioxide, chromic acid mi			
Chromium compounc			
Chromium dioxid			
Cobalt Aluminat			
Cobalt bromid			
Cobalt Carbonat			
Cobalt carbony			
Cobalt Chloride			
Cobalt compound			
Cobalt Hydrocarbony			
Cobalt Naphtha			
Cobalt nitrate			
Cobalt Oxide			
Cobalt Oxide (II,III			
Copper Cyanide			
Cresols (mixed			
Cumene			
Cyanazine			
Cyanide compounc			
Cyanide as Cadmium Cyanami			
Cyanoger			
Cyanogen bromid			
Cyanogen chloride			
Cyanogen iodid			
Cyanopho:			
Cyanuric fluoride			
Di(ethylene glycol monobutyl ether) phthal			
Dichlorvos			
Diesel engine emission:			
Diethanolamine			
Diethylene Glycol Dibenzoa			
DIETHYLENE GLYCOL DIETHYL ETHEI			
Diethylene Glycol Dimethyl Eth			
Diethylene Glycol Ethyl Methyl Etl			
Diethylene glycol monobutyl etl			
Diethylene glycol monoethyl etl			
Diethylene Glycol Monomethyl Etl			
1-Methoxy-2-propan			
Dimethyl formamid			
Epichlorohydrii			
ETHOXYTRIGLYCOL			
Ethyl benzen			
Ethyl chloride			
Ethylene cyanohydr			
Ethylene dibromid			
Ethylene dichlorid			
Ethylene glycc			
Ethylene glycol 2-ethylhexyl eth			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind
(TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Ethylene glycol butyl eth			
Ethylene glycol Diethyl Eth			
Ethylene glycol ethyl eth			
Ethylene glycol ethyl ether aceta			
Ethylene glycol methyl eth			
Ethylene glycol methyl ether acet			
Ethylene Glycol Mono-Sec-Butyl Eth			
ETHYLENE GLYCOL MONOVINYL ETHE			
Ethylene oxid			
Ethylene thioure			
Ethylidene dichlorid			
Formaldehyd			
GASEOUS DIVALENT MERCURY			
Glycol Ethers			
Hexachlorobenzen			
Hexachlorobutadien			
Hexachlorocyclopentadier			
Hexachlorodibenzo-p-diox			
Hexachloroethan			
Hexamethylene-1,6-diisocyana			
Hexanoic acid, 2-ethyl-, cobalt(2+) sa			
Hydrazine			
Hydrochloric acid			
Hydrofluoric acid			
Hydrogen cyanid			
Hydrogen selenide			
Hydrogen Sulfide			
Isophorone			
Lead (II) Oxide			
Lead Acetat			
Lead as Lead Arsena			
Lead as Lead Chroma			
Lead as Lead Chromate Oxi			
Lead chloride			
Lead compounc			
Lead Compounds (Other than inorgan			
Lead Dioxide			
Lead Nitrate			
Lead Subacetat			
Lead Sulfate			
Lindane (gamma-HCH			
Maleic anhydride			
Manganese chloride			
Manganese compounc			
Manganese Dioxide			
Manganese Nitrate			
Manganese oxid			
Manganese Sulfate			
Manganese Tetroxid			
Manganese tricarbonyl (.eta.5-2,4-cyclopentadien-1-			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Manganese Trioxide			
m-Cresol (3-methylpheno			
MERCURIC ACETATE			
Mercuric chloride			
MERCURIC NITRATE			
MERCURIC OXIDE			
Mercury (elemental			
Mercury (organic)			
Mercury compound			
Methano			
Methoxychlo			
Methoxyethylmercuric aceta			
Methoxytriglycc			
Methyl bromide			
Methyl cellosolve acryla			
Methyl chloride			
Methyl ethyl ketor			
Methyl isobutyl ketor			
Methyl isocyanat			
Methyl mercury			
Methyl methacrylat			
Methyl tert-butyl ethe			
Methylene chlorid			
Methylene diphenyl diisocyana			
Methylmercuric dicyanamic			
m-Xylene			
Naphthalene			
n-Hexane			
N-Hexyl Carbito			
Nickel (II) Sulfate Hexahydra			
Nickel Acetate			
Nickel carbony			
Nickel chloride			
Nickel compound			
Nickel nitrate			
Nickel oxide			
Nickel subsulfide			
Nickel sulfamate			
Nickel sulfate			
Nitrobenzene			
o-Cresol			
o-Xylene			
PARTICULATE DIVALENT MERCURY			
p-Cresol (4-methy pheno			
p-Dichlorobenzene			
Pentachloropheno			
Pheno			
Phenyl Cellosolv			
Phenylmercuric acetal			
Phosgene			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind (TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Phosphine			
Phthalic anhydrid			
Potassium Chromat			
Potassium cyanid			
Potassium Dichromat			
Potassium selenat			
Potassium silver cyanic			
Potassium thiocyana			
Propionaldehyd			
Propyl Cellosolv			
Propylene dichlorid			
Propylene oxid			
p-Xylene			
Selenious aci			
Selenium compounc			
Selenium Dioxid			
Selenium Disulfide			
Selenium Hexafluorid			
Selenium Oxid			
Selenium Oxychloric			
Selenium Sulfid			
Selenourea			
Silver cyanid			
Sodium Chromat			
Sodium cyanid			
Sodium Dichromat			
Sodium selenat			
Sodium selenit			
Strontium Chromat			
Styrene			
Styrene oxid			
Tetrachloroethene			
Tetraethyl lea			
Tetramethyl lea			
Thiocyanic acid, 2-(benzothiazolylthio) methyl			
Thiocyanate			
Titanium tetrachloride			
Toluene			
Trichloroethylene	reprod	kidney	immune
Triethylamine			
Triethylene glycol dimethyl eth			
Triglycol monobutyl ethe			
Uranium			
Uranium Compound			
Vinyl acetate			
Vinyl bromide			
Vinyl chloride			
Vinylidene chlorid			
Xylenes (mixec			
Zinc Chromate			

Target Organ Endpoints to Calculate Target Organ-Specific Hazard Ind
(TOSHI)

pollutant	Endpt 4	Endpt 5	Endpt 6
Zinc Cyanide			
Zinc Potassium Chromat			

Site-specific
Resident Equation Inputs for Air

*** Inputted values different from Resident defaults are highlighted.**

Variable	Resident Air Default Value	Form-input Value
ED_{res} (exposure duration) years	26	2.1
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	0.1
ED_{6-16} (mutagenic exposure duration third phase) years	10	0
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	0
EF_{res} (exposure frequency) days/year	350	365
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	365
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	365
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	365
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	365
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Output generated 06FEB2020:08:52:58

Site-specific
Resident Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR $(ug/m^3)^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m ^{3})	Screening Level (ug or fibers/m ^{3})
Amino-4-chlorobenzotrifluoride, 3-	121-50-6	No	Yes	Organics	-		-		-	-	
Benzene	71-43-2	No	Yes	Organics	7.80E-06	I	8.00E-02	P /Subchronic	4.27E+00	8.00E+01	4.27E+00 ca*
Bromo-2-chloroethane, 1-	107-04-0	No	Yes	Organics	6.00E-04	X	-		5.56E-02	-	5.56E-02 ca
Bromo-3-fluorobenzene, 1-	1073-06-9	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Bromo-4-Ethylbenzene, 1-	1585-07-5	No	Yes	Organics	-		-		-	-	
Bromo-4-fluorobenzene, 1-	460-00-4	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Bromoacetophenone, 3-	2142-63-4	No	No	Organics	-		-		-	-	
Bromopyridine, 2-	109-04-6	No	No	Organics	-		-		-	-	
Chlorobenzene	108-90-7	No	Yes	Organics	-		5.00E-01	P /Subchronic	-	5.00E+02	5.00E+02 nc
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	No	Yes	Organics	-		-		-	-	
Chlorobenzotrifluoride, 4-	98-56-6	No	Yes	Organics	-		3.00E+00	P /Subchronic	-	3.00E+03	3.00E+03 nc
Cumene	98-82-8	No	Yes	Organics	-		9.00E-02	H /Subchronic	-	9.00E+01	9.00E+01 nc
Cyclohexane	110-82-7	No	Yes	Organics	-		1.80E+01	P /Subchronic	-	1.80E+04	1.80E+04 nc
Dibromo-3-chloropropane, 1,2-	96-12-8	Yes	Yes	Organics	6.00E-03	P	2.00E-03	P /Subchronic	5.75E-04	2.00E+00	5.75E-04 ca
Dibromobenzene, 1,3-	108-36-1	No	Yes	Organics	-		-		-	-	
Dibromobenzene, 1,4-	106-37-6	No	Yes	Organics	-		-		-	-	
Dibromoethane, 1,2-	106-93-4	No	Yes	Organics	6.00E-04	I	2.00E-03	H /Subchronic	5.56E-02	2.00E+00	5.56E-02 ca*
Dichlorobenzotrifluoride, 3,4-	328-84-7	No	Yes	Organics	-		-		-	-	
Dichloroethane, 1,1-	75-34-3	No	Yes	Organics	1.60E-06	C	-		2.08E+01	-	2.08E+01 ca
Dichloroethane, 1,2-	107-06-2	No	Yes	Organics	2.60E-05	I	7.00E-02	P /Subchronic	1.28E+00	7.00E+01	1.28E+00 ca*

Site-specific
Resident Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)	Screening Level (ug or fibers/m^3)
Dichloroethylene, 1,1-	75-35-4	No	Yes	Organics	-		7.93E-02	A /Subchronic	-	7.93E+01	7.93E+01 nc
Dichloroethylene, 1,2-trans-	156-60-5	No	Yes	Organics	-		7.93E-01	A /Subchronic	-	7.93E+02	7.93E+02 nc
Dichloropropene, cis-1,3-	10061-01-5	No	Yes	Organics	-		-		-	-	
Dichloropropene, trans-1,3-	10061-02-6	No	Yes	Organics	-		-		-	-	
Ethylbenzene	100-41-4	No	Yes	Organics	2.50E-06	C	9.00E+00	P /Subchronic	1.33E+01	9.00E+03	1.33E+01 ca
Fluorobenzene	462-06-6	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Methyl Ethyl Ketone (2-Butanone)	78-93-3	No	Yes	Organics	-		1.00E+00	H /Subchronic	-	1.00E+03	1.00E+03 nc
Methylcyclohexane	108-87-2	No	Yes	Organics	-		-		-	-	
Methylene Chloride	75-09-2	Yes	Yes	Organics	1.00E-08	I	1.04E+00	A /Subchronic	3.45E+02	1.04E+03	3.45E+02 ca**
Styrene	100-42-5	No	Yes	Organics	-		3.00E+00	H /Subchronic	-	3.00E+03	3.00E+03 nc
Tetrachloroethylene	127-18-4	No	Yes	Organics	2.60E-07	I	4.07E-02	A /Subchronic	1.28E+02	4.07E+01	4.07E+01 nc
Toluene	108-88-3	No	Yes	Organics	-		5.00E+00	P /Subchronic	-	5.00E+03	5.00E+03 nc
Trichloroethane, 1,1,1-	71-55-6	No	Yes	Organics	-		5.00E+00	I /Subchronic	-	5.00E+03	5.00E+03 nc
Trichloroethylene	79-01-6	Yes	Yes	Organics	4.10E-06	I	2.15E-03	A /Subchronic	2.61E+00	2.15E+00	2.15E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	Organics	4.40E-06	I	7.67E-02	A /Subchronic	2.21E-01	7.67E+01	2.21E-01 ca
Xylene, m-	108-38-3	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylene, o-	95-47-6	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylene, p-	106-42-3	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylenes	1330-20-7	No	Yes	Organics	-		4.00E-01	P /Subchronic	-	4.00E+02	4.00E+02 nc

Inhalation Unit Risk Toxicity Metadata

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Benzene	71-43-2	Organics	7.80E-06	IRIS	Known/likely human carcinogen	Leukemia	Blood	Human
Bromo-2-chloroethane, 1-	107-04-0	Organics	6.00E-04	PPRTV SCREEN	UN	Nasal cavity (includes adenoma, adenocarcinoma, papillary adenoma, squamous cell carcinoma, and or/papilloma), hemangiosarcomas, mesotheliomasy	Reproductive, Other, Respiratory	Rat
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics						
Bromo-4-fluorobenzene, 1-	460-00-4	Organics						
Chlorobenzene	108-90-7	Organics						
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics						
Chlorobenzotrifluoride, 4-	98-56-6	Organics						
Cumene	98-82-8	Organics						
Cyclohexane	110-82-7	Organics						

Inhalation Unit Risk Toxicity Metadata

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
Low-dose linearity utilizing maximum likelihood estimates	NA	NA	Rinsky et al. 1981, 1987, Paustenbach et al. 1993, Crump and Allen 1984, Crump 1992, 1994, U.S. EPA 1998
NA	Inhalation	6 hours/day, 5 days/week, 103 weeks	NTP 1982

Inhalation Unit Risk Toxicity Metadata

Inhalation Unit Risk Notes
NA
NA

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	6.00E-03	PPRTV	LI	Tumors	Nasal	Rat
Dibromobenzene, 1,3-	108-36-1	Organics						
Dibromobenzene, 1,4-	106-37-6	Organics						
Dibromoethane, 1,2-	106-93-4	Organics	6.00E-04	IRIS	Likely to be carcinogenic to humans	adenoma, adenocarcinoma, papillary adenoma, squamous cell carcinoma, and or/papilloma; hemangiosarcomas, mesotheliomas	Nasal cavity	Rat
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics						
Dichloroethane, 1,1-	75-34-3	Organics	1.60E-06	Cal EPA	C	NA	NA	NA
Dichloroethane, 1,2-	107-06-2	Organics	2.60E-05	IRIS	B2	Hemangioscarcomas	Blood	Rat
Dichloroethylene, 1,1-	75-35-4	Organics						

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
NA	Inhalation	105-107, 103, or 84 weeks	NTP 1982
Multistage-Weibull model; linear extrapolation from lower 95% confidence limit on dose associated with extra risk (adjusted for background) at point of departure at lower end of data range.	NA	NA	NTP 1982
NA	NA	NA	NA
Linearized multistage procedure, extra risk	NA	NA	NCI 1978

Inhalation Unit Risk Notes
Based on the BMC10. For chemicals that have been determined to be carcinogenic by a mutagenic mode of action, sample calculations for estimation of risk are supplied in the Supplementary Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, March, 2005, especially Example 2 which presents a sample calculation for a total lifetime exposure (0-70 years). Both the exposure and the increased potency in early life exposures must be utilized by the risk assessor in the field to determine risk. For inhalation; (IUR), Risk = IUR x ADAF x Exposure Concentration x Duration Factor , which is independent of intake rates and body weights, the ADAFs are applied according to the exposure concentration (e.g. mg chemical/cubic meter) and duration factor in each age category, viz. 0<2 years, 2<16 years using a 10 fold and 3 fold factor, respectively, times the IUR , and greater than 16 years with no additional factor, taking into account the time of exposure relative to a 70 year lifetime. For example an exposure in the 0-2 year category, would be calculated as (exposure concentration x 10 x 2/70 years x IUR); for the 2-16 years (exposure concentration x 3 x 13/70 years x IUR), and finally for greater than 16 years (exposure concentration x 1 x 55/70 x IUR). Exposure concentrations must be determined for each life stage. The lifetime risk is the sum of the individual risks at each life stage. If the exposure concentrations are the same at each life stage, the lifetime risk would be; Exposure Concentration x 1.6 x IUR, i.e. a 60% greater susceptibility from a whole life exposure (from birth.)
NA
NA
NA

Inhalation Unit Risk Toxicity Metadata

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Dichloroethylene, 1,2-trans-	156-60-5	Organics						
Ethylbenzene	100-41-4	Organics	2.50E-06	Cal EPA	D	NA	NA	NA
Fluorobenzene	462-06-6	Organics						
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics						
Methylcyclohexane	108-87-2	Organics						
Methylene Chloride	75-09-2	Organics	1.00E-08	IRIS	likely to be carcinogenic in humans	Hepatocellular carcinomas or adenomas, bronchoalveolar carcinomas or adenomas	Liver	male B6C3F1 mice
Styrene	100-42-5	Organics						
Tetrachloroethylene	127-18-4	Organics	2.60E-07	IRIS	likely to be carcinogenic in humans by all routes of exposure	Hepatocellular adenomas or carcinomas	liver	mouse
Toluene	108-88-3	Organics						
Trichloroethane, 1,1,1-	71-55-6	Organics						
Trichloroethylene	79-01-6	Organics	4.10E-06	IRIS	carcinogenic to humans	Renal cell carcinoma, non-Hodgkin's lymphoma, and liver tumors	Kidney, Liver	human
Vinyl Chloride	75-01-4	Organics	4.40E-06	IRIS	Known/likely human carcinogen	Liver angiosarcomas, angiomas, hepatomas, and neoplastic nodules	Liver	Rat
Xylene, m-	108-38-3	Organics						
Xylene, o-	95-47-6	Organics						
Xylene, p-	106-42-3	Organics						
Xylenes	1330-20-7	Organics						

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
NA	NA	NA	NA
Multistage model with linear extrapolation from the point of departure (BMDL10)	NA	NA	Mennear et al. 1988 and NTP 1986
Multistage model with linear extrapolation from the point of departure (BMCL10), followed by extrapolation to humans using the PBPK model of Chiu and Ginsberg (2011)	NA	NA	JISA 1993
LEC01	NA	NA	Charbotel et al. 2006, EPA 2011, Raaschou-Nielsen et al. 2003
LED 10/ linear method	NA	NA	Maltoni et al. 1981, Maltoni et al. 1984

Inhalation Unit Risk Notes
NA
NA
NA
NA
NA

Chemical	CASNUM	Chemical Type	Oral Slope Factor (mg/kg-day) $^{-1}$	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species
Benzene	71-43-2	Organics	5.50E-02	IRIS	Known/likely human carcinogen	Leukemia	Blood	Human
Bromo-2-chloroethane, 1-	107-04-0	Organics	2.00E+00	PPRTV SCREEN	UN	Forestomach tumors, hemangiosarcomas, thyroid follicular cell adenomas or carcinomas	Gastrointestinal, Endocrine	Rat
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics						
Bromo-4-fluorobenzene, 1-	460-00-4	Organics						
Chlorobenzene	108-90-7	Organics						
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics						
Chlorobenzotrifluoride, 4-	98-56-6	Organics						
Cumene	98-82-8	Organics						
Cyclohexane	110-82-7	Organics						
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	8.00E-01	PPRTV	LI	Renal tubular cell adenoma or carcinoma	Kidney	Rat
Dibromobenzene, 1,3-	108-36-1	Organics						
Dibromobenzene, 1,4-	106-37-6	Organics						
Dibromoethane, 1,2-	106-93-4	Organics	2.00E+00	IRIS	Likely to be carcinogenic to humans	Forestomach tumors, hemangiosarcomas, thyroid follicular cell adenomas or carcinomas	Forestomach and thyroid	Rat
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics						
Dichloroethane, 1,1-	75-34-3	Organics	5.70E-03	Cal EPA	C	NA	NA	NA
Dichloroethane, 1,2-	107-06-2	Organics	9.10E-02	IRIS	B2	Hemangiosarcomas	Blood	Rat
Dichloroethylene, 1,1-	75-35-4	Organics						

Oral Slope Factor Toxicity Metadata

Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference
Linear extrapolation of human occupational data	NA	NA	Rinsky et al. 1981, Rinsky et al. 1987, Paustenbach et al. 1993, Crump 1994, U. S. EPA 1998, U.S. EPA 1999
NA	Oral: gavage	104 weeks	NCI 1978
NA	Oral: diet	104 weeks	Hazelton Laboratories 1977
Multistage model with Poly-3 adjusted incidence data; linear extrapolation from lower 95% confidence limit on dose associated with extra risk (adjusted for background) at point of departure at lower end of data range.	NA	NA	NCI 1978
NA	NA	NA	NA
Linearized multistage procedure with time-to-death analysis, extra risk	NA	NA	NCI 1978

Oral Slope Factor Notes
NA
NA
For chemicals that have been determined to be carcinogenic by a mutagenic mode of action, sample calculations for estimation of risk are supplied in the Supplementary Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, March, 2005, especially Example 2, which presents a sample calculation for a total lifetime exposure (0-70 years). Both the exposure and the increased potency in early life exposures must be utilized by the risk assessor in the field to determine risk. For oral exposure (OSF), the dose (Dose= Intake Rate x Concentration in media / Body Weight; e.g. mg/kg-day; Risk = Dose x ADAF x Duration factor x OSF) must be calculated for each age bracket (0-<2, 2-<16, and 16-70 years). The dose for each life stage is utilized to determine risk as indicated above using the appropriate ADAF (10, 3, 1), and duration factor (2/70, 13/70 and 55/70). The Exposure Factors Handbook indicates that the average weight for human male and female in the age bracket of 0-<2 is 7.6 Kg, for 2-<16 is 36.4 Kg and for 16-70 is 70Kg. Intake rates for each life stage and concentrations in the media must be determined by the risk assessor in the field.
NA
NA
NA

Chemical	CASNUM	Chemical Type	Oral Slope Factor (mg/kg-day) -1	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species
Dichloroethylene, 1,2-trans-	156-60-5	Organics						
Ethylbenzene	100-41-4	Organics	1.10E-02	Cal EPA	D	NA	NA	NA
Fluorobenzene	462-06-6	Organics						
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics						
Methylcyclohexane	108-87-2	Organics						
Methylene Chloride	75-09-2	Organics	2.00E-03	IRIS	likely to be carcinogenic in humans	Hepatocellular carcinomas or adenomas	Liver	male B6C3F1 mice
Styrene	100-42-5	Organics						
Tetrachloroethylene	127-18-4	Organics	2.10E-03	IRIS	likely to be carcinogenic in humans by all routes of exposure	Hepatocellular adenomas or carcinomas	Liver	mouse
Toluene	108-88-3	Organics						
Trichloroethane, 1,1,1-	71-55-6	Organics						
Trichloroethylene	79-01-6	Organics	4.60E-02	IRIS	carcinogenic to humans	Derived from IUR	Derived from IUR	Derived from IUR
Vinyl Chloride	75-01-4	Organics	7.20E-01	IRIS	Known/likely human carcinogen	Total of liver angiosarcoma, hepatocellular carcinoma, and neoplastic nodules	Liver	Rat
Xylene, m-	108-38-3	Organics						
Xylene, o-	95-47-6	Organics						
Xylene, p-	106-42-3	Organics						
Xylenes	1330-20-7	Organics						

Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference
NA	NA	NA	NA
Multistage model with linear extrapolation from the point of departure (BMDL10)	NA	NA	Serota et al. 1986
Multistage model with linear extrapolation from the point of departure (BMDL10), followed by route-to-route extrapolation to the oral route and interspecies extrapolation using the PBPK model of Chiu and Ginsberg (2011)	NA	NA	JISA 1993
Derived from IUR	NA	NA	Derived from IUR
LMS method	NA	NA	Feron et al. 1981

Oral Slope Factor Notes
NA
NA
NA
NA
NA

Chemical	CASNUM	Chemical Type	Subchronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Subchronic Reference Dose Basis	Oral Subchronic Reference Dose Confidence Level
Benzene	71-43-2	Organics	0.01	PPRTV	BMDL: 1.2 mg/kg-day	Medium
Bromo-2-chloroethane, 1-	107-04-0	Organics	-			
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics	0.003	PPRTV SCREEN	NOAEL-HED: 1 mg/kg-day	NA
Bromo-4-fluorobenzene, 1-	460-00-4	Organics	0.003	PPRTV SCREEN	NOAEL-HED: 1 mg/kg-day	NA
Chlorobenzene	108-90-7	Organics	0.07	PPRTV	NOAEL: 19.6 mg/kg/day	Medium
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics	0.0001	PPRTV SCREEN	LOAEL: 1 mg/kg-day	NA
Chlorobenzotrifluoride, 4-	98-56-6	Organics	0.03	PPRTV	BMDL: 8.8 mg/kg-day	Medium
Cumene	98-82-8	Organics	0.4	HEAST	NOAEL: 154 mg/kg/day	NA
Cyclohexane	110-82-7	Organics	-			
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	0.002	PPRTV	NOAEL: .7 mg/kg-day	Medium
Dibromobenzene, 1,3-	108-36-1	Organics	0.004	PPRTV SCREEN	NOAEL: 1.2 mg/kg-day	NA
Dibromobenzene, 1,4-	106-37-6	Organics	0.1	HEAST	NOAEL: 10 mg/kg/day	NA
Dibromoethane, 1,2-	106-93-4	Organics	-			
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics	0.05	PPRTV SCREEN	NOAEL: 14.4 mg/kg-day	NA
Dichloroethane, 1,1-	75-34-3	Organics	2	PPRTV	NOAEL: 714.3 mg/kg-day	Low
Dichloroethane, 1,2-	107-06-2	Organics	0.02	PPRTV	LOAEL: 58 mg/kg-day	Medium
Dichloroethylene, 1,1-	75-35-4	Organics	0.009	HEAST	LOAEL: 9 mg/kg/day	NA
Dichloroethylene, 1,2-trans-	156-60-5	Organics	0.2	ATSDR	NOAEL: 17 mg/kg-day	NA

Oral Subchronic Reference Dose Critical Effect	Oral Subchronic Reference Dose Target Organ	Oral Subchronic Reference Dose Modifying Factor	Oral Subchronic Reference Dose Uncertainty Factor	Oral Subchronic Reference Dose Species
Decreased lymphocyte count	Blood	NA	100	Human
Increased relative liver weight (liver:body weight ratio) and hepatic microsomal enzyme induction for surrogate POD	Liver	NA	300	Rat
Increased relative liver weight (liver:body weight ratio) and hepatic microsomal enzyme induction for surrogate POD	Liver	NA	300	Rat
Slight bile duct proliferation, slight swelling and vacuolation and leukocytic infiltration; Swelling of tubular epithelium and variations in cellularity	Liver; Kidney	NA	300	Dog
Decreased relative brain weight; Increased triglycerides	CNS; Whole body	NA	10000	Rat
Increased cholesterol and triglycerides	Liver	NA	300	Rat
Increased weight	Kidney	NA	300	Rat
Testicular effects	Testicle	NA	300	Rabbit
Increased relative liver weight and hepatic microsomal enzyme induction	Liver	NA	300	Rat
Increased relative weight; Altered enzyme activities	Liver; Liver	NA	100	Rat
Lesions	Kidney	NA	300	Rat
Renal injury	Kidney	NA	300	Rat
Greater than 10 percent increase in relative kidney weight	Kidney	NA	3000	Rat
Lesions	Liver	NA	1000	Rat
Increased serum alkaline phosphatase and increase in relative liver weight	Hepatic	NA	100	Mouse

Oral Subchronic Reference Dose Route	Oral Subchronic Reference Dose Study Duration	Oral Subchronic Reference Dose Study Reference	Oral Subchronic Reference Dose Notes
Occupational Inhalation study	NA	Rothman et al. 1996	Based on the same principal study as the chronic RfD in IRIS.
Oral	90 days	Carlson and Tardiff 1977	NA
Oral	90 days	Carlson and Tardiff 1977	NA
Oral	13 weeks	Hazleton Laboratories 1967	There is also a LOAEL value with this study.
Oral: gavage	28 days	Bucchi et al. 1983	NA
Oral: gavage	28 days	Macri et al. 1987	Benchmark dose modeling was used to calculate a BMDL1 based on the LOAEL of 100 mg/kg-day
Oral: gavage	194 days	NA	NA
Oral	10 weeks	Foote et al. 1986	There is also a LOAEL value with this study.
Oral	90 days	Carlson and Tardiff 1977	NA
Oral: gavage	45 or 90 days	NA	NA
Oral: gavage	14 days	Raltech Scientific Services, Inc. 1980	NA
Oral	13 weeks	Muralidhara et al. 2001	NOAEL was adjusted from 1000 mg/kg-day for continuous exposure
Oral: drinking water	13 weeks	NTP 1991	NA
Oral: drinking water	2 years	NA	The chronic oral RfD was adopted as the subchronic oral [RfD].
Hepatic	90 days	Barnes et al. 1985	NA

Oral Sub-Chronic Toxicity Metadata

Chemical	CASNUM	Chemical Type	Subchronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Subchronic Reference Dose Basis	Oral Subchronic Reference Dose Confidence Level
Ethylbenzene	100-41-4	Organics	0.05	PPRTV	BMDL: 48 mg/kg-day	Medium
Fluorobenzene	462-06-6	Organics	-			
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics	2	HEAST	NOAEL: 1711 mg/kg/day	NA
Methylcyclohexane	108-87-2	Organics	-			
Methylene Chloride	75-09-2	Organics	0.06	HEAST	NOAEL: 5.85 mg/kg/day	NA
Styrene	100-42-5	Organics	-			
Tetrachloroethylene	127-18-4	Organics	0.008	ATSDR	LOAEL: 2.3 mg/kg-day	NA
Toluene	108-88-3	Organics	0.8	PPRTV	BMDL: 238 mg/kg-day	Medium
Trichloroethane, 1,1,1-	71-55-6	Organics	7	IRIS	NA	NA
Trichloroethylene	79-01-6	Organics	0.0005	ATSDR	HEC99: 0.048/0.35/0.37 mg/kg/day	NA
Vinyl Chloride	75-01-4	Organics	-			
Xylene, m-	108-38-3	Organics	-			
Xylene, o-	95-47-6	Organics	-			
Xylene, p-	106-42-3	Organics	-			
Xylenes	1330-20-7	Organics	0.4	PPRTV	BMDL: 440 mg/kg-day	Low-to-medium

Oral Subchronic Reference Dose Critical Effect	Oral Subchronic Reference Dose Target Organ	Oral Subchronic Reference Dose Modifying Factor	Oral Subchronic Reference Dose Uncertainty Factor	Oral Subchronic Reference Dose Species
Centrilobular hepatocyte hypertrophy	Liver	NA	1000	Rat
Decreased birth weight	Fetus	NA	1000	Rat
Toxicity	Liver	NA	100	Rat
Derived from PBPK model-based route-to-route extrapolation	Neurol.	NA	100	Human
Increased kidney weight	Kidney	NA	300	Rat
NA	NA	NA	NA	NA
Increased incidence of congenital heart abnormalities/30% decreased thymus weight, increased serum levels of IgG and selected autoantibodies/Decreased PFC response in male and female pups, increased hypersensitivity response in male pups	Develop./Immuno./Immuno.	NA	NA	Rat/Mouse/Mouse
10% decrease in body weight	Whole body	NA	1000	Rat

Oral Subchronic Reference Dose Route	Oral Subchronic Reference Dose Study Duration	Oral Subchronic Reference Dose Study Reference	Oral Subchronic Reference Dose Notes
Oral: gavage	13 weeks	Mellert et al. 2007	Benchmark dose modeling was used on data for liver changes.
Oral: drinking water	Multi-generation	NA	The chronic oral RfD was modified to estimate the subchronic oral [RfD].
Oral: drinking water	24 months	NA	The chronic oral RfD was adopted as the subchronic oral [RfD].
Neurol.	106 months	Cavalleri et al. 1994	ATSDR has adopted the chronic-duration oral MRL as the acute-duration and intermediate-duration oral MRLs.
Oral: gavage	13 weeks	NTP 1990	Based on the same critical study as the chronic RfD in IRIS.
NA	NA	NA	NA
Develop./Immuno./Immuno.	GD 0-21/30 weeks/GD 0-21 and 3 or 8 weeks PPD	Johnson et al. 2003/Keil et al. 2009/Peden-Adams et al. 2006	3 different studies were used to derive the intermediate and chronic oral MRLs.
Oral: gavage	90 days	Wolfe 1988a	NA

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m³)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Benzene	71-43-2	Organics	0.08	PPRTV	BMDL: 8.2 mg/m3	Medium	Decreased lymphocyte count
Bromo-2-chloroethane, 1-	107-04-0	Organics	-				
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics	0.03	PPRTV SCREEN	BMCL10-HEC: 8.9 mg/m3	NA	Centrolobular hepatocyte enlargement for surrogate POD
Bromo-4-fluorobenzene, 1-	460-00-4	Organics	0.03	PPRTV SCREEN	BMCL10-HEC: 8.9 mg/m3	NA	Centrolobular hepatocyte enlargement for surrogate POD
Chlorobenzene	108-90-7	Organics	0.5	PPRTV	NOAEL: 50 ppm	Low	Increased weight and hepatocellualr hypertrophy; Increased weights, tubule dilation, inflammation of the interstitial cells, and regeneration of the epithelium in males
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics	-				
Chlorobenzotrifluoride, 4-	98-56-6	Organics	3	PPRTV	NOAEL: 332 mg/m3	Low	Hepatocellular hypertrophy, increased liver weight, minor changes in serum chemistry (small increase in serum ATL)
Cumene	98-82-8	Organics	0.09	HEAST	NOAEL: 105.1 ppm	NA	Involvement; Irritation
Cyclohexane	110-82-7	Organics	18	PPRTV	BMCL-ISDHEC: 1822 mg/m3	Moderate	Reduced body weight of F2 pups
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	0.002	PPRTV	NOAEL: .17 mg/m3	Medium	Testicular effects

Inhalation Sub-Chronic Toxicity Metadata

Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Blood	NA	100	Human	Inhalation study	NA	Rothman et al. 1996	Based on the same principal study as the chronic RfC in IRIS.
Liver	NA	300	Rat	Inhalation	6 hr/d, 7 d/wk, 28 days	Safepharm Labs Ltd. 1993 (cited in US EPA 2011b)	NA
Liver	NA	300	Rat	Inhalation	6 hr/d, 7 d/wk, 28 days	Safepharm Labs Ltd. 1993 (cited in US EPA 2011b)	NA
Liver; Kidney	NA	100	Rat	Inhalation	2 generations	Nair et al. 1987	The LED was estimated using EPA benchmark dose methodology and then converted to a human equivalent concentration. A LOAEL is also associated with this value.
Liver	NA	100	Rat	Inhalation	13 weeks	Newton et al. 1998	NOAEL was adjusted from 252 ppm to calculate the HEC
Central nervous system; Nose	NA	1000	Rat	Inhalation: intermittent	4 weeks	NA	NA
Developmental	NA	100	Rat	Inhalation	10 weeks prior to mating through lactation	Kreckmann et al. 2000, Haskell Laboratories 1997a	NA
Testicle	NA	100	Rabbit	Inhalation	14 weeks	Rao et al. 1982	The NOAEL was adjusted from 0.94 mg/m3 to account for intermittent exposure.

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m³)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Dibromobenzene, 1,3-	108-36-1	Organics	-				
Dibromobenzene, 1,4-	106-37-6	Organics	-				
Dibromoethane, 1,2-	106-93-4	Organics	0.002	HEAST	LOAEL: 88 ppb	NA	Effects
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics	-				
Dichloroethane, 1,1-	75-34-3	Organics	-				
Dichloroethane, 1,2-	107-06-2	Organics	0.07	PPRTV	LOAEL-HEC: 22 mg/m3	Low	Neurobehavioral impairment
Dichloroethylene, 1,1-	75-35-4	Organics	0.0792965	ATSDR	NOAEL: 5 ppm	NA	Increased SGPT and AP enzyme activity; decreased lipid content
Dichloroethylene, 1,2-trans-	156-60-5	Organics	0.7929652	ATSDR	LOAEL: 200 ppm	NA	Slight fatty accumulation in liver lobules
Ethylbenzene	100-41-4	Organics	9	PPRTV	LOAEL: 868 mg/m3	Medium	Histopathological evidence of ototoxicity without functional changes in audiometric threshold.
Fluorobenzene	462-06-6	Organics	0.03	PPRTV SCREEN	BMCL-10HEC: 8.9 mg/m3	NA	Centrilobular hepatocyte enlargement in males
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics	1	HEAST	NOAEL: 1010 ppm	NA	Decreased birth weight
Methylcyclohexane	108-87-2	Organics	-				
Methylene Chloride	75-09-2	Organics	1.0420859	ATSDR	LOAEL: 25 ppm	NA	Cytoplasmic vacuolization, fatty infiltration
Styrene	100-42-5	Organics	3	HEAST	NOAEL: 22 ppm	NA	Effects
Tetrachloroethylene	127-18-4	Organics	0.04069	ATSDR	LOAEL: 7.3 ppm	NA	Color vision loss

Inhalation Sub-Chronic Toxicity Metadata

Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Sperm	NA	100	Human	Inhalation: intermittent	NA	NA	The chronic inhalation [RfC] was modified to estimate the subchronic inhalation [RfC].
Neurological	NA	300	Human	Inhalation	Occupational	Kozik 1957	NA
Hepatic	NA	100	Guinea pig	Hepatic	90 days	Prendergast et al. 1967	NA
Hepatic	NA	1000	Rat	Hepatic	8 or 16 weeks	Freundt et al. 1977	NA
Ear	NA	100	Rat	Inhalation: whole body	6 hr/d, 6 d/wk, 13 weeks	Gagnaire et al. 2007	The LOAEL of 868 mg/m3 was converted to a LOAEL-HEC of 868 mg/m3.
Liver	NA	300	Rat	Inhalation	28 days	Safepharm Labs Ltd 1993	NA
Fetus	NA	3000	Mouse	Inhalation: intermittent	10 days	NA	The chronic inhalation RfC was adopted as the subchronic inhalation [RfC].
Hepatic	NA	90	Rat	Hepatic	100 days	Haun et al. 1972	NA
Central nervous system	NA	10	Human	Inhalation: occupational	NA	NA	NA
Neurol.	NA	100	Human	Neurol.	106 months	Cavalleri et al. 1994	ATSDR has adopted the chronic-duration inhalation MRL as the acute-duration and intermediate-duration inhalation MRLs.

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m^3)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Toluene	108-88-3	Organics	5	PPRTV	NOAEL (average): 46 mg/m3	High	Effects
Trichloroethane, 1,1,1-	71-55-6	Organics	5	IRIS	NA	NA	NA
Trichloroethylene	79-01-6	Organics	0.00215	ATSDR	BMDL/LOAEL (HEC99): 0.0037/0.033 ppm	NA	Cardiac malformations in rat fetuses/decreased thymus weight in adult mice
Vinyl Chloride	75-01-4	Organics	0.0766871	ATSDR	LOAEL: 10 ppm	NA	Centrilobular hypertrophy
Xylene, m-	108-38-3	Organics	-				
Xylene, o-	95-47-6	Organics	-				
Xylene, p-	106-42-3	Organics	-				
Xylenes	1330-20-7	Organics	0.4	PPRTV	NOAEL: 39 mg/m3	Medium	Impaired motor coordination

Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Neurological	NA	10	Human	Inhalation	Multiple studies	Multiple human studies	The chronic RfC in IRIS was adopted as the subchronic RfC.
NA	NA	NA	NA	NA	NA	NA	NA
Develop./Immuno.	NA	NA	Rat/Mouse	Develop./Immuno.	GD 1-22/30 weeks	Johnson et al. 2003/Keil et al. 2009	RfC was derived using 2 different oral studies and route-to-route extrapolation.
Hepatic	NA	30	Rat	Hepatic	19 weeks	Thornton et al. 2002	NA
Whole body	NA	100	Rat	Inhalation	6 hr/d, 5 d/wk, 3 months	Korsak et al. 1994	Based on the same date for the chronic RfC on IRIS, where the NOAEL of 50 ppm was converted to a NOAEL-HEC of 39 mg/m3.

Genesee Valley Transportation Company, Inc.

Mohawk Adirondack and Northern Railroad Corporation
Lowville and Beaver River Railroad Company, Inc.
Depew, Lancaster and Western Railroad Company Inc.
Falls Road Railroad Company, Inc.

GENERAL OFFICES: 1 MILL STREET, SIUTE 101, BATAVIA, NEW YORK 14020
TELEPHONE: 585-343-5398 FACSIMILE: 585-343-4369

CONTRACTOR ENTRY PERMIT

Name of Contractor: URS Group, Inc.

Address: 12120 Shamrock Plaza, Suite 300, Omaha, NE 68154

Railroad on which work to be performed: Falls Road Railroad

Location of work to be performed: Diaz Chemical Site, Jackson St., Village of Holley

Is the work to be performed being funded by a state agency? Yes ____ No X

If yes, enter applicable number.

Contract #: ____________ PIN #: ____________

If no, enter other identifying number.

Project #: 60615479 Plan #: ____________

US Army Corps of Engineers Contract No. W912DQ-15-D-3006,
Delivery Order W912DQ 19F3063

Terms and Conditions of Entry Permit:

1. Railroad Flagman/Inspector Charges:

   The **minimum** charge for Railroad Flagman/Inspector to protect work performed Monday through Friday, with the exception railroad holidays, will be $992.00 per day (up to 8 hours). The charge for Railroad Flagman/Inspector to protect work beyond 8 hours per day will be $186.00 per hour or any fraction thereof.

   The **minimum** charge for Railroad Flagman/Inspector to protect work performed on Saturday, Sunday and railroad holidays will be $2480.00 per day (up to 8 hours). The charge for Railroad Flagman/Inspector to protect work beyond 8 hours per day will be $310.00 per hour or any fraction thereof.

   A Railroad Flagman/Inspector is required during all work on railroad property.

2. Before entry onto railroad property, 48 hour advance notice must be given to the appropriate contact person so that a Railroad Flagman/Inspector can be assigned. Following are the contacts for each of GVT's railroads:

   Genesee Valley Transportation
   1 Mill Street, Suite 101
   Batavia, New York 14020
   phone 585-343-5398

Falls Road Railroad/Depew Lancaster and Western Railroad
Christian Henrici, General Superintendent
Batavia, New York
email henrici@gvtrail.com

Mohawk Adirondack and Northern Railroad/Lowville and Beaver River Railroad
Jeff Collins, General Superintendent
Utica, New York
email jcollins@gvtrail.com

Delaware Lackawanna Railroad
Lorie Ransom, General Superintendent
Scranton, Pennsylvania
email lransom@gvtrail.com

3. Contracted workers must receive, if required by Federal or other applicable regulations, Roadway Worker Safety training. This training can be provided by GVT's training officer for a fee of $595, for a class of up to 20 people. Once trained, your employees will receive a certificate good for one year. Previous Roadway Worker Safety training received at other railroads, etc. may be acceptable in lieu of GVT training, providing such training meets all GVT requirements.

4. All contractors working on railroad property are required to have not less than $2,000,000.00 of Railroad Protective Liability Insurance in place naming the railroad as an insured. All contractors working on railroad property are required to have not less than $2,000,000.00 of General Liability Insurance in place naming the railroad as an additional insured. Proof of these insurances must be submitted to GVT's Batavia office before the start of work on railroad property.

Statement:

I, the above-referenced contractor, do hereby agree to, and will abide by the terms and conditions of the Contractor Entry Permit.

Niederreither, Mike — Digitally signed by Niederreither, Mike DN: cn=Niederreither, Mike, ou=USHBG3 Reason: I am approving this document; Vice President; Project Manager Date: 2020.05.26 12:31:11 -04'00'

Contractor's Signature, Title

May 26, 2020
Date

Honda, James — Digitally signed by Honda, James DN: cn=Honda, James, ou=USABY2 Date: 2020.05.26 13:51:55 -04'00'

Witness

May 26, 2020
Date

DIRECTOR PROJECTS

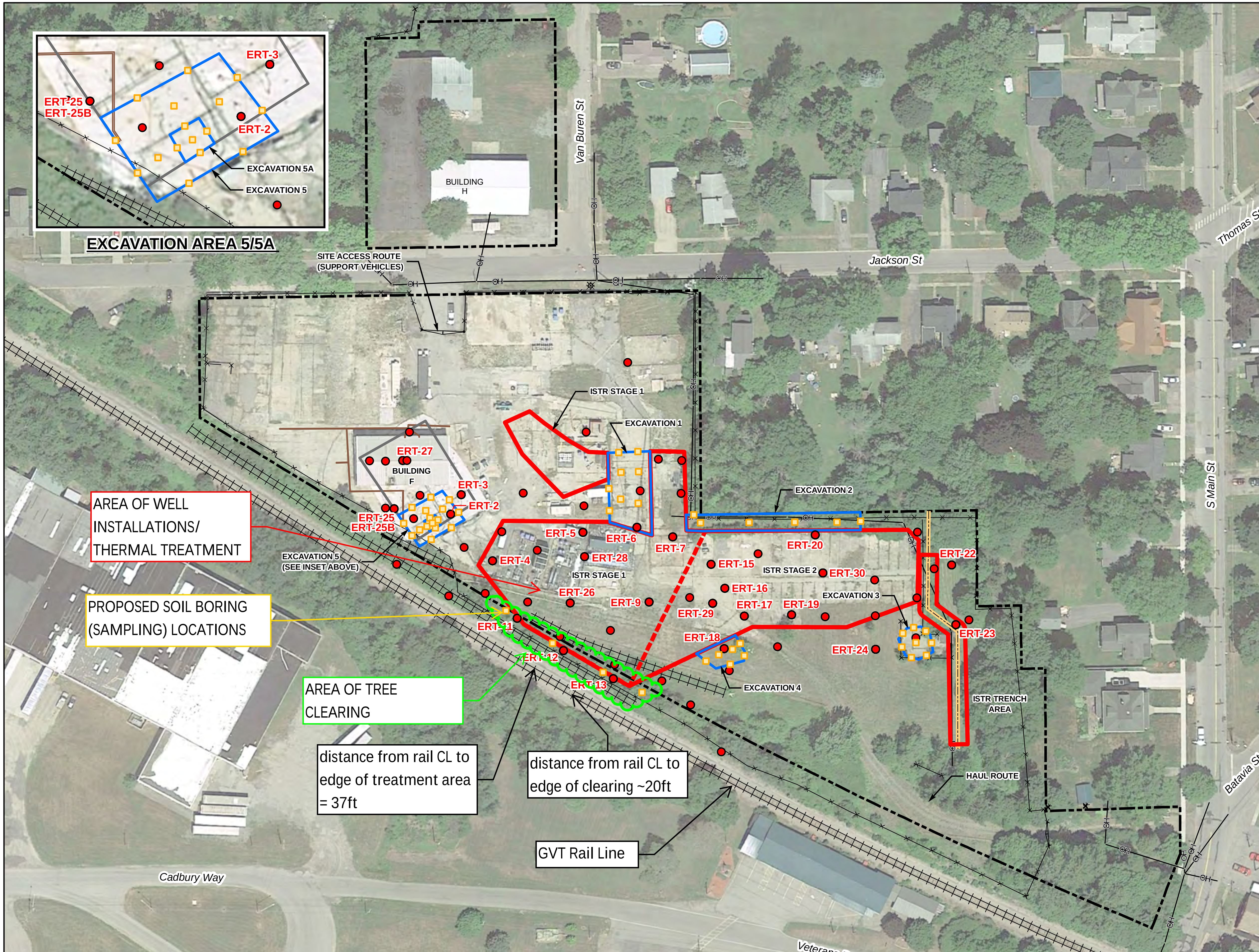
Railroad Official's Signature, Title

05/27/20
Date

Lawrence K Zablonski

Witness

5-27-20
Date



Legend

- Proposed Pre-Excavation Boring Location
- Historical Boring Location
- Diaz Facility Property Boundary
- Excavation Area
- Phase I Thermal Treatment Area
- Phase 2 Thermal Treatment Zone
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

N

0 50 100 200 Feet

Title:	PRE-EXCAVATION SAMPLING
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS URS Corporation 40 British American Boulevard Latham, New York 12110	Drafter: JB	Date: January 10, 2020
	Drg. Size: 11 x17	Job No.: 60615479
	FIGURE 1	

APPENDIX G

Heat Transfer Model

APPENDIX: Summary of Numerical Heat Modeling

GEO conducted a numerical temperature increasing modeling based on the radial heat flow and diffusivity transport modeling, which uses a governing equation inclusive of:

$$\Delta T(r,t) = \frac{-F_1}{4\pi\lambda} E_i[-\frac{r^2}{4\alpha t}]$$

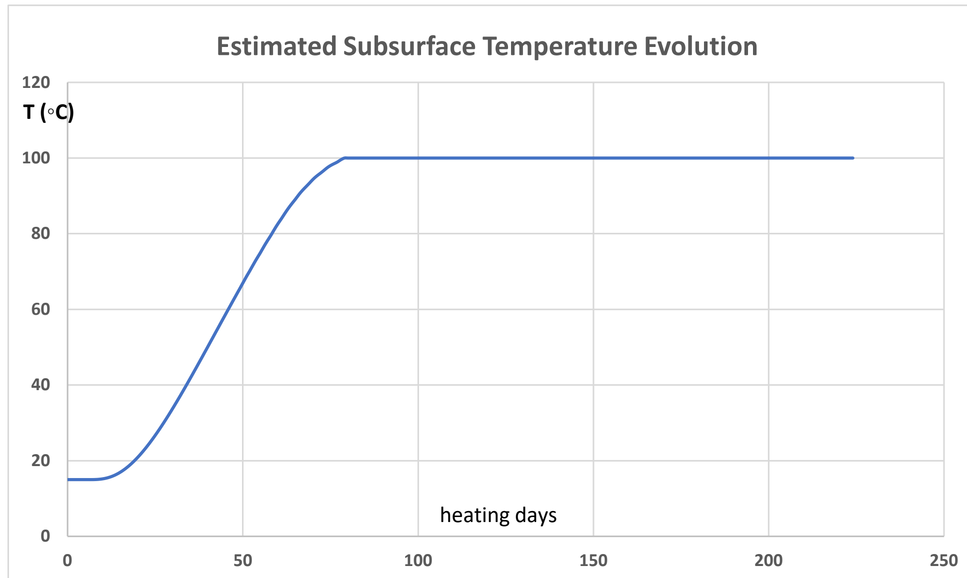
$where,$
$r = radial\ distance$
$\Delta T = temperature\ change\ [T]$
$\lambda = thermal\ conductivity\ of\ soil\ [mlt^{-3}T^{-1}]$
$\alpha = thermal\ diffusivity\ of\ soil = \frac{\lambda}{\rho C}\left[\frac{l^2}{t}\right]$
$F_1 = heat\ injection\ rate\ per\ unit\ length\ [\ mlt^{-3}]$
$m = total\ well\ count$
$l = length\ of\ site$
$t = time$
$\rho = density\ of\ soil$
$T = Temperature$
$C = heat\ capacity\ of\ soil$

The estimated energy usage for remediation is based upon successfully meeting the performance criteria based on the assumed hydraulic control model. It is expected that the thermal remediation system will operate for 80 days to reach and maintain the TTT. For the defined TTZ, an energy balance was calculated based on the energy requirement for the subsurface – soil, ground water and all phases of COCs – to attain and maintain the TTT (100°C).

Note the estimated energy balances also account for the following:

- Heat loss to surrounding areas through all planes of the TTZ;
- Removal of energy from the TTZ through extraction of heated vapor; &
- Delivery efficiency of the GTR™ units and TCH wells.

day	T
0	15
1	15
2	15
3	15
4	15
5	15
6	15
7	15
8	15.0234
9	15.0857
10	15.20139
11	15.38335
12	15.6419
13	15.98452
14	16.41594
15	16.93849
16	17.55246
17	18.25657
18	19.04828
19	19.9242
20	20.8803
21	21.91213
22	23.01504
23	24.18424
24	25.41496
25	26.70249
26	28.04222
27	29.42972
28	30.86071
29	32.33112
30	33.83707
31	35.37485
32	36.94098
33	38.53215
34	40.14521
35	41.77722
36	43.42536
37	45.08699
38	46.7596
39	48.44082
40	50.12838
41	51.82015
42	53.5141



43	55.20829
44	56.90088
45	58.59011
46	60.27431
47	61.95187
48	63.62126
49	65.28101
50	66.95953
51	68.63831
52	70.22388
53	71.87408
54	73.46691
55	74.98452
56	76.60536
57	78.13236
58	79.58565
59	81.15209
60	82.62427
61	83.98069
62	85.40225
63	86.74986
64	87.9739
65	89.13267
66	90.36309
67	91.45518
68	92.4181
69	93.37872
70	94.36093
71	95.1994
72	95.90717
73	96.63677
74	97.39898
75	98.0141
76	98.50151
77	98.97343
78	99.57628
79	100
80	100
81	100
82	100
83	100
84	100
85	100
86	100

87	100
88	100
89	100
90	100
91	100
92	100
93	100
94	100
95	100
96	100
97	100
98	100
99	100
100	100
101	100
102	100
103	100
104	100
105	100
106	100
107	100
108	100
109	100
110	100
111	100
112	100
113	100
114	100
115	100
116	100
117	100
118	100
119	100
120	100
121	100
122	100
123	100
124	100
125	100
126	100
127	100
128	100
129	100
130	100

131	100
132	100
133	100
134	100
135	100
136	100
137	100
138	100
139	100
140	100
141	100
142	100
143	100
144	100
145	100
146	100
147	100
148	100
149	100
150	100
151	100
152	100
153	100
154	100
155	100
156	100
157	100
158	100
159	100
160	100
161	100
162	100
163	100
164	100
165	100
166	100
167	100
168	100
169	100
170	100
171	100
172	100
173	100
174	100

175	100
176	100
177	100
178	100
179	100
180	100
181	100
182	100
183	100
184	100
185	100
186	100
187	100
188	100
189	100
190	100
191	100
192	100
193	100
194	100
195	100
196	100
197	100
198	100
199	100
200	100
201	100
202	100
203	100
204	100
205	100
206	100
207	100
208	100
209	100
210	100
211	100
212	100
213	100
214	100
215	100
216	100
217	100
218	100

219	100
220	100
221	100
222	100
223	100
224	100

APPENDIX H

Environmental Protection Plan-Waste Management Plan-Traffic Control Plan-Stormwater Pollution Prevention Plan-Spill Prevention Control & Countermeasure

FINAL

DIAZ CHEMICAL CORPORATION SUPERFUND SITE, OPERABLE UNIT 2

PHASE II IN-SITU REMEDIAL ACTION

ENVIRONMENTAL PROTECTION PLAN

Village of Holley

Orleans County, New York

May 2020

Prepared for:

United States Army Corps of Engineers,
Kansas City District

Prepared by:

URS Group, Inc.
12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

Contract No. W912DQ -15-D-3006, Delivery Order W912DQ 19F3063

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Figures

List of Appendices

TABLE OF CONTENTS

List of Acronyms and Abbreviations

BAT	Best Available Technology
CAMP	Community Air Monitoring Program
COR	Contracting Officer's Representative
CFP	2-Chloro-6-Fluorophenol
CFR	Code of Federal Regulations
DOT	Department of Transportation
DBCP	1,2-Dibromo-3-Chloropropane
EM	Environmental Manager
EPP	Environmental Protection Plan
HVAC	Heating Ventilation, and Air Conditioning
ISTR	In-Situ Thermal Remediation
NAPL	Non-Aqueous Phase Liquid
OU	Operable Unit
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
SPCC	Spill Prevention, Control, and Countermeasures
SVOC	Semi Volatile Organic Compound
URS	URS Group, Inc.
U.S	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WMP	Waste Management Plan

ENVIRONMENTAL PROTECTION PLAN
DIAZ CHEMICAL CORPORATION
OPERABLE UNIT 2 SUPERFUND SITE
IN-SITU THERMAL REMEDIAL ACTION, PHASE 2
VILLAGE OF HOLLEY, ORLEANS COUNTY, NEW YORK

Contract Number: W912DQ-15-D-3006

Preparation Date: May 2020

Plan Preparer

John Santacroce	4 May 2020
(518) 951 2200	Date
URS Environmental Manager	

Plan Approval

Michael S. Niederreither	4 May 2020
(717) 790-3404	Date
URS Project Manager	

Plan Concurrence

Sam Bartlett	4 May 2020
(401) 854-2853	Date
URS Assistant Project Manager	

The United States (U.S.) Army Corps of Engineers, Kansas City District (USACE) has contracted URS Group, Inc. (URS) to perform remediation construction activities at the Diaz Chemical Corporation Operable Unit (OU) 2 Superfund Site in Holley, New York. URS project work will be conducted for the USACE Kansas City District under Contract Number W912DQ-15-D-3006, Client Task Order Number W912DQ19F3063. This document constitutes the Environmental Protection Plan (EPP) for the Diaz Superfund Site OU2 (the Site), which was prepared in accordance with Specification Section 01 57 19.

Note, per Specification Section 01 57 19 paragraph 1.04.B, topics included in the EPP that are contained in other required planning documents should be incorporated by cross reference and added as appendices. Therefore, required planning documents which are referenced in the text will be included as appendices. However, the referenced documents will be included in the Final Version of the EPP once the documents have been submitted and approved separately. The plans to appended to the EPP for Diaz include:

- Waste Management Plan (**Appendix A**)
- Spill Prevention, Control, and Countermeasures Plan (**Appendix B)**
- Stormwater Pollution Prevention Plan (**Appendix C**)
- Traffic Control Plan (**Appendix D**)

1.1 PURPOSE

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during the construction of the in-situ thermal remediation (ISTR) system. The EPP establishes the procedures and systems that AECOM will use to comply with the environmental protection requirements of Contract No.W912DQ-15-D-30006 for the USACE, Kansas City District. This EPP will be employed during project related activities to:

- Protect the environment and natural resources at the Site, and
- To provide the procedures for proper disposal of materials and waste generated during the project.

The EPP includes site-specific information for:

- Spill prevention and spill control
- Air pollution controls for emissions, dust, and odors
- Protection of natural resources
- Stormwater and sediment management and control
- Regulatory notifications and permits.

1.2 SITE LOCATION AND BACKGROUND

The Diaz chemical facility (facility) is an approximately five acre former halogenated and specialty chemicals manufacturing plant located at 40 Jackson Street in the Village of Holley, Orleans County, New York. The Diaz Facility is located approximately 25 miles west of Rochester and 50 miles east of Buffalo (Figure 1-1).

The facility was initially developed as an industrial plant in the 1890s and was used primarily for tomato processing and cider vinegar production before being purchased by Diaz Chemical in 1974. Diaz Chemical was a manufacturer of specialty organic intermediates for the agricultural, pharmaceutical, photographic, color and dye, and personal care product industries. The Diaz Chemical product line varied over the years of operation, but it primarily consisted of halogenated aromatic compounds and substituted benzotrifluorides.

The Diaz Chemical facility's long history of chemical releases to the environment spanned from 1975 to 2002. Poor housekeeping practices, loss of control of manufacturing systems, and faulty containment systems, resulted in the release of a range of chemical substances to the air, water, and soil. Reported releases included mineral and organic acids, caustics, bromine, chlorine, halogenated organic compounds including parachlorobenzotriflouride and 2-chloro-6-fluorophenol (CFP), organic compounds, and petroleum-related compounds. Low levels of 1,2-dibromo-3-chloropropane (DBCP) have also been detected at the Site.

In June of 2003, Diaz Chemical filed for bankruptcy and abandoned the facility. On July 22, 2004, the former Diaz Chemical site was placed on the National Priorities List. The (USEPA) conducted field investigations from 2004 to 2010 to characterize the impacts at the site. A Feasibility Study and a Proposed Plan were completed in 2012, and the Record of Decision (ROD) was completed in September 2012 and identified ISTR as the selected remedy.

The site is currently divided into two OUs:

- OU1 covers the property acquisition and relocation of owner occupants and individual tenants following the January 2002 air release.
- OU2 addresses contamination at the former Diaz Facility and surrounding environs, including the residential areas and the East Branch of Sandy Creek.

This project will address Remedial Action Objectives (RAOs) established for OU2 in the ROD. The project objective of the Phase II is to achieve site cleanup goals through implementation of ISTR.

Site features and temporary facilities applicable to this project are shown on Figure 1-2. This includes the proposed locations for site office trailers and storage, proposed utility connections, layout of the ISTR treatment system and supporting systems within Building F, and proposed excavation areas.

1.3 ENVIRONMENTAL MANAGER

URS's Project Geologist, John Santacroce, or his designee will serve as the Environmental Manager (EM). Mr. Santacroce holds the requisite qualifications necessary to implement the EPP, and he and or an appointed designee will be responsible for training Site personnel in 40 Code of Federal Regulations (CFR) requirements. The EM will be responsible for ensuring compliance with applicable federal, state, and local environmental regulations, including maintaining required documentation; implementation of implementation of this EPP and related plans; and monitoring and documentation of environmental procedures.

1.4 COMMUNICATION AND TRAINING PROCEDURES

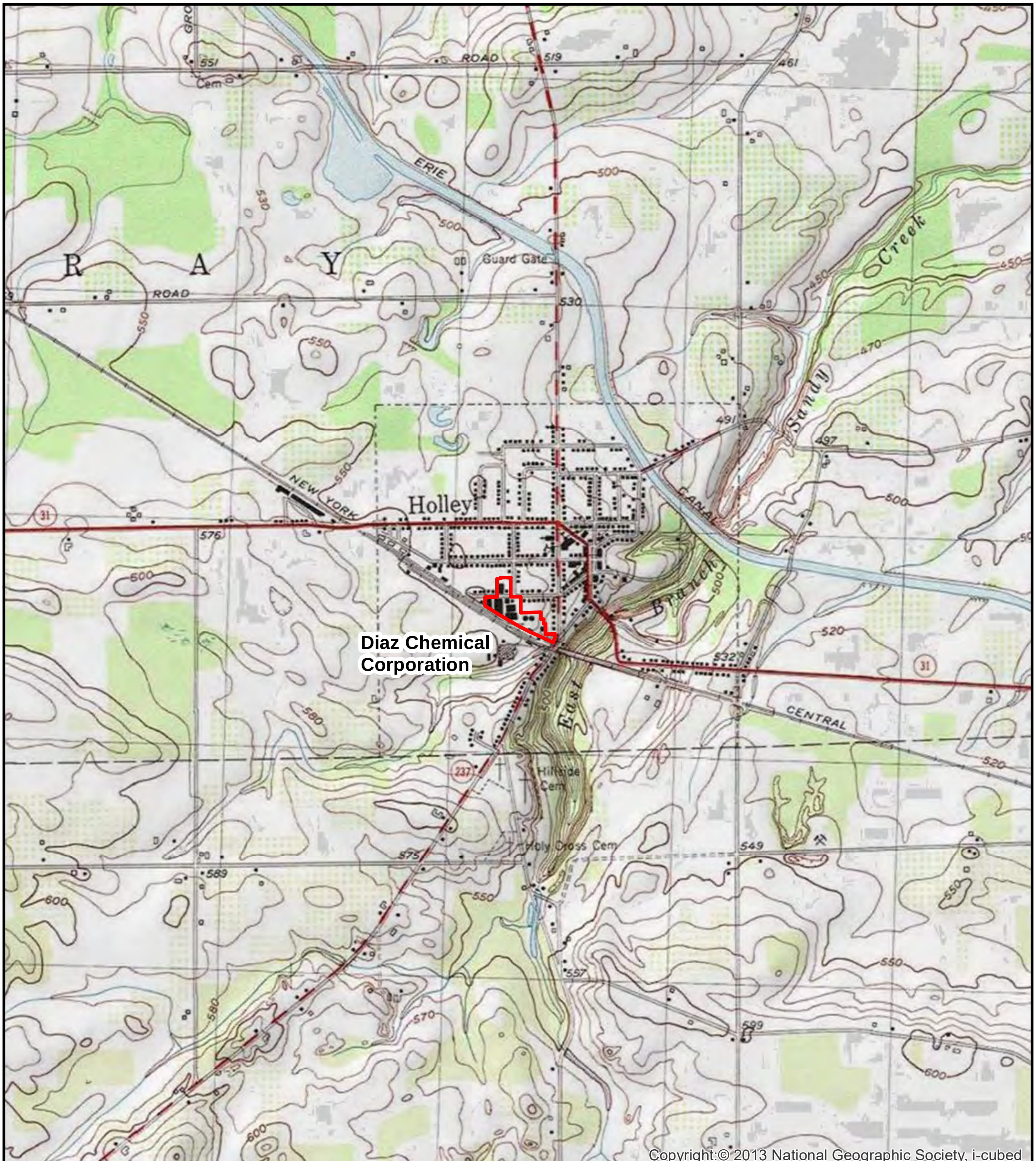
The EM or on-site designee is responsible for training contractor personnel on the requirements of the EPP. URS will ensure that everyone working on the Site, including URS employees and subcontractors, are aware of the requirements of the EPP and supporting plans. All personnel will receive a mandatory briefing on health and safety, and environmental requirements, which will include a review of this EPP and the supporting plans. Additionally, environmental protection will be discussed at daily prework safety meetings. The EPP and supporting plans will be available in the work trailer at all times.

Contact Information for key project personnel and regulators can be found in Table 1 below.

Table 1:

Organization	Name and Project Role	Telephone Number	E-mail Address
USACE	Matt Creamer, USACE New York District PM	917-790-8335	Matthew.T.Creamer@usace.army.mil
USACE	Travis Young, USACE Kansas City District PM	816-389-3421	Travis.S.Young@usace.army.mil
USACE	Mayss Saadoon, USACE Kansas City District Assistant PM	816-389-3439	Mayss.Saadoon@usace.army.mil
URS	Steve Cox, Program Manager	402-952-2542	Steven.R.Cox@aecom.com
URS	Mike Niederreither, Project Manager	717-790-3404	Mike.Niederreither@aecom.com

URS	Sam Bartlett, Assistant Project Manager & Alternate QA Manager	401-854-2853	Sam.Bartlett@aecom.com
URS	Arthur Taddeo, Technical Lead	978-905-2423	Arthur.Taddeo@aecom.com
URS	John Santacroce, Environmental Manager	518-542-6333	John.Santacroce@aecom.com
URS	Scott Serviss, Construction Manager	518-951-2330	Scott.Serviss@aecom.com
URS	Kevin Shaver, SSHO	804-301-2197	Kevin.Shaver@aecom.com
URS	David Tiedman, Site Supervisor & QA Manager	716-480-8013	David.Tiedman@aecom.com



Map Location

N

Site Locus
Diaz Chemical Corporation Superfund Site, Operable Unit 2
Phase II In-Situ Remedial Action
Holley, New York

0 500 1,000 2,000 3,000 4,000 5,000 6,000 Feet

0 100 200 400 600 800 1,000 1,200 1,400 1,600 Meters

Map Projection: State Plane, NAD 83, Feet.
Image Source: USGS Topographic Quadrangle: Holley, NY.

Scale: 1:24,000

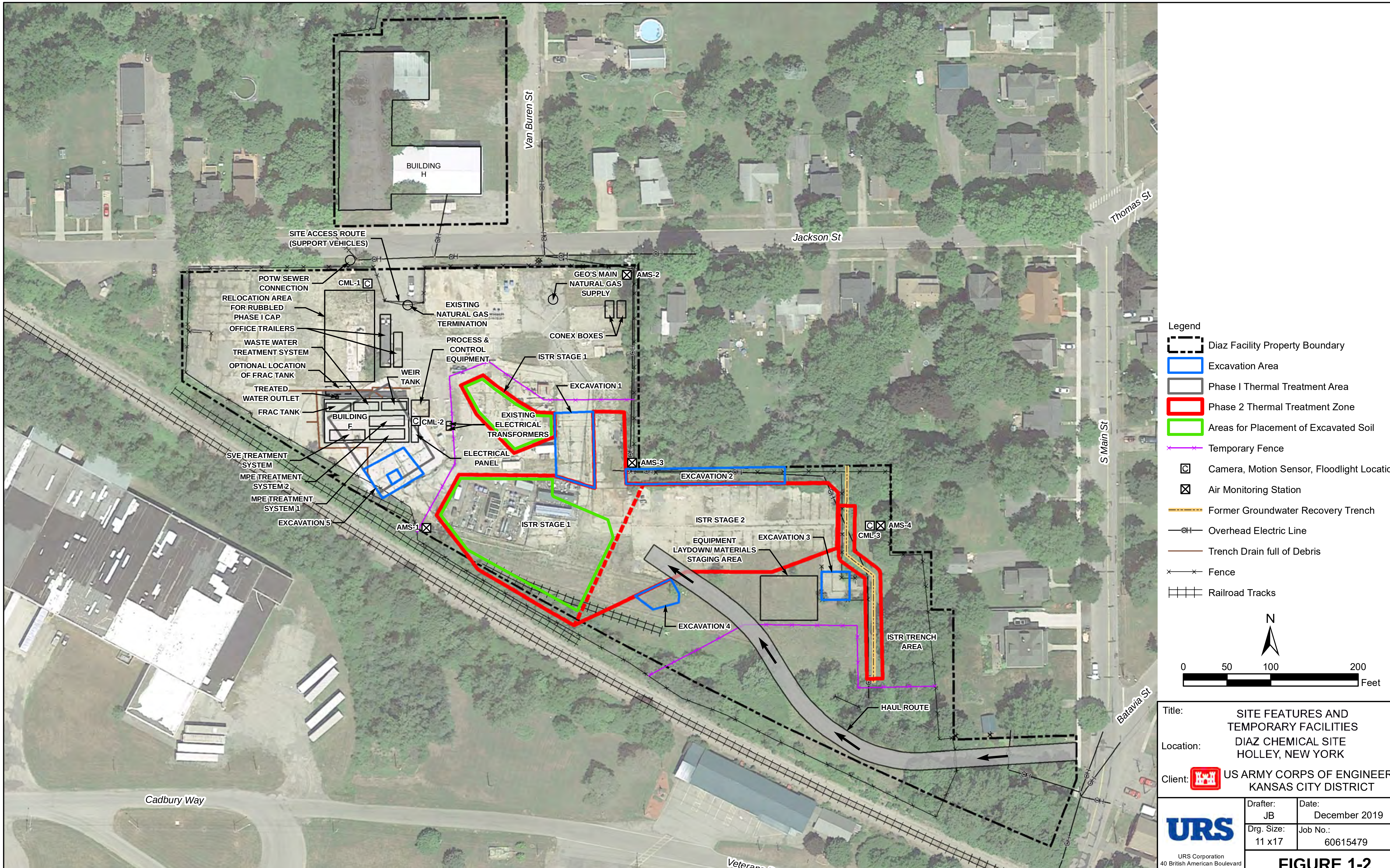
URS

Figure 1-1

Date: December 2019

Project #: 60615479

Path: \\uschl1fp001\Data\Projects\Govt\Projects\USACE New England HTRW 2019\Task Orders\DIAZ\900_GIS\Projects\RAWP\MXD\Fig_1_1_Site_Locus.mxd



Title:	SITE FEATURES AND TEMPORARY FACILITIES
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS
URS Corporation
40 British American Boulevard
Latham, New York 12110

Drafter:	Date:
JB	December 2019
Drg. Size: 11 x17	Job No.: 60615479

FIGURE 1-2

This section presents the relevant federal, state, and local laws, regulations, and permits applicable to environmental protection at the Site.

2.1 REGULATED SITE ACTIVITIES

The following activities are regulated by the State of New York and/or the federal government:

- Accidental oil or hazardous substance spill—40 CFR 110, 33 CFR 153 (Subpart B), 40 CFR 300 (Subpart E), and WAC 173-182 and 173-183 require that the National Response Center and Ecology be notified in the event of a spill.
- Accumulation, storage, transportation, treatment, and disposal of solid waste—Solid waste shall be accumulated, stored, transported, treated (if required), and disposed of at a permitted solid waste disposal facility (Subtitle D) in accordance with the requirements specified in WAC 173-350, 40 CFR 243, and 40 CFR 257.
- Accumulation, storage, and disposal of hazardous waste—Although generation of hazardous waste is not anticipated, 18 AAC 62, 40 CFR 260–262, 40 CFR 268, and 40 CFR 279 address the requirements for hazardous waste identification and proper disposal if hazardous wastes are generated.
- Transportation of hazardous materials (includes transportation of hazardous waste)—The U.S. Environmental Protection Agency and the U.S. Department of Transportation (DOT) specify requirements in 40 CFR 263, 49 CFR 105, 49 CFR 130, and 49 CFR 171–180 for the shipment of hazardous materials, including hazardous waste.
- Accidental oil or hazardous substance spill cleanup—The New York State Department of Environmental Conservation (NYSDEC) Spill Guidance Manual provides regulatory requirements for reporting and cleanup of an accidental spill, including historical releases in accordance with York Navigation Law, Article 12; 17 NYCRR 32.3 and 32.4
- Wastewater disposal—Waste water will comprise equipment decontamination water, well development and purge water. This water will be transported to the Area 6 water treatment facility and introduced to the system for treatment.
- Stormwater pollution and prevention—The requirements for stormwater pollution and prevention are published in the New York State Standards and Specifications for Erosion and Sediment Control (November 2016).
- Air Emissions—The 6 CRR-NY Part 212 regulations (212-1.4(a)) provides a reference to Subpart 201-3 that indicates air Strippers and soil vents that are operated at a Superfund site are trivial and exempt from permitting requirements and NYSDEC confirmed that since the Diaz Site is a USEPA regulated Superfund site, the exemption applies, and a full formal permit is not needed. However, as stated under 6 CRR-NY 201-3.3(b), the owner or operator of any emission source or activity that is listed as being trivial, on the basis of the use of appropriate emission controls, shall operate and maintain those controls in a manner

consistent with manufacturer's specifications and good engineering practices. Exempt treatment systems are required to comply with the substantive regulations in Part 212."

- Community Air Monitoring—The NYSDEC DER-10, Section 1.9 (b.) (1) and (2) describe the procedures for preparing a community air monitoring plan (CAMP) and for monitoring fugitive dust and particulates.

2.2 PERMITS

The following permits have been identified as applicable to this project:

- Wastewater Permit: Although a formal permit is not required URS will obtain permission from the Village of Holley for the discharge of wastewater to the sanitary sewer system.
- Solid Waste: All federal and state disposal facility permits, and waste transporter permits are discussed in the project Waste Management Plan (WMP) (**Appendix A**).
- Air Permit Equivalent: Based on correspondence and discussions with NYSDEC regional and central office representatives, NYSDEC's review of anticipated treatment performance and emissions levels using the best available technology (BAT) may be determined to be sufficient for approval of the Air Permit Equivalent. The anticipated emissions levels presented to NYSDEC during these conversations were estimated based on a mass balance design evaluation by GEO using the maximum concentration detected in soils (a conservative approach). Depending upon the results of NYSDEC's review, it may be necessary to perform a more detailed analysis using the NYSDEC's AERSCREEN software.

This section provides and overview of the Spill Prevention, Control, and Countermeasures (SPCC) plan which is included as **Appendix B.** This plan includes procedures and methods to be used to prevent contamination of the Site as well as the procedures, instructions, and reports to be used in the event of an unforeseen spill of a regulated substance in accordance with local, state, and other applicable laws and regulations. At all times, measures will be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering surface and groundwater.

Safety Data Sheets (SDS) for potentially hazardous substances are included in the Site Safety and Health Plan (SSHP) which is attached to the Accident Prevention Plan (APP). SDSs for products used at the Site will be located within the URS project field trailer. The maximum quantity of fuel and lubricants for equipment and heavy machinery to be on site at any given time is approximately 1,000 gallons. This includes the fuel tanks for heavy machinery and the standby generator.

Equipment fuel will be stored in double walled, properly labeled, and grounded storage tanks. Fire extinguishers and spill control kits will be placed in the immediate vicinity of all storage tanks in accordance with USACE EM385-1-1.

The remediation system will include a double-walled non-aqueous phase liquid (NAPL) recovery tank. This tank will hold recovered liquid chemical from the vapor/liquid treatment system. The expected composition of the recovered liquid chemical is not predominantly petroleum-based (chlorinated hydrocarbons). The capacity of this distinct tank will be approximately 2,000 gallons.

The location of these tanks and fueling areas are shown of Figure 1-2.

In the event of a spill of reportable quantity, the Site Superintendent will notify the Contracting Officers Representative (COR), the USACE project management team, NYSDEC Spills (Region 8), and local emergency response. As required by the PWS URS will meet with the local fire department at the Site near the start of the remediation work.

The WMP (Appendix A) identifies the anticipated waste streams for this project as well as the planned transporters and disposal facilities for each waste stream. The total amount of waste generated and disposed of offsite will be tracked and reported on a waste tracking log as presented in the WMP. As discussed in the WMP, the EM will be responsible for manifesting any hazardous waste generated on the project. Proper housekeeping, segregation, and containment procedures will be followed to ensure that all wastes are properly contained prior to shipment for off-site disposal or recycling.

Potential solid waste streams associated with project activities include the following:

- Nonhazardous solid waste, such as trash and inert construction debris (concrete, metal, wood)
- Volatile organic compound (VOC) and semi-volatile organic compound (SVOC) impacted soil from drill cuttings and remediation.
- VOC and SVOC impacted personal protective equipment (PPE)
- Oily rags and sorbents

Potential liquid waste streams associated with the project include:

- Decontamination, development, process and purge water
- Concentrated VOC and SVOC liquid from the remediation process

The project work statement focusses on meeting project waste diversion metrics, however, there are few potential waste streams that could be effectively recycled as part of this project as this remediation is primarily an in-situ remedy. Some metal waste has been identified for recycling and some of the concrete debris will be reused as fill at the site. Waste minimization practices that will be implemented for all stages of the project from waste generation to disposal are described below. Additional Green Remediation strategies are discussed in section 4.5 of the Remedial Action Work Plan (RAWP).

4.1 REDUCING CONSUMPTION OF ENERGY AND NATURAL RESOURCES

Reduction in the consumption of energy and natural resources will be accomplished through the following ways: 1) Equipment will not be allowed to run idle for extended periods of nonuse; and 2) Lighting and heating, ventilation, and air conditioning (HVAC) systems will be turned off or down during periods of non-use.

4.2 REDUCING WASTE GENERATED IN THE OFFICE

Methods to reduce waste generated in the office include: Using refillable products such as pens, pencils, tape dispensers, and calendars; communicating through the use of bulletin boards or computers; eliminating fax cover sheets, printing directly on envelopes instead of using labels; and reusing single-sided paper. URS will purchase recycled products where applicable. Recyclable waste will be segregated and sent for recycling to the extent practicable.

This section describes the measures that will be put in place to control and reduce air emissions, dust, and odors due to the remedial action in compliance with Section 01 57 19, Subsection 1.6.8 of the PWS.

5.1 Traffic Control

A Traffic Control Plan has been prepared for the project and is included as Appendix C. The plan identifies the routes to be used to move material on and off from the Site and the measures to reduce dirt, dust, and debris from the roadways. The east gate located on Main Street will be the primary entry and exit for the Site. All trucks will be decontaminated by scraping and washing debris at a designated station prior to leaving the Site. A water truck will be used to wet the on-site haul road to reduce fugitive dust emissions from truck traffic. The location of the on-site haul roads and truck decontamination station are shown on Figure 1-2.

5.2 POLUTION GENERATING EQUIPMENT

Pollution generating equipment to be used on this project includes heavy equipment (excavators, drill rigs, etc), backup generator, and the remediation vapor recovery system. The heavy equipment used on the project will be in compliance with federal, state, and local regulations. Efforts will be made to reduce idling of this equipment when not in use.

A diesel fueled backup generator will be used to power the remediation system in the case of a power disruption. The make, model, serial number, manufacture date, size and EPA emissions certification for the generator engine will be provided to the USACE upon delivery to the Site. A log will be maintained by the Site Superintendent including reasons for operation of the generator delineated between emergency and non-emergency operation.

The ISTR vapor recovery system has been designed to minimize air pollution by concentrating contaminants into non-aqueous phase liquid and polishing with vapor phase granular activated carbon. This process and the monitoring on the system effluent is discussed further in the RAWP. The system effluent will be monitored in accordance with the RAWP.

5.3 AIR MONITORING

Air monitoring for the protection of public health will be carried out in accordance with the air monitoring plan included in the RAWP. This plan includes perimeter monitoring at the property fence line for dust, VOCs, and site-specific chemicals of concern.

Environmental resources within the project boundaries as well as those outside of work limits will be protected during the entire duration of the project. This section discusses the environmental monitoring plans and for the job site for land, water, biological resources. URS will take every step possible to minimize potential and actual impact to the environment. All areas within the project boundaries and adjacent to the limits of work will be preserved in their present condition; or restored to a condition that appears to be natural and not detract from the appearance of the project as required by the project specifications. Any ancillary construction activities will be limited to those areas defined by the Contract Drawings and Specifications. This EPP will not relieve URS or its subcontractors of the responsibility for adequate and continual control of pollutants during the life of the contract.

6.1 LAND RESOURCES

URS will protect land resources and vegetation outside the work area limits as shown on Figure 1-2 and in the Stormwater Pollution Prevention Plan (SWPPP), **Appendix D**. Additional detail regarding the proposed activity in each portion of the Site and the project boundaries are shown in the RAWP. The property is currently vegetated with grasses and scrub brush. There will be some minor clearing of brush and saplings along the southern property boundary to facilitate the completion of the excavation work as detailed in the RAWP. In summary, to protect land resources at the Site, URS will take the following steps:

- Identify all features to be preserved by conducting a site survey
- Excavate only within designated areas
- Limit vehicular traffic to designated areas
- Maintain good housekeeping
- Promptly remove all trash and debris

The project scope requires minimal removal of vegetation that impede the excavation and in-situ thermal remediation. If there are areas of protection identified during the survey following the completion of the RAWP and trees and plants located adjacent to and the in-situ thermal areas will be protected with the following steps:

- Orange fencing or other acceptable marking will be installed to mark the allowable limits of disturbance
- Trees within the construction area identified as requiring protection will have
- orange fence installed 3 feet beyond the tree canopy to preserve the root system and drip line
- Existing trees outside the excavation area which are to be retained will not be used as anchors for any activities occurring on site
- Trees outside the excavation area to be retained will not be used for the placement of signs, placards, hooks, or any similar devices that would require damage to the tree

- Limbs of trees to be retained will not be used for the hanging of anymaterials
- Construction activities will be confined to the work areas so designated by the contract drawings and specifications.
- In the event that damage is incurred to the site's landscape features or adjacent properties, URS will notify the COR, who will determine replacement requirements.

6.2 WATER RESOURCES

The designated EM or his on-site designee will continuously inspect construction activities to avoid pollution of surface and groundwater. Procedures will be followed to prevent pollution of surface and groundwater. This includes stockpile management and protection, excavation protection, traffic control, dirt and dust control, and spill prevention and control. Stormwater management and soil erosion controls will be implemented as described in the SWPPP. Wastewater will not be allowed to enter the storm sewer and stormwater will not be discharged to the sanitary sewer. SWPPP compliance notebook will be maintained by the EM or site designee to demonstrate compliance with the SWPPP.

6.3 BIOLOGICAL RESOURCES

URS will take all steps required to prevent interferences to fish and wildlife during construction activities, including earth work and installation and operation of the ISTR system. Disturbance will be limited to areas designated Figure 1-2 and the final design figures in RAWP.

As stated in the conclusions of the 2010 *Stage IA Cultural Resources Survey*, the Site has little or no sensitivity for prehistoric resources, as a result of extensive visible and documented disturbance. It is unlikely that any cultural resources will be disturbed during this work as the remedy is primarily in-situ. If suspected artifacts are encountered during excavation activities URS will notify the COR.

FINAL

DIAZ CHEMICAL CORPORATION SUPERFUND SITE, OPERABLE UNIT 2

PHASE II IN-SITU REMEDIAL ACTION

WASTE MANAGEMENT PLAN

Village of Holley

Orleans County, New York

March 2020

Prepared for:

United States Army Corps of Engineers,
Kansas City District

Prepared by:

URS Group, Inc.
12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

Contract No. W912DQ -15-D-3006, Delivery Order W912DQ 19F3063

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Acronyms and Abbreviations

CAMP	Community Air Monitoring Program
CO	Contracting Officer
COR	Contracting Officer's Representative
CFR	Code of Federal Regulations
DOT	Department of Transportation
DBCP	1,2-Dibromo-3-Chloropropane
EM	Environmental Manager
EPP	Environmental Protection Plan
GAC	Granular Activated Carbon
ISTR	In-Situ Thermal Remediation
NAPL	Non-Aqueous Phase Liquid
PM	Project Manager
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
SPCC	Spill Prevention, Control, and Countermeasures
SVOC	Semi Volatile Organic Compound
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
URS	URS Group, Inc.
U.S	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WMP	Waste Management Plan

WASTE MANAGEMENT PLAN
DIAZ CHEMICAL CORPORATION
OPERABLE UNIT 2 SUPERFUND SITE
IN-SITU THERMAL REMEDIAL ACTION, PHASE 2
VILLAGE OF HOLLEY, ORLEANS COUNTY, NEW YORK

Contract Number: W912DQ-15-D-3006

Preparation Date: March 2020

Plan Preparer

	4 March 2020
Sam Bartlett (401) 854-2853 URS Assistant Project Manager	Date

Plan Approval

	4 March 2020
John Santacroce (518) 951 2200 URS Environmental Manager	Date

Plan Concurrence

	4 March 2020
Michael S. Niederreither (717) 790-3404 URS Project Manager	Date

The purpose of the Waste Management Plan (WMP) is to present the approach for management of waste generated at the Diaz Chemical site that is designed to protect the health and safety of the worker, the public, and the environment.

The WMP provides an overall strategy for how waste management activities will be implemented for all primary and secondary wastes generated by the implementation of the ISTR treatment system. The WMP will identify all types of solid and liquid waste streams anticipated to be generated, as well as the corresponding disposal or reuse methods needed to properly treat / dispose of the waste. In addition, this document describes the proper management of waste streams from generation to disposal, including characterization and segregation to meet the applicable disposal facility requirements.

This section presents the relevant federal, state, and local laws, regulations, and permits applicable to environmental protection at the Site. Unless indicated otherwise, the following codes, standards, laws, and regulations establish the minimum requirements for waste management and transportation related work:

- Accidental oil or hazardous substance spill—40 CFR 110, 33 CFR 153 (Subpart B), 40 CFR 300 (Subpart E), and WAC 173-182 and 173-183 require that the National Response Center be notified in the event of a spill.
- Accidental oil or hazardous substance spill cleanup—The New York State Department of Environmental Conservation (NYSDEC) Spill Guidance Manual provides regulatory requirements for reporting and cleanup of an accidental spill, including historical releases in accordance with York Navigation Law, Article 12; 17 NYCRR 32.3 and 32.4
- Accumulation, storage, transportation, treatment, and disposal of solid waste—Solid waste shall be accumulated, stored, transported, treated (if required), and disposed of at a permitted solid waste disposal facility (Subtitle D) in accordance with the requirements specified in WAC 173-350, 40 CFR 243, and 40 CFR 257.
- Accumulation, storage, and disposal of hazardous waste—18 AAC 62, 40 CFR 260–262, 40 CFR 268, and 40 CFR 279 address the requirements for hazardous waste identification and proper disposal if hazardous wastes are generated. Non-aqueous phase liquid (NAPL) generated from the ISTR system condensate is the only hazardous waste anticipated to be generated on-site.
- Transportation of hazardous materials (includes transportation of hazardous waste)—The U.S. Environmental Protection Agency and the U.S. Department of Transportation (DOT) specify requirements in 40 CFR 263, 49 CFR 105, 49 CFR 130, and 49 CFR 171–180 for the shipment of hazardous materials, including hazardous waste.
- Wastewater disposal—Waste water will comprise equipment decontamination water, well development and purge water. This water will be transported to the Area 6 water treatment facility and introduced to the system for treatment.
- Stormwater pollution and prevention—The requirements for stormwater pollution and prevention are published in the New York State Standards and Specifications for Erosion and Sediment Control (November 2016).
- Air Emissions—The 6 CRR-NY Part 212 regulations (212-1.4(a)) provides a reference to Subpart 201-3 that indicates air Strippers and soil vents that are operated at a Superfund site are trivial and exempt from permitting requirements and NYSDEC confirmed that since the Diaz Site is a USEPA regulated Superfund site, the exemption applies, and a full formal permit is not needed. However, as stated under 6 CRR-NY 201-3.3(b), the owner or operator of any emission source or activity that is listed as being trivial, on the basis of the use of appropriate emission controls, shall operate and maintain those controls in a manner consistent with manufacturer’s specifications and good engineering practices. Exempt treatment systems are required to comply with the substantive regulations in Part 212.”

- Community Air Monitoring—The NYSDEC DER-10, Section 1.9 (b.) (1) and (2) describe the procedures for preparing a community air monitoring plan (CAMP) and for monitoring fugitive dust and particulates.

Waste management activities include volume reduction, waste minimization and pollution prevention, packaging, and transportation and disposal. Waste management is the responsibility of all personnel performing work under this plan. Work procedures and processes are designated to minimize waste generation to the maximum extent practical. All URS personnel and URS subcontractors are required to comply with this WMP and other applicable URS documents. Key positions for waste management are Project Manager, Waste Manager, Shipper, and Quality Control Officer. These roles are defined as follows:

3.1 PROJECT MANAGER (PM)

The PM is responsible for management and control of all activities associated with the Diaz Chemical ISTR implementation. The PM will ensure that personnel assigned to perform waste management activities do so in accordance with this plan and all appropriate procedures. In the event of an emergency, the PM, or designee, will make all appropriate notifications.

3.2 WASTE MANAGER

This lead position will serve as the point of contact for matters relating to characterization and management of wastes. The Waste Manager is responsible for ensuring the proper characterization and management of wastes resulting from the activities associated with the project. This role will be filled by the Site Superintendent or their delegate. Primary responsibilities include, but are not limited to, the following:

- Ensure that personnel involved in the management of waste are qualified and trained to perform job specific duties.
- Interface with waste generators and the Treatment, Storage, Disposal, or Recycling Facility (TSDF) on characterization/certification matters.
- Ensure that waste packages have proper certifications for the type of waste contained therein.
- Ensure that waste being shipped meets the appropriate TSDF acceptance criteria.

3.3 WASTE SHIPPING SUBCONTRACTOR

The Waste Shipping Subcontractor (Shipper) is responsible for providing the support needed to adequately identify, classify, contain, control, and communicate the hazards for waste being shipped off-site.

3.4 QUALITY CONTROL SYSTEM MANAGER

The Quality Control System Manager will facilitate implementation of quality requirements and practices into waste management activities, and verify that these operations are being performed effectively, efficiently, and in accordance with the requirements of the waste management and transportation plan.

3.5 WASTE MANIFEST SIGNATURES

Each manifest for hazardous waste manifests will be signed by the USACE Contracting Officer. Non-hazardous waste manifests will be signed by URS on behalf of USEPA. Each person signing a waste manifest must certify by signature (when required by the receiving facility) that waste is properly segregated, packaged, and prepared for shipment and meets the requirements of a waste profile and the WAC of the receiving facility. More information on waste manifests is provided in Section 7.

Waste forecasting is the process by which waste volumes are estimated for each waste stream to support project costing for waste management and disposal. Project activities will be implemented in order to minimize waste generation to reduce cost and impacts to the environment.

4.1 WASTE GENERATION PLANNING

Potential solid waste streams associated with project activities include the following:

- Nonhazardous solid waste, such as trash and inert construction debris (concrete, air entrained flowable fill, metal, wood);
- Volatile organic compound (VOC) and semi-volatile organic compound (SVOC) impacted soil from drill cuttings and remediation;
- Treated excavated soils;
- Impacted personal protective equipment (PPE);
- Impacted construction debris (concrete, wood, geotextile and liners, 6 millimeter poly);
- Spent vapor-phase granular activated carbon (GAC) and liquid-phase GAC; and
- Oily rags and sorbents.

Potential liquid waste streams associated with the project include:

- Decontamination liquids;
- Water used for sonic drilling;
- Monitoring well development water and purge water;
- ISTR process water; and
- Concentrated VOC and SVOC non-aqueous phase liquid (NAPL) from the remediation process.

4.2 WASTE MINIMIZATION

URS will plan every activity to meet the obligations and responsibilities under Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, Executive Order 13101, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, DOE Order 450.1A, Environmental Protection

Program, and The Pollution Prevention Act of 1990. URS will minimize the generation of waste per the following EPA hierarchy:

- Reduce
- Recycle/Reuse
- Dispose

Reduce: During project planning and implementation, URS will use the following practices to minimize the amount of waste generated.

- Use the least hazardous chemicals and products possible;
- Purchase only the amount of materials required;
- Limit the materials taken into contamination areas to reduce impacted materials and decontamination needs;
- Minimize activity within contaminated areas when possible;
- Decontaminate equipment practically with minimal use of resources; and
- Keep waste streams segregated and sorted.

Recycle/Reuse: When possible, URS will attempt to reuse non-impacted and nonhazardous materials on-site instead of sending these materials offsite for disposal provided reuse of the material is acceptable to the client and does not result in a hazard. Scrap metal will be sent to a recycling facility and will not be disposed of in a landfill.

Concrete construction debris (the Phase I air-entrained flowable fill cover) within and around Building F will be reused on-site to fill the depression to the north of Building F in order to bring this area to grade. Note that USACE has determined the Phase I flowable fill cover within Building F and to the north of Building F does not require waste characterization prior to reuse. The cover material to the south of Building F does require characterization based on observations of condensation. If there is excess material not suitable for on-site reuse, that material will be characterized and disposed offsite to an appropriate disposal facility. The cover material will then be compacted and covered with soil and dense aggregate as an anchor material to prevent dust hazards for the surrounding area.

Soil cuttings from the baseline soil borings and well installation procedures within the Stage 1 area will be incorporated into the ISTR treatment area soil cover.

Liquid IDW generated from drilling, decontamination, or other site activities will be processed through the on-site water treatment system to minimize the amount of liquid IDW that requires offsite transport and disposal.

Dispose: URS will initiate and maintain required treatment/disposal contracts for all waste types generated. In all cases, URS will seek the most compliant, cost-effective facility.

The unnecessary generation of possible hazardous waste will be minimized by controlling chemicals brought on-site and by preventing unnecessary packaging materials, tools, and equipment from entering the exclusion zone. Decontamination activities will be planned to minimize the generation of secondary waste volumes due to the decontamination processes.

4.3 WASTE STREAM HANDLING AND DISPOSAL

The following sections provide general definitions of the waste streams that may be generated during the remedial action of the Site. The list may not be inclusive of all wastes generated.

Non-Contaminated, Non-Regulated Wastes and Recyclable Materials

Sanitary wastes and other wastes that are not hazardous (per RCRA/TSCA) or prohibited from land disposal by the State of New York, will be disposed of at a local commercial disposal facility (landfill).

Materials that are considered by the project to be exempt from regulation, based on the intent to reclaim, recycle, or reuse will be released in compliance with State of New York Official Compilation of Codes, Rules, and Regulations (NYCRR) 6 NYCRR 371.1 (c)(7). As required by the regulation, a notification including all required information will be provided to the New York State Department of Environmental Conservation (NYSDEC) prior to utilizing the exemption or exclusion. General trash and noncontaminated, non-regulated material will be disposed at the JC Fibers Recycling Center in Rochester, New York, with storage and removal by Oaks Dumpsters. Recyclable metal materials will be disposed at Metalico in Rochester, New York. Refer to Section 6 for information on all waste disposal facilities.

Chemical and Hazardous Waste

Federal regulations define hazardous wastes as those solid wastes that are either specifically listed in the solid waste regulations (“F”, “U”, “P”, or “K”-listed RCRA wastes) or have particular characteristics (reactivity, ignitability, corrosivity, or leachability). Hazardous wastes include solids and liquids. In addition, New York regulations define certain wastes containing PCBs as hazardous waste. While NAPL is not a listed hazardous waste, it is expected to fail the ignitibility analysis for hazardous waste. NAPL is the only hazardous waste anticipated to be generated as a part of this field implementation.

Wastes that are determined to be hazardous wastes, per RCRA/TSCA regulations, will be packaged, treated, staged, transported, and disposed consistent with RCRA/TSCA and DOT regulations under 49 CFR 173 and 178. These wastes will be disposed either by direct contract with a permitted Treatment Storage and Disposal Facility (TSDF) or indirectly through a contract with a qualified local hazardous waste broker. Hazardous waste (NAPL) will be sent to Ross Incineration Services, Inc. in Grafton, Ohio. Refer to Section 6 for information on all waste disposal facilities.

Waste is intended to be packaged close to the point of generation or at a designated location within the regulated area of the Site. After packaging the waste, the container can be relocated to an on-site staging area where it can be prepared for shipment. Note that USACE determine that the 90-day storage rule would not come into effect until after the completion of site activities. If waste is still on-site at that time, the waste container will be placed in a 90-day storage area established within the regulated area and the appropriate measures will be taken to ensure that the container is stored and inspected according to CP-SF-110, Storage and Inspection of RCRA Hazardous Waste (Mixed Waste).

Non-Hazardous Waste

For the purposes of this plan, non-hazardous wastes are those that are not considered hazardous under federal or state regulation based on review of waste characterization data. Material that does not exceed levels hazardous waste criteria for waste characterization will be segregated and sent offsite to an approved landfill as non-hazardous waste. Non-hazardous waste will be disposed of at Mill Seat Landfill in Churchville, New York. Refer to Section 6 for information on all waste disposal facilities.

The project team will survey, and/or sample and analyze waste prior to disposal. The team will also transport this material to a local landfill and USACE will sign manifests, weigh bills, and bills of lading. The disposal of all project wastes will be in accordance with all applicable state and federal regulations.

4.4 WASTE SEGREGATION

The volume of the different waste streams will be minimized by decontaminating areas and equipment where practical and by ensuring waste streams are segregated. Waste streams will be segregated to ensure nonhazardous waste does not contact hazardous waste and that different waste streams are not co-mingled. NAPL is the only hazardous waste anticipated to be generated under this project.

4.5 VOLUME REDUCTION

Bulky material will be dismantled or cut up to reduce volume for temporary storage and shipment when it is cost-effective.

4.6 WASTE TRACKING

Waste movement from generation to disposal will be tracked using an electronic database system and/or electronic spreadsheet. On-site containerized waste movements will be tracked using container identification labeling. Off-site tracking will be implemented through logging of shipping manifests, supplementary transportation data, other notifications and documentation provided per subcontract, and documents provided in accordance with DOT and EPA regulations (e.g., certificates of treatment/disposal).

The tracking systems will provide the capability to identify for each waste container, the type of container, the type of waste contained, the container location, the approximate volume of waste contained, the pertinent Waste Characterization profile (when available), date loaded, date disposed, related container or waste material certifications.

As the information for each container is received and logged into the tracking system, the supporting documentation will be compiled into a record package for that container. Upon receiving and logging the Certificate of Disposal, the record package will be transferred to the Resident Management System. The procedure for implementing the waste tracking process, including the necessary tracking forms and documents will be provided to the Project Manager.

4.7 WASTE STORAGE ON-SITE

Waste materials and other construction materials will be stockpiled on-site in order to isolate the stored material from the environment. Per the PWS, stockpiles will be a maximum of 500 cubic yards in volume and will not be placed within 75 feet of the north or eastern site property boundary.

Stockpiled materials will be staged on a competent, undamaged, chemically-resistant geomembrane liner. Non-reinforced liners shall be a minimum thickness of 20 millimeters. Geomembrane liners reinforced with scrim will be a minimum weight of 40 pounds per 1,000 square feet. Stockpiles will be constructed in areas free of rocks greater than 0.5 inches in diameter that could damage the geomembrane liner.

Stockpiles will be covered with competent, undamaged geomembrane to prevent precipitation infiltration into the stockpiled material. Non-reinforced geomembrane covers will have a minimum thickness of 10 millimeters. Geomembrane covers reinforced with scrim will be a minimum weight of 26 pounds per 1,000 square feet. Stockpile covers will be anchored and ballasted with 40 pound sand bags or an equivalent to ensure the material remains covered.

Stockpiles will be constructed with a surrounding berm at 12 inches. The liner system will be sloped to allow collection of liquids within the stockpile. Liquids will be decanted into a temporary container and processed with liquid IDW as described in Section 5.5.

In addition to stockpiles, roll-off units may also be used for temporary materials storage. Roll-offs will be water tight and covered to prevent precipitation infiltration into the stored material. Liquid which collects in the roll-off will be decanted into a temporary container and processed with liquid IDW as described in Section 5.5.

.

There are several different potential waste generation activities during the preconstruction phase of work and during the construction and operation of the ISTR system. A general discussion regarding the generation, sampling, and disposal of remedial action wastes is presented in the following sections.

USACE will be listed as the generator for all waste that is shipped for disposal from this remedial action project. Characterization of waste will assure waste is in compliance for acceptance and disposal off-site. Characterization of waste will include waste sampling, testing, and analysis for each waste stream.

The following sections describe the generation, handling, and characterization of anticipated waste streams.

5.1 WASTE CHARACTERIZATION

Waste characterization data will be compared to hazardous waste characteristics for Ignitability (40 CFR 261.21), Corrosivity (40 CFR 261.22), Reactivity (40 CFR 261.23), and Toxicity ((40 CFR 261.24). Other waste parameter requirements are dictated by the disposal facilities. NAPL is the only hazardous waste anticipated for this program, and it is assumed that all generated waste will be disposed as nonhazardous.

The following table outlines the specific analytical parameters and methods that will be used to characterize waste in accordance with EPA SW-846 and 40 CFR 261. SW-846 Method versions are subject to change. Because of the nature of the matrix, characterization of GAC and liquid GAC will require modifications and adaptations of some of the analytical methods cited.

Table 5.1: Waste Characterization Parameters

Parameter	Analytical Method
Ignitability	EPA SW-846 Method 1030
Corrosivity	EPA SW-846 Method 9045D
TCLP Metals	EPA SW-846 Method 1311 and 6010C
TCLP VOCs	EPA SW-846 Method 1311 and 8260B
TCLP SVOCs	EPA SW-846 Method 1311 and 8270C
TCLP Herbicides/Pesticides	EPA SW-846 Method 1311 and 8081A /8151A
Total PCBs	EPA SW-846 Method 8082A
Reactive Cyanides	EPA SW-846 Method 9012B
Reactive Sulfides	EPA SW-846 Method 9030B

5.2 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) will be generated during the soil sampling events and drilling. All IDW generated from sampling activities will be considered contaminated and be handled and staged accordingly.

Liquid IDW generated from decontamination, drilling, groundwater sampling, and other site activities will be processed through the waste water treatment system as described below. This material will be temporarily stored as needed on-site in a frac tank, 55-gallon drums, or a similar suitable container before being pumped into the weir tank used for on-site liquid processing. Due to the similarity of source contamination, liquid IDW will not require characterization prior to being incorporated into the weir storage tank. Approximately 40,000 gallons of liquid IDW are anticipated to be generated as a result of sampling activities.

Solid IDW generated from sampling activities includes excess soil cuttings from drilling. Soil cuttings will be temporarily staged on-site in a roll-off or stockpile in accordance with Section 4.7. During excavation and placement of soil within the Stage 1 treatment area, staged soil cuttings will be mixed with the excavated material and distributed throughout the Stage 1 treatment area for treatment. Soil cuttings will not require characterization prior to being incorporated into the treatment areas. Approximately 150 tons of soil cuttings are anticipated to be generated as a result of drilling activities between Stage 1 and Stage 2 of treatment.

Soil cuttings for Stage 2 will be packaged, characterized, and disposed offsite. Waste characterization samples will be analyzed for the parameters presented in Section 5.1 by Eurofins TestAmerica, Inc. Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP. Samples will be collected at a frequency of one waste characterization sample for the first 500 tons of material with an additional sample collected for every subsequent 1,000 tons of material generated.

QAQC samples will not be collected. Waste characterization will not undergo data validation; however, the data package from the analytical laboratory will be verified for completeness to confirm that all requested analyses were completed, and laboratory information is in agreement with the chain of custody. Any anomalous results or results inconsistent with the known dataset on-site will be investigated and discussed with the analytical laboratory. Waste characterization data will not be uploaded into the EPA Region 2 database.

5.3 DEMOLITION/CONSTRUCTION DEBRIS

Demolition and construction debris are anticipated to include removed concrete, air-entrained flowable fill, gravel/stone, scrap metal, and scrap wood material resulting from the removal of surface concrete within the treatment areas, the wooden perimeter fence, the Phase I insulating cover and ISTR wells, and the Stage 1 and Stage 2 cover material and wells (post-treatment). Demolition and construction debris will be stockpiled and staged in accordance with the procedures in Section 4.7.

Concrete material from demolition waste will be sampled and analyzed by the project team as necessary to provide the basis for disposal facility selection. Some demolition debris such as removed fencing will not warrant waste characterization prior to disposal. The project team will provide documentation of waste characterization prior to disposal of waste. The disposal of all project wastes will be in accordance with all applicable state and federal regulations.

Concrete, air entrained flowable fill, and gravel/stone will either be pulverized and sampled in the field or provided to the analytical laboratory to pulverize prior to analysis. Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Waste characterization samples will be analyzed for the parameters presented in Section 5.1 by Eurofins TestAmerica, Inc. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP. Samples will be collected at a frequency of one waste characterization sample for the first 500 tons of material with an additional sample collected for every subsequent 1,000 tons of material generated.

QAQC samples will not be collected. Waste characterization will not undergo data validation; however, the data package from the analytical laboratory will be verified for completeness to confirm that all requested analyses were completed, and laboratory information is in agreement with the chain of custody. Any anomalous results or results inconsistent with the known dataset on-site will be investigated and discussed with the analytical laboratory. Waste characterization data will not be uploaded into the EPA Region 2 database.

5.4 EXCAVATED SOIL

Following ISTR treatment, excavated soil beneath the insulating cover of ISTR Stage 1 will be removed, characterized, and disposed offsite to return the Site to starting grade.

Waste characterization samples for excavated soil will be analyzed for the parameters presented in Section 5.1 by Eurofins TestAmerica, Inc. Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP. Samples will be collected at a frequency of one waste characterization sample for the first 500 tons of material with an additional sample collected for every subsequent 1,000 tons of material generated.

QAQC samples will not be collected. Waste characterization will not undergo data validation; however, the data package from the analytical laboratory will be verified for completeness to confirm that all requested analyses were completed, and laboratory information is in agreement with the chain of custody. Any anomalous results or results inconsistent with the known dataset on-site will be investigated and discussed with the analytical laboratory. Waste characterization data will not be uploaded into the EPA Region 2 database.

5.5 WASTE WATER

As presented in the RAWP, waste water generated from the ISTR process will go through an on-site waste water treatment system consisting of a weir tank, bag filters, liquid-phase GAC filter, and post-treatment holding tank. Water will be discharged continuously at a rate of 5 to 10 gallons per minute into the sanitary sewer connection on Jackson Street.

Effluent from the treatment system will be monitored on a weekly basis for site COCs with monthly monitoring for discharge quality parameters requested by the Village of Holley. The table below discusses the sampling frequency, methods, and discharge limits provided by the Village.

Table 5.5: Sewer Discharge Parameters and Criteria

Parameter	Analytical Method	Limits	Frequency
VOCs (Site CoCs*)	SW-846 Method 8260C	Refer to Worksheet #15 of the UFP-QAPP	One Sample Weekly
SVOCs (Site CoCs*)	SW-846 Method 8270D	Refer to Worksheet #15 of the UFP-QAPP	One Sample Weekly
BOD-5	SM5210B	200 mg/L	One Sample Monthly
Ammonia	350.1	No Limit Defined	One Sample Monthly
Total Dissolved Solids (TDS)/ Total Suspended Solids (TSS)	SM 2540 C and D	TDS: 1,100 mg/L TSS: 200 mg/L	One Sample Monthly

* Site CoCs are listed in the UFP-QAPP in Worksheet #15.

Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Analysis will be completed by by Eurofins TestAmerica, Inc. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP.

QAQC samples will be collected for effluent samples in accordance with the procedures outlined in Worksheets #31, 32, 33, 34, 35, and 36 in the UFP-QAPP. Refer to these worksheets for a discussion of the data validation process. Waste characterization data for the effluent sampling will be uploaded into the EPA Region 2 database.

5.6 NAPL

NAPL will be generated during the operation of the ISTR system as VOC and SVOC vapor is condensed and collected for disposal. A 2,000 to 4,000 gallon tank will be used to store NAPL during collection. It is anticipated that NAPL will be disposed in two events, once at the end of Stage 1 operations and again at the end of Stage 2. NAPL will be characterized in accordance with 40 CFR 261 as described in Section 5.1. NAPL will also be analyzed for the Site CoCs to get an understanding of overall mass removal from the successful implementation of the ISTR system. Analysis for CoCs will be conducted using a combination of the waste dilution methods and VOC and SVOC analyses: For VOCs, SW-846 Methods 3585 and 8260C; for SVOCs SW-846 Method 3580A and 8270D.

Analysis will be completed by Eurofins TestAmerica, Inc. Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP.

QAQC samples will not be collected. Waste characterization for NAPL will not undergo data validation; however, the data package from the analytical laboratory will be verified for completeness to confirm that all requested analyses were completed, and laboratory information is in agreement with the chain of custody. Any anomalous results or results inconsistent with the known dataset on-site will be investigated and discussed with the analytical laboratory. Waste characterization data will not be uploaded into the EPA Region 2 database.

5.7 GAC

Vapor-phase GAC and liquid-phase GAC will require replacement if breakthrough of GAC is identified during the monitoring of the ISTR system. After removal and replacement, the spent GAC will be characterized in accordance with 40 CFR 261 as described in Section 5.1.

Nonhazardous GAC will be taken offsite and regenerated by Activated Carbon Corporation. If GAC is found to be hazardous, it will be disposed at an appropriate incineration facility; however, this is not anticipated based on prior experience with similar systems.

GAC waste characterization samples will be analyzed for the parameters presented in Section 5.1 by Eurofins TestAmerica, Inc. Samples will be collected and documented in accordance with the field sampling procedures and field records procedures presented in Worksheet #21 of the UFP-QAPP. Sample preservation requirements, containers, and hold times are presented in Worksheet #19 & 30 in the UFP-QAPP. One waste characterization sample will be collected when it is determined that the GAC needs to be replaced in the system.

QAQC samples will not be collected. Waste characterization will not undergo data validation; however, the data package from the analytical laboratory will be verified for completeness to confirm that all requested analyses were completed, and laboratory information is in agreement with the chain of custody. Any anomalous results or results inconsistent with the known dataset on-site will be investigated and discussed with the analytical laboratory. Waste characterization data will not be uploaded into the EPA Region 2 database.

5.8 PERSONAL PROTECTIVE EQUIPMENT

Waste PPE generated by remedial activities (including nitrile gloves, disposable sampling equipment, disposable protective coveralls) will be placed in plastic bags, marked and labeled, and then disposed of concurrently with and other wastes destined for an approved disposal facility.

Transport of waste offsite will be performed in compliance with 40 CFR 260, state, and local requirements for solid waste disposal.

Nonhazardous treated soil, concrete, flowable fill, stone, and fabrics will be disposed of by Waste Management at the Mill Seat Landfill in Churchville, New York. Waste Management Mill Seat is a Subtitle D RCRA permitted landfill that complies with local, state, and federal requirements.

Waste Management – Mill Seat Landfill
303 Brew Road
Bergen, NY 14416
585-494-3000
State Facility ID #: 8-2648-00014/00001

Nonhazardous liquid waste that is unable to be treated on-site will be disposed at American Recyclers Company in Tonawanda, New York.

American Recyclers Company
177 Wales Avenue
Tonawanda, NY 14150
716-695-6720
EPA ID #: NYR000030809

Hazardous waste will be disposed of by Ross Incineration Services, Inc in Grafton, Ohio. Note that the only hazardous waste that is anticipated to be generated during this program is the NAPL condensate from the ISTR system operations. Ross Incineration Services, Inc. is a Federal RCRA Part B Permitted facility.

Ross Incineration Services, Inc.
36790 Giles Road
Grafton, Ohio 44044
EPA ID #: OHD 048 415 665
Ohio Haz Permit #: 02-47-0295
Ohio Air Permit #: 0247050278

General trash and noncontaminated, non-regulated material will be disposed at the JC Fibers Recycling Center in Rochester, New York with storage and removal by Oaks Dumpsters.

JC Fibers Recycling Center
1801 Mt Reed Boulevard
Rochester, NY 14615
DEC Permit #: 8-2699-00117/00001
Facilities/Program #: 28T14

Recyclable metal materials will be removed by Oaks Dumpsters and disposed at Metalico in Rochester, New York.

Metalico-Scottsville Rd
1515 Scottsville Rd

Rochester NY 14623
585-697-4103

6.1 WASTE ESTIMATES AND DISPOSAL FACILITIES

The following lists the estimated quantities of waste materials generated at the site for off-site disposal.

Table 6.1: Waste Stream Estimates

Waste Stream Classification	Description	Estimated Waste Volume	Disposal Facility
Demolition/construction Debris from subsurface and surface preparation	Concrete, large dense aggregate, excess Phase I cover material	TBD	Waste Management – Mill Seat
Scrap Metal	Scrap metal reclaimed for offsite recycling	TBD	Metalico
NAPL Recovered	Oily NAPL recovered from ISTR operation	40,814 pounds	Ross Incineration
Vapor-phase GAC	Spent GAC material used for vapor scrubbing	32,000 pounds	Regenerated by Activated Carbon Corporation
Liquid-phase GAC	Spent GAC material used for liquid	8,000 pounds	Regenerated by Activated Carbon Corporation
Liquid IDW	Any liquid IDW that is not treated onsite	1,000 gallons	American Recyclers
Soil post-treatment	Excavated soil removed for disposal following completion of treatment	2,150 cubic yards	Waste Management – Mill Seat
Stage 2 Drill Cuttings	Drill cuttings from the Stage 2 well installation	75 tons	Waste Management – Mill Seat
Surface Insulating Cover Material	Removed and disposed following completion of ISTR treatment	500 cubic yards	Waste Management – Mill Seat

7.1 RECYCLING FACILITIES

Prior to transport of waste determined to be appropriate for a recycling facility, URS will provide USACE with the following information:

- Name and Address
- Telephone Number of the hauler and facility
- Material destination, State or Local Permit or license for recycling (unless exempt)

7.2 WASTE DETERMINATION DOCUMENTATION

A Waste Determination Form will be completed for any contractor-derived waste that will be generated. All potentially hazardous waste will be characterized in accordance with 40 CFR 261; however, hazardous waste is not expected to be generated on this project. Waste determination will be based on user knowledge of the materials and if necessary laboratory analysis.

7.3 LABORATORY ANALYSIS

Analytical data will be collected as discussed in Section 5. Analytical results and reports will be provided to the Contracting Officer, on-site USACE representative, and USACE project management team following a completeness review by the project chemist. Waste characterization data will not be uploaded into the EPA database.

7.4 SOLID WASTE MANAGEMENT REPORT

The Contracting Officer and USACE project management team will be provided with written notifications that outline the anticipated quantity of solid waste or debris that is anticipated to be generated during construction. This will include where waste will be disposed or recycled, letters of acceptance from receiving facilities, and a copy of the facility's state and local Solid Waste Management Permit or license showing approval of disposal prior to disposal.

A Solid Waste Management Report will be provided to the Contracting Officer and USACE project management team on a monthly basis. This will summarize waste classifications, quantities, locations and names of receiving facilities for each waste. The Solid Waste Management Report will also include copies of weight tickets, receipts, bills of sale, and any other sales documentation. A statement indicating the disposal location for the solid waste signed by an authorized employee to legally obligate or bind the facility will be submitted in lieu of sales documentation. Sales documentation will include the receiver's tax identification number and business title, EPA or state registration number, and the delivery and business address and contact information.

7.5 HAZARDOUS AND NON-HAZARDOUS WASTE MANIFESTS

Each manifest for hazardous waste will include the facility RCRA identification number that can be obtained by the Contracting Officer. URS will submit a copy of the facility permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste to the Contracting Officer who will review, sign, and approve the waste manifest.

Each waste manifest package for non-hazardous waste will be signed by URS on behalf of USEPA. Non-hazardous waste manifests that require a shipping certification number will be signed by a USEPA Region 2 representative.

APPENDIX B Spill Control, Containment, and Countermeasures Plan

Oil Spill Prevention Control and

Countermeasure Plan

Diaz Chemical Corporation Superfund Site

Village of Holley

Orleans County, New York

Prepared for:

United States Army Corps of Engineers,

Kansas City District

Prepared by

URS Group, Inc.

12120 Shamrock Plaza, Suite 300

Omaha, NE 68154

Date:

Last Revised:

TABLE OF CONTENTS

Appendices

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has promulgated regulations on oil pollution prevention in an effort to prevent discharges of oil to the nation's waters. The regulations were originally published in the Federal Register on 11 December 1973 and are further identified as 40 CFR Part 112.

The regulations on oil pollution prevention apply to non-transportation related facilities that reasonably could be expected to discharge oil into or upon the navigable waters of the United States or adjoining shorelines, and that have an aggregate oil storage capacity of over 1,320 gallons aboveground or 42,000 gallons underground. The Diaz Chemical Corporation Superfund Site (hereafter "the Diaz Chemical Superfund Site" or "the facility") is a facility to which 40 CFR 112 applies. The main requirement for this facility is the preparation and implementation of a Spill Prevention Control and Countermeasure (SPCC) Plan to prevent any discharge of oil into or upon the navigable waters of the United States or adjoining shorelines. This SPCC Plan is prepared to address the regulatory provisions of 40 CFR Part 112 for the facility. This facility is not required to submit a Facility Response Plan to EPA because it does not meet any of the criteria listed in 40 CFR Part 112.20(f)(1)(i) and (ii). As documentation, Appendix B contains a completed Certification of the Applicability of the Substantial Harm Criteria form, pursuant to the provisions of 40 CFR Part 112.20(e).

The Oil SPCC Regulation Cross-Reference Table in Appendix A lists the requirements of Part 112 and the respective parts of this Plan that discuss the facility's conformance with those requirements. The facility is in conformance with the currently applicable portions of the Part 112 regulations that became effective January 14, 2010. [§112.3; §112.7; §112.7(a)(1)]

A copy of this SPCC Plan will be maintained onsite in the construction trailer east of the site entrance along Jackson Street and will be available to the EPA Regional Administrator for review during normal working hours. [§112.3(e)]

This SPCC Plan will be amended whenever there is a change in facility design, construction, operation, or maintenance that materially affects the facility's potential for the discharge of oil into or upon navigable waters of the United States or adjoining shorelines. Such amendments must be prepared within six months, and implemented as soon as possible, but no later than six months following preparation of the amendment. Each required Plan amendment will be subject to review and certification by a Licensed Professional Engineer (if applicable) and approval by management. [§112.5(a)]

The following table is a summary of tanks on-site and their respective operations and maintenance requirements:

PETROLEUM BULK STORAGE SUMMARY					
NYSDEC ID No.	Size (gallons)	Product Stored	Underground/ Aboveground	Monitoring Type and Schedule	Required Signage
001	500	Diesel	Aboveground	Monthly and Annual walkthrough inspection.	NYSDEC PBS No., Tank ID, Tank Capacity, Product Color Code
001A	50	Diesel	Aboveground	Monthly and Annual walkthrough inspection.	NYSDEC PBS No., Tank ID, Tank Capacity, Product Color Code
002	500	Diesel	Aboveground	Monthly and Annual walkthrough inspection.	NYSDEC PBS No., Tank ID, Tank Capacity, Product Color Code
003	2,000	Used Oil	Aboveground	Monthly and Annual walkthrough inspection.	NYSDEC PBS No., Tank ID, Tank Capacity, Product Color Code

2.0 SPCC PLAN APPROVALS AND REVIEWS

2.1 PROFESSIONAL ENGINEERING CERTIFICATION

I hereby attest and certify that: (i) I am familiar with the requirements of 40 CFR Part 112; (ii) I (or my agent) have visited and examined the facility; (iii) this SPCC Plan for the Diaz Chemical Superfund Site located at 40 Jackson Street, Holley NY 14470 has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of 40 CFR Part 112; (iv) procedures for required inspections and testing have been established in this SPCC Plan; and (v) this SPCC Plan is adequate for the facility. Employees working at this facility have provided certain information in this SPCC Plan. It is understood that the management of this facility also certifies that the information provided is true and accurate. This certification does not relieve the facility of its duty to implement this SPCC Plan in accordance with 40 CFR Part 112. [§ 112.3(d)(1); § 112.3(d)(2)]

Name: Gerlinde Wolf, P.E.
License No.: 097793
State: New York
Date:

Signature (Seal)

WARNING: It is in violation of New York State Education Law, Article 145, Section 7209, Special Provision 2, for any person unless he is acting under the direction of a Licensed Professional Engineer or Land Surveyor to alter an item in any way. If an item bearing the seal of an Engineer or Land Surveyor is altered, the altering Engineer or Land Surveyor shall affix to the item his/her seal and notation "Altered By" followed by his/her signature and date of such alteration, and a specific description of the alteration.

2.2 MANAGEMENT APPROVAL

By acceptance of this certified SPCC Plan, and incorporation of the Plan into the site's standard operating procedures, the management of the facility will commit the necessary equipment, resources, and manpower to implement this SPCC Plan as described herein.

Name Title

Signature Date

2.3 FIVE-YEAR SPCC PLAN REVIEW AND EVALUATION

The owner and/or operator of the facility must conduct a review and evaluation of this Oil Spill Prevention Control and Countermeasure Plan (SPCC Plan) at least once every five years. This SPCC Plan must be amended within six months of each review and evaluation to include more effective prevention and control technology if: (1) such technology will significantly reduce the likelihood of a discharge of oil in quantities that may be harmful (as described in 40 CFR Part 110) into or upon the navigable waters of the United States or adjoining shorelines; *and* (2) such technology has been field-proven at the time of review. Any technical amendment(s) to this SPCC Plan must be reviewed and certified by a Licensed Professional Engineer within six months after a change in the facility, design, construction, operation, or maintenance occurs which materially affects the facility's potential for the discharge of oil in quantities that may be harmful into or upon the navigable waters of the United States or adjoining shorelines. [§ 112.5(b); § 112.5(c)]

I, as an authorized management representative of the owner and/or operator, have completed a five-year review of this SPCC Plan, and determined that (*check one*):

[ ] Significant changes to the facility have occurred since the last review, and therefore this SPCC Plan must be appropriately updated and re-certified by a Licensed Professional Engineer.

[ ] Only non-technical amendments to this SPCC Plan were necessary, and they have been made.

[ ] No amendment to this SPCC Plan is necessary at this time, per 40 CFR §112.5(b).

Reviewer's Name and Title:	
Reviewer's Signature and Date:	

Licensed Professional Engineer's recertification, if technical amendments are made to this SPCC Plan

I hereby attest and certify that: (i) I am familiar with the requirements of 40 CFR Part 112; (ii) I (or my agent) have visited and examined the facility; (iii) this SPCC Plan for the Diaz Chemical Superfund Site located at 40 Jackson Street, Holley NY 14470 has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of 40 CFR Part 112; (iv) procedures for required inspections and testing have been established in this SPCC Plan; and (v) this SPCC Plan is adequate for the facility. Employees working at this facility have provided some of the information in this SPCC Plan. It is understood that the management of this facility also certifies that the information provided is true and accurate. This certification does not relieve the facility of its duty to implement this SPCC Plan in accordance with 40 CFR Part 112.

Printed Name of Professional Engineer:	
Signature of Professional Engineer and Date:	
P. E. Registration Number: (*Apply P. E. seal over the written information*)	

3.0 FACILITY IDENTIFICATION AND SUMMARY DESCRIPTION

Name of Facility:	Diaz Chemical Superfund Site
Address of Facility:	40 Jackson Street, Holley NY 11470
Name of Owner:	USEPA, Region 2, John DiMartino
Owner's Address:	290 Broadway, New York NY 10007
Owner's Phone:	(212) 637-4270
Emergency Phone Number:	
Primary Facility Contact: (SPCC Coordinator)	David Tiedman
Primary Contact's Work Phone: Primary Contact's Off-Hours Phone:	(716) 480-8013 David.tiedman@aecom.com
Secondary Facility Contact: (Backup SPCC Coordinator)	John Santacroce
Secondary Contact's Phone: Secondary Contact's Off-Hours Phone:	(518) 951-2206 John.santacroce@aecom.com

(Note: Facility contact information can be updated in ink in the remaining space.)

The facility contact is the person directly accountable for oil spill prevention and response (i.e., the facility's **SPCC Coordinator**). [§112.7(f)(2)]

This facility is engaged in environmental remediation and general construction activities. It occupies approximately 5 acres, about 30% of which is covered by buildings and paved areas. Appendix C contains Figure 1 Site Preparation Plan (i.e. the facility diagram; not to scale) that include: (1) the general facility layout, including the location and contents for each aboveground oil tank and other fixed bulk storage containers; (2) an indication of each area where drums and/or other portable containers with a capacity of 55 gallons or greater are normally stored; (3) each oil transfer station and the general location of its connecting pipes; (4) each bulk oil loading and unloading area; (5) the general facility surface drainage pattern, including, at a minimum, sufficient information identifying drainage patterns from all outdoor container locations, including all bulk storage tank locations, and all tank truck loading and unloading locations; and (6) an indication of each area where spill response equipment is normally stored. [§112.7(a)(3)]

Based on the topographic survey data for the facility, drainage patterns indicate stormwater runoff and potential oil discharging to the northeast.

The facility is in a residential neighborhood with residential housing bordering the facility to the northeast and northwest. A railroad track operated by Genesee Valley Transportation Co. borders the facility to the southeast and southwest.

4.0 OIL STORAGE INVENTORY AND POTENTIAL DISCHARGES

The facility has petroleum storage facilities for emergency electricity generation, motor vehicle fueling, and used oil collection. This facility has three (3) bulk storage tanks, one emergency electrical generator with an oil storage capacity less than 55 gallons, and two (2) oil-filled transformers with an oil storage capacity of approximately 270 gallons each. Figure 1 depicts the location of each stationary tank, normal storage locations for drums and other portable containers, tank truck loading/unloading areas, electrical transformers, and electrical generators. [§112.7(a)(3)(i)]

The petroleum storage tanks at the facility store ULSD fuel for emergency electricity generation (Tank 001/001A), ULSD fuel for vehicles refueling (Tank 002), and collected used oil from the remediation system (Tank 003). The tanks are registered under the provisions of 6 NYCRR Part 613-1.9 and operated under the provisions of 6 NYCRR Part 613-4, “AST Systems.”

New or substantially modified tanks must be constructed, designed, and installed pursuant to the provisions of 6 NYCRR Parts 613-4.1 “AST Systems: design, construction and installation.”
All stationary tanks are regulated by NYSDEC under the conditions of Petroleum Bulk Storage Facility Registration No. (to be assigned upon application submission). The facility’s Petroleum Bulk Storage Registration Application is provided in Appendix D. A listing of the tanks that store petroleum at the facility is as follows:

NYSDEC ID No.	Installation Date	Underground/ Aboveground	Product Stored	Construction Material	Tank Capacity (gallons)	Containment
001	03/01/2020	Aboveground	Diesel	Steel	500	Double walled with drip berm
001A	03/01/2020	Aboveground	Diesel	Steel	50	Double walled with drip berm
002	03/01/2020	Aboveground	Diesel	Steel	500	Double walled with drip berm
003	03/01/2020	Aboveground	Used Oil	Steel	2,000	Double walled with drip berm

The facility has one (1) emergency electricity generator with an oil storage capacity less than 55 gallons. The emergency generator day tank (Tank 001A) will be double walled.

Two (2) transformers are known or presumed to contain approximately 270 gallons of dielectric oil. These units are located outdoors on raised concrete pads. A listing of the oil-insulated transformers located at the facility is as follows:

KVA	Gallons of Oil	Containment
750	270	Concrete curb
750	270	Concrete curb

The most probable spill events at the facility are summarized in the following sets of tables. Possible flow rates for delivery truck spills and tank leaks are highly variable and, therefore, spills could be near instantaneous releases from the vessels, or slow leakage over a period of time. [§112.7(b), §112.7(c)]

TANK 001/001A – Stores ULSD fuel for emergency electricity generation. Day Tank 001A is filled from Main Tank 001.

TANK 002 – Stores ULSD fuel for on-site motor vehicle refueling.

TANK 003 – Stores NAPL used oil from the on-site remediation system.

Description of Discharge	Maximum Predicted Spill (gallons)	Probable Spill Route
Delivery truck spill	125	A delivery truck spill at Transfer Station A would flow overland to the northeast. The three stormwater drains (identified in Appendix C, Figure 1) in the immediate vicinity of the facility will be covered by drain mats. Additional procedures to minimize the potential for an oil discharge during a transfer are discussed in Section 9.0.
Tank overfill	100	Overfill from Tank 001 would flow out the vent pipe or fill line and onto the ground where it would be contained in the secondary drip berm. In the event of Tanks 001A being overfilled, the fuel would be returned to Main Tank 001 by way of return piping.
Tank leakage	Tank 001 - 500 Tank 001A - 50 Tank 002 – 500 Tank 003 – 2,000	The tanks are all double wall tanks located within drip berms. Tank leakage would be contained within the respective containment structure for each tank.
NOTE: A delivery truck spill of 125 gallons is an estimate based on the flow rate of the transfer pump on the tank truck expected to deliver petroleum to these tanks. The tank overfill of 100 gallons is based on the time it would take for the delivery truck driver to acknowledge overfill and stop delivery (3 to 5 minutes). The tank leakage volume is based on the total capacity of the tank.		

5.0 CONTAINMENT AND/OR DIVERSIONARY STRUCTURES OR EQUIPMENT TO PREVENT A DISCHARGE

Appropriate containment and/or diversionary structures and/or equipment are provided (or are able to be expeditiously provided in the event of an oil release) for the facility's oil storage, handling and transfer areas that are directly regulated under 40 CFR Part 112 to prevent a discharge of oil in harmful quantities into or upon the navigable waters of the United States or adjoining shorelines, as summarized below. [§112.7(c)] [§112.7(a)(3)(i)–(iv)]

TANK 001 – This 500-gallon ULSD fuel tank is located aboveground, east of the site entrance along Jackson Street. The tank is of double-wall steel construction and stores fuel for use in emergency electricity generation. The tank is equipped with a high-level alarm that sounds near the fill port location. A continuous interstitial monitoring system provides leak detection. The double walled tank construction serves as a secondary containment structure for this tank per §112.7(c).

TANK 001A – This 50-gallon ULSD fuel tank is located aboveground, east of the site entrance along Jackson Street. The tank is of double-wall street construction and stores fuel for use in emergency electricity generation. The tank is a day tank equipped with an automatic product level gauge. The double walled tank construction serves as a secondary containment structure for this tank per §112.7(c).

TANK 002 – This 500-gallon ULSD fuel tank is located aboveground, east of the site entrance along Jackson Street. The tank is of double-walled steel construction and stored fuel for on-site vehicle refueling. The tank is equipped with a high-level alarm near the fill port location. A continuous interstitial monitoring system provides leak detection. The double walled tank construction serves as a secondary containment structure for this tank per §112.7(c).

TANK 003 – This 2,000-gallon used oil tank is located aboveground inside Building F. The tank is of double-walled steel construction and stores NAPL collected from on-site remediation system. The tank is equipped with a high-level alarm and a product level gauge. A continuous interstitial monitoring system provides leak detection. The double walled tank construction serves as a secondary containment structure for this tank per §112.7(c).

OIL-FILLED TRANSFORMERS – The facility has two (2) oil-filled transformers that are known or presumed to have an oil storage capacity of approximately 270 gallons. All of the transformer units are located outdoors on raised concrete pads.

All transformers at the facility are designed, constructed and maintained according to specifications for their particular operation and function, and their materials of construction are corrosion-resistant. Oil transfers for the transformers occur infrequently, if at all. The loss of a substantive amount of oil from an individual transformer will cause associated electrical equipment to cease to operate, resulting in power outage and thereby in an almost immediate facility response and action. Dedicated, readily-available spill kits are maintained onsite for immediate use by facility personnel in the event of detection of an oil release from a transformer. The facility's two (2) transformers are visually inspected at least monthly for signs of oil seepage or any physical deterioration that may lead to a release of oil (Section 10.0); any observed deficiencies are promptly corrected to prevent conditions conducive to an oil release. The individual transformers being sited away from active storm and/or sanitary drain systems, their design and construction measures, their closed-loop operating status with infrequent loading, the immediate facility response that will be prompted by an oil release, and the monthly visual inspection program provided for the transformers collectively provide the requisite discharge prevention measures for these pieces of electrical equipment to prevent an oil discharge, per §112.7(c).

OTHER OIL HANDLING AREAS/ACTIVITIES -

TANK TRUCK LOADING/UNLOADING AREAS - The facility's designated tank truck loading/unloading areas are un-diked. The facility's tank truck loading/unloading procedures are detailed in Section 9.0, below. As indicated by these procedures, the active tank truck loading/unloading activity is to be continuously monitored by the carrier driver and a designated facility employee. Dedicated, readily-available spill kits are maintained onsite, for immediate use by facility personnel in the event of an oil spill during the tank truck transfer activity. The three stormwater drains in the immediate vicinity downgradient of the transfer area shall be covered with drains mats prior to any tank truck loading/unloading activities, per §112.7(c).

Procedures to minimize the potential for an oil discharge during a transfer are discussed in Section 9.0.

6.0 FACILITY DRAINAGE

6.1 VALVES FOR DIKED AREAS

According to 40 CFR Part 112.8(b)(1), the facility must "Restrain drainage from diked storage areas by valves to prevent a discharge into the drainage system or facility effluent treatment system, except where facility systems are designed to control such discharge. You may empty diked areas by pumps or ejectors; however, you must manually activate these pumps or ejectors and must inspect the condition of the accumulation before starting, to ensure no oil will be discharged."

There are no diked areas at this facility that contain drainage valves.

6.2 MANUAL VALVE OPERATION

According to 40 CFR Part 112.8(b)(2), the facility must "Use valves of manual, open-and-closed design, for the drainage of diked areas."

There are no diked areas at this facility that contain drainage valves.

6.3 DRAINAGE FROM UNDIKED AREAS

According to 40 CFR Part 112.8(b)(3) and 40 CFR 112.12(b)(3), facility drainage systems from undiked areas must flow into ponds, lagoons, or catchment basins designed to retain oil or return it to the facility.

The facility's tank truck loading/unloading areas and vehicle refueling area are undiked. Drainage from these areas may contact oil that has accumulated or may be present in these areas at the time of precipitation. The potential for oil to accumulate or otherwise be present in these areas will arise only from leakage or spillage occurring during the active truck loading/unloading operation or vehicle refueling. As described in Section 9.0, below, the truck loading/unloading activity is continuously attended and monitored by facility personnel. Prior to any truck loading/unloading activity, the three stormwater drains (identified in Appendix C, Figure 1) in the immediate vicinity of the facility shall be covered by drain mats. In the event that oil leakage or spillage occurs during the active transfer operation, facility personnel will immediately implement its oil spill response procedures (Section 13.0 and Appendix G). Oil spill booms and/or oil absorbent materials will be used to control the oil and/or drainage that may contact the oil. Secondary containment of the immediate area will be provided by prompt placement of oil spill booms or by implementation of equivalent measures. Oil spill booms or equivalent measures will be used to either directly contain the oil and/or to divert the oil away from local drainage courses and structures. Oil absorbent materials will be used to clean up and remove the released oil. Final cleanup and housekeeping measures will be provided to the extent necessary to ensure that no residual oil remains that could contact and adversely impact subsequent drainage from the area. Information regarding the type and quantity of oil spill booms, oil absorbent materials and other oil spill response materials and equipment is provided in Section 13, below.

6.4 DRAINAGE DIVERSION

According to 40 CFR Part 112.8(b)(4), "if facility drainage is not engineered as in paragraph (b)(3) of this section, equip the final discharge of all ditches inside the facility with a diversion system that would, in the event of an uncontrolled discharge, retain oil in the facility."

There are no drainage diversion systems at this facility.

6.5 DRAINAGE WATER TREATMENT SYSTEMS

According to 40 CFR Part 112.8(b)(5), "Where drainage waters are treated in more than one treatment unit and such treatment is continuous, and pump transfer is needed, provide two "lift" pumps and permanently install at least one of the pumps. Whatever techniques you use, you must engineer facility drainage systems to prevent a discharge as described in §112.1(b) in case there is an equipment failure or human error at the facility."

There are no storm water drainage treatment systems at the facility.

7.0 BULK STORAGE CONTAINERS

7.1 MATERIAL COMPATIBILITY

According to 40 CFR Part 112.8(c)(1) facilities should "Not use a container for the storage of oil unless its material and construction are compatible with the material stored and conditions of storage such as pressure and temperature."

The bulk storage tanks at this facility were designed and constructed to contain or store oil and are compatible with the conditions of storage such as pressure and temperature. Additionally, new installations of petroleum storage tanks must be in compliance with the "AST Systems: design, construction and installation." as regulated by 6 NYCRR Parts 613-4.1.

7.2 DIKED AREAS

According to 40 CFR Part 112.8(c)(2), facilities must "Construct all bulk storage tank installations (except mobile refuelers and other non-transportation-related fuel trucks) so that you provide a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. You must ensure that diked areas are sufficiently impervious to contain discharged oil."

All of the bulk storage tanks at the facility are provided a secondary means of containment for the entire capacity of the largest single tank via double-walled structure (Tank 001, 001A, 002, 003), and protection from drips by field-fabricated synthetic berms (Tank 001, 001A, 002, 300). The berms are for protection from drips and spills only as they do not contain enough volume to contain the entire volume of the tank.

7.3 DRAINAGE FROM DIKED AREAS

According to 40 CFR Part 112.8(c)(3), the facility should "Not allow drainage of uncontaminated rainwater from the diked area into a storm drain or discharge of an effluent into an open watercourse, lake, or pond, bypassing the facility treatment system unless you: (i) Normally keep the bypass valve sealed close. (ii) Inspect the retained rainwater to ensure that its presence will not cause a discharge describe as defined in 40 CFR 112.1 (b). (iii) Open the bypass valve and reseal it following drainage under responsible supervision; and (iv) Keep adequate records of such events."

Tanks 001, 001A, and 002 are located outside within secondary containment berms. Tank 003 is located inside Building F, where rainfall will not accumulate within the secondary containment berms. The site personnel shall inspect the secondary containment areas after any heavy rainfall. The inspections are documented on inspection forms in Appendix E. If there are no signs of oil or oil sheen in the rainwater, the rainwater is pumped from the berm with a portable pump. If oil or oil sheen is detected in the rainwater, then the oily rainwater is pumped into a 55-gallon waste oil drum for disposal by the waste oil hauler contractor. Recordkeeping for disposal of the oil-contaminated water accumulated in the berm is in found in Appendix E.

7.4 BURIED METALLIC STORAGE TANKS

According to 40 CFR Part 112.8(c)(4), facilities must "Protect any completely buried metallic storage tank installed on or after January 10, 1974 from corrosion by coatings or cathodic protection compatible with local soil conditions."

There are no completely buried storage tanks at the facility.

7.5 PARTIALLY BURIED METALLIC TANKS

According to 40 CFR Part 112.8(c)(5), facilities should "Not use partially buried or bunkered tanks for the storage of oil, unless you protect the buried section of the tank from corrosion. You must protect partially buried and bunkered tanks from corrosion by coatings or cathodic protection compatible with local soil conditions."

There are no partially buried or bunkered storage tanks at the facility.

7.6 ABOVEGROUND STORAGE TANK INTEGRITY TESTING

According to 40 CFR Part 112.8(c)(6), facilities must "Test or inspect each aboveground container for integrity on a regular schedule and whenever you make material repairs. You must determine, in accordance with industry standards, the appropriate qualifications for personnel performing tests and inspections, the frequency and type of testing and inspections, which take into account container size, configuration, and design (such as containers that are: shop-built, field-erected, skid-mounted, elevated, equipped with a liner, double-walled, or partially buried). Examples of these integrity tests include, but are not limited to: visual inspection, hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or other systems of non-destructive testing. You must keep comparison records and you must also inspect the container's supports and foundations. In addition, you must frequently inspect the outside of the container for signs of deterioration, discharges, or accumulation of oil inside diked areas. Records of inspections and tests kept under usual and customary business practices satisfy the recordkeeping requirements of this paragraph."

TANKS 001, 001A, 002, and 003 – These ASTs have capacities ranging from 50 to 2,000 gallons. These tanks require monthly inspection per 6 NYCRR Part 613.6. Tanks 001, 001A, 002, 003 and the portable generator tanks must also undergo a detailed annual inspection. The monthly and annual inspections shall be inspected in accordance with industry standard prepared by the Steel Tank Institute (STI) SP001.

All inspection requirements are identified in the Petroleum Bulk Storage table in Section 1.0. Inspection forms are provided in Appendix F.

7.7 INTERNAL HEATING COILS

According to 40 CFR Part 112.8(c)(7), facilities must "Control leakage through defective internal heating coils, by monitoring the steam return and exhaust lines for contamination from internal heating coils that discharge into an open watercourse, or pass the steam return or exhaust lines through a settling tank, skimmer, or other separation or retention system."

This facility does not store petroleum in internally heated bulk storage tanks.

7.8 FAIL-SAFE SYSTEMS

According to 40 CFR Part 112.8 (c)(8), facilities must "Engineer or update each container installation in accordance with good engineering practice to avoid discharges. You must provide at least one of the following devices: (i) High liquid level alarms with an audible or visual signal at a constantly attended operation or surveillance station. In smaller facilities an audible air vent may suffice. (ii) High liquid level pump cutoff devices set to stop flow at a predetermined container content level. (iii) Direct audible or code signal communication between container gauge and the pumping station. (iv) A fast response system for determining the liquid level of each bulk storage container...(v) You must regularly test liquid level sensing devices to ensure proper operation."

Tanks 001, 002, and 003 are equipped with high level alarms that sound near the fill port for each tank. The high level alarms are checked as part of the monthly inspection (reference Appendix E).

Tanks 001A is equipped with a product level gauge. The tank is automatically refilled daily from Tank 001 to ensure adequate fuel supply to the generator. The tank is equipped with a return line and any overfill will flow back into the main Tank 001. The product level gauges are checked as part of the monthly inspection (reference Appendix E).

7.9 PLANT EFFLUENTS

According to 40 CFR Part 112.8 (c)(9), the facility must "Observe effluent treatment facilities frequently enough to detect possible system upsets that could cause a discharge as described in 40 CFR Part 112.1(b)."

The facility does not have any plant effluents associated with bulk storage tanks that are discharged into navigable waters.

7.10 CORRECTION OF LEAKS

According to 40 CFR Part 112.8 (c)(10), facilities must "Promptly correct visible discharges which result in the loss of oil from the container, including but not limited to seams, gaskets, piping, pumps, valves, rivets and bolts. You must promptly remove any accumulations of oil in diked areas."

Any visible oil leak that is detected anywhere onsite is promptly corrected by the site superintendent or an outside contractor. Oil that is released is cleaned using absorbent materials available in spill containment kits throughout the facility.

7.11 MOBILE TANKS

According to 40 CFR Part 112.8 (c)(11), facilities must "Position or locate mobile or portable oil storage containers to prevent a discharge as described in 40 CFR Part 112.1(b). Except for mobile refuelers and other non-transportation-related tank trucks, you must furnish a secondary means of containment, such as a dike or catchment basin, sufficient to contain the capacity of the largest single compartment or container with sufficient freeboard to contain precipitation."

The facility typically stores two empty drums on-site inside the berms to store any contaminated rainwater to be pumped out of the berm. The berms will contain any release from the drums.

8.0 FACILITY TRANSFER OPERATIONS

8.1 BURIED PIPING

According to 40 CFR Part 112.8(d)(1), facilities must "Provide buried piping that is installed or replaced on or after August 16, 2002 with a protective wrapping and coating. You must also cathodically protect such buried piping installations or otherwise satisfy the corrosion protection standards…"

Additionally, sections of underground piping must be designed, constructed and protected from corrosion under the regulatory provisions of 6 NYCRR Parts 613-2.1(b)(2), 613-3.1(b)(2) and 613-4.1(b)(2).

The facility does not include any buried piping associated with bulk storage tanks that are directly regulated under 40 CFR Part 112.8 and that was installed or replaced after August 16, 2002.

8.2 OUT-OF-SERVICE PIPELINES

According to 40 CFR Part 112.8(d)(2), facilities must "Cap or blank-flange the terminal connection at the transfer point and mark it as to origin when piping is not in service or is in standby for an extended period of time."

Lines that are not in service or are on standby for an extended period of time are capped or blank-flanged and marked as to their origin.

8.3 PIPE SUPPORTS

According to 40 CFR Part 112.8(d)(3), facilities must, "Properly design pipe supports to minimize abrasion and corrosion and allow for expansion and contraction."

All aboveground piping is supported by steel pipe supports that allow for expansion and contraction of piping. All pipe supports must be kept painted to prevent corrosion.

8.4 INSPECTION OF ABOVEGROUND PIPING

According to 40 CFR Part 112.8(d)(4), facilities must "Regularly inspect all aboveground valves, piping and appurtenances. During inspection you must assess the general condition of items, such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking valves, and metal surfaces."

All aboveground piping from the oil storage tanks at the facility is visually inspected monthly to assess that the lines are in good operating condition. Inspection records must be maintained onsite for a minimum of ten years. See Section 10.0 of this Plan for more details.

8.5 VEHICULAR TRAFFIC

According to 40 CFR Part 112.8(d)(5), facilities must "Warn all vehicles entering the facility to be sure that no vehicle will endanger aboveground piping or other oil transfer operations."

All aboveground piping at the facility is located so that it will not be endangered by vehicular traffic.

9.0 TANK TRUCK UNLOADING/LOADING

The facility's tank truck loading/unloading procedures meet the minimum requirements of the U.S. Department of Transportation (USDOT) and include, at a minimum, the following standard operating procedures [§112.7(a)(3)(ii), §112.7(a)(3)(iv), §112.7(a)(5)]:

- Appropriate facility personnel are notified when to a tank truck unloading/loading event will take place, prior to initiation.
- No smoking is allowed during the active tank truck unloading/loading event. Fire is kept away from the immediate unloading/loading area at all times.
- Tank truck unloading/loading operations are conducted only in areas specifically designated for that purpose.
- Prior to any loading/unloading activity within the diesel product transfer station, the three stormwater drains (identified in Appendix C, Figure 1) in the immediate vicinity of the facility shall be covered by drain mats.
- Each tank truck unloading/loading event is directly attended and continuously monitored by the truck driver and by an appropriate facility employee. These personnel will take immediate actions to stop the flow of oil when the working capacity of the receiving tank (designated as 90% of the design capacity) has been reached, or in the event that an equipment failure or emergency occurs.
- The truck's manual brake is set throughout the duration of the unloading/loading event. Wheel chocks must be put in place prior to unloading or loading, to prevent motion of the truck during the unloading/loading event. Wheel chocks shall be removed prior to departure of the truck.
- Prior to filling any tank truck and departure of the truck, the lowermost drain and all outlets of the tank truck are closely inspected for potential for discharge. If necessary, such drains and outlets are tightened, adjusted, or replaced to prevent liquid discharge while in transit.
- A facility employee ensures that drip pans or buckets, or oil absorbent pads are placed beneath all hose connections that may be prone to leakage, prior to initiation of the tank truck unloading/loading event.
- Unloading or loading does not begin until the product level in the receiving tank truck or tank has been checked and confirmed to have sufficient available capacity, based on the working capacity of the receiving tank (90% of the design capacity), to receive the volume of oil to be transferred.
- Either metallic bonds or ground conductors shall be provided for the neutralization of possible static charges prior to and during transfer of material (49 CFR 177.837).
- Throughout the transfer process, the truck driver and facility employee must remain alert and keep an unobstructed view of the truck, delivery hose(s), and storage tank, to the maximum extent practicable. Unless the truck engine is used for operation of the transfer pump, no flammable oil shall be transferred while the engine is running.
- The drain/transfer valve on the truck/tank is closed and the transfer line is fully drained back to the tank truck or tank (as appropriate), or blown empty, prior to disconnecting the transfer line, except for nozzle-fill transfer hoses that are designed to remain full.
- The facility will promptly implement appropriate spill response procedures for any leakage or spillage arising from an unloading/loading event.

The fill ports of bulk storage tanks meet the color-coding requirements of 6 NYCRR Part 613-2.2 (a)(4), 613-3.2(a)(4), and 613-4.2(a)(4) as follows:

Tank Identification No.	Product Stored	Color-Code Requirement (to be marked at the fill port)
001	Diesel	Yellow Hexagon
001A	Diesel	Yellow Hexagon
002	Diesel	Yellow Hexagon
003	Used Oil	Purple Square

The aboveground storage tanks and UST fill ports are labeled with the design capacity, working capacity, and PBS tank identification number.

9.1 DRAINAGE

According to 40 CFR Part 112.7(h)(1), "Where loading/unloading rack drainage does not flow into a catchment basin or treatment facility designed to handle discharges, use a quick drainage system for tank car or tank truck loading/unloading racks. You must design any containment system to hold at least the maximum capacity of any single compartment of a tank car or tank truck loaded or unloaded at the facility."

The facility does not include any tank truck loading/unloading racks. The facility's designated tank truck loading/unloading areas are undiked. Section 5.0, above, summarizes the passive and active secondary containment measures that are provided for the tank truck loading/unloading activity. In the event of a release of oil from these or any other transfer areas without containment, the Oil Spill Response Procedures will be immediately implemented.

9.2 WARNING SIGNS

According to 40 CFR Part 112.7(h)(2), the facility must "Provide an interlocked warning light or physical barrier system, warning signs, wheel chocks or vehicle brake interlock system in the area adjacent to a loading/unloading rack, to prevent vehicles from departing before complete disconnection of flexible or fixed oil transfer lines."

Within the common understanding of the term, the facility does not contain a truck rack. For each tank truck unloading/loading event, delivery vehicle and facility personnel will follow the procedures outlined in Section 9.0 to ensure that the vehicle does not move or shift during fuel transfer or depart before complete closing and disconnection of all transfer lines.

10.0 INSPECTIONS, TESTS AND RECORDS

10.1 ROUTINE VISUAL INSPECTIONS AND MAINTENANCE

Employees routinely observe aboveground oil containers and piping each workday. The facility's **SPCC Coordinator** or their designee must conduct a monthly documented visual inspection of the facility's overall oil storage inventory and handling areas, as follows: 1) the facility's aboveground bulk storage tank installation/locations; and 2) the facility's various oil-filled electrical and operating equipment installations/locations and associated oil management support features, in each case looking for signs of leaks or equipment deterioration that might result in an oil spill and/or discharge. Appendix E contains inspection forms that can be used for completion and documentation of each of these monthly visual inspection components. Any identified deficiency must be promptly reported and repaired as soon as practicable. Deficient equipment must be drained of oil and taken out of use if necessary, to accommodate the required repairs and/or if a release may be imminent. Records must be kept of adequate response measures for all significant deficiencies identified during visual inspections. [§112.7 (e)] [§112.7(a)(3)(iv)]

In addition to response measures triggered by monthly visual inspections, corrective action is to be initiated promptly at any time in response to any observed loss of oil from a container, including but not limited to leaks from seams, gaskets, piping, pumps, valves, etc. [§112.8 (c)(10)]

The documented monthly inspections include checking/testing the aboveground bulk storage tank level gauges for operability and visually/manually checking the secondary containment berms for the presence of oil. This inspection must also include a check of the overall functionality of any leak detection and other monitoring or warning system in place in accordance with 6 NYCRR Part 613-4.3(b)(1)(iv). [§112.8(c)(8)(v)]

The facility's routine preventive maintenance program for oil-containing equipment includes performing regularly scheduled equipment maintenance, conducting routine inspections, keeping appropriate types of oil spill response equipment and materials, and maintaining good housekeeping.

10.2 TESTS

In addition to the routine monthly visual inspection program (Section 10.1, above), each AST must be inspected and tested in accordance with industry standards. The industry standard prepared by the Steel Tank Institute (STI) SP001, Standard for Inspection of Aboveground Storage Tanks, was used to determine the required testing frequency for the facility's four (4) active ASTs (Tanks 001,001A, 002, 003) based upon the installation date and capacity for each tank. A completed Tank Information Form for each of these ASTs per this standard is provided in Appendix F. The associated inspection requirements for each of these tanks are outlined below. [§112.8(c)(6)].

All ASTs at the facility are inspected monthly following the routine preventative maintenance program. Tanks 001, 001A, 002, and 003 must also have a more detailed annual inspection per the STI SP-001 standard. These inspections are performed by facility personnel.

Based on the capacities of the ASTs and according to STI SP001, periodic inspection of the ASTs is sufficient and no additional testing is required. These inspections are performed by facility personnel. Inspection forms are provided in Appendix F.

The interstitial monitoring system for ASTs 001, 001A, 002 and 003 must be tested and documented monthly, in accordance with 6 NYCRR Part 613.6(a)(3). This monthly test must include both testing of the interstitial space for the presence of oil and testing the overall functionality of the interstitial monitoring system. A form is provided in Appendix E.

10.3 RECORDS

The records listed below are maintained for a minimum of three years from the date they are created (or as otherwise specified below) in support of this Plan: [§112.7(e)]

- Completed records of monthly visual inspections of ASTs and associated leak detection monitoring systems (6 NYCRR 613-4.3(b)(1)).
- Completed records of the monthly visual inspections of the facility's various oil-filled electrical and operating equipment installations/locations and associated oil management support features.
- Completed records of annual visual inspection of facility's ASTs and associated leak detection monitoring systems (SP001).
- Documentation of major repairs and/or upgrades made to ASTs or their appurtenances or secondary containment structures, including in response to deficiencies identified during the monthly visual inspections.
- Reports on any spill incidents (best management practice to retain records).
- Documentation of training sessions for all oil handling personnel.

11.0 SECURITY

The facility is equipped with various security and monitoring related features to protect local residence, project personnel, and on-site equipment.

Tanks 001, 001A, 002, and 003 are not equipped with drain valves that would enable direct outward flow of the products stored. Dispensing of diesel fuel (Tank 002) from the vehicle refueling tanks is controlled by means of an electronic locking system on the dispensing pumps. The electronic locking system can be unlocked only by authorized personnel.

All unloading/loading connections are securely capped or blank-flanged when not in service or when in standby service for an extended time, including piping that is emptied of liquid content either by draining or by blowing it empty.

Appropriate lighting is provided at the outdoor AST locations (Tanks 001, 001A, 002) to assist in: (1) the discovery of discharges occurring during hours of darkness, both by facility employees, and by others (such as local police); and (2) the prevention of discharges occurring due to acts of vandalism.

The facility utilizes multiple electric powered CCTV-type (closed circuit television) cameras linked to a cellular phone app-based system to provide off-hour security coverage.

The various security provisions summarized above provide for sufficient acceptable security provisions for the facility as required by §112.7(g).

12.0 PERSONNEL TRAINING

All facility personnel involved with handling of oil are properly trained in general facility operations; applicable oil pollution control laws, rules and regulations; the operation and management of equipment to prevent discharges; discharge (spill) initial response procedures and protocols; and the contents and requirements of this SPCC Plan, as required by §112.7(f). Further, the training highlights and describes any past spill or discharge incident at the facility that reached the environment, past equipment failures, component malfunctions, and any recently developed precautionary measures.

Training is provided by or at the direction of the facility's **SPCC Coordinator**. Refresher training is provided on an annual basis for all employees involved with handling of oil. New employees involved with the handling of oil receive this training prior to a work assignment involving oil-handling activities such as receiving fuel deliveries and completing tank inspections.

All training sessions are documented, with records retained in support of this SPCC Plan for at least three years. An outline of the typical training provided to such personnel, and an example attendance form are provided in Appendix G.

13.0 OIL SPILL RESPONSE PROCEDURES

Oil Spill Response Equipment [§112.7(a)(3)]

Minimum Quantity	Type of Equipment	General Location
1 ct.	Fire extinguishers	Construction trailer
5 ct.	Absorbent - pads/rolls	Tank fill port and dispenser
5 ct.	Absorbent - pigs/socks	Tank fill port and dispenser
10 lb.	Absorbent - granular	Construction trailer
3 ct.	Commercial oil spill response kits	Tank fill port and dispenser
1 ct.	Drain cover mats	Construction trailer

Oil Spill Response Procedures [§112.7(a)(3), §112.7(a)(5)]

The facility's Oil Spill Contingency Plan is in Appendix G. This plan is in three stand-alone pages, for ease of reference in the event of an oil spill emergency and a third page that provides emergency contact telephone numbers. A list of telephone numbers follows the Contingency Plan. Those numbers are on one stand-alone page, also for ease of reference during an emergency. A form for documenting and reporting oil spills is provided in Appendix H. A list of regulatory and facility spill response emergency contacts and contractors is provided in Appendix G. [§112.7(a)(3)(vi) & (iv), §112.7(a)(5)]

All spills should be reported to the USACE in a timely matter.

Methods of Disposal of Recovered Materials [§112.7(a)(3)(v)]

As indicated in the facility's Oil Spill Contingency Plan (Appendix G), all materials recovered from a spill response will be appropriately containerized and labeled as to contents, date and nature of origination, etc. The facility will make a hazardous waste determination of each such containerized waste, in accordance with applicable federal and/or state regulations for hazardous and otherwise regulated waste. This will include, in part: (1) a review of the waste in comparison with listed hazardous wastes; (2) a review of it vis-à-vis the hazardous waste characteristics; (3) a review of the waste in comparison with mixtures of the waste with other hazardous wastes; and (4) knowledge of the waste's characteristics. If a recovered material is determined to be a regulated waste, it will be managed and disposed of in accordance with the appropriate requirements, including the requirements for manifesting if applicable. If a recovered material is determined to be non-regulated, it will be managed as part of the facility's routine solid waste stream.

Spill Incident Reporting [§112.7(a)(4)]

Federal: Federal regulations at 40 CFR §110.3 define a spill as the discharge of oil into, or upon the navigable waters of the United States or adjoining shorelines, in harmful quantities. Harmful quantities are defined as a discharge that violates applicable water quality standards or causes a sheen upon, or discoloration of, the surface water or adjoining shoreline. In the event that such a discharge of oil occurs, the facility's designated SPCC Coordinator or their designee is to be notified immediately. That person will then immediately notify the National Response Center (NRC) at (800) 424-8802. [§112.7(a)(3)(vi)]

The regulations in 40 CFR Part 110.6 will be further consulted for appropriate notification procedures in the event that direct reporting to the NRC is not practicable. Information to be reported includes:

- The name of the person making the report, and his/her job title;
- The name, address and phone number of the facility;
- Time and date of the discharge;
- Type of material discharged;
- Estimates of the total quantity discharged;
- Estimates of the quantity discharged as described in 40 CFR 112.1(b);
- The source of the discharge;
- A description of all affected media (e.g., soil, surface water, ground water);
- The cause of the discharge;
- Any known damages or injuries caused by the discharge;
- Actions being taken to stop, remove, and mitigate the effects of the discharge;
- Whether an evacuation has occurred or may be needed; and
- The names of individuals and/or other organizations that have also been contacted.

State: The applicable regulations (613-4.4(d)(1)) state "a facility must report every spill to the Department's [New York State Department of Environmental Conservation] Spill Hotline (518-457-7362) within two hours after discovery, contain the spill, and begin corrective action in accordance with the requirements of Subpart 6 of 6 NYCRR §613 except if the spill meets the following conditions [§112.7(a)(3)(vi)]:

(i) It is known to be less than five (5) gallons;
(ii) It is contained and under control of the spiller;
(iii) It has not and will not reach the land or waters of the State; and
(iv) It is cleaned up within two (2) hours of discovery."

Additionally, a facility must report any suspected leaks to the Department within two hours after discovery and follow the procedures for leak investigation and confirmation steps contained in 613-4.4(c). Per §613-1.3(af) a "leak, spill, or spillage means any escape of petroleum from the ordinary container employed in the normal course of storage, transfer, processing or use. Any escape of petroleum that enters containment (for example, a catch basin) is a spill. See 6 NYCRR Part 613-1.3 for additional definitions of terms.

Even if a spill does not need to be reported to the NYSDEC, it should be documented internally to evaluate the cause and response and to prepare for potential future events. Any "lessons learned" will be added to the facility spill training and the SPCC Plan will be amended as necessary.

14.0 STATE REGULATIONS AND GUIDELINES FOR OIL DISCHARGE PREVENTION AND CONTAINMENT

14.1 NEW OIL

The New York State Petroleum Bulk Storage (PBS) regulations (6 NYCRR Parts 613) apply to all aboveground and underground petroleum storage tanks at a facility that has a total storage capacity in tanks of more than eleven hundred (1,100) gallons. Hydraulic system reservoirs and electrical transformers are not considered tanks under these regulations. The NYSDEC administers the PBS program. Key requirements of that program are summarized below; the regulations must be consulted for more detailed information. [§112.7(j)]

Part 613-1 – General Provisions

- §613-1.3 provides definitions for the terms used by the PBS program. They clarify, in part, the specific applicability of the overall PBS program to individual facilities.
- §613-1.7 provides for delegation of the PBS program to certain local governmental agencies upon specific approval by the NYSDEC.
- §613-1.9 requires registration of petroleum storage facilities, including any temporary tanks that have not been removed within 180 days after installation, and out-of-service facilities that have not been permanently closed, with the NYSDEC. New facilities must be registered prior to being placed into service, and the NYSDEC must be notified within thirty days prior to installing a new tank at an existing petroleum storage facility. The NYSDEC registration certificate must be displayed on the facility premises at all times.

The facility conforms to these regulations.

Part 613-2 – UST Systems Subject to Both Subtitle I and Title 10

- §613-2.1(b) UST systems: design, construction, and installation provides the equipment standards for Category 2 and 3 UST systems in order to prevent releases due to structural failure, corrosion, or spills and overfills.
- §613-2.1(c) UST systems: design, construction, and installation provides the equipment standards for Category 1 UST systems in order to prevent releases due to structural failure, corrosion, or spills and overfills
- §613-2.2(a)(3) requires every Category 2 or 3 UST system to have a label at the fill port specifying tank registration identification number, tank design and working capacities, an type of petroleum that is able to be stored in the UST system
- §613-2.2(a)(4) requires every UST system fill port to be color coded in accordance with American Petroleum Institute (API) guidelines (e.g., a yellow hexagon for diesel fuel, and a green hexagon for No. 2 fuel oil). If a UST system contains petroleum that does not have a corresponding API color code, the facility must otherwise mark the fill port to identify the petroleum currently in the UST system.
- §613-2.2(a)(6) specifies that the facility must maintain all gauges, valves and other equipment for spill prevention in good working order.
- §613-2.2(a)(7) details minimum requirements for carrier personnel for petroleum transfer events, to prevent transfer spills and accidental discharges.

- §613-2.2(b) details the inspection requirements for cathodic protection systems, including impressed current systems.
- §613-2.2(d) outlines the requirements for allowable repairs to a UST system.
- §613-2.2(e) requires Category 1 and 2 UST systems located in an area where the UST may become buoyant to be safeguarded against buoyancy and lateral movement by flood waters in accordance with section 2-5.6 of National Fire Protection Association (NFPA) Code No. 30.
- §613-2.3(b) details the leak monitoring requirements for Category 1, 2 and 3 UST systems as well as the inspection frequency for electronic tank monitoring systems.
- §613-2.3(c) details the allowable methods of leak detection for tanks.
- §613-2.3(d) details the allowable methods of leak detection for piping.
- §613-2.3(e) lists the records a facility must maintain to demonstrate compliance with the leak detection requirements of this section.
- §613-2.4 details the requirements for reporting of suspected leaks, investigation due to off-site impacts, leak investigation and confirmation steps, and facility response to spills and overfills.
- §613-2.5 details the requirements for Operator testing and training as well as the associated recordkeeping requirements.
- §613-2.6 details requirements for the closure of out-of-service tanks, including closure of tanks temporarily out-of-service, closure of tanks permanently out-of-service, reporting to the NYSDEC of out-of-service tanks, and criteria for the reuse of used tanks.

These regulations do not apply to this facility.

Part 613-3 – UST Systems Subject Only to Title 10

- §613-3.1(b) UST systems: design, construction, and installation provides the equipment standards for Category 2 and 3 UST systems in order to prevent releases due to structural failure, corrosion, or spills and overfills.
- §613-3.1(c) UST systems: design, construction, and installation provides the equipment standards for Category 1 UST systems in order to prevent releases due to structural failure, corrosion, or spills and overfills.
- §613-3.2(a)(3) requires every Category 2 or 3 UST system to have a label at the fill port specifying tank registration identification number, tank design and working capacities, an type of petroleum that is able to be stored in the UST system.
- §613-3.2(a)(4) requires every UST system fill port to be color coded in accordance with American Petroleum Institute (API) guidelines (e.g., a yellow hexagon for diesel fuel, and a green hexagon for No. 2 fuel oil). If a UST system contains petroleum that does not have a corresponding API color code, the facility must otherwise mark the fill port to identify the petroleum currently in the UST system.
- §613-3.2(a)(6) specifies that the facility must maintain all gauges, valves and other equipment for spill prevention in good working order.
- §613-3.2(a)(7) details minimum requirements for carrier personnel for petroleum transfer events, to prevent transfer spills and accidental discharges.
- §613-3.2(b) details the inspection requirements for cathodic protection systems.
- §613-3.2(d) outlines the requirements for lining repairs to steel USTs.
- §613-3.2(e) requires Category 1 and 2 UST systems located in an area where the UST may

become buoyant to be safeguarded against buoyancy and lateral movement by flood waters in accordance with section2-5.6 of National Fire Protection Association (NFPA) Code No. 30.

- §613-3.3(b) details the leak monitoring requirements for Category 1, 2 and 3 UST systems as well as the inspection frequency for electronic tank monitoring systems.
- §613-3.3(c) details the allowable methods of leak detection for tanks.
- §613-3.3(d) details the allowable methods of leak detection for piping.
- §613-3.3(e) lists the records a facility must maintain to demonstrate compliance with the leak detection requirements of this section.
- §613-3.4 details the requirements for reporting of suspected leaks, investigation due to off-site impacts, leak investigation and confirmation steps, and facility response to spills and overfills.
- §613-3.5 details requirements for the closure of out-of-service tanks, including closure of tanks temporarily out-of-service, closure of tanks permanently out-of-service, reporting to the NYSDEC of out-of-service tanks, and criteria for the reuse of used tanks.

These regulations do not apply to this facility.

Part 613-4 – AST Systems

- §613-4.1(b)(1) details the design requirements for Category 2 and 3 ASTs including corrosion protection and secondary containment.
- §613-4.1(b)(2) details the requirements for Category 2 and 3 AST piping including piping that is contact with the ground and underground piping.
- §613-4.1(b)(3) requires every AST to be equipped with a gauge that accurately shows the level of petroleum in the AST. A high-level warning alarm, a high-level liquid pump cut-off controller or equivalent device may be used in lieu of a gauge.
- §613-4.1(b)(4) details the installation requirements for ASTs.
- §613-4.1(b)(5)(i) requires that all dispensers of motor fuel under pressure from a remote pumping system be equipped with a shear valve (impact valve) located in the supply line of the dispenser.
- §613-4.1(b)(5)(ii) requires that all dispensers of motor fuel that causes a gravity head be equipped with a device such as a solenoid valve that is positioned adjacent to and downstream from the operating valve.
- §613-4.1(b)(5)(iii) requires all fill pipes leading to a pump-filled petroleum tank to be equipped with a properly functioning check valve (or equivalent device) that provides automatic backflow protection, if the fill piping arrangement is such that backflow from the receiving tank is possible.
- §613-4.1(b)(5)(iv) requires that each connection on a gravity-drained AST through which petroleum can normally flow be equipped with an appropriate operating valve to control the flow.
- §613-4.1(c) details the corresponding secondary containment, gauge, and valve requirements for Category 1 AST systems.
- §613-4.2(a)(3) requires every Category 2 or 3 AST system to have a label at the fill port specifying tank registration identification number, tank design and working capacities.
- §613-3.2(a)(4) requires every AST system to be color coded in accordance with American Petroleum Institute (API) guidelines (e.g., a yellow hexagon for diesel fuel, and a green

hexagon for No. 2 fuel oil) at or near the fill port. If an AST system contains petroleum that does not have a corresponding API color code, the facility must otherwise mark the fill port to identify the petroleum currently in the AST system.

- §613-4.2(a)(6) specifies that the facility must maintain all gauges, valves and other equipment for spill prevention in good working order.
- §613-2.2(a)(7) details minimum requirements for carrier personnel for petroleum transfer events, to prevent transfer spills and accidental discharges.
- §613-4.2(b) details the inspection requirements for cathodic protection systems including impressed current systems.
- §613-4.2(d)(1) outlines the requirements for permanent repairs.
- §613-4.2(d)((3)-(5) detail the specification, inspection and installation requirements for linings.
- §613-4.2(e) requires Category 1 and 2 AST systems located in an area where the AST may become buoyant to be safeguarded against buoyancy and lateral movement by flood waters in accordance with section 2-5.6 of National Fire Protection Association (NFPA) Code No. 30.
- §613-4.2(f) details the requirements for stormwater management.
- §613-4.3(b)(1) specifies that ASTs must be inspected monthly for specified items.
- §613-4.3(b)(2) outlines the requirements for ten-year inspections of specified ASTs per §613-4.3(a)(1)(ii) and (iii).
- §613-4.3(c) outlines the requirements for tightness tests of ASTs and the associated test reports.
- §613-4.3(d) outlines the acceptable methods of leak detection for underground piping.
- §613-4.3(e) outlines requirements for keeping the monthly inspection reports for at least three years and ten-year inspection reports for at least ten years, and specifies the minimum inspection information that must be documented.
- §613-4.4 details the requirements for reporting of suspected leaks, investigation due to off-site impacts, leak investigation and confirmation steps, and facility response to spills and overfills.
- §613-4.5 details requirements for the closure of out-of-service tanks, including closure of tanks temporarily out-of-service, closure of tanks permanently out-of-service, and reporting to the NYSDEC of out-of-service tanks.
- §613-5 details the circumstances and process for the NYSDEC to impose a delivery prohibition for a tank system including notice of delivery prohibition to facility and carrier, termination of the prohibition, including review of compliance submissions and expedited hearing, as well as tag removal.
- §613-6 outlines the requirements for a facility response to a release from a tank system including initial response, initial abatement measures and site check, initial site characterization, free product removal, investigations for soil and groundwater cleanup and a corrective action plan.

The facility conforms to these regulations.

14.2 USED OIL

Title 6 NYCRR Subpart 374-2: Standards for the Management of Used Oil apply, in part, to generators of used oil and these regulations address management of used oil primarily in the context of recycling and disposal of used oil.

Pertinent excerpts from Subpart 374-2 that may apply to the facility include the following:

- §374-2.1 provides definitions for management of used oil under this Subpart, including definitions for "used oil" and related terms.
- §374-2.2 outlines the overall applicability of Subpart 374-2.
- §374-2.3 outlines standards for used oil generators.
- §374-2.3(a) outlines the applicability of Subsection §374-2.3.
- §374-2.3(c) outlines used oil storage requirements.
- §374-2.3(c)(2)(i) requires all aboveground and underground used oil tank systems, regardless of size, to be in compliance with 6 NYCRR Part 613, including registration.
- §374-2.3(c)(4) requires every container and aboveground used oil tank used to store used oil to be labeled with the words "Used Oil." Additionally, fill pipes used to transfer used oil into underground used oil tanks must also be labeled with the words "Used Oil."
- §374-2.3(d) outlines requirements for burning used oil in onsite space heaters.
- §374-2.3(e) outlines requirements for off-site shipments of used oil.

The facility conforms to these regulations.

15.0 AMENDMENT OF SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN BY REGIONAL ADMINISTRATOR

A written report shall be submitted to the EPA Administrator, Region 2, within 60 days of a discharge of more than 1,000 gallons of petroleum into or upon the navigable waters of the United States or adjoining shorelines in a single spill event or discharges of more than 42 gallons of oil in each of two discharges into or upon the navigable waters of the United States or adjoining shorelines within any twelve month period. If such an incident should occur, the report must include the following information:

1. Facility name;
2. Name of the facility personnel providing this information;
3. Facility location;
4. Maximum storage and handling capacity and normal daily throughput;
5. Corrective actions and countermeasures that have been taken by the facility, including a description of equipment repairs and replacements;
6. Detailed description of the facility, including maps flow diagrams, and topographical maps, as necessary;
7. The cause of such discharge(s), including a failure analysis of the system or subsystem in which the failure occurred;
8. Additional preventive measures that the facility has taken or contemplated to minimize the possibility of recurrence; and
9. Other pertinent information as required by the Regional Administrator.

A copy of this report must also be sent to the NYSDEC for review and to provide them with the opportunity to make further recommendations.

Following review of the SPCC Plan by the Regional Administrator due to the report of a discharge as described above, the Regional Administrator may require the facility to amend the SPCC Plan if the Plan does not meet the requirements set forth by 40 CFR Part 112, or if the SPCC Plan is deemed to be insufficient for the purposes of prevention and control of discharges at the facility.

APPENDIX A

SPCC Regulation Cross Reference Table

Table 1 – Oil SPCC Regulations Cross-Reference Table

This table provides a cross-reference for the requirements listed in the SPCC regulations in 40 CFR Part 112 with the equivalent requirements contained in the facility's SPCC Plan. It lists each requirement in those regulations, provides a brief summary description of the requirement, and indicates the section number of the facility's SPCC Plan in which the requirement is addressed. The Table of Contents in this Plan identifies the page number for each referenced SPCC Plan section. For each requirement, the referenced SPCC Plan section provides a discussion of the facility's conformance with the listed requirement.

SPCC Rule Regulatory Citations	Description of Requirement	SPCC Plan Section
§ 112.1	General applicability	1.0
§ 112.2	Definitions	N/A
§ 112.3(a)-(c)	Timeframe to prepare SPCC Plan	N/A
§ 112.3(d)	Certification by Licensed PE	2.1, 2.3
§ 112.3(e)	Onsite maintenance and availability of SPCC Plan	1.0
§ 112.4	Amendment of SPCC Plan by EPA Regional Administrator	15.0
§ 112.5	Amendment of SPCC Plan by the facility	1.0, 2.3
§ 112.7	General requirements for SPCC Plans for all facilities and all oil types.	Entire Plan
§ 112.7	Management approval of the SPCC Plan	2.2
§ 112.7(a)	General requirements; discussion of facility's conformance with rule requirements; deviations from Plan requirements; facility characteristics that must be described in the Plan; spill reporting information in the Plan; emergency procedures.	Entire Plan
§ 112.7(b)	Fault analysis.	4.0
§ 112.7(c)	Secondary containment.	5.0
§ 112.7(d)	Contingency planning.	13.0
§ 112.7(e)	Inspections, tests, and records.	10.0

Table 1 – Oil SPCC Regulations Cross-Reference Table

SPCC Rule Regulatory Citations	Description of Requirement	SPCC Plan Section
§ 112.7(f)	Employee training and discharge prevention procedures.	12.0
§ 112.7(g)	Security (excluding oil production facilities).	11.0
§ 112.7(h)	Unloading/loading (excluding offshore facilities).	9.0
§ 112.7(i)	Brittle fracture evaluation requirements.	7.1
§ 112.7(j)	Conformance with State requirements.	14.0
§112.7(k)	Qualified Oil-Filled Operational Equipment	5.0, 10.3, 13.0
§ 112.8 § 112.12	Requirements for onshore facilities (excluding production facilities).	Entire Plan
§ 112.8(a) § 112.12(a)	General and specific requirements.	Entire Plan
§ 112.8(b) § 112.12(b)	Facility drainage.	6.0
§ 112.8(c) § 112.12(c)	Bulk storage containers.	7.0
§ 112.8(d) § 112.12(d)	Facility transfer operations, pumping, and facility process.	8.0
§ 112.9	Requirements for onshore production facilities.	(Not Applicable)
§ 112.9(a)	General and specific requirements.	(Not Applicable)
§ 112.9(b)	Oil production facility drainage.	(Not Applicable)
§ 112.9(c)	Oil production facility bulk storage containers.	(Not Applicable)
§ 112.9(d)	Facility transfer operations, oil production facility.	(Not Applicable)
§ 112.10	Requirements for onshore oil drilling and workover facilities.	(Not Applicable)

Table 1 – Oil SPCC Regulations Cross-Reference Table

SPCC Rule Regulatory Citations	Description of Requirement	SPCC Plan Section
§ 112.10(a)	General and specific requirements.	(Not Applicable)
§ 112.10(b)	Mobile facilities.	(Not Applicable)
§ 112.10(c)	Secondary containment - catchment basins or diversion structures.	(Not Applicable)
§ 112.10(d)	Blowout prevention (BOP).	(Not Applicable)
§ 112.11	Requirements for offshore oil drilling, production, or workover facilities.	(Not Applicable)
§ 112.11(a)	General and specific requirements.	(Not Applicable)
§ 112.11(b)	Facility drainage.	(Not Applicable)
§ 112.11(c)	Sump systems.	(Not Applicable)
§ 112.11(d)	Discharge prevention systems for separators and treaters.	(Not Applicable)
§ 112.11(e)	Atmospheric storage or surge containers; alarms.	(Not Applicable)
§ 112.11(f)	Pressure containers; alarm systems.	(Not Applicable)
§ 112.11(g)	Corrosion protection.	(Not Applicable)
§ 112.11(h)	Pollution prevention system procedures.	(Not Applicable)
§ 112.11(i)	Pollution prevention systems; testing and inspection.	(Not Applicable)
§ 112.11(j)	Surface and subsurface well shut-in valves and devices.	(Not Applicable)

Table 1 – Oil SPCC Regulations Cross-Reference Table

SPCC Rule Regulatory Citations	Description of Requirement	SPCC Plan Section
§ 112.11(k)	Blowout prevention.	(Not Applicable)
§ 112.11(l)	Manifolds.	(Not Applicable)
§ 112.11(m)	Flowlines, pressure sensing devices.	(Not Applicable)
§ 112.11(n)	Piping; corrosion protection.	(Not Applicable)
§ 112.11(o)	Sub-marine piping; environmental stresses.	(Not Applicable)
§ 112.11(p)	Inspections of sub-marine piping.	(Not Applicable)

APPENDIX B

Certification of the Applicability of the Substantial Harm Criteria

CERTIFICATION OF SUBSTANTIAL HARM DETERMINATION FORM

Facility Name: Diaz Chemical Corporation Superfund Site
Facility Address: 40 Jackson Street, Holley NY 14470

1. Does this "non-transportation-related" facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

   ☐Yes ☒No

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?

   ☐Yes ☒No

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III, 40 CFR Parts 9 and II 2 or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (see Appendix E, Section 10, 40 CFR Parts 9 and 112 for availability) and the applicable Area Contingency Plan.

   ☐Yes ☒No

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-111, 40 CFR Parts 9 and 112 or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake, which is analogous to a public water system as described at 40 CFR 143.2?

   ☐Yes ☒No

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   ☐Yes ☒No

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, and accurate, and complete.

Name (please type or print)	Signature
Title	Date

*If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

**For the purposes of 40 CFR Part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c). [From 40 CFR 112 Appendix C, Attachment C-II]

APPENDIX C

Figure 1 : Site Preparation Plan

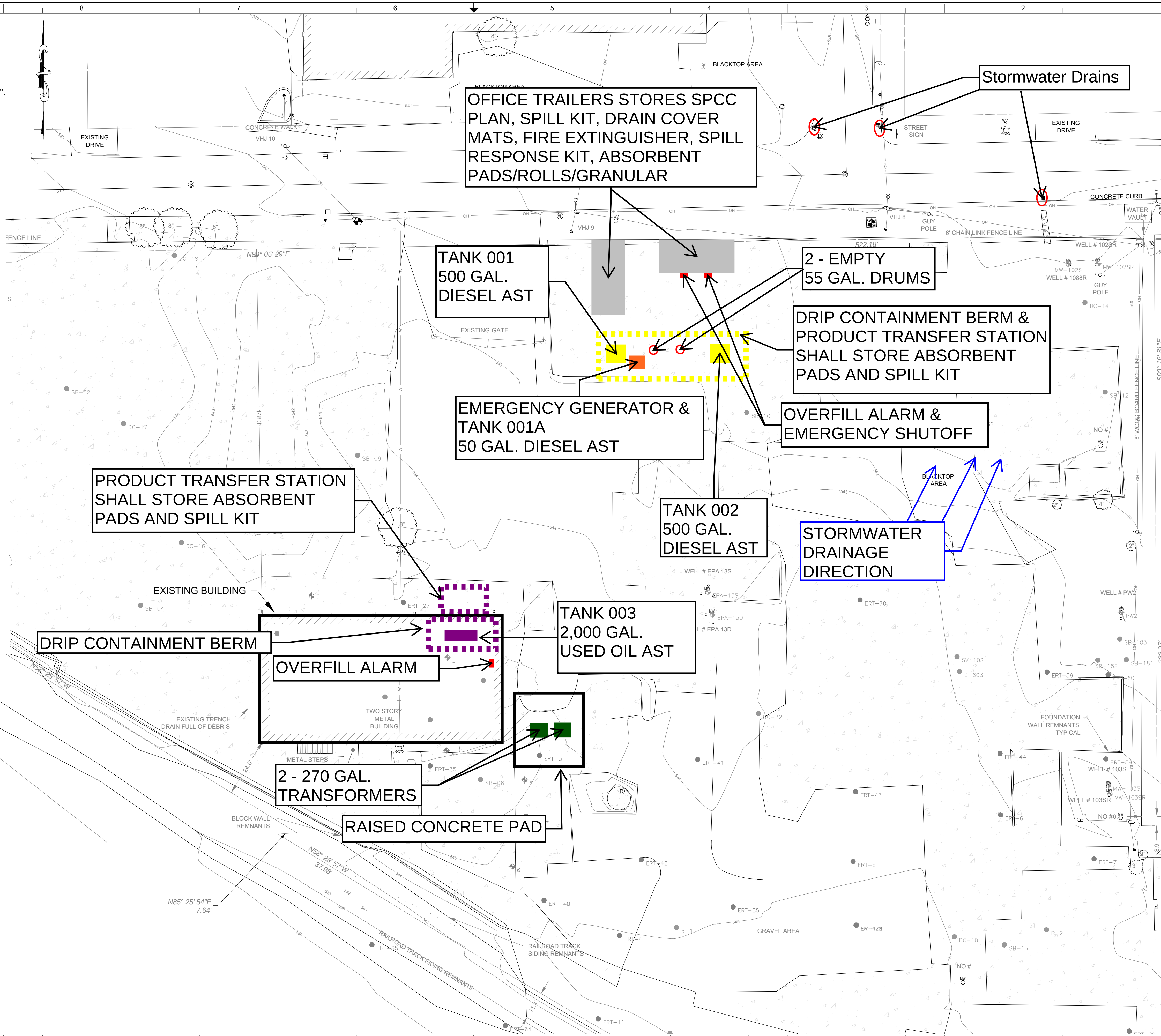
NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "EXISTING FEATURES", PREPARED BY COSTICH ENGINEERING OF ROCHESTER, NY AND WAS RECEIVED ELECTRONICALLY JUNE 7, 2017 WITH AN ORIGINAL SCALE: 1" = 30".

LEGEND:

THERMAL TREATMENT ZONE (TTZ)

DRAINAGE MANHOLE	ELECTRIC MANHOLE
INLET DRAINAGE MANHOLE	ELECTRIC METER
CATCH BASIN	TELEPHONE MANHOLE
END SECTION	TELEPHONE PEDESTAL
END OF PIPE	PHONE BOOTH
MANHOLE	PEDESTRIAN POLE
SANITARY MANHOLE	TRAFFIC CONTROL CABINET
CLEAN OUT	LAMP POST
GAS VALVE	LIGHT POLE
GAS SERVICE	UTILITY POLE WITH LIGHT
GAS METER	FLAG POLE
SPRINKLER VALVE	MAILBOX
SPRINKLER HEAD	BOLLARD
WATER VALVE	POST
WATER SERVICE	SIGN
HYDRANT	SIGN
WATER METER	SIGN
WELL	TURNING ARROW
MONITOR WELL	HANDICAP
BORE	STOP BAR
CABLE TV PEDESTAL	TREE DECIDUOUS
SIGNAL POLE	TREE CONIFEROUS
UTILITY POLE	BUSH
GUY WIRE	AIR CONDITIONING UNIT
PULL BOX	SANITARY UTILITY LATH
ELECTRIC PULL BOX	GAS UTILITY LATH
TELEPHONE PULL BOX	WATER UTILITY LATH
TRAFFIC PULL BOX	TELEPHONE UTILITY LATH
TRANSFORMER	ELECTRIC UTILITY LATH
	CABLE UTILITY LATH



GRAPHICAL SCALE

0 10 20 40 FT

DIAZ CHEMICAL CORPORATION SUPERFUND SITE, PHASE 1
HOLLEY, NEW YORK

FIGURE 1
SITE PREPARATION PLAN

SHEET: 1 OF 1

©2019 TERRATHERM, INC. ALL RIGHTS RESERVED

PLOT DATE: 1/14/2019

APPENDIX D

NYSDEC Petroleum Bulk Storage Application

New York State Department of Environmental Conservation
Division of Environmental Remediation

Petroleum Bulk Storage Application

Pursuant to the Environmental Conservation Law: Article 17, Title 10; and
Regulations 6 NYCRR Part 613 and 6 NYCRR Subpart 374-2

(Please Type or Print Clearly and Complete All Items for Sections A, B & C)

PBS Number:

Return Completed Form To:
NYSDEC, Region 8
6274 E. Avon-Lima Road
Avon, NY 14414
585-266-5428

Expiration Date:

Section A - Facility/Property Owner/Contact Information

Transaction Type: 1

1) Initial/New Facility
2) Change of Ownership
3) Tank Installation, Closing, or Repair
4) Information Correction
5) Renewal

FACILITY

Facility Name: Diaz Chemical Superfund Site

Tax Map Info

Facility Address (Physical Address, No P.O. Boxes): 40 Jackson Street

Block:

Facility Address (cont.):

Lot

City: Holley | State: NY | ZIP Code: 14470

County: Orleans | Township/City: Holley | Facility Phone Number: 716-480-8013

Facility Operator:

TYPE OF PETROLEUM FACILITY (Check only one)

- [ ] 01=Storage Terminal/Petrol. Distributor
- [ ] 02=Retail Gasoline Sales
- [ ] 03=Other Retail Sales
- [ ] 04=Manufacturing
- [ ] 05=Utility
- [ ] 06=Trucking/Transportation/Fleet
- [ ] 07=Apartment/Office Building
- [ ] 08=School
- [ ] 09=Farm
- [ ] 10=Private Residence
- [ ] 11=Airline/Air Taxi/Airport
- [ ] 12=Chemical Distributor
- [ ] 13=Municipality
- [ ] 15=Railroad
- [ ] 25=Auto Service/Repair (No Gasoline
- [ ] 28=Cemetery/Memorial
- [ ] 26=Religious (Church, Synagogue, Mosque, Temple, etc.)
- [ ] 27=Hospital/Nursing Home/Health Care
- [ ] 52=Marina
- 53=Nuclear Power Plant
- [X] 99=Other (Specify): Environmental Remediation System

Emergency Contact Name: DAVID TIEDMAN | Emergency Telephone Number: 716-480-8013

NOTE:

Fill in Property Owner information here....>>>

Indicate Tank Owner in Section C.

OWNER

Facility (Property) Owner (from Deed):

Facility Owner Address (Street and/or P.O. Box):

City: | State: | ZIP Code:

Federal Tax ID Number: | Owner Telephone Number:

Type of Owner (check only one):
- 1 [ ] Private Resident
- 2 [ ] State Government
- 3 [X] Local Government
- 4 [ ] Federal Government
- 5 [ ] Corporate/Commercial/Other

I hereby certify, under penalty of law, that all of the information provided on this form is true and correct. False statements made herein may be punishable as a criminal offense and/or a civil violation in accordance with applicable state and federal law.

Name of Owner or Authorized Representative: John Santacroce | Amount Enclosed: $ 300.00

Title: Environmental Manager

Signature: | Date:

Official Use Only
Date Received: ____/____/____
Date Processed: ____/____/____
Amount Received: $__________
Reviewed By: __________

CORRESPONDENCE

(Please keep this information up to date.)

Facility Contact Person Name: John Santacroce

Contact Person Company Name: AECOM

Address: 40 British American Boulevard

Address (cont.):

City/State/ZIP Code: Latham, NY 12110

Tel. Number: 518-951-2200 | eMail Address: john.santacroce@aecom.com

PBS Number:

Section B - Tank Information

(Please use the key located on the last page to complete each item/column)

Registration Expiration Date:

(1) Action	(2) Tank Number	(3) Tank Location	(4) Status	(5) Installation, out-of-service, or Permanent ClosureDate (mm/dd/yyyy) **Application will be returned if blank**	(6) Capacity (Gallons)	(7) Product Stored (If Gasoline w/ethanol or Biodiesel, list % additive)	(8) Tank Type	(9) Tank Internal Protection	(10) Tank External Protection	(11) Tank Secondary Containment	(12) Tank Leak Detection	(13) Tank Overfill Prevention	(14) Tank Spill Prevention	(15) Pumping/Dispensing Method	(16) Piping Location	(17) Piping Type	(18) Piping External Protection	(19) Piping Secondary Containment	(20) Piping Leak Detection	(21) Under Dispenser Containment (UDC) (Check box if present)
1	001	3	1	99/99/2020	500	2731	01	01	01	12 99[1]	06	04	01	05	01	01	01	99[2]	99[3]	☐
1	001A	3	1	99/99/2020	50	2731	01	01	01	12 99[1]	06	04	01	05	01	01	01	99[2]	99[3]	☐
1	002	3	1	99/99/2020	500	0008	01	01	01	12 99[1]	06	04	01	02	01	01	01	99[2]	99[3]	☐
1	003	3	1	99/99/2020	2000	0022	01	01	01	12 99[1]	06	04	01	02	01	01	01	99[4]	99[3]	☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐
																				☐

[1] 99 - Earthen berm with polyethylene cover
[2] 99 - Piping will be inside earthen berm with polyethylene cover
[3] 99 - Other: Impervious barrier & Monthly inspections of AST system including all associated components (valves, gauges, piping, etc.)
[4] 99 - Piping will be inside building with no drains in the immediate vicinity

Note: If you need to add tanks to your registration, write them in using blank lines above. Attach additional sheets as needed.
Blank Section B is available at http:/www.dec.ny.gov/docs/remediation_hudson_pdf/pbsrenewal.pdf

PBS Number:

Petroleum Bulk Storage Application

Section C - Tank Ownership Information (for PBS tanks listed in Section B

Tank Owner Information ☐ Check box if same as Facility (Property) Owner. If tank owner is different from property owner, fill out information below:	**Tank Owner Information** ☐ Check box if same as Facility (Property) Owner. If tank owner is different from property owner, fill out information below:
Tank Owner Name (Company/Individual): AECOM	Tank Owner Name (Company/Individual):
Contact Person: JOHN SANTACROCE	Contact Person:
Tank Owner Address: 40 JACKSON STREET	Tank Owner Address:
City: HOLLEY; State: NY; ZIP: 14470	City: ; State: ; ZIP:
Contact Person Telephone Number: (518) 951 - 2206; Contact Person email: JOHN.SANTACROCE@AECOM.COM	Contact Person Telephone Number: ; Contact Person email:
Specific Tanks Owned [X] Check box if this owner owns all tanks at this facility. If not, list tanks owned by this owner below: Tank Number:	**Specific Tanks Owned** ☐ Check box if this owner owns all tanks at this facility. If not, list tanks owned by this owner below: Tank Number:
Name of Class B (Daily On-Site) Operator: ; Authorization No:	Name of Class B (Daily On-Site) Operator: ; Authorization No:
Name of Class A (Primary) Operator: ; Authorization No:	Name of Class A (Primary) Operator: ; Authorization No:

PETROLEUM BULK STORAGE APLICATION - SECTION B - TANK INFORMATION - CODE KEYS

Action (1)
1. Initial Listing
2. Add Tank
3. Close/Remove Tank
4. Information Correction
5. Repair/Reline Tank

Tank Location (3)
1. Aboveground-contact w/soil
2. Aboveground-contact w/ impervious barrier
3. Aboveground on saddles, legs, stilts, rack or cradle
4. Partially buried tank (tank with 10% or more below ground)
5. Underground including vaulted with no access for inspection
6. Aboveground in Subterranean Vault w/access for inspections

Status (4)
1. In-service
2. Out-of-service
3. Closed-Removed
4. Closed- In Place
5. Tank converted to Non-Regulated use

Products Stored (7)

Heating Oils: On-Site Consumption

0001. #2 Fuel Oil
0002. #4 Fuel Oil
0259. #5 Fuel Oil
0003. #6 Fuel Oil
0012. Kerosene
0591. Clarified Oil
2711. Biodiesel (Heating)
2642. Used Oil (Heating)

Heating Oils: Resale/ Redistribution

2718. #2 Fuel Oil
2719. #4 Fuel Oil
2720. #5 Fuel Oil
2721. #6 Fuel Oil
2722. Kerosene
2723. Clarified Oil

Motor Fuels
0009. Gasoline
2712. Gasoline/Ethanol
0008. Diesel
2710. Biodiesel
0011. Jet Fuel
1044. Jet Fuel (Biofuel)
2641. Aviation Gasoline

Emergency Generator Fuels
0001. #2 Fuel Oil
2730. Biodiesel (E-Gen)
2731. Diesel (E-Gen)

Lubricating/Cutting Oils
0013. Lube Oil
0015. Motor Oil
1045. Gear/Spindle Oil
0010. Hydraulic Oil
0007. Cutting Oil
0021. Transmission Fluid
1836. Turbine Oil
0308. Petroleum Grease

Oils Used as Building Materials
2626. Asphaltic Emulsions
0748. Form Oil

Petroleum Spirits
0014. White/Mineral Spirits
1731. Naptha

Mineral/Insulating Oils
0020. Insulating Oil (e.g., Transformer, Cable Oil)
2630. Mineral Oil

Waste/Used/Other Oils
0022 Waste/Used Oil
9999. Other-Please list:*

Crude Oil
0006. Crude Oil
0701. Crude Oil Fractions

Tank Type (8)
01. Steel/Carbon Steel/Iron
02. Galvanized Steel Alloy
03. Stainless Steel Alloy
04. Fiberglass Coated Steel
05. Steel Tank in Concrete
06. Fiberglass Reinforced Plastic (FRP)
07. Plastic
08. Equivalent Technology
09. Concrete
10. Urethane Clad Steel
99. Other-Please list:*

Internal Protection (9)
00. None
01 Epoxy Liner
02. Rubber Liner
03. Fiberglass Liner (FRP)
04. Glass Liner
99. Other-Please list:*

External Protection (10/18)
00. None
01. Painted/Asphalt Coating
02. Original Sacrificial Anode
03. Original Impressed Current
04. Fiberglass
05. Jacketed
06. Wrapped (Piping)
07 Retrofitted Sacrificial Anode
08. Retrofitted Impressed Current
09. Urethane
99. Other-Please list:*

Tank Secondary Containment (11)
00. None
01. Diking (AST Only)
02. Vault (w/access)
03. Vault (w/o access)
04. Double-Walled (UST Only)
05. Synthetic Liner
06. Remote Impounding Area
07. Excavation Liner
09. Modified Double-Walled (AST Only)
10. Impervious Underlayment (AST Only)**
11. Double Bottom (AST Only)**
12. Double-Walled (AST Only)
99. Other - Please list*

Tank Leak Detection (12)
00. None
01. Interstitial Electronic Monitoring
02. Interstitial Manual Monitoring
03. Vapor Well
04. Groundwater Well
05. In-Tank System (Auto Tank
06. Impervious Barrier/Concrete Pad (AST Only)
07. Statistical Inventory Reconciliation (SIR)
08. Weep holes in vaults with no access for inspection
99. Other-Please list: *

Overfill Protection (13)
00. None
01. Float Vent Valve
02. High Level Alarm
03. Automatic Shut-Off
04. Product Level Gauge (AST Only)
05. Vent Whistle
99. Other-Please list:*

Spill Prevention (14)
00. None
01. Catch Basin
99. Other-Please list:*

Pumping/Dispensing Method (15)
00. None
01. Presurized Dispenser
02. Suction Dispenser
03. Gravity
04. On-Site Heating System (Suction)
05. On-Site Heating System (Supply/Return)
06. Tank-Mounted Dispenser
07. Loading Rack/Transfer Pump

Piping Location (16)
00. No Piping
01. Aboveground
02. Underground/On-ground
03. Aboveground/Underground Combination

Piping Type (17)
00. None
01. Steel/Carbon Steel/Iron
02. Galvanized Steel
03. Stainless Steel Alloy
04. Fiberglass Coated Steel
05. Steel Encased in Concrete
06. Fiberglass Reinforced Plastic (FRP)
07. Plastic
08. Equivalent Technology
09. Concrete
10. Copper
11. Flexible Piping
99. Other-Please list:*

Piping Secondary Containment (19)
00. None
01. Diking (Aboveground Only)
02. Vault (w/access)
04. Double-Walled (Underground Only)
06. Remote Impounding Area
07. Trench Liner
12. Double-Walled (Aboveground Only)
99. Other-Please list: *

Pipe Leak Detection (20)
00. None
01. Interstitial Electronic Monitoring
02. Insterstitial Manual Monitoring
03. Vapor Well
04. Groundwater Well
07. Pressurized Piping Leak Detector
09. Exempt Suction Piping
10. Statistical Inventory Reconciliation (SIR)
99. Other-Please list:*

Under Dispenser Containment (UDC) (21)

Check Box if Present

* If other, please list on a separate sheet including tank number.

** Each of these codes must be combined with code 01 or 06 to meet compliance requirements.

APPENDIX E

Petroleum Bulk Storage Tanks and Oil Handling Inspection Forms

Tank Information Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID: 001 Category: 3

Manufacturer: Unknown Contents: ULSD
Construction Date: 03/2020 Capacity: 500 gallons
Last Change of Product Date: ______ Dimensions: ______
Last Repair/Reconstruction Date: ______

Specification Design:
- ☑ UL
- ☐ API
- ☐ SWRI
- ☐ Other: ______
- ☐ Unknown
- ☐ Horizontal
- ☐ Vertical
- ☑ Rectangular

Construction:
- ☐ Bare Steel
- ☑ Coated Steel
- ☐ Double Bottom
- ☐ Concrete Encased Steel
- ☑ Double Wall
- ☐ Cathodically Protected; Date Installed: ______
  - ☐ Galvanic
  - ☐ Impressed Current
- ☐ Stainless Steel
- ☐ Lined inside; Date Lining Installed:

Containment
- ☐ Earthen Dike
- ☐ Steel Dike
- ☑ Concrete
- ☑ Other: Double-walled

Tank Elevated on Supports: ☑ YES ☐ NO
Support Material: ☑ Steel ☐ Concrete ☐ Other: ______

Continuous Release Detection Method: ☑ YES ☐ NO
- ☑ Release Prevention Barrier
- ☑ Elevated Tank
- ☐ Double Bottom Tank
- ☑ Double Walled Tank
- ☐ CE-AST
- ☐ Other: ______

Release Prevention Barrier: ☑ YES ☐ NO If yes, Date installed: 03/2020
If yes, Type: ☐ Clay Liner ☐ Synthetic Liner ☐ Other: ______
☐ Concrete ☑ Steel

Tank Inspection schedule based on Industry Standard STI SP001 and information provided by the facility on the tank.

Tank Information Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID: 001A   Category: 3

Manufacturer: Unknown   Contents: ULSD
Construction Date: 03/2020   Capacity: 50 gallons
Last Change of Product Date: Dimensions:
Last Repair/Reconstruction Date:

Specification Design:
- ☑ UL
- ☐ API
- ☐ SWRI
- ☐ Other:
- ☐ Unknown
- ☐ Horizontal
- ☐ Vertical
- ☑ Rectangular

Construction:
- ☐ Bare Steel
- ☑ Coated Steel
- ☐ Double Bottom
- ☐ Concrete Encased Steel
- ☐ Double Wall
- ☐ Cathodically Protected; Date Installed:
  - ☐ Galvanic
  - ☐ Impressed Current
- ☐ Stainless Steel
- ☐ Lined inside; Date Lining Installed:

Containment
- ☐ Earthen Dike
- ☐ Steel Dike
- ☑ Concrete
- ☑ Other: Double-walled

Tank Elevated on Supports: ☑ YES ☐ NO
Support Material: ☑ Steel ☐ Concrete ☐ Other:

Continuous Release Detection Method: ☑ YES ☐ NO
- ☑ Release Prevention Barrier
- ☑ Elevated Tank
- ☐ Double Bottom Tank
- ☑ Double Walled Tank
- ☐ CE-AST
- ☐ Other:

Release Prevention Barrier: ☑ YES ☐ NO   If yes, Date installed: 03/2020
If yes, Type: ☐ Clay Liner ☐ Synthetic Liner ☐ Other:
☐ Concrete ☑ Steel

Tank Inspection schedule based on Industry Standard STI SP001 and information provided by the facility on the tank.

Tank Information Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID: 002 Category: 3

Manufacturer: Unknown Contents: ULSD
Construction Date: 03/2020 Capacity: 500 gallons
Last Change of Product Date: Dimensions:
Last Repair/Reconstruction Date:

Specification Design:
- ☑ UL
- ☐ API
- ☐ SWRI
- ☐ Other: ____
- ☐ Unknown

- ☐ Horizontal
- ☐ Vertical
- ☑ Rectangular

Construction:
- ☐ Bare Steel
- ☑ Coated Steel
- ☐ Double Bottom
- ☐ Concrete Encased Steel
- ☐ Double Wall
- ☐ Cathodically Protected; Date Installed: ____
  - ☐ Galvanic
  - ☐ Impressed Current
- ☐ Stainless Steel
- ☐ Lined inside; Date Lining Installed:

Containment
- ☐ Earthen Dike
- ☐ Steel Dike
- ☑ Concrete
- ☑ Other: Double-walled

Tank Elevated on Supports: ☑ YES ☐ NO
Support Material: ☑ Steel ☐ Concrete ☐ Other: ____

Continuous Release Detection Method: ☑ YES ☐ NO
- ☑ Release Prevention Barrier
- ☑ Elevated Tank
- ☐ Double Bottom Tank
- ☑ Double Walled Tank
- ☐ CE-AST
- ☐ Other: ____

Release Prevention Barrier: ☑ YES ☐ NO If yes, Date installed: 03/2020
If yes, Type: ☐ Clay Liner ☐ Synthetic Liner ☐ Other: ____
☐ Concrete ☑ Steel

Tank Inspection schedule based on Industry Standard STI SP001 and information provided by the facility on the tank.

Tank Information Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID: 003 Category: 3

Manufacturer: Unknown Contents: ULSD
Construction Date: 03/2020 Capacity: 2,000 gallons
Last Change of Product Date: Dimensions:
Last Repair/Reconstruction Date:

Specification Design:
- ☑ UL
- ☐ API
- ☐ SWRI
- ☐ Other: ______
- ☐ Unknown
- ☐ Horizontal
- ☐ Vertical
- ☑ Rectangular

Construction:
- ☐ Bare Steel
- ☑ Coated Steel
- ☐ Double Bottom
- ☐ Concrete Encased Steel
- ☐ Double Wall
- ☐ Cathodically Protected; Date Installed: ______
  - ☐ Galvanic
  - ☐ Impressed Current
- ☐ Stainless Steel
- ☐ Lined inside; Date Lining Installed:

Containment
- ☐ Earthen Dike
- ☐ Steel Dike
- ☐ Concrete
- ☑ Other: Double-walled

Tank Elevated on Supports: ☑ YES ☐ NO
Support Material: ☑ Steel ☐ Concrete ☐ Other: ______

Continuous Release Detection Method: ☑ YES ☐ NO
- ☑ Release Prevention Barrier
- ☑ Elevated Tank
- ☐ Double Bottom Tank
- ☑ Double Walled Tank
- ☐ CE-AST
- ☐ Other: ______

Release Prevention Barrier: ☑ YES ☐ NO If yes, Date installed: 03/2020
If yes, Type: ☐ Clay Liner ☐ Synthetic Liner ☑ Other: Double-walled
☐ Concrete ☑ Steel

Tank Inspection schedule based on Industry Standard STI SP001 and information provided by the facility on the tank.

Aboveground Storage Tank
Petroleum Bulk Storage Monthly Inspection Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, New York 14470
PBS Registration No. 9-999999

	Tank #001 ULSD			Tank #001A ULSD			Tank #002 ULSD			Tank #003 ULSD		
Item	**Yes**	**No**	**N/A**	**Yes**	**No**	**N/A**	**Yes**	**No**	**N/A**	**Yes**	**No**	**N/A**
Tank and Piping												
Is tank exterior (roof, shell, heads, bottoms, connections, fittings, valves etc.) free of visible leaks? **NOTE:** *If "No", describe leak and actions taken.*												
Is the area around the tank (concrete pad, containment, tank truck loading/unloading area, or ground etc.) free of visible signs of leakage?												
Is tank exterior free of cracks, pitting (steel), corrosion, areas of wear and poor maintenance?												
Is the tank liquid level gauge readable and in good condition?												
Is the primary tank free of water?												
Is interstitial monitoring equipment (where applicable) in good working condition?												
Is the interstice space free of liquid? *Remove the liquid if found. If tank product found, investigate possible leak.*												
Is the AST system free of evidence of tank settling or foundation deterioration?												
Are tank foundation, supports, and other structural components in satisfactory condition?												
Is the tank exterior free of separation or swelling of tank insulation?												
Equipment on Tank												
Test functionality of the electronic monitoring system. If equipped with a "test" button, does it activate the audible horn and/or light to confirm operation?												
Is overfill prevention equipment in good working condition? If it is equipped with a mechanical test mechanism, actuate the mechanism to confirm operation.												
Is the spill container (spill bucket) empty, free of visible leaks, and in good working condition?												
Are piping connections to the tank (valves, fittings, pumps, etc.) free of visible leaks? **NOTE**: *If "No", describe leak and actions taken.*												
Do ladder and platform structures appear to be secure with no sign of severe corrosion or damage?												
Containment (Diking/Impounding)												
Is the containment free of excess liquid, debris, cracks, corrosion, erosion, fire hazards, and other integrity issues?												
Are dike drain valves closed and in good working condition?												
Are containment egress pathways clear and any gates/doors operable?												
Concrete Exterior ASTs (Convault type)												
Inspect all sides for cracks in concrete. Free of any cracks in the concrete exterior larger than 1/16"?												
Inspect concrete exterior body of the tank for cleanliness, need of coating, or rusting where applicable. Tank exterior in acceptable condition?												
Visual inspect all tank top openings including nipples, manways, tank top overfill containers, and leak detection tubes. Is the sealant between all tank top openings and concrete intact and in good condition?												
Other Conditions												
Is the system free of any other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?												

Designates an item in non-conformance status. Indicates that action is required to address a problem

Comments: ______________________________

Signature of Inspector — Date of Inspection
Inspector's Address: (same as facility address)

IMMEDIATELY REPORT ANY LEAK OR SPILL TO THE PLANT SUPERINTENDENT AND THE DESIGNATED INDIVIDUAL IN CHARGE OF SPILL PREVENTION AT THE FACILITY SO THE FACILITY SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN CAN BE IMPLEMENTED.

Aboveground Storage Tank
Annual Inspection Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID No.: ____________________ Inspection Date: ____________________

Item	Yes	No	N/A	Comments
Tank Foundation/Supports				
Free of evidence of tank settlement or foundation washout?				
Concrete pad or ring wall free of cracking and spalling?				
Tank supports in satisfactory condition?				
Water able to drain away from tank?				
Grounding strap secured and in good condition?				
Tank Shell, Heads, and Roof				
Tank appears in Satisfactory Condition - cracks, wear, corrosion are minimal? Free of visible signs of coating failure?				
Free of noticeable shell/head distortions, buckling, denting, bulging, corrosion, or cracking?				
Tank roof in good condition? Free of standing water on roof?				
Are all labels and tags intact and legible?				
Secondary Containment				
Secondary Containment structure in good condition? (e.g., no erosion, cracks, structural weakness, etc.)				
Drainage Pipes/Valves fit for continued service?				
Tank Manways, Piping, and Equipment				
Piping, valves, and pump in good condition?				
Flanged connection bolts tight and fully engaged with no sign of wear or corrosion?				
Tank Equipment				
Normal and emergency vents operable, free of obstructions?				
Normal vent on tanks storing gasoline equipped with pressure/vacuum vent?				
Are flame arrestors free of corrosion and are passages free of blockage?				
Is the emergency vent in good working condition and functional, as required by manufacturer? Consult manufacturer's requirements. Verify that components are moving freely (including long-bolt manways).				

Aboveground Storage Tank
Annual Inspection Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID No.: ____________________ Inspection Date: ____________________

Item	Yes	No	N/A	Comments
Is the interstitial leak detection equipment in good condition? Are windows on sight gauges clear? Are wire connections intact? If equipment has test function, does it activate to confirm operation?				
Are all valves free of leaks, corrosion and other damage? Follow manufacturer's instructions for regular maintenance of these items. Check the following and verify as applicable				
□ Anti-siphon valve	□ Yes	□ No	□ N/A	
□ Check valve	□ Yes	□ No	□ N/A	
□ Gate valve	□ Yes	□ No	□ N/A	
□ Pressure regulator valve	□ Yes	□ No	□ N/A	
□ Expansion relief valve	□ Yes	□ No	□ N/A	
□ Solenoid valve	□ Yes	□ No	□ N/A	
□ Fire valve	□ Yes	□ No	□ N/A	
□ Shear valve	□ Yes	□ No	□ N/A	
Are strainers and filters clean and in good condition?				
Insulated Tanks				
Tank Insulation free of moisture, mold, and other damage?				
Free of visible signs of coating failure?				
Tank / Piping Release Detection				
Is inventory control being performed and documented if required?				
Has the tank liquid level sensing device been tested to ensure proper operation? Verify by physically removing and moving to verify operation.				Service contractor used: Maintenance record filed with:
Does the tank liquid level sensing device operate as required?				
Is release detection being performed and documented if required?				
Overfill prevention device in proper working order? Verify by physically removing and operating to verify alarm activates.				Service contractor used: Maintenance record filed with:
Other Equipment				
Is electrical wiring for control boxes/ lights in good condition?				

Aboveground Storage Tank
Annual Inspection Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, NY 14470
PBS Registration No. 9-999999

Tank ID No.: ____________________ Inspection Date: ____________________

Item	Yes	No	N/A	Comments
Has the Cathodic Protection System on the tank been tested as required by the designing engineer?				Rectifier Reading:

Designates an item in non-conformance status. Indicates that action is required to address a problem

Signature of Inspector Date of Inspection
Address of Inspector: (same as facility address)

Inspect:

1. Earthen containment structures including examination for holes, washout, and cracking in addition to liner degradation and tank settling.
2. Concrete containment structures and tank foundations/supports including examination for holes, washout, settling, paint failure, in addition to examination for corrosion and leakage.
3. Steel containment structures and tank foundations/supports including examination for washout, settling, cracking, and for paint failure in addition to examination for corrosion and leakage.
4. Inspection of Cathodic Protection system, if applicable, includes the wire connections for galvanic systems and visual inspection of the operational components (power switch, meters, and alarms) and impressed current systems.

Oil-Filled Equipment
Monthly Inspection Form

Diaz Chemical Superfund Site
40 Jackson Street
Holley, New York 14470
PBS Registration No. 9-999999

	Visible Signs of leakage, bulging, seeping by container/equipment?		Secondary Containment leaking, cracking?			Comments
	Yes	No	Yes	No	N/A	
Transformers						
No. 001						
No. 002						
Drum Storage Areas						
Near Tank No. 001/001a						
Near Tank No. 002						
Spill Kits contains minimum spill response equipment per SPCC Plan Section 13.0? Y N (circle one)						

Designates an item in non-conformance status. Indicates that action is required to address a problem

Signature of Inspector　　　　　　　　　　　　　　　　　　　　Date of Inspection

Address of Inspector: (same as facility address)

IMMEDIATELY REPORT ANY LEAK OR SPILL TO THE PLANT SUPERINTENDENT AND TEH DESIGNATED INDIVIDUAL IN CHARGE OF SPIL PREVENTION AT THE FACILITY SO THE FACILITY SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN CAN BE IMPLEMENTED.

APPENDIX F

SPCC Personnel Training Program Outline and Record

Diaz Chemical Corporation Superfund Site – 40 Jackson Street, Holley NY 14470

A. Program Intent

- Federal (U.S. EPA) program for the proper onsite management and handling of oil, prevention of spills, and proper spill response if a spill should occur. The U.S. EPA could inspect the facility for compliance with this SPCC Plan.

- "Oil" includes petroleum-based materials (gasoline, diesel fuel, kerosene, fuel oil, motor oil, hydraulic fluid, used oil, transformer oil, etc.), as well as vegetable oil.

- A "bulk storage container" is a container used to store oil that has a capacity of 55 gallons or more. The definition *excludes* "oil-filled electrical, operating, or manufacturing equipment."

B. SPCC Plan

- Developed for implementation by facility personnel.
- A copy must be maintained/updated by facility's SPCC Coordinator.
- A copy is available for review by any employees at any time during normal working hours.

C. Training - Who, When, What

Who: All employees involved in handling and management of any new or used oil.

When: Minimum initial and annual refresher for all employees involved in oil handling.
- Within two weeks of hire for new employees involved in oil handling.
- If/when facility oil handling changes (so the SPCC Plan must be updated).

What: Initial: Entire SPCC Plan.
Annual Update: Known spill events or failures, malfunctioning components.
Ongoing: Facility changes, recently developed precautionary measures.

D. SPCC Coordinator

- Responsible for SPCC Plan implementation and oil spill prevention at the facility; see the SPCC Coordinator if there is ever any question or concern.

E. General Facility Layout, Site Plan and Drainage Systems (SPCC Plan Section 3.0)

- Provide an understanding of general facility operations, the overall facility layout, surface drainage discharge locations and directions, sensitive receiving water bodies, etc.

- Explain figure(s) showing the locations in which oil is kept in bulk storage containers having individual capacities of 55 gallons or more.

F. Facility's Specific Oil Handling Inventory (SPCC Plan Section 4.0)

Applies to bulk storage containers 55 gallons and larger, and transfers to/from them:

- Stationary and mobile aboveground storage tanks (ASTs).
- Drum storage and handling.

Also applies to:

- Gauges, alarms, and leak detection systems.
- Piping systems.
- Oil-filled electrical, operating, and manufacturing equipment.
- Oil unloading/loading areas.
- Additional oil storage or handling activities.

G. Containment and/or Diversionary Structures or Equipment to Prevent a Discharge

- Specific facility measures provided, as per the SPCC Plan
- Important because spilled oil will flow in accordance with drainage paths
- Intent of program is to keep oil out of surface water, stormwater, and drainage features
- Review operation and maintenance of all equipment intended to prevent discharges

H. Facility Drainage (SPCC Plan Section 6.0)

- Management of drainage from diked areas.
- Drainage from undiked areas.
- Potential impact on surface waters (including wetlands).

I. Facility Transfer Operations, Pumping and In-plant Processes (SPCC Plan Section 8.0)

- Operation and maintenance measures to prevent discharges.

J. Bulk Unloading/Loading Areas

- Spills from inbound/outbound transfers, including direction of flow.
- Transfers must be visually monitored at all times.
- Immediate response must be made to any spill, per the Plan's spill response procedures.

K. Inspections and Tests (SPCC Plan Section 10.0)

- Comprehensive monthly visual inspection of each AST, with documentation.
- Comprehensive monthly visual inspections of 55-gallon drums and larger portable containers, oil-filled equipment that contains oil in quantities 55 gallons or greater (oil-filled transformers), and spill cleanup supplies.
- Prompt completion of required repairs, with documentation.
- Periodic integrity testing of tanks.

L. Security (SPCC Plan Section 11.0)

- General facility security measures, and localized measures for individual oil handling areas.

M. Spill Response Procedures (SPCC Plan Section 13.0)

- Need to watch for, report, and clean up spills.
- Spill response equipment, inventory, minimum amount to be maintained, replenishment of used materials, etc.
- Review understanding of spill equipment, intent and how to use/deploy it; supplemented with construction equipment if necessary, etc.
- Spill reporting requirements to Federal and State agencies.

N. Additional State Requirements

- Petroleum Bulk Storage Program.

O. Miscellaneous

- Describe and review past discharges, reasons or causes, procedures to prevent recurrence, etc.
- Describe and review any other equipment failures, malfunctioning components and any recently developed precautionary measures relative to oil handling and spill control.

P. General Rules

- Do not wait for problems or spills to occur. Keep eyes open, anticipate problems and take precautionary measures to prevent incidents. Report all identified or suspected concerns.

Q. Any Questions?

Facility: Diaz Chemical Superfund Site

1. SPCC Plan Personnel Training topics

   Operation and maintenance of equipment to prevent discharges
   Discharge procedure protocols
   Applicable pollution control, laws, rules and regulations
   General facility operations
   Contents of the facility SPCC Plan

2. Discharge Prevention Briefings

   Known discharges and failures
   Malfunctioning components
   Any recently developed precautionary measures

Training/Briefings Date: ___________________________________

Training/Briefings Presented By: ___________________________________

Attendees:

Name	Signature	ID Number

APPENDIX G

Oil Spill Contingency Plan

OIL SPILL CONTINGENCY PLAN

The **SPCC** Coordinator is responsible for petroleum spill prevention and containment, and for implementing the procedures described in this SPCC Plan.

General Petroleum Spills (Diesel Fuel, Unleaded Gasoline, Motor Oil, Lubricating Oil, Used Oil)

Control and cleanup of a spill will be conducted only by the petroleum truck delivery person, maintenance personnel, individuals appointed by the Plant Superintendent, or outside emergency responders (e.g., fire company, cleanup contractors).

- Assess the leak as to the quantity and source. Notify the nearest maintenance person or manager. Evacuate all unnecessary personnel and proceed as instructed by the Environmental Compliance Coordinator, Administrative Support, or NYSDEC.

- Contain the leak. If possible, the designated person will attempt to stop the leak or spill (shut off valves, discontinue fill-up). Absorbent pillows will be spread at the site of the leak or spill and used to contain the spread of the material. The source of the spill is to be diked and controlled as much as possible. Routes of petroleum flow are to be blocked.

- Contaminated cleanup material will be placed in drums.

- As appropriate, the doors will be opened and exhaust fans will be turned on to maintain good air quality.

- Disposal of material will be in accordance with federal and state solid and hazardous waste regulations. Protective equipment that becomes contaminated will be cleaned with cloths or other materials stored in the locker and will also be designated as a waste, if not reused. At no time will protective equipment be cleaned in areas where contaminants may enter the water supply.

- In case of injury, immediate first aid must be given. Then bring the victim to the local hospital.

- The following information is to be noted:

    — Time and date of the discharge
    — Type of material discharged
    — Estimates of total quantity discharged
    — Source and cause of discharge
    — Description of all effected media
    — Any known damages or injuries
    — Actions being taken to stop, remove, and mitigate the effects of the discharge
    — Names of individuals and/or other organizations that been contacted

- The designated cleanup persons will work together to ensure that all procedures are being followed and that cleanup can be accomplished without delay in notifying appropriate authorities.

NYSDEC regulation 6 NYCRR Part 613.8 requires that "any person with knowledge of a spill, leak, or discharge of petroleum must report the incident to the Department within two hours of the discovery."

On December 27, 1995, NYSDEC published a proposal to revise the current spill reporting requirement. The current policy had been that a spill of any amount is to be reported. The proposed revision was that spills meeting all of the following five criteria need not be reported to NYSDEC:

Criteria	Current Policy
1. Quantity	The spill must be known to be less than five gallons.
2. Containment	The spill must be contained on an impervious surface or within an impervious structure.
3. Control	The spill must be under control and not reach a drain or leave the impervious surface.
4. Clean up	The spill must be cleaned up within two hours of occurrence.
5. Environment	The spill must not have already entered onto or into the soil, grass, ground water or surface water.

Though never formally promulgated, the proposal was adopted in 1996 in published agency guidelines. For a petroleum release that is not required to be reported, NYSDEC has recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year. However, as a best management practice this SPCC Plan requires spill records (reportable and non-reportable) to be maintained for at least ten years.

Each construction trailer maintains a current list of emergency notification telephone numbers. A list of emergency numbers is provided at the end of this appendix.

Each fill location will have spill cleanup materials in close proximity for emergency spill containment, or facility personnel who accompany the petroleum deliveries will have absorbent materials on hand that can be used for emergency spill containment. Facility personnel will remain at the petroleum transfer location until the transfer is complete, all lines are disconnected, and the truck is ready to leave the facility. All valves and fitting connections are to be inspected prior to, during, and after the transfers.

The **SPCC Coordinator** or designated personnel will contact their local facility representative and necessary agencies in the event there is a spill that is larger than can be handled by local personnel. The facility will call upon the services of an approved contract vendor listed on the last of page of this appendix section.

EMERGENCY TELEPHONE NUMBERS (In Case of Petroleum Leaks or Spills)	
Facility	
David Tiedman	(716) 480-8013
Federal, State, and County	
NYSDEC Spill Hot Line	(800) 457-7362
EPA Region 2, SPCC Coordinator	(732) 906-6847
State Emergency Planning Commission	(518) 457-4107
State Emergency Response Commission	(800) 457-7362
National Response Center	(800) 424-8802
Local Emergency Response	
Fire Department	911 (emergency)
Police Department	911 (emergency)
Sewage Treatment Plant	
Village of Holley	(585) 638-633
Emergency Response Contractor	

APPENDIX H

Spill Report Form

SPILL REPORT FORM

Diaz Chemical Corporation Superfund Site
PBS Registration No.

Date: ______________________________

Time Discovered: ________________________ AM or PM (circle)

Time Stopped: ________________________ AM or PM (circle)

Spill Location: ____

Type of Oil Spilled: ____

Amount of Oil Released (Approximate) ______________________________

What media was affected? **SOIL/GRASS, SURFACE WATER, GROUND WATER, STORMWATER, OTHER** ________________(circle)

Was this a non-reportable spill, *(De Minimis)*? **YES NO** (circle)

Non-reportable spills must meet **ALL** conditions below:

- Less than five gallons;
- Contained on impervious surface or within an impervious structure;
- Must be under control (source stopped);
- Must be cleaned within two hours;
- Must not contact soil, grass, ground water, or surface water; and
- Should document and keep on file for ten years.

What actions were taken to stop and clean the release?

____

____

Describe what happened: ____

____

____

CONTACTS (within 2 hours of discovery, unless non-reportable spill):

		Contact Name:
NYSDEC Spill Hotline	**(800) 457-7362**	Spill Number: ________________
		Contact Name: ________________
National Response Center*	**(800) 424-8802**	Spill Number: ________________

*Notify the National Response Center if spill/release results in any of the following:

- Violation of applicable water quality standards, or
- Causes a film, sheen upon, or discoloration of surface water or adjoining shoreline.

______________________________ ______________________________

Print Name/Title Signature/Date

**STORMWATER POLLUTION PREVENTION PLAN
FOR COMPLIANCE WITH NYSDEC
GENERAL PERMIT GP-0-20-001
FOR STORMWATER DISCHARGES
FROM CONSTRUCTION ACTIVITY**

Location:

Diaz Chemical Corporation Superfund Site, Operable Unit 2
40 Jackson Street
Village of Holley
Orleans County, New York

Prepared for:

United States Army Corps of Engineers,
Kansas City District

Prepared by:

URS Group, Inc.
12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

SWPPP Preparation Date:

May 2020

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

FIGURES

ATTACHMENTS

1.0 Introduction

This SWPPP has been prepared as part of the requirements for coverage under the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001).

As a project conducted under CERCLA, response actions are exempt by law from the requirement to obtain Federal, state or local permits. The purpose of this SWPPP is to demonstrate the work conducted under this project will meet the substantive provisions of NYSDEC stormwater discharge permit. This SWPPP provides requirements and instructions for the management of construction-related stormwater discharges. NYSDEC Standards and Specifications for Erosion and Sediment Control best management practices (BMPs) form the basis of this SWPPP.

This SWPPP identifies the minimum requirements necessary for proper stormwater management during construction. If site conditions warrant additional controls, the Contractor is required to implement those measures in accordance with the New York State Standards and Specifications for Erosion and Sediment Control BMPs referenced above.

It is anticipated that no changes to current drainage patterns or final site cover will be required. The current site cover is mostly impervious due to the presence of existing buildings, pavement and building pads of former buildings. The project will require removal of some areas of concrete pavement, which will be replaced at project completion with vegetated soil. The project will therefore result in a decrease in the area of impervious surface at the site. Permanent BMPs are not required for this scope of work.

2.0 Existing Site Conditions

2.1 Site Location

The project is located on the south side of Jackson Street in the Village of Holley, Orleans County, New York, at the Diaz Superfund Site OU2. The project is located within NYSDEC Region 9. Land use adjacent to the project includes railroad tracks, across which lies undeveloped land. Private residences also border the project area.

2.2 Waterbodies and Wetlands

No New York State or Federally regulated wetlands have been called out within the project area based upon a search of the New York State Department of Environmental Conservation Environmental Resource Mapper.

2.3 Soils

The National Resources Conservation Service (NRCS) Soil Survey Map indicates that the project is mapped entirely with Arkport very fine sandy loam (0 to 6 percent slopes). Group A soils have low runoff potential and high infiltration rates, even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 0.30 in/hr.).

3.0 Description of Proposed Work

3.1 General

The proposed work consists of remediating existing contamination by Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) at the project site. The selected remedial method for site contamination, based on the 2012 Record of Decision issued by EPA, is In-Situ Thermal Remediation (ISTR) of contaminated soils. The remediation design is based on treating the impacted soils in two stages (Stage 1 and 2), as discussed in the Remedial Action Work Plan (RAWP), each occupying an area of approximately 0.75 acres. The project requires the excavation of approximately 2,150 cubic yards of impacted soil from 5 excavation areas. The soil will be spread over the ISTR area to be treated in Stage 1. Each treatment area will be stabilized during the treatment process by an impervious insulating cover, to be installed after the installation of the treatment wells and heaters. Soils will not be exposed during the treatment period of each Stage.

Existing site cover consists of mostly impervious material due to the presence of pavement, existing buildings or the building pads of previously demolished buildings. The project will require removal of some areas of concrete pavement, which will be replaced at project completion with vegetated soil. The project will therefore result in a decrease in the area of impervious surface at the site.

It is expected that changes in the grading or cover material of the site will not permanently alter existing drainage patterns. As a result, the direction of post-construction flow of runoff will remain the same.

Access to the site will utilize an existing stone access road and will not result in an increase in the impervious area of the site.

BMPs will be installed prior to any construction work. BMPs to be used during the project are presented in the Erosion and Sediment Control Plan in Attachment C.

3.2 Contractor Responsibility

All Contractors will be bound by the conditions of this SWPPP and GP-0-20-001 at all times during construction. All Contractors will be responsible for the maintenance and upkeep of the BMPs until earthmoving operations have been completed or discontinued and acceptable groundcover has been established.

3.3 Sequence and Timing of Construction Activities

Construction is anticipated to begin in the Summer 2020. Prior to any construction activities on-site all temporary site BMPs will be installed.

4.0 Stormwater Management Controls

4.1 Potential Impacts to stormwater

When considering the requirements for erosion and sediment control during construction, the following general operations have the potential to cause erosion or sediment discharge:

- Construction Access: Temporary construction access can cause ruts which can create paths for concentrated water flows and expose underlying soils to erosion;
- Construction Site Entrance: Vehicles Leaving the site can track soil onto public and private roadways;
- Excavation: Open excavation areas disturb soils, which can lead to erosion;
- De-watering Procedures: Water pumped from excavations may contain sediment;
- Soil Stockpiles: Stockpiled soils, including excavated soils spread over each treatment area, are subject to erosion.
- Increased runoff from temporary impermeable ISTR cap: The cap over the ISTR areas will be impermeable, constructed over areas of existing concrete and vegetated soil.

4.2 Temporary Best Management Practices

Based on temporary conditions that are anticipated due to the various construction-related operations, the following summarizes the minimum BMPs that will be appropriate and necessary to address erosion and sediment control during construction:

- Maintenance and Cleaning of Public and Private Roadways to keep sediment and other debris from leaving the construction areas;
- Silt Fence and/or Compost Filter Sock to reduce the effects of runoff velocity and subsequent erosion of exposed granular surfaces;
- Sediment Filter Bag and discharging to vegetated upland areas in order to prevent sediment in pumped water from discharging to sensitive resources;
- Mulching to temporarily and/or permanently stabilize restored areas which have been disturbed; and
- Seeding to establish perennial groundcover to control runoff and erosion and restore disturbed areas to pre-construction conditions.
- Grading: The ISTR cap will be graded to direct the increased runoff to existing vegetated areas. The grading will also direct the flow of runoff away from neighboring railroad tracks, to prevent an increase in runoff flow to that property.

The above-listed BMPs will be implemented during construction as follows:

- Soil or sediment which is tracked onto public roadways will be cleaned daily and will not be allowed to accumulate throughout the project. Truck tires will be washed on haul road prior to exiting the Site to minimize soil transport to public roads.

- Runoff from stockpiled material will be contained by silt fence.

- If needed, excavations will be dewatered by pumping to a sediment filter bag within a vegetated upland area.

- All ruts and other depressions will be filled and leveled as soon as practical during the course of the project.

- In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within 14 days from the date the current soil disturbance activity ceased. Where the initiation of stabilization measures is precluded by snow cover or frozen ground conditions, stabilization measures will be initiated as soon as practical.

Permanent soil stabilization and seeding will be initiated after work is completed and access is finalized in work areas.

4.3 Permanent Water Quality and Quality Controls

The project will not result in a decrease in the impervious surface at the site, but will not alter pre-existing drainage patterns. All erosion and sediment control measures installed for construction will be temporary and will be removed upon completion of construction. For the aforementioned reasons, permanent post-construction measures to address and control water quantity and quality and peak flow attenuation are not proposed.

5.0 Spill Prevention and Solid Waste Management

All information regarding Spill Prevention and Solid Waste management can be found in the Spill Prevention, Control, and Counter Measure Plan (SPCC), and the Waste Management Plan (WMP).

6.0 Maintenance and Inspections

The SWPPP and GP-0-20-001 shall be implemented by a "qualified person", defined as someone that received four hours of training, which has been endorsed by the NYSDEC, in proper erosion and sediment control principles. After receiving the initial training, the trained individual will receive four hours of training every three years.

In order to meet the substantive requirements of NYSDEC GP-0-20-001 , visual inspections of all BMPs on the construction site will be performed by the project's designated qualified SWPPP Inspector at least once every seven calendar days. It is not anticipated that greater than 5.0 acres will be disturbed at one time, therefore more frequent inspections will not be required. The qualified inspection personnel designated in Attachment A of this SWPPP will conduct the inspection and will have the sole authority over the appropriateness and adequacy of all required stormwater management controls during construction.

The inspections will verify that the in-place BMPs are in good condition and are minimizing erosion and sediment transport. The inspection will also recommend whether corrective actions to established BMPs are required or whether additional measures are necessary to prevent stormwater contamination (based on unanticipated site conditions). A sample copy of the inspection report form is provided in Attachment D. Completed forms will be provided to the on-site supervisor and maintained at the Owner's office during the entire construction project.

If construction or design modifications are made to the project that could impact stormwater, this SWPPP will be amended appropriately. The amended SWPPP will then include a description of the new activities, their associated impacts, and a summary of the appropriate and applicable BMPs to minimize those impacts. Amendments to the SWPPP will be added to Attachment E.

Additionally, the Contractor is expected to inspect and maintain all BMPs throughout construction and following rain events. The Contractor shall maintain BMPs in accordance with the standards and specifications included in Attachment C.

If a portion of the site/project area is permanently stabilized, inspections can cease in that area as long as the condition has been documented. Permanent stabilization is characterized by greater than 80% vegetative coverage on restored areas.

7.0 Compliance with Federal, State, and Local Regulations

7.1 Rare, Threatened, and Endangered Species

For a preliminary determination of potential project impacts on Rare, Threatened, and Endangered Species, the U.S. Fish & Wildlife Service (USFWS) IPaC website (https://ecos.fws.gov/ipac/) and the NYSDEC Environmental Resource mapper were reviewed for the project location.

Additionally, the NYSDEC Natural Heritage Program, Environmental Assessment Form Mapper was consulted for a review of the project area. The USFWS IPaC results and the NYSDEC Natural Heritage Program Environmental Assessment Form Mapper results are included in Attachment G.

<u>U.S. Fish & Wildlife Service</u>

The USFWS IPaC website (https://ecos.fws.gov/ipac/) lists no endangered species for the project area. No Critical Habitats were identified in the project area.

<u>NY Natural Heritage Program</u>

The Natural Heritage Program does not list any threatened or endangered plants or animals in the project area or the adjacent area. The Natural Heritage Program Environmental Assessment Form Mapper results are included in Attachment G.

7.2 Historic Places

Preliminary investigation of cultural resource impacts was conducted through the use of SHPO Cultural Resource Information System (CRIS). It was determined that the project is neither in or adjacent to an area designated as sensitive to archaeological sites on the SHPO archaeological site inventory. The site is adjacent to two properties designated as eligible for listing on the State Register of Historic Places. Based on these results and the scope of work, it is anticipated there will be no impact on cultural resources in or eligible for inclusion in the State and National Register of Historic Places.

8.0 Post-Construction Stormwater Management Measures

There are no Post-Construction Stormwater Management measures anticipated or proposed for the project. All construction accesses, work areas, or any other ground disturbances resulting from construction or erosion and sediment control measures will be temporary and removed following completion of work. All ground disturbances will be stabilized and restored upon completion of construction activities.

Figure 1:

NRCS Soil Survey Map

Soil Map—Orleans County, New York

Map Scale: 1:1,790 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orleans County, New York
Survey Area Data: Version 16, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 11, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ArB	Arkport very fine sandy loam, 0 to 6 percent slopes	6.4	100.0%
Totals for Area of Interest		**6.4**	**100.0%**

Attachment A – SWPPP Contact List

Name	Title	Company	Contact Number
Jon Santacroce	Environmental Manager	URS	(518)-951-2200
Randolph West PE	SWPPP Engineer and Qualified Professional	URS	(716)-923-1222
Lindsey Hunka	SWPPP Inspector	URS	(716)-923-1235

Attachment B – Owner/Operator and Contractor Certifications

Any Contractor hired by United States Army Corps of Engineers or its project-specific General Contractor to perform earth-disturbing activities (e.g., clearing, grading, excavating) shall acknowledge his/her understanding of the contents of this SWPPP and GP-0-20-001, as well as certify his/her commitment to perform his operations in conformance with all technical requirements included herein.

Contractor's Certification

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

1) ____________________________ Name of Construction Company

____
____
____
Address and Telephone

____
Printed Name of Authorized Representative
(Trained Contractor)

____
Title

____
Signature of Authorized Representative

____
Date Signed

____
SWPPP Responsibility

2) ____________________________ Name of Construction Company (Subcontractor)

____
____
____
Address and Telephone

____
Printed Name of Authorized Representative
(Trained Contractor)

____
Title

____
Signature of Authorized Representative

____
Date Signed

____
SWPPP Responsibility

3) Name of Construction Company (Subcontractor)

Address and Telephone

Printed Name of Authorized Representative (Trained Contractor)

Title

Signature of Authorized Representative

Date Signed

SWPPP Responsibility

4) Name of Construction Company (Subcontractor)

Address and Telephone

Printed Name of Authorized Representative (Trained Contractor)

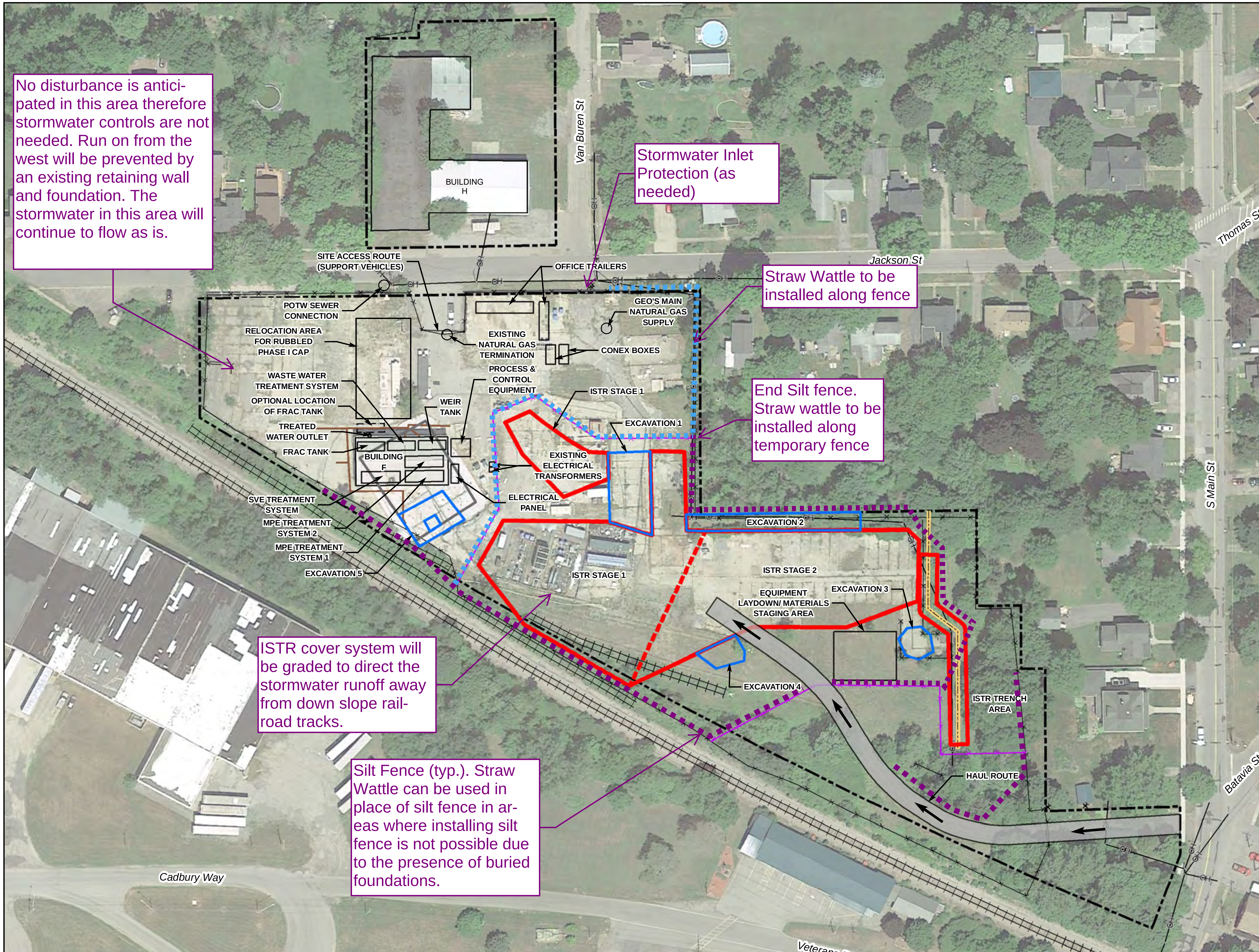
Title

Signature of Authorized Representative

Date Signed

SWPPP Responsibility

Attachment C – Erosion and Sediment Control Plans



Legend

- Diaz Facility Property Boundary
- Excavation Area
- Phase I Thermal Treatment Area
- Phase 2 Thermal Treatment Zone
- Temporary Fence
- Former Groundwater Recovery Trench
- Overhead Electric Line
- Trench Drain full of Debris
- Fence
- Railroad Tracks

N

0 50 100 200 Feet

Title:	SITE PREPARATION PLAN
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS

URS Corporation
40 British American Boulevard
Latham, New York 12110

Drafter: JB	Date: December 2019
Drg. Size: 11 x17	Job No.: 60615479

FIGURE 4-1

Attachment D – Sample Inspection Report

SITE PLAN/SKETCH

______________________________ ______________________________
Inspector (print name) **Date of Inspection**

______________________________ ______________________________
Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
Sediment accumulation is ___% of design capacity.

<u>Note</u>: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

Attachment E – Draft Notice of Intent

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR [ ][ ][ ][ ][ ][ ]
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-20-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
USEPA Region 2

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
DiMartino

Owner/Operator Contact Person First Name
John

Owner/Operator Mailing Address
290 Broadway - 18th Floor

City
New York City

State: NY

Zip: 10007 -

Phone (Owner/Operator): 212 - 637 - 4270

Fax (Owner/Operator): - -

Email (Owner/Operator)
DiMartino.John@epa.gov

FED TAX ID
- (not required for individuals)

6401089828

Project Site Information

Project/Site Name

DIAZ Chemical CO. Superfund Site

Street Address (NOT P.O. BOX)

40 Jackson Street

Side of Street

○ North ● South ○ East ○ West

City/Town/Village (THAT ISSUES BUILDING PERMIT)

Village of Holley

State	Zip	County	DEC Region
NY	14470 -	Orleans	9

Name of Nearest Cross Street

Van Buren Street

Distance to Nearest Cross Street (Feet)

10

Project In Relation to Cross Street

○ North ● South ○ East ○ West

Tax Map Numbers
Section-Block-Parcel

87.8-2-38.1

Tax Map Numbers

343201

1. Provide the Geographic Coordinates for the project site. To do this, go to the NYSDEC Stormwater Interactive Map on the DEC website at:

https://gisservices.dec.ny.gov/gis/stormwater/

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located the centroid of your project site, go to the bottom right hand corner of the map for the X, Y coordinates. Enter the coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	**Y Coordinates (Northing)**
-7 8 0 2 9 0 0	4 3 22 22 33
Ex. -73.749	**Ex. 42.652**

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

● **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ● INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER [ ]

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION — Number of Lots [ ]
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ● INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER [ ]

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
5.0	1.5	0.2	0.0

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ● **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
100 %	0 %	0 %	0 %

7. Is this a phased project? ● **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date 06/01/2020 - **End Date** 06/01/2025

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

None. All runoff to village storm sys.

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001? ○ **Yes** ● **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001? ○ **Yes** ● **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters?
If no, skip question 13. ○ **Yes** ● **No**

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey?
If Yes, what is the acreage to be disturbed? ○ **Yes** ○ **No**

.

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ● **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)?
● Yes ○ No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

(V) Holley, (T)Murray, (C) Orleans

17. Does any runoff from the site enter a sewer classified as a Combined Sewer?
○ Yes ○ No ● Unknown

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law?
○ Yes ● No

19. Is this property owned by a state authority, state agency, federal government or local government?
○ Yes ● No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.)
● Yes ○ No

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)?
● Yes ○ No

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)?
If No, skip questions 23 and 27-39.
○ Yes ● No

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual?
○ Yes ○ No

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- [x] **Professional Engineer (P.E.)**
- [ ] **Soil and Water Conservation District (SWCD)**
- [ ] **Registered Landscape Architect (R.L.A)**
- [ ] **Certified Professional in Erosion and Sediment Control (CPESC)**
- [ ] **Owner/Operator**
- [ ] **Other**

SWPPP Preparer
Randolph West

Contact Name (Last, Space, First)
(same)

Mailing Address
257 W. Genesee St., Suite 400

City
Buffalo

State: NY
Zip: 14202-

Phone: 716-923-1222
Fax: 716-856-2545

Email
randy.west@aecom.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name
Randolph

MI

Last Name
West

Signature

Date
/ /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ Check Dams
- ● Construction Road Stabilization
- ● Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ○ Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ○ Sediment Traps
- ● Silt Fence
- ● Stabilized Construction Entrance
- ● Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ○ Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ○ Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ○ Grassed Waterway
- ● Mulching
- ○ Protecting Vegetation
- ○ Recreation Area Improvement
- ● Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ● Topsoiling
- ○ Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ○ Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ○ Rock Outlet Protection
- ○ Streambank Protection

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

7738089822

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1) ...	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ Hydrodynamic	.
○ Wet Vault	.
○ Media Filter	.
○ Other	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

☐☐☐.☐☐☐ **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). ☐☐☐.☐☐☐

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required ☐☐☐.☐☐☐ **acre-feet**

CPv Provided ☐☐☐.☐☐☐ **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development ☐☐☐.☐☐☐ **CFS**

Post-development ☐☐☐.☐☐☐ **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development ☐☐☐.☐☐☐ **CFS**

Post-development ☐☐☐.☐☐☐ **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP N Y R
- ○ Other
- ● None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ● No
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ Yes ● No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ○ No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. N Y R

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date

/ /

APPENDIX D

Traffic Control Plan

FINAL

DIAZ CHEMICAL CORPORATION SUPERFUND SITE, OPERABLE UNIT 2 TRAFFIC CONTROL PLAN

Village of Holley
Orleans County, New York

February 2020

Prepared for:

United States Army Corps of Engineers,

Kansas City District

Prepared by:

URS Group, Inc.

12120 Shamrock Plaza, Suite 300

Omaha, NE 68154

Contract No. W912DQ -15-D-3006, Delivery Order W912DQ 19F3063

Table of Contents

LIST OF FIGURES

LIST OF ATTACHMENTS

Section 1
Introduction

The United States (U.S.) Army Corps of Engineers, Kansas City District (USACE) has contracted URS Group, Inc. (URS) to perform remediation construction activities at the Diaz Chemical Corporation Operable Unit (OU) 2 Superfund Site in Holley, New York. URS project work will be conducted for the USACE Kansas City District under Contract Number W912DQ-15-D-3006, Client Task Order Number W912DQ19F3063. This document constitutes the Traffic Control Plan (TCP) for the Diaz Superfund Site OU2 (the site). This TCP describes the traffic controls that will be implemented for contractors during remediation as detailed in the Remedial Action Work Plan (RAWP).

The Diaz Chemical Facility is an approximately five-acre former specialty chemicals manufacturing plant located at 40 Jackson Street in the Village of Holley, Orleans County, New York. The Site is located approximately 25 miles west of Rochester and 50 miles east of Buffalo. The Diaz Chemical Corporation is no longer active. The Site is bounded on the north by Jackson Street, where both residential parcels and a parcel of land owned by Diaz Chemical, which includes a parking lot and a warehouse, are located. To the east, the property is bounded by residential parcels along South Main Street. To the south and west, the property is bordered by railroad tracks operated by Genesee Valley Transportation, and beyond that by undeveloped land and a group of buildings.

Section 2
Transportation Requirements

The remediation work at the site will require the mobilization of supplies, heavy equipment, temporary facilities, and transportation of construction materials (concrete, stone, soil, etc.) to and from the Site. A temporary haul road will be constructed allowing the eastern gate on South Main Street to be used as the primary entrance and exit for trucks hauling heavy equipment and construction materials. The Jackson Street entrance will be used sparingly during the remediation primarily for the delivery of temporary office trailers, remediation equipment that will be housed in or adjacent to site Building F, delivery of fuel for equipment tanks and generators, and for the removal of waste oil from Building F. The two entrances are shown of **Figure 1** in the following section.

The primary factors for transportation requirements include:

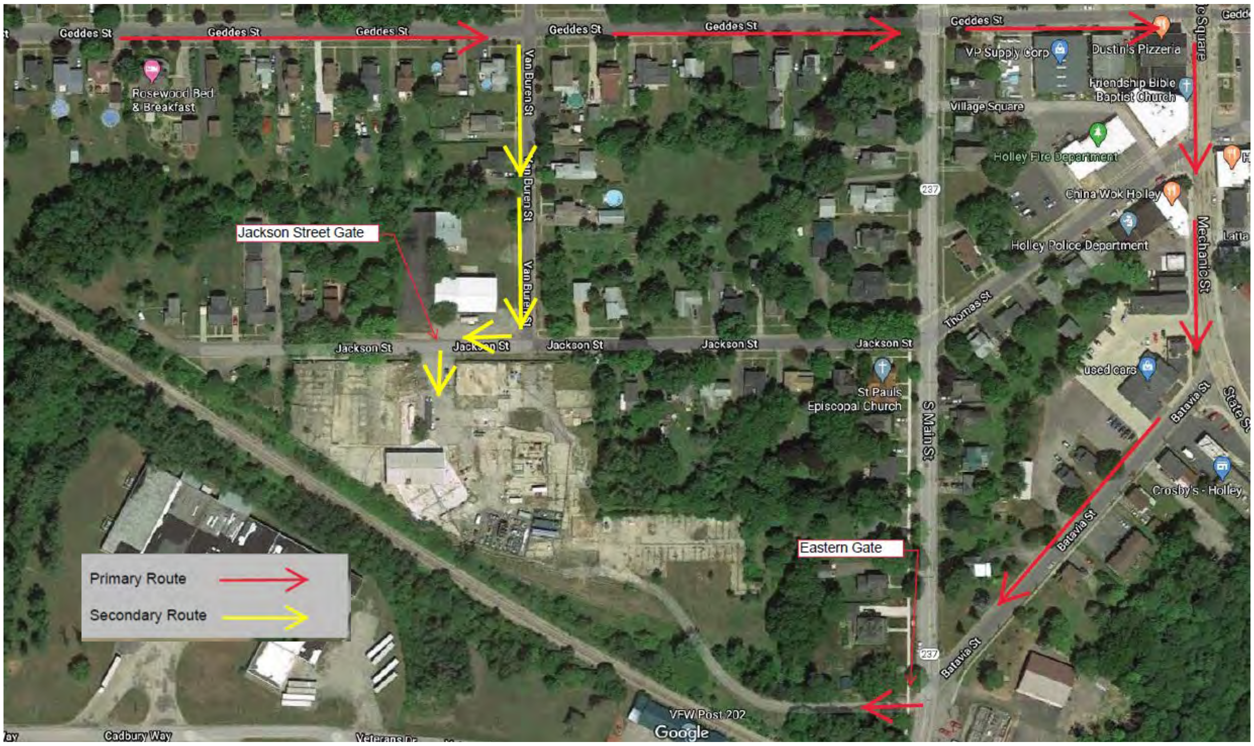
- Transportation and off-site disposal of concrete debris;
- Transportation and offsite recycling of scrap metal;
- Transportation and offsite disposal of treated soil;
- Transportation and offsite disposal of liquid waste;
- Delivery of general clean fill;
- Delivery of clean aggregate base;
- Delivery of metal pipe and well casing materials;
- Mobilization and demobilization heavy equipment for Site work;
- Mobilization and demobilization of drilling equipment;
- Mobilization and demobilization of remedial equipment; and
- Mobilization and demobilization of office trailers and temporary facilities.

The requirements of this TCP will apply to all truck traffic in and out of the site (i.e. material & equipment deliveries, waste transportation, backfill delivery, etc.). Pickup trucks and other light duty vehicles will abide but may not be restricted by this TCP.

Section 3
Transportation Routes

The eastern gate on South Main Street will be the primary entrance to the Site for heavy construction traffic. This entrance will lead to the temporary haul road to be constructed at the site over the existing hard pack surface (Figure 1). The detailed haul road location is shown in the RAWP and is provided in Attachment B. The traffic route has been designed to avoid passage under the rail road bridge, sharp curves, blind corners, and cross traffic. The secondary route will only be used for mobilization and demobilization of work trailers, remediation equipment deliveries to be housed in Site Building F, fuel deliveries, and waste oil hauling from tanks housed in Site Building F.

Figure 1— Transportation Plan



Section 4
Traffic Control

As part of this project the following controls will be used to manage traffic.

4.1 TRANSPORTATION CONTROL SUPERVISOR (TCS)

A Transportation Control Supervisor (TCS) will be present during all transportation of heavy construction materials and deliveries to the Site. The TCS responsibility will be to control all truck traffic entering and exiting the site. The TCS will be responsible for the following:

1. Maintaining radio and/or cellular phone contact with all incoming vehicles.
2. Coordinating incoming vehicle staging.
3. Communication with drivers and enforcement of the Transportation Plan.
4. Make sure all waste transportation trucks are lined and covered before leaving the site.
5. Decontamination and/or wheel washing (as necessary) for all vehicles exiting the site.

The TCS will inspect all roads and staging areas each day of the project in order to fully understand any traffic issues or concerns. The TCS will be the Site Superintendent or their appointee.

4.2 TRAFFIC CONTROL

During days of heavy truck traffic where materials and waste are being transported to and away from the Site, URS will isolate their work areas from pedestrian and vehicle traffic by using flagmen at the entrance or other effective means of isolation. Signs, signals and barricades shall be visible at all times where a potential hazard exists. Special attention will be made to limit hazards near the rail bridge adjacent to the eastern entrance. Attachment 2 includes a site map showing where vehicular traffic control measures will be required, and pictures of the types of vehicular controls. URS will utilize a flagman when trucks are entering and exit the AOCs at the Truck Crossings as shown on Figure 2.

When working near or in high traffic areas, the following precautions will be required of all workers to protect them from vehicle traffic:

- All workers will wear high visibility safety vest and hard hat;
- All workers will stay within the work zones of the traffic control barriers. If work on the traffic side is required (such as moving a truck from the work zone), a flag person will be used to control or divert traffic;
- All workers will remain aware of their position relative to traffic control barriers and surrounding traffic;
- Inside the site work area, workers will remain alert for vehicular and equipment movement within the work zone.

Section 5
Dust Control and Decontamination

5.1 DUST CONTROL

URS will implement dust control measures in accordance with the requirements of the approved Community Air Monitoring Plan (CAMP) and/or whenever dust creates a potential community nuisance. In most cases, URS will utilize the following control measures to control dust within the work areas, haul roads, and the site entrance:

- Water wagon
- Polyethylene Sheeting (for covering disturbed soil, material stockpiles, etc.)
- Minimizing disturbed soil surface area to be exposed at any given time.

5.2 DECONTAMINATION PAD

The wheel wash will be utilized for vehicles which have come into contact with impacted soils (i.e. excavators, loaders, off-road dumps etc.). It is anticipated that off-site haul trucks will only require decontamination in the event that the exterior bed or wheels of the vehicle come in contact with impacted materials. Poly sheeting will be used to cover the ground in instances where haul trucks may need drive over impacted areas.

During preparation of the construction entrances, URS will construct a wheel wash on haul road near the east access gate. The wheel wash will consist of:

- Non-woven geotextile filter fabric
- 40-millimeter LLDPE Geomembrane
- Non-woven geotextile filter fabric
- 12-inches of crushed aggregate of size between 3” and 6”
- Section of corrugated steel panels
- Sump and pumps

ATTACHMENT 1

TRUCK DRIVER INFORMATION SHEET

URS

Diaz Chemical Corporation Superfund Site,
Village of Holley, NY
Truck Drivers Information Sheet

URS Dispatch: David Tiedman (716-480-8013)

All arriving trucks/deliveries MUST comply with the following:

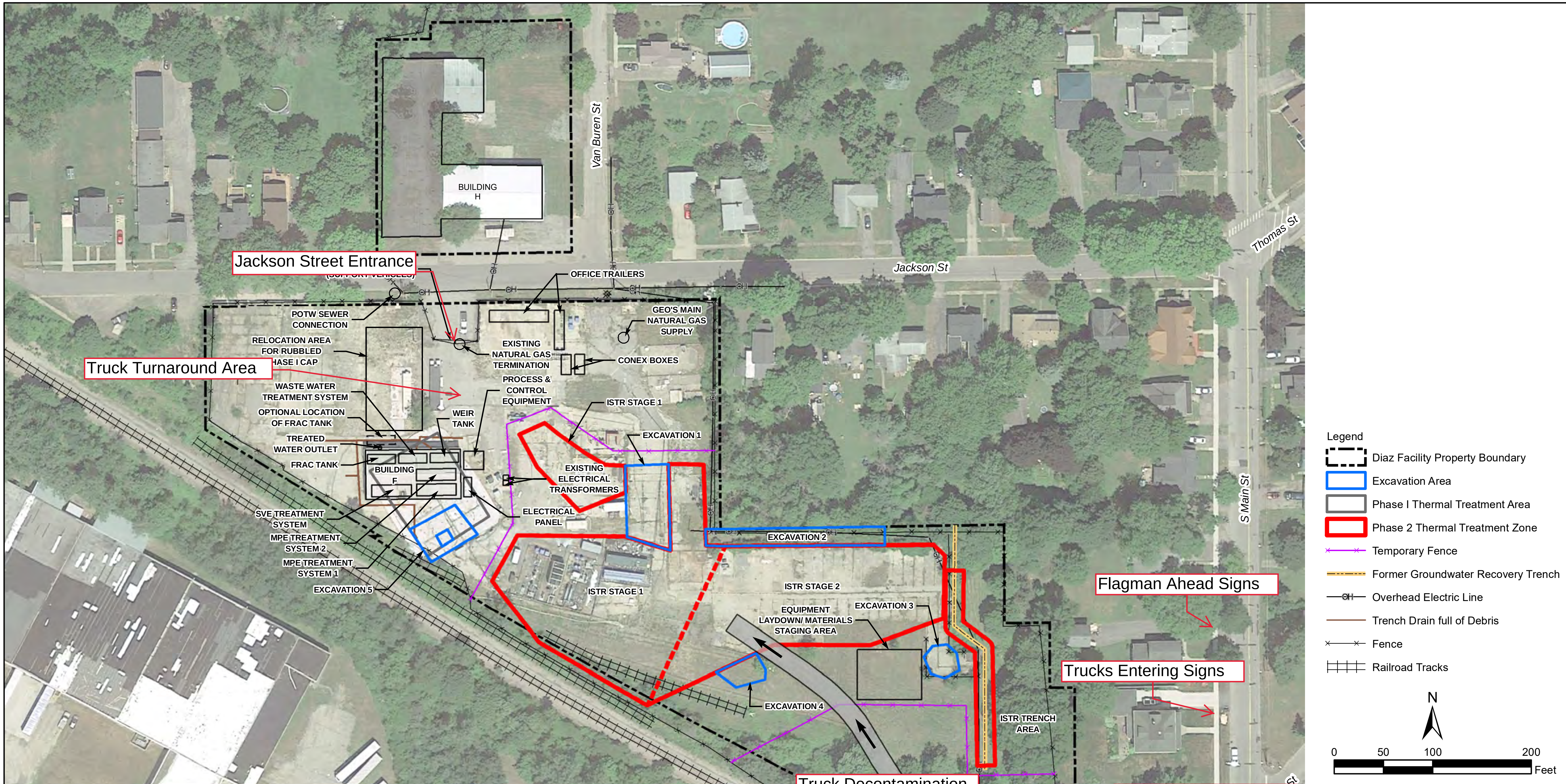
1. URS must be present and onsite for all deliveries and services.
2. When drivers are approximately 15 minutes away call URS dispatch (number listed above).
3. Do not proceed directly to site unless specifically authorized by URS.
4. Meet at URS designated gate, where URS personnel will meet the driver and escort them to their destination.

<u>Remember</u>:

* **No deliveries unless a URS representative is present**
* Drivers must treat safety as a top priority at all times
* Drivers must obey all applicable laws (no speeding, no double parking, etc.)
* Drivers must act in a professional manner (no spitting, no cursing, etc.)
* Trucks shall not be staged on the streets adjoining the Site or in other residential areas.

ATTACHMENT 2

TRAFFIC CONTROLS



Title:	SITE PLAN - TRAFFIC CONTROL
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS

URS Corporation
40 British American Boulevard
Latham, New York 12110

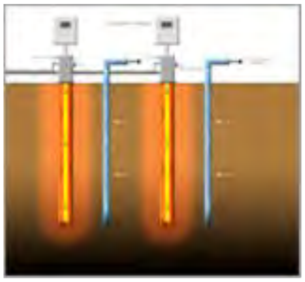
Drafter:	Date:
JB	December 2019
Drg. Size: 11 x17	Job No.: 60615479

FIGURE 4-1

All road signs are 36-inches by 36-inches


DANGER
CONSTRUCTION
AREA
AUTHORIZED
PERSONNEL ONLY


DANGER
HARD HAT
AREA




GEO Environmental Remediation Company




OPERATIONS AND MAINTENANCE MANUAL

Project Name:

DIAZ CHEMICAL CORP.

Project No. 60615479

Prepared For:

URS

Document Control

DOCUMENT TITLE

GEO – Operations and Maintenance Manual (OMM)

DOCUMENT LOCATION

Server:file; GEO and STD: Z:\GEO and GTR Sites\Current Jobs\Diaz Chemical Superfund, NY\PHASE II AECOM\06 - Operations\O and M Manual

DOCUMENT OWNER

Iain Cowie, Project Management, GEO

VERSION

Revision	Revision Date	Status	Author/Editor	Comments
0	12/11/19	Draft	Iain Cowie	
1	3/1/20	Draft Final	Iain Cowie	
2	3/3/20	Final	Grant Geckeler	
2.1	4/27/20	Final	Iain Cowie	Section 2.1, Table 4

Contents

Introduction

This operation and maintenance (O&M) manual provides instructions for the proper operation and maintenance of the GEO Inc. (GEO) In-Situ Thermal Remediation (ISTR) System proposed for the Diaz Chemical Company Superfund Site, Holley, New York. ISTR sites consist of a well field and an effluent extraction system. The well field and the effluent extraction system are designed to operate independently of each other. For example, the effluent extraction system may operate while certain [heater] wells are offline.

The ISTR system designed for the Diaz application utilizes one soil vapor extraction & treatment module, one multiple-phase extraction treatment module and one wastewater treatment module. Heat exchangers, cooling towers, chillers and compressors are accessory equipment that compose these modules. This manual is intended for use only by GEO technicians, or those who have received training from a qualified GEO technician.

1.1 Definitions and Acronyms

CO- Carbon Monoxide

CO_2- Carbon Dioxide

COC- Contaminant of Concern

MPE- Multi-Phase Extraction

GAC- Granular Activated Carbon (V) signifies 'vapor' and (L) signifies 'liquid'

HASP- Health and Safety Plan

HMI- Human/Machine Interface

ISTR- In Situ Thermal Remediation

ISTT- In Situ Thermal Treatment

MPE- Multi Phase Extraction

NAPL- Non-Aqueous Phase Liquid

PLC- Programmable Logic Controller

SVE- Soil Vapor Extraction

SVOC- Semi-Volatile Organic Compound

TCU- Thermal Control Unit

TCH- Thermal Conductive Heater

1.2 Warnings and Disclaimers

Read and fully understand the following warnings and disclaimers before operating any GEO system!

The GEO system is an innovative product, custom designed for the site, to mobilize and recover mobile NAPL through thermally enhanced vapor extraction and dual phase extraction.

Do NOT operate or attempt to manipulate any controls of the GEO units unless you have been trained to do so by GEO.

Do NOT operate or attempt to manipulate any controls of the GEO units in a manner that is beyond the scope of, or inconsistent with, these standard operating procedures, unless you have been given instruction by an authorized GEO representative.

Do NOT operate or attempt to manipulate any controls of the GEO units if any confusion exists as to the instructions included in these standard operating procedures.

Operating the system in any manner inconsistent with the warnings and instructions of these standard operating procedures may result in severe bodily injury, electrocution, and/or death to you and surrounding persons. Exercise extreme care and discretion in accordance with these standard operating procedures, and all safety procedures promulgated by the Occupational Health and Safety Act.

This document describes measurements and monitoring for system operations. The project's UFP-QAPP should be consulted for details on other in sampling, measurement and monitoring procedures.

1.3 General Safety

1.3.1 Introduction

For all life-threatening injuries, fire, or criminal activity, **call 911** for immediate assistance. For all other instances (i.e. chemical exposure, release of chemical into the environment, and any unsafe condition) reference the GEO HASP.

1.3.2 General Safety

The major hazards present with the equipment are as follows:

- Electrical – 480 volts
- Rotating Equipment
- High Temperature Surfaces
- Chemical Hazards associated with chemicals likely to be removed
- NAPL Compounds

The major methods to control these risks are presented in Table 1.

Table 1: Major Methods to Control General Risks

Hazard	Control
Electrical	Training – access only by licensed personnel
	Lockout/Tagout
	Standards – manufactured to NEC
Rotating Equipment	Guards on motors, compressor drives, and fans
High Temperature Surfaces	Insulation
	Hot surface warning labels
	Use of high temperature resistant gloves to handle hot components
Chemical Exposure	Proper PPE as described in HASP

1.3.3 Lockout / Tagout

Only an authorized employee with knowledge of power sources and controls can fix or service powered equipment.

Isolation of the GEO system or any part of it, must consider the following sources of energy: Electrical energy sources

There is one main electrical isolation point in the GEO system at the DIAZ site: Main Disconnect for the Primary electrical service at the electrical distribution panel at the south side of the equipment area.

Main Control Panel – all equipment is isolated through the Main Control Panel.

Any major changes to the system require two forms of LO/TO on all potential energy sources associated with the equipment being serviced or maintained.

The following are general guidelines that should be followed when locking/tagging out equipment:

1. Alert employees in the area that equipment will be turned off and locked out.
2. Turn off the machine or equipment and its energy control device.
3. Lock the energy control switch in the “off” or “safe” position.
4. Release or block any stored energy. Before maintenance or servicing work can begin, equipment must be at zero energy state (ZES).
   i. Verify that voltage is 0.0V at appropriate location.

5. Check that power is off by turning controls "on" and trying to start the equipment.
6. Return controls to the "off" position.

Perform the required service or maintenance, then:

7. Remove tools and other materials from the area.
8. Replace machine guards and test the equipment that is ready to operate.
9. Instruct employees to stay a safe distance away while locks or tags are removed.
10. Remove all locks and tags.
11. Inform affected employees that locks/tags are off and the equipment is ready for use.
12. Turn on the equipment and make sure it operates properly.

1.3.4 Daily Safety Meeting

The safety meeting should be held at the start of each workday and at the start of each shift (see Appendix 2: Daily Safety Sheet).

2. Responsibilities

2.1 GEO Project Staff

Table 2: GEO Project Staff.

Contractor:		**GEO INC.**
Address:		1500 W. Katella Ave Orange, CA 92867
Telephone	**Fax**	**Primary Contact**
(714) 283-1682	(714) 637-2460	Iain Cowie Project Manager Cell Phone: (714) 906-1821 Iain.cowie@georemco.com
GEO Design Engineer		**Contact No.**
Xiaosong Chen, PhD, PE		Direct Line: (714) 283-1682 Cell Phone: (352) 235-4762 xiaosong@georemco.com

GEO Project Engineer	**Contact No.**
Brian Krumbholz	Direct Line: 207-338-0562 Cell Phone: (207) 323-5465 Email: brian@georemco.com
GEO Project Manager	**Contact No.**
Iain Cowie	Direct Line: (714) 283-1682 Cell Phone: (714) 906-1821 Email: scott.mckeag@georemco.com
GEO, Inc. Site Health and Safety Manager	**Contact No.**
Brian Morris	Direct Line: (714) 283-1682 Cell Phone: (601) 227-0230 Email: brian.morris@georemco.com
GEO Site Health and Safety Manager (alt)	**Contact No.**
Iain Cowie	Direct Line: (714) 283-1682 Cell Phone: (951) 751-9633 Iain.cowie@georemco.com

Iain Cowie is the designated GEO Project Manager for the DIAZ ISTR Project. Brian Krumbholz is the assigned Project Engineer and Dr. Xiaosong (Jason) Chen is the assigned Design Engineer.

The TCH process will operate 24 hours per day, seven days per week throughout the heating/operations period. A GEO Project Engineer or Operator, with engineering staff as needed, will be on site during the initial testing and commissioning phase. As the system transitions into full operation mode, GEO Project Engineers, Mr. Brian Krumbholz and Dr. Xiaosong Chen will monitor and tune the system components, and interface with and train the Field Supervisor as well as the Project Manager and Project Specialists.

Support from the Project Engineer, Technical Lead, and field engineering staff will be provided as necessary. The TCH process will be fully automated and alarmed, sending an email alarm to the System Field Supervisor and Project Manager should an issue arise. The System Field Supervisor and support personnel will be on site during regular workings hours (typically 07:00 to 16:00), and will be available at weekends, so the maximum delay for any site presence will be no greater than 24 hours to provide engineering support or to perform repairs or maintenance, as necessary. If these methods fail to resolve the issues, additional GEO support staff is prepared to be on site within 72 hours.

Alarm notification list to GEO (minimum notification list): Project Manager, Project Engineer, Field Supervisor, Field Technicians.

The System Field Supervisor and/or technician will perform a variety of functions, including: routine system maintenance, troubleshooting, adjustments and repairs as required, emissions monitoring, soil temperature and pressure measurement collection, ambient air sampling, and system performance and process sampling. The System Field Supervisor and/or technician, in consultation with the project team, will be responsible for reviewing the operating records and evaluating changes in the status and condition of the TCH operation.

Brian Morris is the designated Site Health and Safety Manager with the Project Manager is responsible for overall implementation of the Site Health and Safety Plan on the project. All onsite personnel will follow the DIAZ approved HASP.

The GEO project team will communicate regularly with URS Project Manager, Mike Niederreither/Sam Bartlett by way of daily reports, weekly operational status reports and weekly project team meetings as required.

2.2 Chain of Command

The chain of command for GEO is as follows:

A. Project Manager
B. Site Safety Officer
C. Project Engineer
D. Field Supervisor
E. Field Technician

2.3 Responsibility (Decision Making)

Project Manager (PM)
The PM is responsible for making final approvals regarding all site operations. The PM also oversees all site operations and data management.

Project Engineer (PE)
The PE is responsible for construction of the project. All design changes must be approved by the PE in consultation with the Design Engineer before implementation. The PE guides and instructs the PM.

Site Health and Safety Manager (HSM)
The HSM is accountable for ensuring all safety regulations are followed. The HSM will implement and maintain compliance with the site approved Health and Safety Plan, the requirements of this Manual, the Occupational Health and Safety Act, and other safety regulations during site activities. If needed, the HSM will be responsible for preparing safety reports.

2.4 Site Security

The current site perimeter fence (with optional privacy barrier) will be maintained or extended if necessary. The fence will surround the process treatment equipment area and Target Treatment Area.

**For further information pertaining to security and emergency response procedures, please refer to the site Health and Safety Plan.*

3. Commissioning

During commissioning, verify that the primary power supply is providing the proper voltage. Once established, GEO personnel will check rotation of every motor to ensure proper rotational direction. Then, the knockout tank(s) will be filled with water to test the float switches and pump controls. Once water is in the system, check for leaks in all liquid conveyance lines. Test all alarms and emergency devices according to the commissioning list (Table 3).

Table 3 Commissioning List.

Item #	Description	Completed (✓ / --)	Testing Method	Pass / Fail	Initials	Notes
1	Primary Electrical Supply Voltage		voltmeter			
2	Backup Generator Voltage (if applicable)		voltmeter			
3	Check rotation of water pumps		visual inspection			
4	Check rotation of Xchanger fans		visual inspection			
5	Check rotation of Blowers		visual inspection			
6	Check rotation of Compressor(s)		visual inspection			
7	Check rotation of Combustion fans		visual inspection			
8	Check rotation of cooling tower fans		visual inspection			
9	Check rotation of cooling tower pumps		visual inspection			

10	Check rotation on chiller fans		visual inspection			
11	Check operation of manual pump switches/pushbuttons		visual inspection			
12	Verify liquid level switches engage on PLC inputs		Fill all knockouts to HIHI level switch Fill WT1 and HT1 to HI level switch or manual manipulation of the high level float			
13	Check for leaks in liquid plumbing on knockouts		visual inspection while verifying level switches			
14	Prime caustic injection pump and check for leaks		Visual inspection while priming pump			If applicable
15	KO-1 HIHI		Fill KO to HIHI level			
16	KO-2 HIHI		Fill KO to HIHI level			
17	KO-3 HIHI		Fill KO to HIHI level			
18	SO-1 HIHI		Fill SO to HIHI level			
19	KO-4 HIHI		Fill KO to HIHI level			
20	KO-5 HIHI		Fill KO to HIHI level			
21	WT-1 HIHI		manually lift float			
22	HT-1 HIHI		manually lift float			
23	TT-1 HIHI		manually lift float			
24	SVEBlower HI temp		Checked at shop			
25	MPEBlower HI temp		Checked at shop			
26	GAC HI Temp		Checked at shop			
27	E-STOP		Push E-Stop button/s			
28	Combustion Air Loss TCU auto shut off		Remove pressure tube after starting TCUs (at each TCU)			See checklist in Appendix 17
29	Check C3 Systems pressures		Visual inspection			See Checklist in Appendix 17
30	Check C3 Temperatures and refrigeration		Visual inspection			See Checklist in Appendix 17

31	Check solenoids and actuated valves in each C3 unit		Operate C3			See Checklist in Appendix 17
32	Check fuel lines and connections for leaks		Pressure test (utilize leak locator if necessary)			

All systems and major components will be tested for proper performance prior to start-up. These systems and major components consist of the following;

- The Well Field - electrical source, gas supply, compressed air supply lines and combustion fans are all operational,
- The SVE System – verify vacuum and operability,
- The MPE System – verify vacuum and operability,
- The Compressor(s) – verify pressure, flow, loading/unloading and operating temperature,
- The C3 system – flow, DH operability, cooling levels, can and valve operation, instrument pressure
- The Water Treatment System – verify all filters are in place and all valves all operational,
- The Cooling Towers – fill and verify water and air circulation and check for leaks, and
- Heat Exchangers – verify that all fans are operational and that water is flowing.

4. ISTR System Start-Up & Operation

This section outlines the sequence of operations to be followed to properly initiate heating of the well field and vapor extraction system(s). Prior to well field heating, the vacuum extraction systems must be on and operating properly. Both the SVE and MPE systems must be at vacuum and all heat exchangers and cooling towers must be operational with vapor flow processed through the C3 and vGAC.

Once the vapor extraction systems are operational the well field can start heating. This requires a technician to individually start each TCU. Once the \ISTR System is fully functioning, the TCUs need to be optimized to operate at the proper temperature and flue gas composition.

4.1 Well Field Operation

4.1.1 TCU Heater Control

To achieve optimum burner operation and efficiency, a flue gas monitor is used to “dial-in” the quantity of gas, combustion air and cooling air. During operation, the monitored flue gas parameters should adhere to the following:

- The temperature of the flue gas at each burner (at the entrance of exhaust tube) should not exceed 500°C. (Operation over 500C can severely damage the heater well.)

- The temperature of the flue gas must be greater than 300°C (after 48 h of continuous operation). Optimal flue gas temperature is between 425C and 475C.
- Oxygen levels of the flue gas should be between 12% and 14%.
- Carbon Monoxide (CO) values of the flue gas should be less than 50 ppm (12% O_2).

Note: The presence of carbon monoxide indicates an improper fuel to combustion air ratio, which may lead to inefficient fuel usage.

Using a flue gas monitor, determine if the fuel to combustion air ratio is correct using the guidelines above. To adjust the amount of gas flow, use the LCD display control on the TCU. This adjustment is performed by adjusting the gas valve in the TCU.

Check the composition of the flue gas at the exit of the exhaust tube (wait 10 min after each adjustment). If it is anomalous (based on the ranges provided above), adjust the combustion airflow valves. There are two valved air supplies on the burner. The upper valve controls the combustion air amount and the lower valve controls the cooling air (used primarily to keep the upper portion of the burner cool) [Opening of the air valves 1 (maximum 60%) and air 2 (maximum 30%) via 2" gate valves on burner.] These adjustments can be very tedious but once a technician is trained should only take about 20 minutes per burner. If the operating conditions indicated above cannot be obtained, there is something seriously wrong with the burner and the PE should be informed.

Once these flue gas operating parameters are set on each burner, the well field should work properly for the duration of the treatment without additional adjustment. However, it is wise to check flue gas compositions occasionally. Once the target temperature is achieved, gas consumption can be reduced by periodically turning certain burners on/off.

4.1.2 MPE Well Control

The MPE hydraulic recovery performance will be verified in two ways. First, total extracted liquid flow from the wellfield will be evaluated by measuring the volume generated at the vapor-liquid separator (Knockout tank) and its rate of generation. Secondly, individual MPE recoveries will be evaluated by periodic onsite evaluations by field personnel that will confirm liquid flow from these wells by observing vibrations and temperatures of the hoses as indications of hydraulic recovery. The operational strategy is to partially dewater the wellfield prior to heat up initially and then as heat is added, MPE well recovery will primarily be for the extraction and conveyance of vapors.

<u>Operation of MPE wells to support attainment, enhancement of superheated subsurface temperatures:</u>

NOTES: This procedure assumes the decision to modify MPE wells for full dewatering to advance, improve superheated subsurface temperatures has been decided, communicated and approved; also assumes replacement (longer) stingers are manufactured offsite and delivered to site for installation. Use "hot surface" safety practices for each and every step. Each and every step must be performed in a team (i.e. do NOT work alone to perform any step(s)).

1. At subject MPE well: position shutoff valve to closed/off setting [detent] to isolate vacuum communication from MPE (extraction system) and the subject wellhead and well.
2. At TPMP nearest subject MPE well: measure, record pressure to verify no positive pressure in subsurface.
3. At subject MPE well: measure, record pressure to verify no positive pressure at the wellhead and well.
4. At subject MPE well: unbolt, disconnect and remove upper wellhead.
5. At subject MPE well: remove 0.75 inch diameter steel 'stinger' tube from the well.
6. Install replacement 'stinger' tube to specified depth and setting. Ensure no communication of stinger with bottom end cap of well interior and/or debris at bottom of well interior is detected (this is to verify open bottom end of 'stinger' tube is not blocked and does not become clogged). Secure 'stinger' tube in proper and lowest setting possible.
7. At subject MPE well: replace upper wellhead and secure all bolts, connections.
8. At subject MPE well: reposition shutoff valve to open/on setting [detent] to reestablish vacuum communication from MPE (extraction system) and the subject wellhead and well.
9. At MPE controls: if necessary, adjust [increase] flow and vacuum rate through well network.
10. At subject MPE well: measure, record pressure to verify sustained vacuum (i.e. negative pressure) at the wellhead and well.
11. Repeat above steps at other MPE well(s) as approved and directed.

4.1.3 Well Field Monitoring

4.1.3.1 Soil Temperature Monitoring

Constant measurement of soil temperature development, across the well field, over time is the principal indicator of decontamination progress. GEO determines that the Site is decontaminated, bases primarily on the well field soil temperature and the length of time at temperature. Ideally, once a well field has been at or near 100°C for a period of time, all COCs have vaporized or decomposed. Secondary indicators are also used, such as a decrease in COC concentrations in the treatment stream as determined daily using a PID. Also, individual SVE and MPE wells can be vapor sampled to determine if certain portions of the well field need additional time at temperature.

Real-time well field temperature measurement is achieved with thermocouple bundles in the temperature and pressure monitoring (TPMP) wells. A thermocouple consists of two metal components which form an open circuit, enabling measurement of the potential difference due to the difference between the reference temperature (typically measured at the junction box), and the temperature measured on the connection point of the two metals (Figure 1). A data collection interface enables the temperatures measured to display on a computer with specialized software. This software allows continuous temperature displays at well field points that are considered strategic. The computer display may be remotely accessed via an internet connection to monitor treatment progress.

The remedial temperature is measured at TPMP wells located at 'cold-points' or centroids at various depths in the soil. A centroid is in the center of a triangle formed by three heater wells or burners. (Because heat is conducted from a heater well outwards, soil at the centroid is the coolest and therefore represents a soil temperature minimum.) Thermocouples also measure temperatures of conveyance pipework, the vapor extraction wells, the individual heater wells and within the vapor treatment process at various locations. This vast thermocouple array allows real-time monitoring of well field thermal progress and treatment conditions. This real-time temperature monitoring map is updated every ten minutes allowing GEO's management, engineering and operation staff to verify thermal performance. Clients and associated engineering firms are also able to verify thermal operation of their project online using this system.

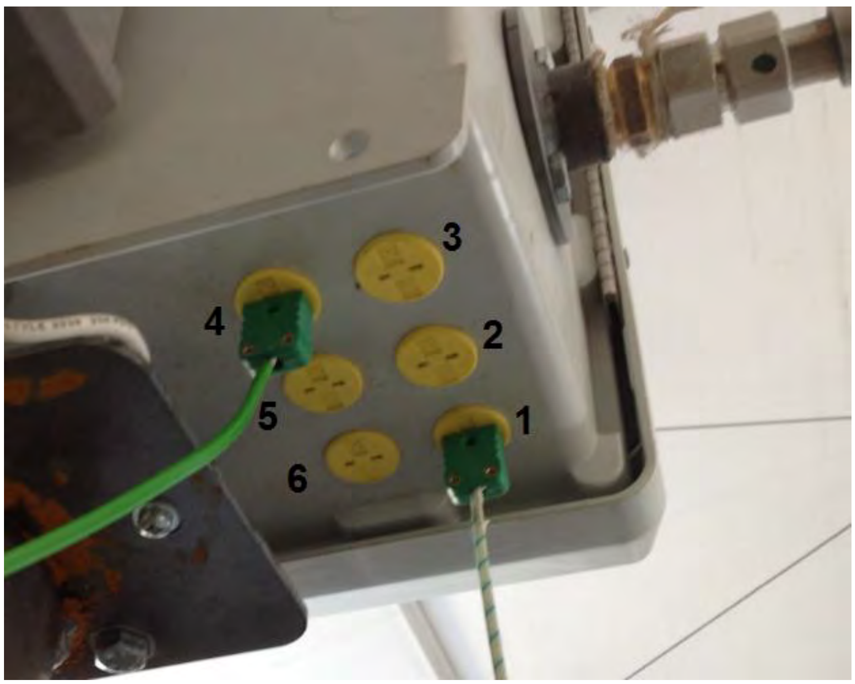


Figure 1: thermocouple ports on the underside of each TPMP unit.

4.1.2.2 Pressure Monitoring

Each TPMP also contains a pressure monitoring point used to verify sub-slab pressure and pneumatic control. It is a simple ¼" stainless-steel tube inserted through the vapor cap to a depth of less than one meter, fitted with a quarter-turn ball valve. Onsite technicians will periodically connect a Magnehelic (pressure/vacuum measurement device) to this tube fitting in order to assess, measure and document subsurface [negative] pressures. Pressures during remediation should be slightly negative ensuring that vapors are collected by the vapor extraction system rather than being pushed beyond the vapor cap. Slight minimum pressures also indicate that the vapor cap is minimizing entrained atmospheric gases and verifying pneumatic control.

4.1.2.3 Remote System Operation

In addition to local automatic control (e.g. heaters, vapor treatment unit, levels in the recovery tanks), an onsite computer will be available 24/7 for the recording of temperatures, performance indicia, and allow for remote monitoring of the treatment system. GEO will provide a daily monitoring of this data (see Appendix 1 Daily Field Report) to ensure proper system operation.

4.1.2.4 Well Field Operation – Daily System Checks

Field operators are required to record daily data using the field log and daily field report (see attached Daily Field Report). During each site visit, there is a procedure for the verification of the proper functioning of the well field system:

- Verify that all TCUs are on (check well temperature)
- Check the pressure gauge on the main line (must be 5psi or lower).
- Check that the TCU supports (if any) are correctly positioned (if not, reposition them correctly).
- Check the sub-slab pressure using a Magnahelic or equivalent,
- Vacuum will be monitored at the Pressure monitoring and SVE locations and recorded in the field log using inches of Water or inches of Hg.
- Vacuum and pressure measurements will be recorded using gauges installed on the SVE and MPE systems to monitor any pressure changes across the vapor extraction systems.
- Check the fuel lines for apparent leaks (hissing sound or natural gas smell).
- Check the combustion gas circuits (no broken or disconnected duct work).
- Listen for suspicious or new noises at the combustion fans.
- Be aware of suspicious smells.

4.2 Vapor Extraction Systems

The vapor extraction system is complex with multiple sub-systems. Figure 2 presents the entire process flow at DIAZ. Both SVE and MPE vapor extraction systems are used. The SVE system provides vacuum extraction at the uppermost portions of the TTZ or the vadose zone. This area is above the water table where the soil is typically dry. The purpose of the SVE system is to capture volatilized vapors that may accumulate beneath the concrete vapor cap or were originally present in the vadose zone. The MPE is very similar to the SVE system but its vapor wells extend much deeper into the soil within the groundwater or within the saturated zone. The MPE process flow has notable differences from the SVE, with the main being a larger blower. The MPE system is used initially to lower the water table within the TTZ so that volatilized vapors can be removed from the saturated zone. During this initial period of operation groundwater is the principal product from the MPE system. Once the water level within the TTZ is lowered significantly, the saturated soils can be heated and the MPE system's primary function is to remove VOCs from the saturated zone. Both the SVE and MPE systems produce vapor and liquid (groundwater and condensate). The separation occurs at the various knockout tanks with the vapor actively cooled with various heat exchangers prior to reporting to the C3 system. The liquid is pumped from the knockout tanks reporting to the liquid holding tank, the first component of the liquid treatment system.

4.3 C3 System and Compressor

The C3 systems and compressors are discussed together because both are needed to re-condense vapors and neither can run (for long periods) without the other. The compressor controls are tied to the C3 controls. The compressor takes in the VOC-laden vapor from the vapor extraction systems and feeds the compressed vapor stream to the C3 systems. The C3 system operates at very low temperatures removing condensable vapors (including H2O and the COCs) from the gaseous stream by forming solids and the cleansed air stream exits the process through the vGAC system that traps any residual VOCs. The captured condensates exit the C3 system via the drain cans which are periodically discharged to the product storage tank. Figure 5 is the process flow diagram (PFD) for the C3 system. At DIAZ there are three C3 systems, one tied to the SVE system and the other two tied to the MPE system.

4.4 vGAC Systems

The vGAC or granulated activated carbon system designed for vapor recovery consists of a dual vessel lead/lag system whereby cooled, conditioned vapor containing detectable concentrations of COCs is processed through a lead vessel and then through a lag vessel of vGAC in series. The lead vessel removes any residual VOCs and the lag vessel acts as a backup to capture COCs once the lead vessel has reached saturation. Figure 2 shows the vGAC systems are present in the Process Flow Diagram (PDF) of the combined C3 system output.

A separate backup set of two (2) VGAC vessels will be plumbed into the vapor treatment system and valved-off [isolated] until the first [primary] pair of VGAC vessels are saturated, at which point the backup set will be put on-line while the former vessels have their spent media removed and replaced; where after they will be re-sequenced as the backup pair of vessels.   The allows for the continuous operation of all critical vapor treatment systems at the desired flow/vacuum rate.

Unless otherwise noted by a formalized change in project SOPs, the procedure for the vGAC change-over and subsequent change-out (replacement) is as follows:

- Sampling and/or analytical data from VGAC media will be reviewed by the Project Technical Team, and if loading efficiency has decreased to a point indicating the need for a change-over of new VGAC media, the correct operational field personnel will be notified.
- The VGAC vendor will be scheduled for delivery of replacement VGAC media for the two in-series vessels requiring replacement.
- Prior to entering the wellfield, proper lock-out-tag-out (LOTO) procedures will be followed, if necessary, and any project specific PPE will be utilized at all times during this procedure as dictated by the O&M and related project documentation.

- Once entering the field, select personnel will manually close the butterfly valve on the influent side of the VGAC vessels, prior to the split in conveyance dividing the two sets of parallel vessels.
- Once the butterfly valve has been closed, and influent wellfield vapors have been redirected to the unused parallel set of in series VGAC vessels.
- The spent VGAC vessels will be replaced and all conveyance connections will be checked to ensure proper connection and replacement has been completed.
- These procedures will be repeated as necessary for the opposite set of in series VGAC vessels when indicated by influent and midpoint sampling data, such that there will be a continuous set of in-series VGAC vessels for vapor abatement at all times throughout the project duration.

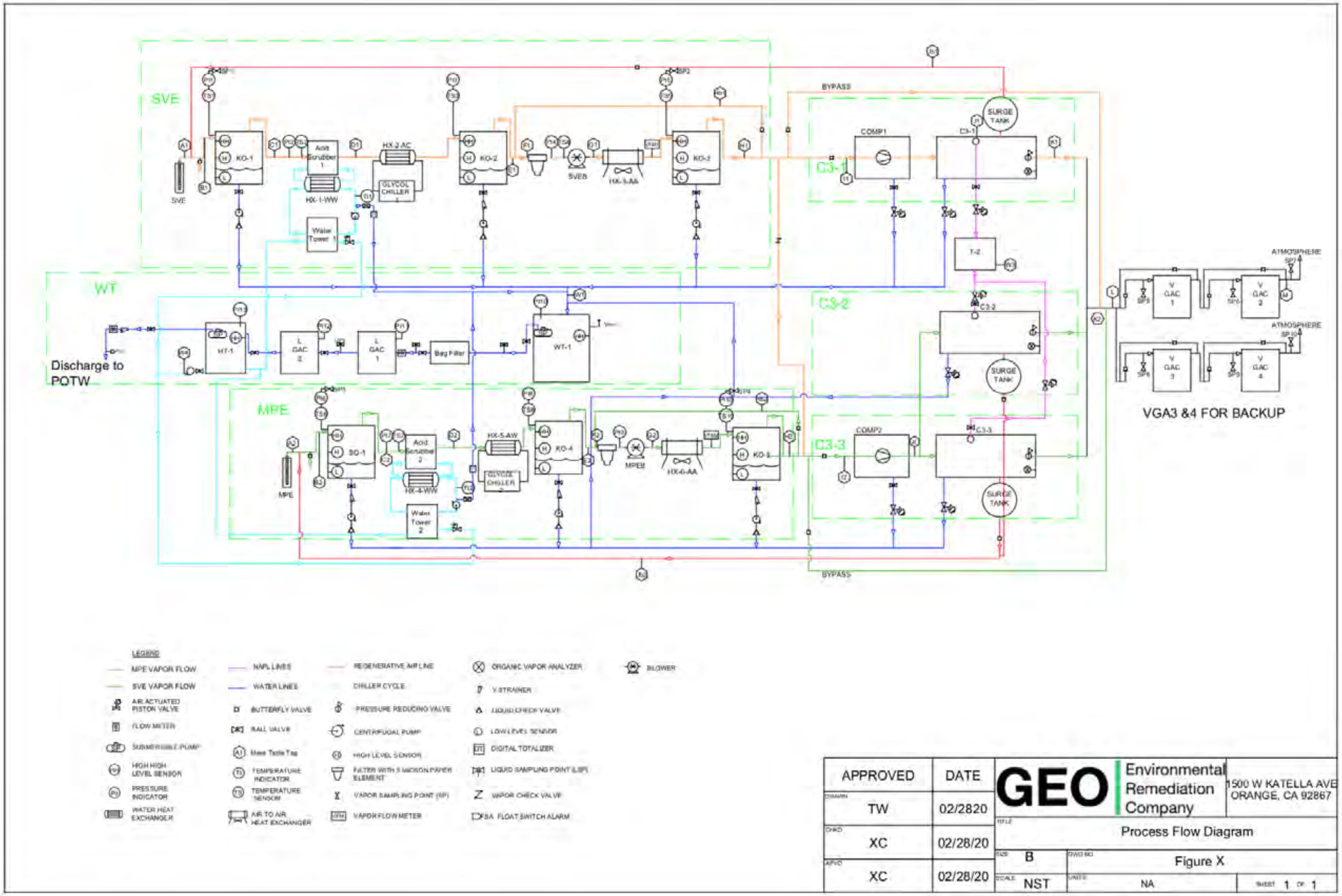


Figure 2: Overall Process Flow Diagram for the vapor extraction system.

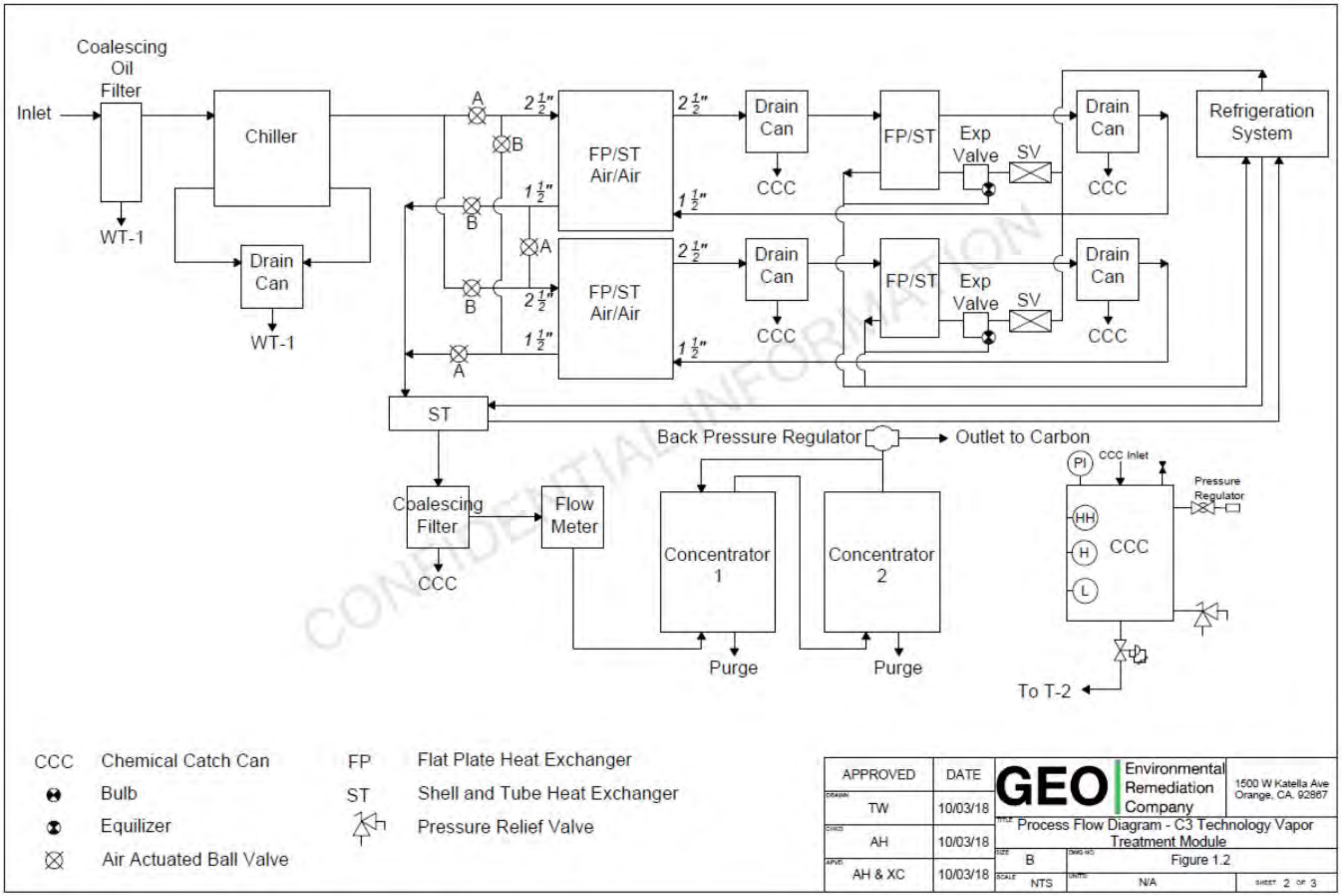


Figure 3: Process Flow Diagram for the C3 System.

4.5 LGAC System

Groundwater and condensate generated in the vapor extraction system is first pumped into a three compartment 10,000 gallon weir tank where any oil or grease and solids are separated from the water stream in the first two compartments. Water from the third compartment is pumped to the LGAC system.

The LGAC system is designed to remove minor amounts of VOC from the liquid phase (VOCs are almost insoluble in water). Figure 7 presents the Process Flow Diagram (PDF) for the lGAC system. The system typically consists of a bag filter to capture silt and minor amounts of sand that fine their way into the liquid system. The liquid stream then flows through a cartridge filter to trap clays and other exceedingly fine solids. The liquid fraction reporting to the first of two lGAC vessels which like the vGAC operate in a lead/lag manner to capture minor amounts VOC. The cleansed water reports to the clean water holding tank which feeds the cooling towers. The water in the clean water holding tank is analyzed weekly to verify that it is clean enough to be used as cooling tower make-up water or for POTW discharge. The cooling towers provide cooling for the entire vapor extraction system and much of the make-up water eventually evaporates. If excess clean water is produced, it will be released to the local POTW under permit through a flow metered discharge line.

4.6 Vapor Extraction Field Operations – Daily System Checks

Field operators are required to record daily data using the field log and daily data report (see attached Daily Field Report). During each site visit, there is a procedure for the verification of the proper functioning of the individual vapor extraction sub-systems.

4.6.1 SVE & MPE Systems

On a daily basis;

- Check that all SVE and MPE Wells are free of vacuum leaks,
- Check for signs of corrosion,
- Check the fluid levels in the knockout tanks,
- Check the temperature of the vapor stream at various identified points, and
- Check the blower and blower motors for usual vibration and noise.

On a weekly basis;

- Check the blower’s oil for color and top-off levels as necessary,
- Grease the blower motor as needed,
- Clean-out the y-strainers at each knockout, and
- Replace malfunctioning thermocouples as needed.

4.6.2 C3 System

On a daily basis;

- Verify vapor flow and temperature and pressures,
- Verify the DH vessels are cycling properly,
- Verify refrigeration function,
- Verify that the various catch-cans are functioning properly,
- Check and record the compressor's temperature and pressure,
- Verify the compressor is loading and unloading properly.

On a weekly basis;

- Verify that the coalescing filters have low back pressure,
- Exercise the back-pressure regulators to avoid freeze-up,
- Verify smooth motion of pneumatically operated system valves to avoid failure,
- Verify the oil level in the compressor, and
- Verify "Freon" levels.

4.6.3 Vapor GAC System

The vGAC system requires daily sampling and PID analysis. Four sample locations (SP5 through SP7) are specified at each vGAC system for a total of eight, including; the SVE and MPE system discharges, the C3-1, C3-2 and C3-3 system discharges, each vGAC influent, each mid-fluent, and each effluent. These values will be used to determine system performance and will be used collectively to determine mass removal of VOC. The mid-fluent and effluent valves will be used to determine whether the lead GAC vessel has reached saturation and requires change-out. Additionally, the influent temperature to each vGAC system should be recorded daily and the PE should be informed if this temperature exceeds 30C.

4.6.4 Liquid GAC System

The lGAC system should be checked weekly for back-pressure which indicates that the bag filter and cartridge filters need changing. If VOCs are detected in the weekly sampling of the clean water holding tank, the GAC should be changed-out.

4.6.5 Cooling Towers

Proper operation of the cooling towers requires frequent water level verification, proper float valve operation, proper fan operation and proper water flow throughout the towers. On a daily basis, verify that there are no leaks in the recirculating water flow and that debris is not clogging pump inlet screens

5. Preventative Maintenance

5.1 Heat Exchangers/Cooling Towers

Heat exchange units must be visually inspected daily. All connections going to and leaving the unit must be monitored and maintained for leaks and unusual temperatures. Verify the fan is operating as designed and no strange sounds are originating at the fan motor. Check the cooling tower ensuring there are no leaks, that the float valve is functioning properly and that the bleed line is operational. (Clogged or poorly flowing bleed valves will lead to scaling and/or unhealthful situations that require, serious attention.) Verify that monthly sampling and water treatment schemes are maintained.

5.2 Water Knockouts

Knockout units must be visually inspected daily. All connections to and from the knockouts should be visually inspected for leaks and Y-strainers should be cleaned once a week. Discharge water pump operation should be verified by witnessing periodic operation and water levels in the sight-glass. If sight-glass is cloudy of hard to read, replace.

5.3 Blowers

Grease blower and electric motor at manufacturer provided locations per maintenance schedule. Visually inspect the belts on the blower weekly and make sure there are no cracks or damage. Verify all safety equipment is returned to operating condition after unit is shut-down for maintenance and re-started.

5.4 Filters

Filters will be monitored weekly for differential pressure. Any pressure exceeding 15” of water column measured using a Magnehelic gauge will result in changing of the filter element. The filter housing is to be inspected whenever the system is shutdown or when the element is being changed.

6. Replacement Parts

6.1 List of On-Site Replacement Parts

- Plumbing: Spare valves and connections (Tees, 90's and unions, pieces of straight pipe, etc.) will be kept on site at all used diameters and all materials used for any repairs that may be necessary.

- Filters: Solberg 5 micron canister filter 500cfm

  - Gas Hoses- Spare gas lines will be kept on site for repairs.

  - TCU Units- Spare TCU units will be on site for any complete change outs that may be necessary.

  - 100 Micron filter bags for water treatment system

Table 4 Summary of O&M Monitoring during Operations.

Task	DQO or Purpose	Detail	Sampling Location[a]	Frequency of Measurements[b]
Vapor extraction flow rates from field	Track the rate of vapor extraction to calculate treated vapor volume	Vapor flow rate at the influent of the ISTR treatment system using an anemometer	VFM1 VFM-2	Daily when operator is on site
Vapor flow rates in C3	Track the rate of vapor treated volume through C3 system	Vapor flow rate at the influent of the C3 treatment system using an anemometer	VFM 3,4,5	Automatic data log in C3 system
Water accumulated production	Track the accumulated water production rate of water from the field	Liquid production rate of the whole system (flow meter)	WFM-1	Daily when operator is on site
Water discharge volume	Track the accumulated water discharge rate	Liquid flow rate to the trade waste / sewer (flow meter)	WFM-2	Daily when operator is on site
Condensate Liquid production rates from C3	Track the rate of liquid production to evaluate contaminant mass removal from C3 system	Volumes stored in tanks of the treatment system; Log running total of volumes and mass of extracted NAPL captured from C3 system	T-2	Weekly
Temperature monitoring	Continuous measurement of temperatures to evaluate heating rates and verify treatment temperatures within the ISTR treatment zone	PLCs monitor thermocouple temperatures continuously	Thermo-couples at TPMPs in Well Field	Every 15 minutes with near real-time upload to the project website
Subsurface Pressure Monitoring at TPMPs	Measure, record & track subsurface pressures throughout well field	Pressure indicator gauge	Pressures in Subsurface of TTZ, measured at TPMPs in Well Field	Weekly
Temperature at vapor treatment system	Track the temperature at different points of treatment system to evaluate the vapor extraction and cooling efficiency	PLCs monitor thermocouple temperatures continuously	SVE/MPE system	Every 1 minute; automatic; recorded in control box PLCs
Pressure/ Vacuum at vapor treatment system	Monitor the vacuum through different points of treatment system to evaluate pressure loss	Vacuum/Pressure Gauge	PI1, PI2, PI3, PI4, PI5, PI6, PI7, PI8, PI9, PI10	Daily when operator is on site
VOCs in Vapor Stream	VGAC/C3 Influent and Effluent	10.6eV PID reading	SP 5, 6,7	Daily when operator on site

	Evaluate influent and effluent concentrations to evaluate the VGAC treatment system and to ensure compliance with permit.	Collect bag samples of vapor influent before, mid, and after vGAC treatment system, and analyze with a PID.	SP 5, 6, 7	Biweekly
	Evaluate influent of VOCs and the effects of cooling system	Collect bag samples for PID analysis	SP 1, 2, 3, 4	As needed
VOCs in Liquid Stream	Evaluate chemical concentrations for calculating contaminant mass removal	Collect samples of extracted liquids from WT1 for offsite analysis	LSP1 at Weir Tank	Monthly
Liquid GAC	LGAC Effluent for POTW Discharge	Collect samples for offsite analysis	LSP5	Frequency dictated by UFP QAPP
Fuel Gas Supply	Track Fuel Usage	Meter Reading	Gas Meter	Weekly
Electricity Supply	Track Power Usage	Meter Reading	Electricity Meter	Daily when operator on site
Downgradient Ground Water Level	Hydraulic control	Measure depth to Groundwater and Groundwater Temperature	Downgradient monitoring wells	Weekly

[a] for numbers, please refer to the Process & Instrumentation Diagram.
[b] Frequency of sampling may change based on results of previous sampling.
[C] only when the VOCs concentration is high and more data is required.

7. Extraction P&ID Tags and Interlocks

The table below lists the P & ID tags and Interlocks for the ISTR treatment system.

Extraction P&ID Tags and Interlocks

GROUP	ID	NAME	DESCRIPTION	LOCATION	PLC PARENT	FUNCTION	SET POINT or Norm	RANGE or State	CONTROL NOTES AND INTERLOCKS	FAIL MODE ANALYSIS
						SENSORS & SWITCHES 01				
	0001		THERMAL LEVEL SENSOR	MPE	MPE	Low Level cut out for SOP-1	fixed	binary-NO	Stops SO-1	SOP-1 would run dry; burn seals
	0002		THERMAL LEVEL SENSOR	MPE	MPE	High Level cut out for SOP-1	fixed	binary-NC	Starts SOP-1, Off Delay Timer	SOP-1 would not start
	0003		THERMAL LEVEL SENSOR	MPE	MPE	High High Level cut out for SOP-1	fixed	binary-NC	High Level ALARM SO-1, WARNING	KnockOut Tank SO- 1 would flood
	0004		KO-4 LOW LEVELSWITCH	MPE	MPE	Low Level cut out for KOP-4	fixed	binary-NO	Stops KOP-4	KOP-4 would run dry ; burn seals
	0005		KO-4 HIGH LEVELSWITCH	MPE	MPE	High Level cut out for KOP-4	fixed	binary-NC	Starts KOP-4	KOP-4 would not start
	0006		KO-4 HIGH HIGH LEVELSWITCH	MPE	MPE	High High Level cut out for KOP-4	fixed	binary-NC	High Level ALARM KO-4, WARNING	KOP-4 would not start; KnockOut Tank 1 would flood
	0007		KO-5 LOW LEVELSWITCH	MPE	MPE	Low Level cut out for KOP-5	fixed	binary-NC	Stops KOP-5	KOP-5would run dry; burn seals
	0008		KO-5 HIGH LEVELSWITCH	MPE	MPE	High Level cut out for KOP-5	fixed	binary-NC	Starts KOP-5	KOP-5would not start
	0009		KO-5 HIGH HIGH LEVELSWITCH	MPE	MPE	High High Level cut out for KOP-5	fixed	binary-NC	High Level ALARM KO-5, STOPS COMPRESSOR	KOP-5 would not start; KnockOut Tank 3 would flood; water to compressor
	0010									
	0011		KO-1 LOW LEVELSWITCH	SVE	SVE	Low Level cut out for KOP-1	fixed	binary-NO	Stops KOP-1	KOP-1 would run dry ; burn seals
	0012		KO-1 HIGH LEVELSWITCH	SVE	SVE	High Level cut out for KOP-1	fixed	binary-NC	Starts KOP-1	KOP-1 would not start
	0013		KO-1 HIGH HIGH LEVELSWITCH	SVE	SVE	High High Level cut out for KOP-1	fixed	binary-NC	High Level ALARM KO-1, WARNING	KOP-1would not start; KnockOut Tank 4 would flood
	0014		KO-2 LOW LEVELSWITCH	SVE	SVE	Low Level cut out for KOP-2	fixed	binary-NO	Stops KOP-2	KOP-2 would run dry; burn seals
	0015		KO-2 HIGH LEVELSWITCH	SVE	SVE	High Level cut out for KOP-2	fixed	binary-NC	Starts KOP-2	KOP-2 would not start
	0016		KO-2 HIGH HIGH LEVELSWITCH	SVE	SVE	High High Level cut out for KOP-2	fixed	binary-NC	High Level ALARM KO-2, STOPS SVEB	KOP-2 would not start; KnockOut Tank 5 would flood; water to blower
	0017		KO-3 LOW LEVELSWITCH	SVE	SVE	Low Level cut out for KOP-3	fixed	binary-NO	Stops KOP-3	KOP-3would run dry; burn seals
	0018		KO-3 HIGH LEVELSWITCH	SVE	SVE	High Level cut out for KOP-3	fixed	binary-NC	Starts KOP-3	KOP-3would not start
01	0019		KO-3 HIGH HIGH LEVELSWITCH	SVE	SVE	High High Level cut out for KOP-3	fixed	binary-NC	High Level ALARM KO-3, STOPS COMPRESSOR	KOP-3 would not start; KnockOut Tank 6 would flood; water to compressor
	0020									
	0021		WT-1 High High Level Switch	WT	MASTER	High Level cut out for system	fixed	binary-NC	High Level ALARM WEIR TANK, WARNING	Haz Spill
	0022		HT-1 High High Level Switch	WT	MASTER	High Level cut out for system	fixed	binary-NC	High Level ALARM Holding Tank, WARNING	Spill
	0023		TT-1 High High Level Switch	WT	MASTER	High Level cut out for system	fixed	binary-NC	High Level ALARM Transfer Tank, WARNING	Spill
	0024									
	0025		CCC1 LOW LEVELSWITCH	C31	C31	Low Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NO	Closes DC-3	CCC1 would run dry; burn seals
	0026		CCC1 HIGH LEVELSWITCH	C31	C31	High Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NC	Opens DC-3	Liquid would not flow to T-2
	0027		CCC1 HIGH HIGH LEVELSWITCH	C31	C31	High High Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NC	High Level ALARM CCC1, STOPS C3-1	Haz Spill
	0028		T2 High High Level Switch	C31	C31	High Level system cutout on chemical storage tank	fixed	binary-NC	High Level ALARM Chemical Tank, STOPS C3-1 & C3-2	Haz Spill
	0029		CCC2 LOW LEVELSWITCH	C32	C32	Low Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NO	Closes DC-6	CCC2 would run dry; burn seals
	0030		CCC2 HIGH LEVELSWITCH	C32	C32	High Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NC	Opens DC-6	Liquid would not flow to T-2
	0031		CCC2 HIGH HIGH LEVELSWITCH	C32	C32	High High Level cut out for CONTAMINATE CATCH CAN 1	fixed	binary-NC	High Level ALARM CCC2, STOPS C3-2	Haz Spill
	0032		CCC3 LOW LEVELSWITCH	C32	C32	Low Level cut out for CONTAMINATE CATCH CAN 2	fixed	binary-NO	Closes DC-9	CCC2 would run dry; burn seals
	0033		CCC3 HIGH LEVELSWITCH	C32	C32	High Level cut out for CONTAMINATE CATCH CAN 2	fixed	binary-NC	Opens DC-9	Liquid would not flow to T-3
	0034		CCC3 HIGH HIGH LEVELSWITCH	C33	C33	High High Level cut out for CONTAMINATE CATCH CAN 3	fixed	binary-NC	High Level ALARM CCC2, STOPS C3-3	Haz Spill
	0032		VACUUM SENSOR	C31	C31	For Blower Control				
	0033		VACUUM SENSOR	C32	C32	For Blower Control				
	0034		VACUUM SENSOR	C33	C33	For Blower Control				
						GAUGES, THERMOMETERS, THERMOCOUPLES 02				
	0001	PI1	PRESSURE INDICATOR	SVE		Monitor Pressure @ KO-1		-1 to 0 Bar		
	0002	TS1	THERMOCOUPLE	SVE	SVE	Remote Monitor Temp @ KO-1		neg50C to 600C		
		PI2	PRESSURE INDICATOR	SVE		Monitor Pressure @ Acid Scrubber 1		-1 to 0 Bar		
		TS2	THERMOCOUPLE	SVE	SVE	Remote Monitor Temp @ Acid Scrubber 1		neg50C to 600C		
	0003	PI3	PRESSURE INDICATOR	SVE		Monitor Pressure @ KO-2		-1 to 0 Bar		
	0004	TS3	THERMOCOUPLE	SVE	SVE	Remote Monitor Temp @ KO-2	65C	neg50C to 600C		
	0005	PI4	PRESSURE INDICATOR	SVE		Monitor Pressure @ SVEB		-1 to 0 Bar		
	0006	TS4	THERMOCOUPLE	SVE	SVE	Remote Monitor Temp @ SVEB	65C	neg50C to 600C	STOP BLOWER SVEB	Blower SVEB overheat
	0007	PI5	PRESSURE INDICATOR	SVE		Monitor Pressure @ KO-3		-1 to 0 Bar		
	0008	TS5	THERMOCOUPLE	SVE	SVE	Remote Monitor Temp @ KO-3		neg50C to 600C		
	0009	PI6	PRESSURE INDICATOR	MPE		Monitor Pressure @ SO-1		-1 to 1 Bar		
	0010	TS6	THERMOCOUPLE	MPE	MPE	Remote Monitor Temp @ SO-1	65C	neg50C to 600C		
	0011	PI7	PRESSURE INDICATOR	MPE		Monitor Pressure @ Acid Scrubber 2		-1 to 1 Bar		
	0012	TS7	THERMOCOUPLE	MPE	MPE	Remote Monitor Temp @ Acid Scrubber 2	65C	neg50C to 600C		
	0013	PI8	PRESSURE INDICATOR	MPE		Monitor Pressure @ KO-4		-1 to 0 Bar		
	0014	TS8	THERMOCOUPLE	MPE	MPE	Remote Monitor Temp @ KO-4		neg50C to 600C		
	0015	PI9	PRESSURE INDICATOR	MPE		Monitor Pressure at MPEB		-1 to 0 Bar		
	0016	TS9	THERMOMETER	MPE	MPE	Remote Monitor Temp at MPEB	65C	neg50C to 600C	STOP BLOWER SVEB1	Blower SVEB1 overheat
	0017	PI10	PRESSURE INDICATOR	MPE		Monitor Pressure @ KO-5		-1 to 1 Bar		
02	0018	TS10	THERMOCOUPLE	SVE	SVE	Monitor Temp @ KO-5	65C	neg50C to 600C		
	0019	PI10	PRESSURE INDICATOR	WT-1		Monitor Pressure @ WT-1		0 Bar to 7 Bar		
	0020	PI11	PRESSURE INDICATOR	LGAC-1		Monitor Pressure @ LGAC-1		0 Bar to 7 Bar		
	0021	PI12	PRESSURE INDICATOR	LGAC-2		Monitor Pressure @ LGAC-2		0 Bar to 7 Bar		
	0022	PI13	PRESSURE INDICATOR	HT-1		Monitor Pressure @ HT-1		0 Bar to 7 Bar		
	0024	PI14	PRESSURE INDICATOR	C31		Monitor Pressure at C3 Outlet	8.3 Bar	0-20 Bar		
	0025	TS11	THERMOCOUPLE	C31	C31	Remote Monitor Temp @ C3 Outlet	25C	0-300C	High Temp cut off if exceeds 25C, STOPS C3-1	
	0026	PI15	PRESSURE INDICATOR	C32		Monitor Pressure at C3 Outlet	8.3 Bar	0-20 Bar		
	0027	TS12	THERMOCOUPLE	C32	C32	Remote Monitor Temp @ C3 Outlet	25C	0-300C	High Temp cut off if exceeds 25C, STOPS C3-2	
	0028	PI16	PRESSURE INDICATOR	C33		Monitor Pressure at C3 Outlet	8.3 Bar	0-20 Bar		
	0029	TS13	THERMOCOUPLE	C33	C33	Remote Monitor Temp @ C3 Outlet	25C	0-300C	High Temp cut off if exceeds 25C, STOPS C3-3	
	0028	TI1	TEMPERATURE GAUGE	SVE		Monitor Temp of Cooling Water to HX-1-WW				
	0029	TI2	TEMPERATURE GAUGE	MPE		Monitor Temp of Cooling Water from HX-4-WW				
	0032	TG5	TEMPERATURE GAUGE	SVE		Monitor Temp of Cooling Water to HX-3-W				
	0033	TG6	TEMPERATURE GAUGE	SVE		Monitor Temp of Cooling Water from HX-3-W				

					VESSELS 03					
03	0001	SO-1	SILT OUT TANK	MPE		Remove silt & water from stream		1.1 m3 capacity		
	0002	KO-4	KNOCK OUT TANK	MPE		Remove water from stream		2.2 m3 capacity		
	0003	KO-5	KNOCK OUT TANK	MPE		Remove water from stream		2.2 m3 capacity		
	0005	KO-1	KNOCK OUT TANK	SVE		Remove water from stream		2.2 m3 capacity		
	0006	KO-2	KNOCK OUT TANK	SVE		Remove water from stream		2.2 m3 capacity		
	0007	KO-3	KNOCK OUT TANK	SVE		Remove water from stream		2.2 m3capacity		
	0008	WT-1	Weir tank	WT		Collect contaminated liquids from extraction system/ settle out silt		10,000 g		
	0009	BAG FILTER	BAG FILTER	WT		Remove particles > 50um in size				
	0010	LGAC1	Liquid Granulated Carbon Tank	WT		Polish liquid discharge		500 lb		
	0011	LGAC2	Liquid Granulated Carbon Tank	WT		Polish liquid discharge		500 lb		
	0012	HT-1	Holding Tank	WT		Store processed water		20,000 g		
	0015	ST1	SURGE TANK 1	C31		Absorb regenrative surge		750Lcapacity		
	0016	VGAC1	Vapor Granulated Carbon Tank	C31		Polish air outstream		2000 lb		
	0017	VGAC2	Vapor Granulated Carbon Tank	C31		Polish air outstream		2000 lb		
	0020	T-2	Contaminate Discharge Tank	C31		Store recovered chemicals		2000-4000L capacity		
	0021	ST2	SURGE TANK 2	C32		Absorb regenrative surge		750Lcapacity		
	0022	VGAC3	Vapor Granulated Carbon Tank	C31 &C32		Polish vent air outstream from T-2				
					PUMPS 04					
04	0001	SOP1	CENTRIFUGAL PUMP	MPE		Remove silt & water from Silt Tank		379lpm capacity, 5kW	High Level ALARM SO-1, WARNING	failure means silt not removed from stream prior to Heat exchangers, SOP-1 would not start; KnockOut Tank 1 would flood
	0002	CP1	CENTRIFUGAL PUMP	MPE		Circulate cooling water from water tower 1 to HX-1-W		Included in Water Tower 1		failure means HX-1-W can not be cooled down, overtemp
	0004	KOP-4	CENTRIFICAL PUMP, 3/4 HP	MPE		Remove water from Knock Out	9.5 lpm	0.75kW	High Level ALARM KO-4, WARNING	KOP-4 would not start; KnockOut Tank 1 would flood
	0005	KOP-5	CENTRIFICAL PUMP, 3/4 HP	MPE		Remove water from Knock Out	9.5 lpm	0.75kW	High Level ALARM KO-5, WARNING	KOP-5 would not start; KnockOut Tank 2 would flood, water to blower
	0006	MPEB1	ROOTS BLOWER URA1-711	MPE		pull vacuum on system	14sm^3/m@1 Bar	URAI-711; 50kW @ 1830 rpm	MPEB, WARNING	MPE system failure
	0008	KOP-1	CENTRIFUGAL PUMP, 3/4 HP	SVE		Remove water from Knock Out	9.5 lpm	0.75kW	High Level ALARM KO-1, WARNING	KOP-1 would not start; KnockOut Tank 4 would flood
	0003	CP2	CENTRIFICAL PUMP	SVE		Circulate cooling water from water tower 1 to HX-2-W		Included in Water Tower 2		failure means HX-4-WW cannot be cooled down
	0010	KOP-2	CENTRIFICAL PUMP, 3/4 HP	SVE		Remove water from Knock Out	9.5 lpm	0.75kW	High Level ALARM KO-2, WARNING	KOP-5 would not start; KnockOut Tank 5 would flood, water to blower
	0011	KOP-3	CENTRIFICAL PUMP, 3/4 HP	SVE		Remove water from Knock Out	9.5 lpm	0.75kW	High Level ALARM KO-3, WARNING	KOP-6 would not start; KnockOut Tank 6 would flood, water to compressor
	0010	SVEB1	ROOTS BLOWER URA1-711	SVE		Remove water from Knock Out	14sm^3/m@1 Bar	URAI-711; 20kW @ 1830 rpm	SVEB1, WARNING	SVEB system failure
	0011	SUB1	SUBMERSIBLE PUMP	WT-1		Discharge processed liquids		1kW		can't transfer liquids out of WT-1
	0012	SUB2	SUBMERSIBLE PUMP	HT-1		Discharge processed liquids		1kW		can't transfer liquids out of HT-1
	0013	RP-1	TRANSFER PUMP	HT-1		Pump water to Water Tower 1 & 2 from HT-1		1kW		can't pump water to water tower
					COMPRESSORS 05					
05	0001	COMP 1	SCREW COMPRESSOR UNIT	C31		COMPRESS VAPOR STREAM		17 m^3/m @ 11 Bar, 125kW	OEM Package controls-contaminated enviro version	C31 system failure
	0002	COMP 2	SCREW COMPRESSOR UNIT	C32		COMPRESS VAPOR STREAM		17 m^3/m @ 11 Bar, 75kW	OEM Package controls-contaminated enviro version	C32 system failure
	0003	COMP 3	SCREW COMPRESSOR UNIT	C33		COMPRESS VAPOR STREAM		17 m^3/m @ 11 Bar, 75kW	OEM Package controls-contaminated enviro version	C33 system failure
					HEAT EXCHANGERS 06					
06	0001	HX-1-WW	Heat Exchanger	MPE	MPE	Cool and condense stream		14m2,		Temperature Overheat
	0002	HX-2-AC	Heat Exchanger	MPE	MPE	Cool and condense stream		14m2		Temperature Overheat
	0003	HX-6-AA	Air Heat Exchanger	MPE	MPE	Cool stream		850m3/hr, 1kW	standard OEM package controls	Temperature Overheat
	0004	HX-1-WW	Heat Exchanger	SVE	SVE	Cool and condense stream		14m2		Temperature Overheat
	0005	HX-5-AW	Heat Exchanger	SVE	SVE	Cool and condense stream		14m2,		Temperature Overheat
	0003	HX-3-AA	Air Heat Exchanger	SVE	SVE	Cool stream		850m3/hr, 1kW	standard OEM package controls	Temperature Overheat
					CONDESNORS, COOLING UNITS 07					
07	0001	WATER TOWER	Disapate heat from stream	MPE		disapate heat from stream		100 ton; 3 Fan Motor, 12kW	standard OEM package controls	Temperature Overheat
	0002	WATER TOWER	Disapate heat from stream	SVE		disapate heat from stream		60 ton; 3 Fan Motor, 9 kW	standard OEM package controls	Temperature Overheat
	0003	C1	AIR STREAM CHILLER	C31		disapate heat from stream, POST COMPRESSOR			standard OEM package controls	Temperature Overheat
	0004	C2	AIR STREAM CHILLER	C32		disapate heat from stream, POST COMPRESSOR			standard OEM package controls	Temperature Overheat
	0005	C3	AIR STREAM CHILLER	C33		disapate heat from stream, POST COMPRESSOR			standard OEM package controls	Temperature Overheat
	0005	GLYCOL CHILLER 1	GLYCOL CHILLER	MPE		disapate heat from stream		15 ton	standard OEM package controls	Temperature Overheat
	0006	GLYCOL CHILLER 2	GLYCOL CHILLER	SVE		disapate heat from stream		15 ton	standard OEM package controls	Temperature Overheat
					VALVES 08					
08	0001	BFV3	BUTTERFLY VALVE	MPE		admit dilution air to stream			Opened during startup to reduce load, Normally Closed during Operation	
	0002	BV4	BALL VALVE	MPE		control outlet of SO-1			manual	
	0003	BV5	BALL VALVE	MPE		control outlet of KO-4			manual	
	0005	BV6	BALL VALVE	MPE		control outlet of KO-5			manual	
	0006	BFV4	BLOWER RECIRC VALVE, Butterfly V	MPE		modulate blower thruput			Adjust during Ops to achieve proper vacuum and blower discharge pressure	
	0007	BFV11	BUTTERFLY VALVE	MPE		isolate C3 Regen from MPE			manual	
	0008	BFV8	BUTTERFLY VALVE	MPE		isolate C3 system from stream			manual	
	0009	BFV7	BUTTERFLY VALVE	MPE		bypass C3 system			manual, used at end of project to bypass C3	
	0010	BFV11	BUTTERFLY VALVE	SVE		admit dilution air to stream			Opened during startup to reduce load, Normally Closed during Operation	
	0011	BV1	BALL VALVE	SVE		control outlet of KO-1			manual	
	0012	BV2	BALL VALVE	SVE		control outlet of KO-2			manual	
	0013	BV3	BALL VALVE	SVE		control outlet of KO-3			manual	
	0014	BFV2	BLOWER RECIRC VALVE, BUTTERFLY VALVE	SVE		modulate blower thruput			Adjust during Ops to achieve proper vacuum and blower discharge pressure	
	0015	BFV9	BUTTERFLY VALVE	SVE		isolate C3 Regen from SVE			manual	
	0016	BFV6	BUTTERFLY VALVE	SVE		isolate C3 system from stream			manual	
	0017	BFV5	BUTTERFLY VALVE	SVE		bypass C3 system			manual, used at end of project to bypass C3	
	0018	BV12	BALL VALVE	WT		control outlet of WT1			manual	
	0019	BV13	BALL VALVE	WT		control inlet of LGAC chamber 1			manual	
	0020	BV14	BALL VALVE	WT		control inlet of LGAC chamber 2			manual	
	0021	BV15	BALL VALVE	WT		control outlet LGAC chamber 2			manual	
	0023	BV16	BALL VALVE	WT		control outlet of HT-1			manual	
	0025	BV15	BALL VALVE	C31	C31				manual	
	0026	BV16	BALL VALVE	C31	C31				manual	
	0027	DC-1	AIR ACTUATED BALL VALVE	C31	C31	discharge drain from Comp 1	level regulated	binary-NC	controlled by Comp 1 onboard controls	
	0028	DC-2	AIR ACTUATED BALL VALVE	C31	C31	discharge drain from Chiller 1	level regulated	binary-NC		
	0029	DC-3	AIR ACTUATED BALL VALVE	C31	C31	chemical discharge from C31	level regulated	binary-NC	controlled by CCC1 level switches	
	0030	BV17	BALL VALVE	C32	C32				manual	
	0031	BV18	BALL VALVE	C32	C32				manual	
	0032	DC-4	AIR ACTUATED BALL VALVE	C32	C32	discharge drain from Comp 2	level regulated	binary-NC	controlled by Comp 2 onboard controls	
	0033	DC-5	AIR ACTUATED BALL VALVE	C32	C32	discharge drain from Chiller 2	level regulated	binary-NC		
	0034	DC-6	AIR ACTUATED BALL VALVE	C32	C32	chemical discharge from C32	level regulated	binary-NC	controlled by CCC2 level switches	
	0035	BV19	BALL VALVE	C33	C33				manual	
	0036	BV20	BALL VALVE	C33	C33				manual	
	0037	DC-7	AIR ACTUATED BALL VALVE	C33	C33	discharge drain from Comp 3	level regulated	binary-NC	controlled by Comp 2 onboard controls	
	0038	DC-8	AIR ACTUATED BALL VALVE	C33	C33	discharge drain from Chiller 3	level regulated	binary-NC		
	0039	DC-9	AIR ACTUATED BALL VALVE	C33	C33	chemical discharge from C33	level regulated	binary-NC	controlled by CCC2 level switches	
	0035	SP1	PETCOCK	SVE		sample point KO-1			sample port, manual	
	0036	SP2	PETCOCK	SVE		sample point KO-3			sample port, manual	
	0037	SP3	PETCOCK	MPE		sample point SO-1			sample port, manual	
	0038	SP4	PETCOCK	MPE		sample point KO-5			sample port, manual	
	0039	SP5	PETCOCK	VGAC1		sample point VGAC1 IN			sample port, manual	
	0040	SP6	PETCOCK	VGAC2		sample point VGAC2 IN			sample port, manual	
	0041	SP7	PETCOCK	VGAC2		sample point VGAC2 EXIT			sample port, manual	
	0045	LSP1	BALL VALVE	WT		Liquid sample point before Bag Filter			sample port, manual	
	0046	LSP5	BALL VALVE	WT		Liquid sample point before discharge			sample port, manual	
	0048	MU-1	FLOAT VALVE	SVE		Control make up water for Water Tower 1			mannual	
	0049	MU-2	FLOAT VALVE	MPE		Control make up water for Water Tower 2			mannual	

APPENDICES

GEO Environmental Remediation Company

Appendix 1: Daily Report Sheet

GEO Environmental Remediation Company

Project	Diaz Chemical, NY
Date & Time	
Weather	
Technician	

Pressure/Vacuum Record

ID	location	value	unit
PI1	from SVE (KO-1)		"H2OV
PI2	before AS-1		"H2OV
PI3	before KO-2		"HgV
PI4	before SVEB		"HgV
PI5	after HX-3-AA		"HgV/PSI
PI6	from MPE (SO-1)		"H2OV
PI7	before AS-2		"H2OV
PI8	before KO-4		"HgV
PI9	before MPEB		"HgV
PI10	after HX-6-AA		"HgV/PSI

Temperature Record

ID	location	value	unit
TI1	cooling water inlet @ HX-1-WW		°C
TI2	cooling water inlet @ HX-4-WW		°C

Power Usage

item	value	unit
electricity meter		KWh

Weekly Data

item	value	unit
gas meter		Mscfm
T-2 volume		Gallon

Monthly Water Sample Record

ID	location	Y/N
LSP1	before LGAC	
LSP5	before POWT	

PID Reading and Sampling Record

ID	location	PID	biweekly sample(Y/N)
SP1	before KO1		
SP2	before KO3		
SP3	before SO-1		
SP4	before KO-5		
SP5	before VGAC1		
SP6	after VGAC1		
SP7	after VGAC2		

Vapor and Water Flow Meter

ID	location	value	unit
VFM1	after HX-3-AA		CFM
VFM2	after HX-6-AA		CFM
WFM1	before LCAC		Gallon
WFM2	before POWT		Gallon

C3 System

Checked Item (Y/N)	C3-1	C3-2	C3-3
C3 system On?			
Correct Pressures?			
Temps Desired Levels?			
Oil in compressors?			
Compressors Serviced?			
Filters inspected?			
Check leaks in/outside & tanks			
Check system refrigeration			

Field Note:

Subsurface Pressures in/near Wellfield (measured at TPMPs, PMPs)								
ID	Location	Value	Unit	-	ID	Location	Value	Unit
TPMP-01			inch wc		PMP-01			inch wc
TPMP-02			inch wc		PMP-02			inch wc
TPMP-03			inch wc		PMP-03			inch wc
TPMP-04			inch wc		PMP-04			inch wc
TPMP-05			inch wc					

GEO | Environmental Remediation Company

Appendix 2: Daily Safety Meeting

GEO | Environmental Remediation Company

DAILY SAFETY MEETING

CLIENT: ______________________ LOCATION: ______________________
DATE: ______________________ TIME: ______________________

Personal Pertective Equipment (PPE) – *Check all that apply*			
EYES/FACE/HEAD	**HANDS**	**FEET**	**OTHER**
☐ Safety Glasses	☐ Cold Weather Gloves	☐ Steel Toe Boots	☐ Carbon Respirator
☐ Goggles	☐ Cotton or Leather	☐ Chemical Resistant	☐ Supplied Air
☐ Face Shield	☐ Chemical Resistant	☐ Cold Weather Boots	☐ Personal Fall Arrest
☐ Hearing Protection	☐ Dielectric Gloves	☐ Anti Static Footware	☐ Clean Air Respirator
☐ Hard Hat	☐ Heat Resistant	☐ Rubber Boots	☐ Coveralls

Enviromental Hazards – *Check all that apply*		
CLIMATE	**AREA**	**SPECIAL**
☐ Extreme Outside Temperatures	☐ Spill potential	☐ Snakes/Insects
☐ High Wind	☐ Sensitive area	☐ Trapped Pressure
☐ Lightning	☐ Close by population	☐ Ground Sensitive
☐ Snow/Ice or Heavy Rain	☐ Hazardous Waste	☐ Wildlife Sensitive (Sanctuary)

Potential Hazards – *Check all that apply*			
☐ Slips & Trips	☐ Flamables/Explosives	☐ High Pressure	☐ Communications Limited
☐ Pinch Points	☐ Falling From Heights	☐ Overhead Hazards/Power Lines	☐ Heavy Lifting
☐ Electrical Current	☐ Chemicals	☐ H2S Potential or Present	☐ Open Well
☐ Vehicle/Driving	☐ Rigging Concerns	☐ Visitors On Location	☐ Other ______

Emergency Preperation – *Check all that apply*			
☐ First Aid Kit	☐ Fire Extinguisher	☐ Means of Egress	☐ Emerg. Equipment
☐ Gas Monitor	☐ Muster Area Identified	☐ Wind Socks	☐ Communications
☐ Signage	☐ Medi Center Identified	☐ Support Vehicle	☐ Proof of Training Available

Other Areas Of Concern – *Please discribe*

NAME	COMPANY	SIGNATURE

Appendix 3: TCU Commissioning Checklist

GEO Environmental Remediation Company

TCU Commissioning Checklist

This form is to be completed at the start of the heating project before full time operation. Technician shall keep copies in the jobsite folder on site at all times.

SITE INFORMATION	
Site name:	
Address:	
Contact Name:	
Contact number:	
TCU INFORMATION	
TCU Model:	
Fuel Type: NG or LPG	
Orifice Size: mm	
Line Pressure:8"-11" w.c.	

	MAX. FIRING OPERATION CHECKLIST	NOTES/VALUES
☐	Safety Pressure Switch operating correctly	
☐	Gas firing Pressure set to 5" w.c.	
☐	O2 measured at exhaust 14% - 17%	
☐	CO measured at exhaust <50ppm	
☐	Temperature measured at exhaust 300 – 500 degC	

X______________________________ Date:__________________

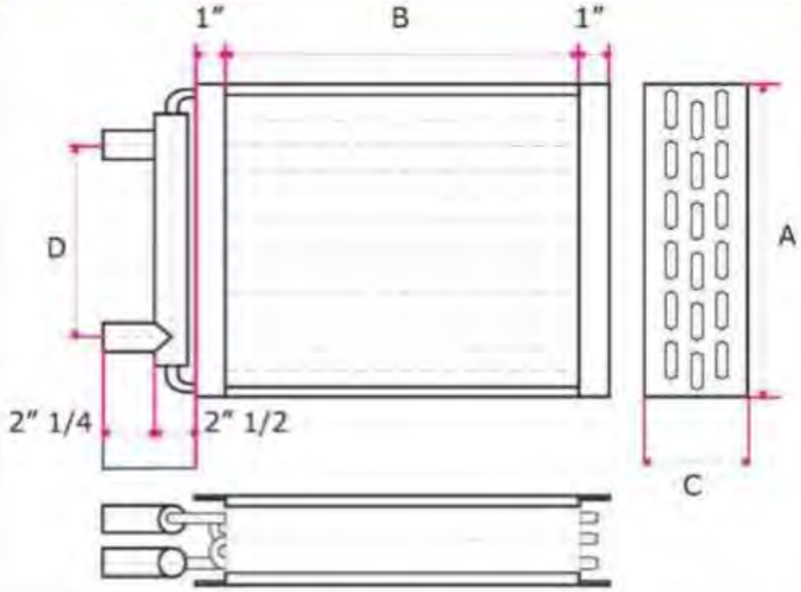
GEO Technician

Appendix 4. Water to Air Heat Exchanger

HX-5-AW HX-6-AW

Features of the Water to Air Heat Exchanger:

Materials	Tube Coil	36" Seamless Copper
-	Plate Fin	Aluminum
-	Core Housing	Galvanized Steel
-	Header	Copper
Rating:	Tubeside	175 psig/350F
Plate Fin Spacing	12/inch	-
All Connections	1" ID Solder	



													A	B	C	D
			CFM	800		1000		1200		1400			16	18	3.5	11 1/2
HTL			APD	0.18	LAT	0.26	LAT	0.35	LAT	0.46	LAT	WPD				
16x18	GPM	5	BTU	65563	140	74152	133	82598	128	89045	123	0.72				
		10		71288	147	82154	140	91567	135	99843	130	2.59				
		12		72310	148	83611	141	93472	136	102203	132	3.63				

Appendix 5. Air-Cooled Portable Chillers

GC-1

Specifications

Air-Cooled Portable Chillers

Nominal operating parameters for air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

GPAC-20

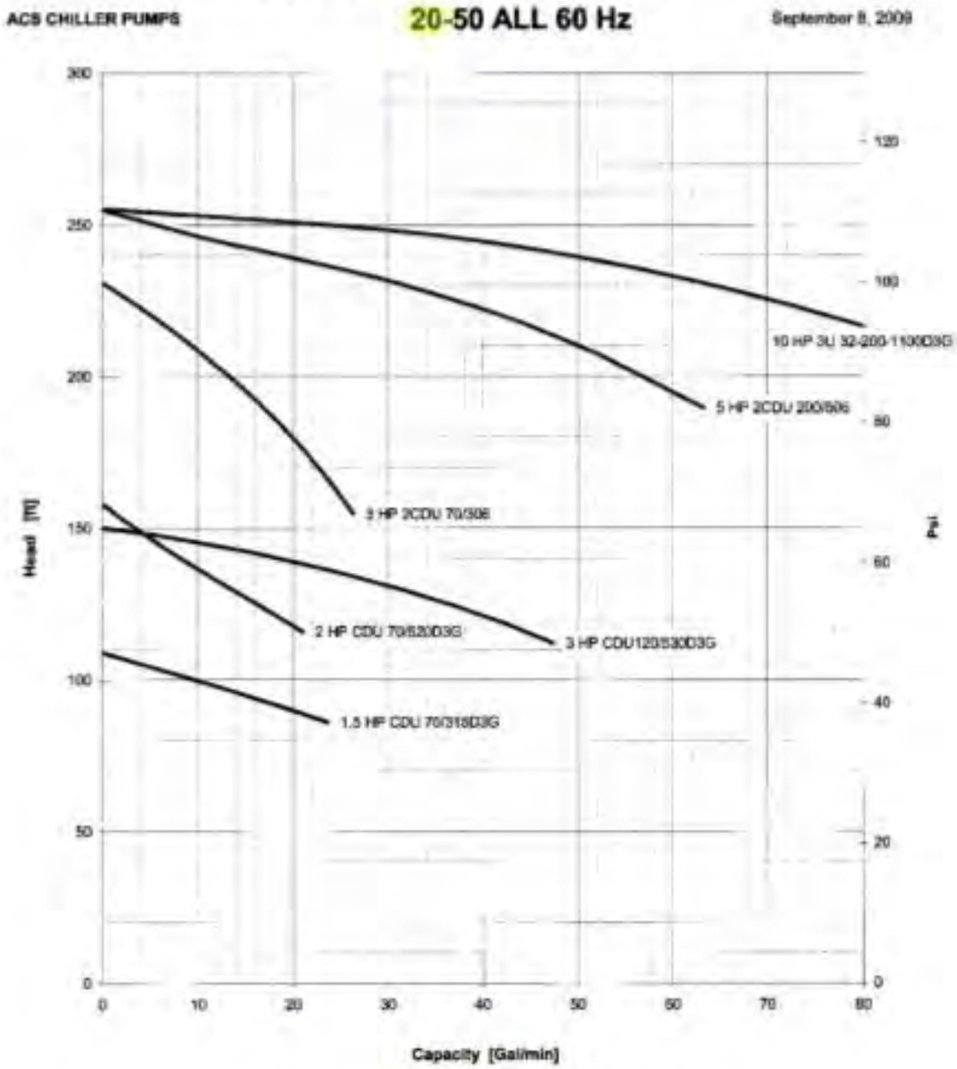
PERFORMANCE (NOMINAL DESIGN CONDITIONS)					
COOLING CAPACITY	4.65	TONS	ALTITUDE		SEA LEVEL
COOLANT SUPPLY TEMPERATURE	50	°F	COMPRESSOR POWER	4936	WATTS
AMBIENT AIR TEMPERATURE	95	°F	EER	11.31	BTU/WATT
COOLANT	WATER		CONDENSER AIR FLOW	4230	CFM
COOLANT FLOW	11	GPM	SOUND POWER LEVEL	86	dBA
UNIT PRESSURE DROP	7	PSID	SOUND PRESSURE LEVEL @ 1 METER		dBA
OPERATING PARAMETERS					
COOLANT SUPPLY TEMPERATURE	20-80	°F	COOLANT FLOW	6-24	GPM
AMBIENT AIR TEMPERATURE	60-115	°F	MINIMUM LOAD	0.944	TONS
SPECIFICATIONS					
COMPRESSOR	SCROLL		EVAPORATOR FILTER	20 MESH	
COOLANT PUMP	STAINLESS STEEL CENTRIFUGAL		COOLANT CIRCUIT	NON-FERROUS	
EVAPORATOR	BRAZED PLATE		CAPACITY CONTROL	HOT GAS BYPASS	
CONDENSER	ALUMINUM		REFRIGERANT	3 LBS R-410A	
CONDENSER FANS	24 INCH AXIAL		FRAME	GALVANIZED STEEL	
CONDENSER FAN MOTOR	1/2 HP OAO, 1140 RPM		PANELS	POWDER COATED STEEL	
RESERVOIR	20 GALLON POLYETHYLENE		WEIGHT (OPERATING)	690	LBS
POWER	460V/3PH/60HZ		WEIGHT (SHIPPING)	520	LBS
CONTROL CIRCUIT	120	VDC	ELECTRICAL ENCLOSURE	NEMA 12	
COMPRESSOR FULL LOAD AMPS	10.7	AMPS	CONTROL	MICROPROCESSOR	

GPAC-30

PERFORMANCE (NOMINAL DESIGN CONDITIONS)					
COOLING CAPACITY	7.30	TONS	ALTITUDE		SEA LEVEL
COOLANT SUPPLY TEMPERATURE	50	°F	COMPRESSOR POWER	7579	WATTS
AMBIENT AIR TEMPERATURE	95	°F	EER	11.56	BTU/WATT
COOLANT	WATER		CONDENSER AIR FLOW	6343	CFM
COOLANT FLOW	18	GPM	SOUND POWER LEVEL	92	dBA
UNIT PRESSURE DROP	7	PSID	SOUND PRESSURE LEVEL @ 1 METER		dBA
OPERATING PARAMETERS					
COOLANT SUPPLY TEMPERATURE	20-80	°F	COOLANT FLOW	9-36	GPM
AMBIENT AIR TEMPERATURE	60-115	°F	MINIMUM LOAD	1.504	TONS
SPECIFICATIONS					
COMPRESSOR	SCROLL		EVAPORATOR FILTER	20 MESH	
COOLANT PUMP	STAINLESS STEEL CENTRIFUGAL		COOLANT CIRCUIT	NON-FERROUS	
EVAPORATOR	BRAZED PLATE		CAPACITY CONTROL	HOT GAS BYPASS	
CONDENSER	ALUMINUM		REFRIGERANT	4 LBS R-410A	
CONDENSER FANS	24 INCH AXIAL		FRAME	GALVANIZED STEEL	
CONDENSER FAN MOTOR	1 HP OAO, 1140 RPM		PANELS	POWDER COATED STEEL	
RESERVOIR	20 GALLON POLYETHYLENE		WEIGHT (OPERATING)	870	LBS
POWER	460V/3PH/60HZ		WEIGHT (SHIPPING)	700	LBS
CONTROL CIRCUIT	120	VDC	ELECTRICAL ENCLOSURE	NEMA 12	
COMPRESSOR FULL LOAD AMPS	16.4	AMPS	CONTROL	MICROPROCESSOR	

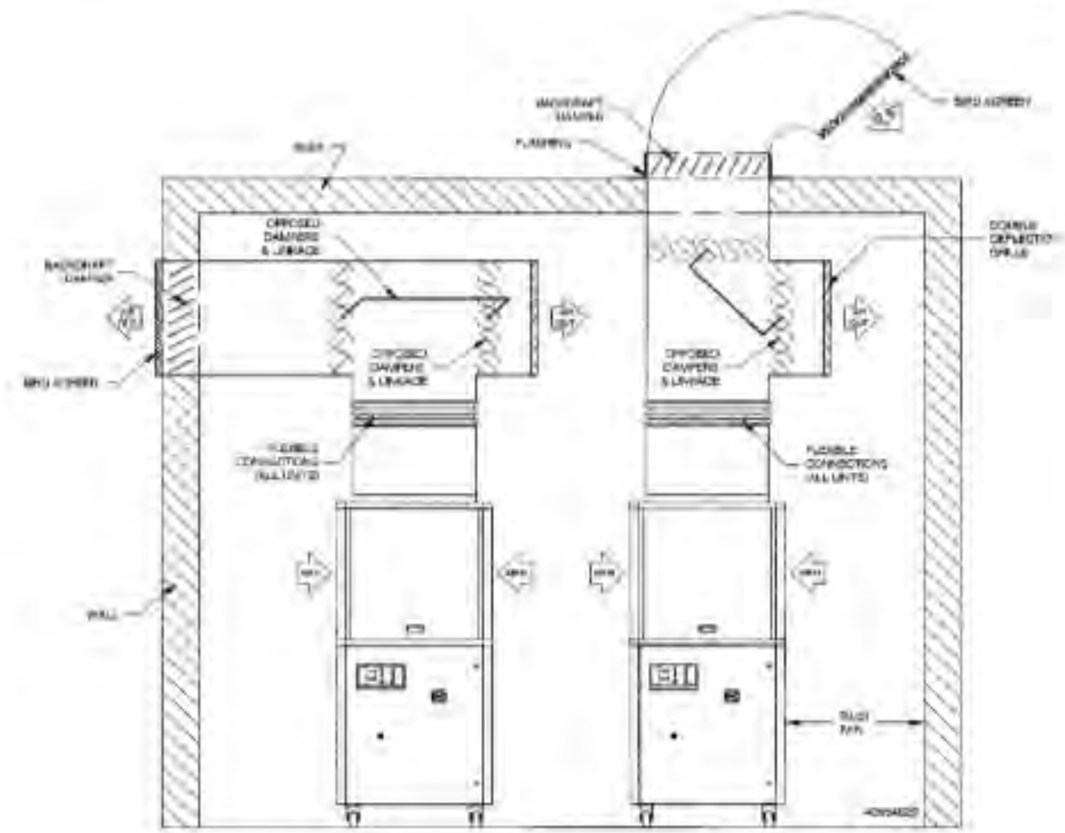
7-3 Pump Curves, Flow, and Pressure Considerations

60 Hertz Pump Curves



HP	Model	GP 20	GP 30	GP 40	GP 50
1.5	CDU 70/315D3G	STD			
2	CDU 70/520D3G	OPT	STD	STD	
3	CDU 120/530D3G		OPT	OPT	STD
3	2CDU 70/306	OPT			
5	2CDU 200/506	OPT	OPT	OPT	OPT
10	3U 32-200-1100D3G			OPT	OPT

7-5 Typical Ductwork for Air-Cooled Chillers



Model	Fan		60 Hz Discharge air volume		50 Hz Discharge air volume	
	HP	kW	CFM	m³/min	CFM	m³/min
GPAC-20	0.5	0.4	4230	120	3525	100
GPAC-30	1.0	0.7	6343	180	5285	150
GPAC-40	1.0	0.7	8458	240	7048	200
GPAC-50	2.0	1.5	12687	360	10573	300
GPAC-70	(2) 1.0	(2) 0.7	16916	479	14087	399
GPAC-90	(2) 2.0	(2) 1.4	25374	718	21145	598
GPAC-105	(2) 2.0	(2) 1.4	25374	718	21145	598
GPAC-140	(3) 2.0	(3) 1.4	38061	1077	31718	898
GPAC-175	(3) 2.0	(3) 1.4	38061	1077	31718	898
GPAC-210	(4) 2.0	(4) 1.4	50748	1436	42290	1197

When locating your air-cooled portable chiller and designing its ductwork, note any potential high temperature conditions when discharging into your building and any negative pressures with the building when discharging air outside.

Notes:

- Customer use of ductwork requires the high pressure fan option.
- Allow 30 in. (77 cm) minimum clearance around the chiller footprint to facilitate free passage of cooling air and service accessibility.
- Figure 20 shows the pressure loss per foot of ductwork. Calculate the total equivalent length before using the data below.
- Support ductwork from the building structure, not off of the chiller.
- Back draft damper to outside must be closed at all times when fan/blower is not operating. Size the damper so that the pressure drop across is no greater than 0.2 in WG (50 Pascal) at the rated output.
- Chillers are designed to operate at a condensing entering air temperature of 60°F (16°C) minimum without optional Variable Frequency Drive.

Figure 20 - Loss of Pressure through round duct - inches of water column per equivalent foot

	60 hz Condenser Fan Flow Rate (cfm / cmm)				50 hz Condenser Fan Flow Rate (cfm / cmm)			
Nominal Duct Diameter (in / cm)	GPAC-20 4230 / 120	GPAC-30 6343 / 180	GPAC-40 8458 / 240	GPAC-50 12687 / 360	GPAC-20 3525 / 100	GPAC-30 5286 / 150	GPAC-40 7048 / 200	GPAC-50 10573 / 300
18 / 45	0.003	0.007	0.013	0.03	0.002	0.005	0.009	0.020
20 / 50	0.002	0.005	0.008	0.02	0.001	0.003	0.005	0.012
22 / 55	0.001	0.003	0.005	0.01		0.002	0.003	0.007
24 / 60		0.002	0.003	0.007		0.001	0.002	0.005
26 / 65		0.001	0.002	0.004			0.001	0.003
28 / 70			0.001	0.003				0.002
30 / 75				0.002				0.002
32 / 80				0.002				0.001
36 / 90				0.001				

Note: 1 inch of water column = 250 Pascal

Appendix 6. Dayton 1 HP Pump

Manufacturer: **P1a,b** **P2, P2b, P2c, P2d, P2e**

DAYTON ELECTRIC MANUFACTURING CO.

Cast-Iron

Mechanical seals are made from carbon, ceramic, and Buna N. Semiopen impellers. Stainless steel shaft, except Nos. 12N810, 12N812, and 12N814 have a steel with stainless steel shaft and built-in check valve.

- Temp. range: 40° to 180°F

Self-Priming Cast-Iron and Stainless Steel Pumps and Pedestal Pumps

Pumps with 1" NPT port self-prime to 7 ft.; pumps with 1-1/2", 2", and 3" NPT ports self-prime to 20 ft. For high-volume industrial and commercial applications including liquid and chemical transfer, irrigation, dewatering, and processing. Replacement seals are available on Grainger.com®.

Technical Specifications: **P3**

Item	Centrifugal Pump
Type	Self-Priming
HP	1
Phase	1
Voltage	115/230
Amps	14.4/7.2
Housing Material	Cast-Iron
Impeller Material	Cast-Iron
Wetted Materials	CI, Buna N, Carbon, Ceramic
Hz	60
Inlet (In.)	1-1/2
Outlet (In.)	1-1/2
Motor Enclosure	ODP
NEMA/IEC Frame	56J
Motor RPM	3500
Motor Type	Capacitor Start
Service Factor	1.4
Volute Material	Cast-Iron
Shaft Material	Stainless Steel
Screw Material	Zinc Plated
Seal Type	Mechanical
Seal Material	Carbon Ceramic-Buna N
Seal Application	Nonflammable and Nonabrasive Liquids Compatible with Seal Component Materials Up to 180F
GPM of Water @ 10 Ft. of Head	80
GPM of Water @ 15 Ft. of Head	78
GPM of Water @ 20 Ft. of Head	75
GPM of Water @ 25 Ft. of Head	74
GPM of Water @ 30 Ft. of Head	71
GPM of Water @ 40 Ft. of Head	67
GPM of Water @ 50 Ft. of Head	61
GPM of Water @ 60 Ft. of Head	52
GPM of Water @ 70 Ft. of Head	41
GPM of Water @ 80 Ft. of Head	20
Max. Head (Ft.)	90
Max. GPM @ Head (Ft.)	76 @ 10
Best Efficiency GPM @ Head (Ft.)	45 @ 66
Min. GPM @ Head (Ft.)	23 @ 80
Best Efficiency Range	41-52 GPM @ 70-60 Ft.

GPM @ Head (Ft.)	
Max. Specific Gravity	1.0
Max. Case Pressure (PSI)	165
Max. Fluid Viscosity	100 SSU
Inlet Pressure (PSI)	100
Impeller Type	Semi Open
Bearing Type	Ball
Duty	Continuous
Max. Dia. Solids (In.)	1/8
Port Rotation	No
Drain Plug	1/4"-18 NPT
Manufacturers Warranty Length	1 Year
Application	For High Volume Service, Industrial and Commercial Applications, Such as Process Applications, Dewatering, Irrigation, Chemical Transfer, Decorative Water Features
For Use With	Nonflammable and Non-abrasive Liquids Compatible with Pump Component Materials
Height (In.)	9.12
Length (In.)	17.25
Width (In.)	6.87
Includes	Manual

Appendix 7. Dayton Trash Pump

P2a

Manufacturer:
DAYTON ELECTRIC MANUFACTURING CO.

Self-Priming Sewage and Trash Pumps
Pumps with continuous-duty motors and internal check valves handle high volumes of liquids containing sewage and other solids up to 8% max.; self-prime to 20 ft. They are close-coupled for simple installation and can be truck-mounted. All include a suction strainer. Nos. 12N807 to 12N809 feature a cleanout with 2 twist knobs for easy access. Provide support to such applications as process, liquid transfer, irrigation, clear or gray water, and sewage treatment in industrial and commercial facilities. Replacement seals are available on Grainger.com®.

- TEFC motor enclosure Temp. range: 40° to 160°F

Technical Specifications:

Item	Sewage/Trash Centrifugal Pump
HP	3
Phase	3
Voltage	208-230/460
Amps	8.3-7.6/3.8
Hz	60
Inlet/Outlet (In.)	2
Motor Enclosure	TEFC
NEMA/IEC Frame	56J
Motor RPM	3500
Service Factor	1.0
Wetted Materials	CI, SS, Silicon Carbide, Buna N
Impeller Material	Stainless Steel
Housing Material	Cast Iron
Volute Material	Cast Iron
Shaft Material	Stainless Steel
Screw Material	Zinc Plated
Seal Type	Mechanical
Seal Material	Silicon Carbide Buna N
Max. Liquid Temp. (F)	Water and Nonflammable Liquids Compatible with Seal Component Materials up to 160F
GPM of Water @ 2 Ft. of Head	160
GPM of Water @ 20 Ft. of Head	105
GPM of Water @ 30 Ft. of Head	78
GPM of Water @ 40 Ft. of Head	54
GPM of Water @ 50 Ft. of Head	30
Max. Head (Ft.)	60
Best Efficiency GPM @ Head (Ft.)	55 @ 39
Best Efficiency Range GPM @ Head (Ft.)	70-94 GPM @ 33-24 Ft
Max. Specific Gravity	1.0
Max. Case Pressure (PSI)	60
Max. Fluid Viscosity	100 SSU
Inlet Pressure (PSI)	25
Impeller Type	Nonclog
Bearing Type	Ball
Duty	Continuous
Max. Dia. Solids (In.)	1
Port Rotation	None
Drain Plug	3/8" NPT
Manufacturers Warranty Length	1 Year
Application	Process, Liquid Transfer, Irrigation, Clear or Gray Water and Sewage Treatment

For Use With	Water and Nonflammable Liquids Compatible with Pump Component Materials
Height (in.)	8.72
Length (in.)	21.27
Width (in.)	8.63
Includes	Strainer and Manual

GEO | Environmental Remediation Company

Appendix 8. Fixed Tube Bundle Liquid Cooled Heat Exchangers

American Industrial
Heat Transfer Inc. ®

Manufacturer of Quality Heat Exchangers

AA - STA SERIES

PAGE 22
PAGE 23
PAGE 24
PAGE 25
PAGE 26
PAGE 27
PAGE 28
PAGE 29
PAGE 30

Fit to Screen

HX-4-GA

Heat Exchanger
Selected Model:
AA-1636-4-6-SP

Click here to see unit schematic and parts

Fixed Tube Bundle Liquid Cooled

HEAT EXCHANGERS

- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit your needs.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

note: AIHTI reserves the right to make reasonable design changes without notice.

Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

AA & STA Series *overview*

AA SERIES

Fixed tube construction heat exchangers with NPT connections. Made of brass with copper cooling tubes and cast iron end bonnets. Standard sizes from 2" through 8" diameters, and from 1.3 to 200 sq.ft. Standard one, two, and four pass models are available. Options include 90/10 copper nickel and 316 stainless steel cooling tubes, bronze end bonnets and zinc anodes. Can be customized to fit your requirements.

Optional 10" diameter units in brass are available upon request.

SAA Series

Similar to AA series with the exception of steel shell material. For use in applications where the shell fluid is non-corrosive with steel. Offered in 5" through 8" shell diameter.

STA SERIES

Similar in design to AA series with fixed tube construction and NPT connections made of all 316 stainless steel. Standard sizes from 2" through 8" diameters. From 1.3 to 200 sq. ft. Standard one, two and four pass models are available. Larger diameters available upon request. Can be customized to fit your requirements.

FBF SERIES

Similar to AA series with the exception of shell ports. FBF series offered from 5" through 8" diameter has SAE code 61 four bolt flange shell port connections. Available with single pass, two pass, and four pass end bonnets. Options include 90/10 copper nickel and 316 stainless steel cooling tubes, bronze end bonnets, and zinc anodes. In applications where shell fluid is non-corrosive with steel, SFBF series can be used.

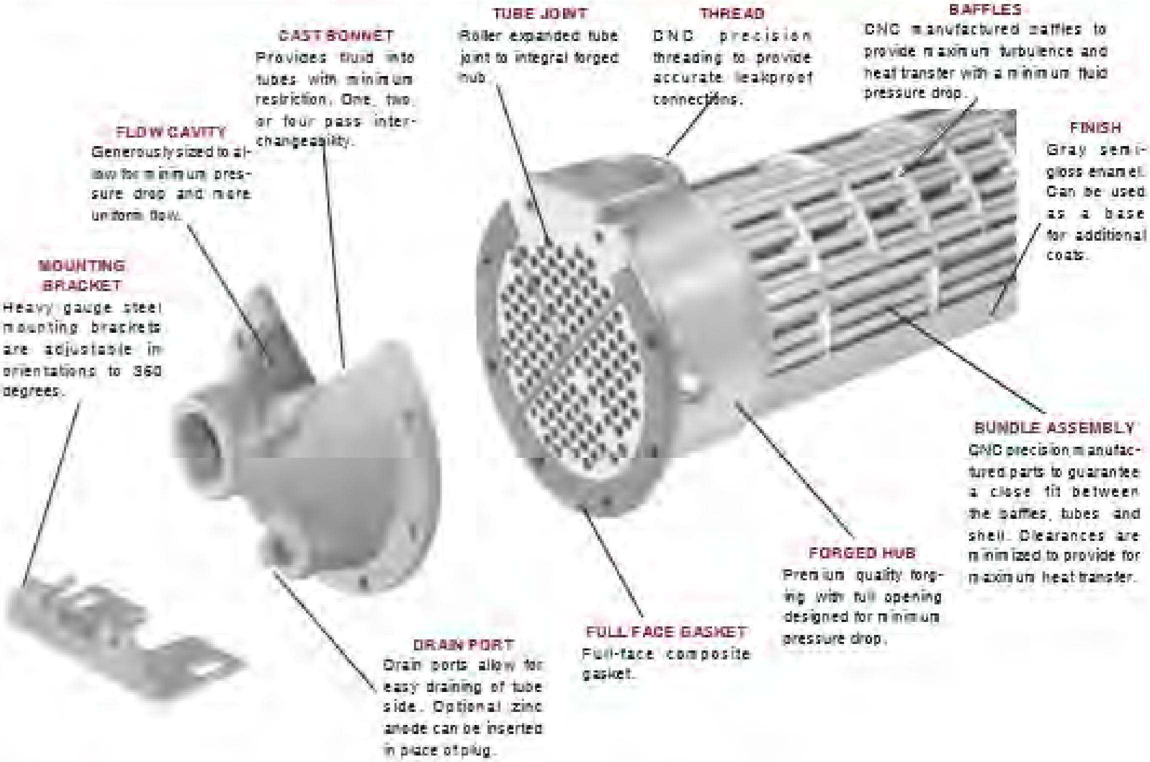
(See Page 31)

AC SERIES with electric drive

Air-cooled oil coolers with AC electric, DC electric, and hydraulic fan drive motors. Eight standard sizes with optional washable air filter. Rated flow from 2 to 120 GPM. Thermal capacity up to 100 hp (75Kw). NPT, flange, or SAE straight thread port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, phosphate ester, ethylene glycol, and many other fluids compatible with listed material.

In applications where water is not available for cooling (see page 131)

AA & STA Series *construction*



Example Model

AA - 1224 - 4 - 6 - TP - CNT - B - Z

Options: CNT - B - Z

Model
AA

Shell Diameter
400 = 2.13"
600 = 3.13"
800 = 4.13"
1000 = 5.13"
1200 = 6.13"
1600 = 8.00"

Effective Tube Length
(12" increments)

Baffle Spacing Code
1.5"
2.0"
3.0"
4.0"
6.0"
8.0"

Cooling Tube Diameter
4 = 1/4"
6 = 3/8"
10 = 5/8"

Tube Side Passes
SP = 1 pass
TP = 2 pass
FP = 4 pass

Tubing
Blank = Copper
Options
CNT = 90/10 Cu Ni
STS = Stainless Steel

End Bonnets
Blank = Cast Iron
Options
B = Cast Bronze

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.
3Z = 3 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

	AA Series	SAA Series★	STA Series	Standard Unit Ratings
Shell	Brass	Steel	316 Stainless Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 °F
Tubes	Copper	Copper	316 Stainless Steel	
Baffle	Aluminum	Aluminum	316 Stainless Steel	
Integral End Hub	Forged Brass	Forged Brass	316 Stainless Steel	
End Bonnets	Cast Iron	Cast Iron	316 Stainless Steel	
Mounting Brackets	Steel	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	Hypalon Composite	

★Offered in 5" through 8" shell diameter.

Note: AIHTI reserves the right to make reasonable design changes without notice.

Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

e maximum turbulence and ansfer with a minimum fluid re drop.

FINISH
Gray semi-gloss enamel. Can be used as a base for additional coats.

BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

3
forg-
ning
num

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.
3Z = 3 Zinc Anode etc.

End Bonnets
Blank = Cast Iron

Options
B = Cast Bronze

Standard Unit Ratings
Operating Pressure Tubes
150 psig
Operating Pressure Shell
300 psig
Operating Temperature
300 °F

shell diameter.

hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM	=	Gallons Per Minute
CN	=	Constant Number for a given fluid
ΔT	=	Temperature differential across the potential
PSI	=	Pounds per Square Inch (pressure) of the operating side of the system
MHP	=	Horsepower of the electric motor driving the hydraulic pump
Kw	=	Kilowatt (watts x 1000)
T_{in}	=	Hot fluid entering temperature in °F
T_{out}	=	Hot fluid exiting temperature in °F
t_{in}	=	Cold fluid temperature entering in °F
t_{out}	=	Cold fluid temperature exiting in °F
Q	=	BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump vs. exiting the system is about 5.3°F. Even though our return line pressur operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use on of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may dif fer slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represent the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportiona valves, etc... will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual ΔT	A) Q = 80 x 210 x 5.3°F = 89,040 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (v) x 2545	B) Q = [(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
C) Q = MHP x (v) x 2545	C) Q = 125 x .30 x 2545 = 95,347 BTU/HR
D) Q = Kw to be removed x 3415	D) Q = 28 x 3415 = 95,620 BTU/HR
E) Q = HP to be removed x 2545	E) Q = 37.5 x 2545 = 95,437 BTU/HR

Constant for a given fluid (CN)	
1) Oil	CN = 210
2) Water	CN = 500
3) 50% E. Glycol	CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the cold side ΔT. If your water flow is unknown you ma need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For ap plications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

$$\text{HOT FLUID } \Delta T \ (\text{Oil}) = \frac{Q}{CN \times GPM}$$

$$\text{COLD FLUID } \Delta t \ (\text{Water}) = \frac{BTU / hr}{CN \times GPM}$$

Example

$$\Delta T = \frac{89{,}090 \text{ BTU/hr (from step 1 item B)}}{210 \text{ CN} \times 80 \text{GPM}} = 5.3°F = \Delta T \text{ Reject}$$

$$\Delta t = \frac{89{,}090 \text{ BTU/hr}}{500 \text{ CN} \times 40 \text{GPM (for a 2:1 ratio)}} = 4.45°F = \Delta T \text{ Absorb}$$

T_{in}	=	Hot Fluid entering temperature in degrees F	T_{in} = 125.3 °F
T_{out}	=	Hot Fluid exiting temperature in degrees F	T_{out} = 120.0 °F
t_{in}	=	Cold Fluid entering temperature in degrees F	t_{in} = 70.0 °F
t_{out}	=	Cold Fluid exiting temperature in degrees F	t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{\text{S [smaller temperature difference]}}{\text{L [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2
M = S/L number (located in table A)

$LMTD_1$ = L x M $\qquad$ $LMTD_1$ = 50.8 x .992 (from table A) = 50.39

To correct the $LMTD_1$ for a multipass heat exchangers calculate R & K as follows:

Formula

$$R = \frac{T_{in} - T_{out}}{t_{out} - t_{in}} \qquad K = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$$

Example

$$R = \frac{125.3°F - 120°F}{74.5°F - 70°F} = \frac{5.3°F}{4.5°F} = [1.17 = R]$$

$$K = \frac{74.5°F - 70°F}{124.5°F - 70°F} = \frac{4.5°F}{55.4°F} = [0.081 = K]$$

Locate the correction factor CF_B (from table B)
$LMTD_2 = LMTD_1 \times CF_B$
$LMTD_2 = 50.39 \times 1 = \mathbf{50.39}$

Note: AIHTI reserves the right to make reasonable design changes without notice.

Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

AA & STA Series *selection*

STEP 4: Calculate the area required

Required Area sq.ft. = $\dfrac{Q\ (BTU / HR)}{LMTD \times U\ (\text{FROM TABLE C})}$ $\dfrac{89{,}090}{50.39 \times 100}$ **= 17.68 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **4**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 17.68sq.ft Closest model required based upon sq.ft. & series = **AA-1224-4-6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.884
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.996	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.963	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

K

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft. 1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing	Model Number	Surface Area in Sq.ft. 1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing
AA-408	1.3	–	–	AA-1224	–	23.6	11.8
				AA-1236	–	35.3	17.7
AA-608	2.6	–	–	AA-1248	–	47.1	23.6
AA-614	4.6	–	–	AA-1260	–	58.9	29.5
AA-624	7.9	–	–	AA-1272	–	70.6	35.4
AA-636	11.2	–	–	AA-1284	–	82.3	41.3
				AA-1296	–	94.0	47.2
AA-814	8.3	–	–				
AA-824	14.1	–	–	AA-1824	–	41.0	23.6
AA-836	21.2	–	–	[illegible]	–	62.0	35.3
AA-848	28.3	–	–	AA-1848	–	82.0	47.1
				AA-1860	–	103.0	58.9
AA-1014	–	9.1	4.6	AA-1872	–	124.0	70.7
AA-1024	–	16.0	7.8	AA-1884	–	145.0	82.5
AA-1036	–	24.0	11.8	AA-1896	–	166.0	94.3
AA-1048	–	32.0	15.8	AA-18108	–	187.0	106.1
AA-1060	–	40.0	19.8	AA-18120	–	208.0	117.9

TABLE E- Flow Rate for Shell & Tube

Shell dia. Code	Max. liquid Flow - Shell Side: Baffle Spacing 1.5	2	3	4	6	Liquid Flow - Tube Side: SP Min.	SP Max.	TP Min.	TP Max.	FP Min.	FP Max.
400	10	19	–	–	–	3.5	20	–	–	–	–
600	15	20	25	30	–	7.5	48	3.5	24	2	12
800	20	35	45	60	–	10	70	4.5	38	3	21
1000	24	35	60	70	–	20	120	10	70	5.0	37
1200	35	45	70	100	120	30	220	15	112	7.5	56
1600	38	70	150	200	220	57	300	29	180	14	90

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

note: AIHTI reserves the right to make reasonable design changes without notice.

Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

AA & STA Series *performance*

Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 24 & 25 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5"

1) HP Curves are based upon a 40°F approach temperature. for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

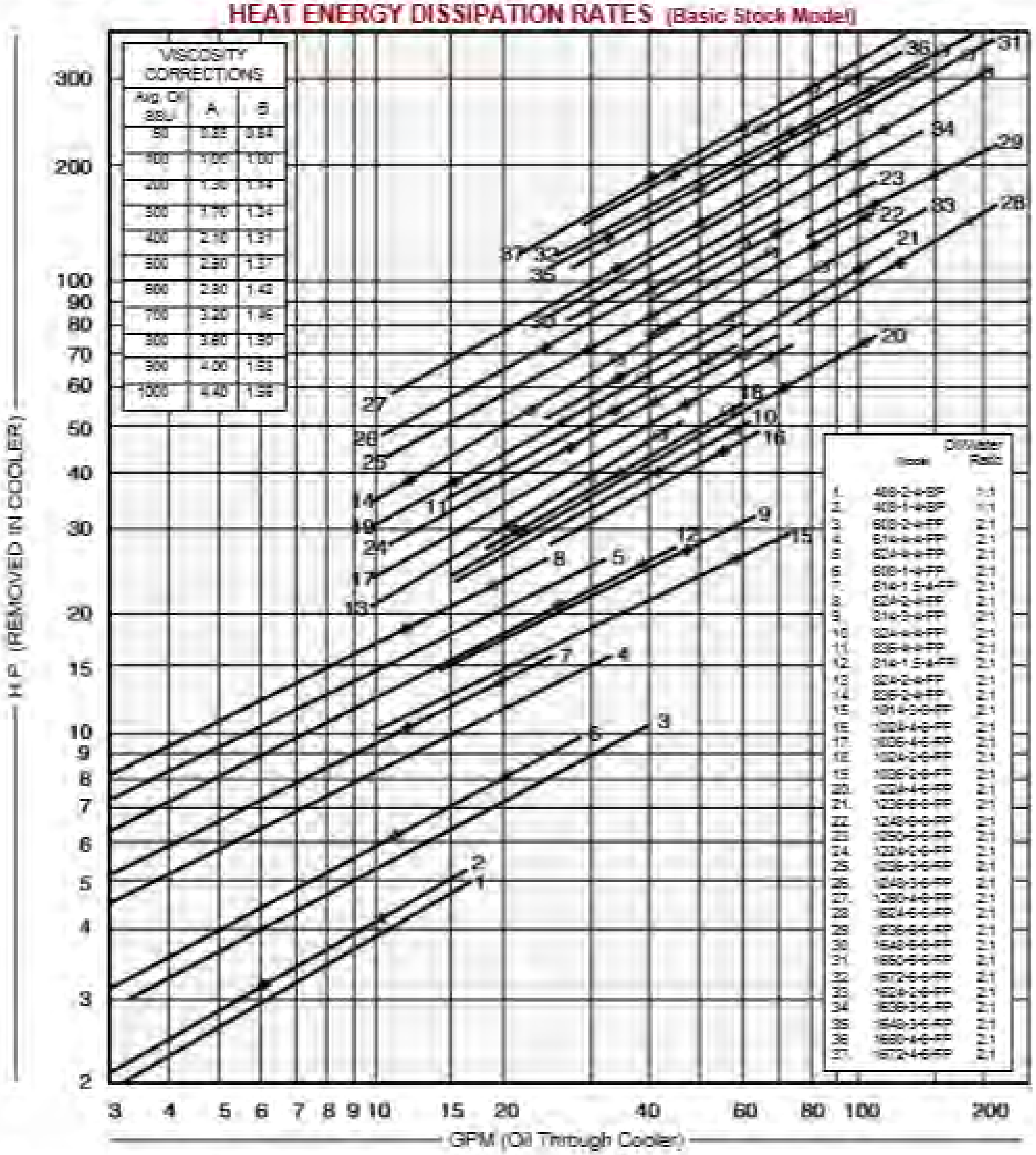
3) OIL PRESSURE DROP CODING: ● = 5 psi, ⊸ = 10 psi, ▭ = 20 psi, △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P.\left(\frac{\text{Removed}}{\text{in Cooler}}\right) = H.P.\left(\frac{\text{Actual}}{\text{Heat Load}}\right) \times \left(\frac{40}{\text{Actual Approach}}\right) \times B$$

HEAT ENERGY DISSIPATION RATES (Basic Stock Model)



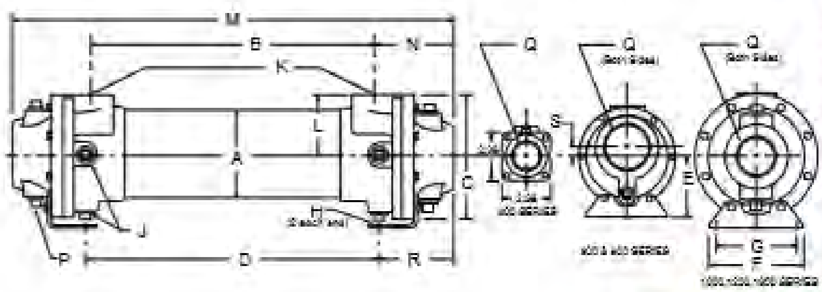
VISCOSITY CORRECTIONS		
Avg. Oil SSU	A	B
50	0.85	0.84
100	1.00	1.00
200	1.30	1.14
300	1.70	1.24
400	2.10	1.31
500	2.30	1.37
600	2.80	1.42
700	3.20	1.46
800	3.60	1.50
900	4.00	1.53
1000	4.40	1.56

	Model	Oil/Water Ratio
1.	408-2-4-BP	1:1
2.	408-1-4-BP	1:1
3.	608-2-4-FP	2:1
4.	614-4-4-FP	2:1
5.	624-4-4-FP	2:1
6.	608-1-4-FP	2:1
7.	614-1.5-4-FP	2:1
8.	624-2-4-FP	2:1
9.	814-3-4-FP	2:1
10.	824-4-4-FP	2:1
11.	836-4-4-FP	2:1
12.	814-1.5-4-FP	2:1
13.	824-2-4-FP	2:1
14.	836-2-4-FP	2:1
15.	1014-3-6-FP	2:1
16.	1024-4-6-FP	2:1
17.	1036-4-6-FP	2:1
18.	1024-2-6-FP	2:1
19.	1036-2-6-FP	2:1
20.	1224-4-6-FP	2:1
21.	1236-6-6-FP	2:1
22.	1248-6-6-FP	2:1
23.	1260-6-6-FP	2:1
24.	1224-2-6-FP	2:1
25.	1236-3-6-FP	2:1
26.	1248-3-6-FP	2:1
27.	1260-4-6-FP	2:1
28.	1624-6-6-FP	2:1
29.	1636-6-6-FP	2:1
30.	1648-6-6-FP	2:1
31.	1660-6-6-FP	2:1
32.	1672-6-6-FP	2:1
33.	1624-2-6-FP	2:1
34.	1636-3-6-FP	2:1
35.	1648-3-6-FP	2:1
36.	1660-4-6-FP	2:1
37.	1672-4-6-FP	2:1

Note: AIHTI reserves the right to make reasonable design changes without notice.

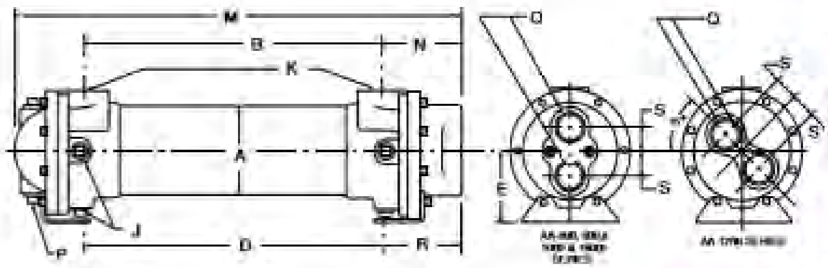
Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

dimensions



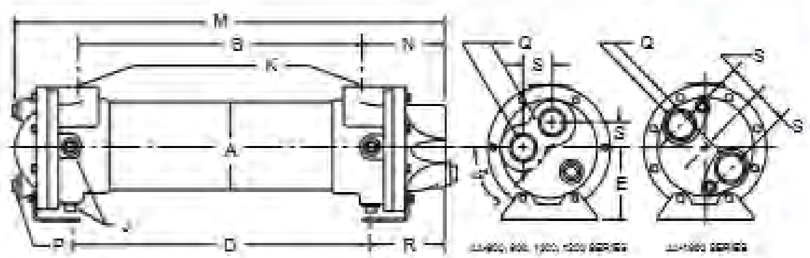
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT	R	S
AA-408	11.00	2.38	-	1.00	-	-
AA-608 AA-614 AA-624	11.25 17.25 27.25	2.56	(2) .38	1.50	3.06	0.38
AA-814 AA-824 AA-836	18.00 28.00 40.00	3.44	(2) .38	2.00	2.56	0.50
AA-1014 AA-1024 AA-1036	18.50 28.50 40.50	3.69	(4) .38	2.50	3.38	-
AA-1224 AA-1236 AA-1248 AA-1260 AA-1272	29.25 41.25 53.25 65.25 77.25	4.25	(4) .38	3.00	3.75	-
AA-1624 AA-1636 AA-1648 AA-1660 AA-1672 AA-1684	31.25 43.25 55.25 67.25 79.25 91.25	6.52	(4) .50	4.00	5.25	-



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R	S
AA-608 AA-614 AA-624	10.75 16.75 26.75	2.44	(2) .38	1.00	2.94	1.00
AA-814 AA-824 AA-836	17.62 27.62 39.62	3.44	(2) .38	1.25	2.56	1.19
AA-1014 AA-1024 AA-1036	18.50 28.50 40.50	3.69	(2) .38	1.50	3.50	1.50
AA-1224 AA-1236 AA-1248 AA-1260 AA-1272	28.75 40.75 52.75 64.75 76.75	4.25	(2) .38	2.00	3.75	1.56
AA-1624 AA-1636 AA-1648 AA-1660 AA-1672 AA-1684	30.50 42.50 54.50 66.50 78.50 90.50	6.00	(2) .50	2.50	5.25	2.25



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
AA-608 AA-614 AA-624	10.88 16.88 26.88	2.44	(2) .38	.75	2.81	1.00
AA-814 AA-824 AA-836	17.62 27.62 39.62	3.44	(2) .38	.75	2.56	1.06
AA-1014 AA-1024 AA-1036	18.50 28.50 40.50	3.80	(3) .38	1.00	3.25	1.69
AA-1224 AA-1236 AA-1248 AA-1260 AA-1272	29.50 41.50 53.50 65.50 77.50	4.56	(3) .50	1.50	3.75	2.00
AA-1624 AA-1636 AA-1648 AA-1660 AA-1672 AA-1684	30.75 42.75 54.75 66.75 78.75 90.75	6.06	(4) .50	2.00	5.25	2.62

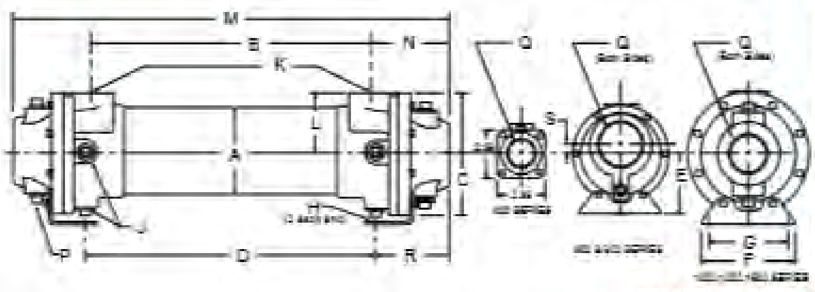
COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
AA-408	2.125	6.25	-	-	-	-	-	-	-	.50	1.69	7	AA-408
AA-608 AA-614 AA-624	3.125	6.12 12.12 22.12	4.19	5.12 11.12 21.12	2.44	3.50	2.50	.38ex.88	(2) .25	1.00	2.44	12 16 20	AA-608 AA-614 AA-624
AA-814 AA-824 AA-836	4.125	11.12 21.12 33.12	5.88	12.88 22.88 34.88	3.50	4.75	3.50	.50ex1.62	(8) .38	1.50	3.12	37 47 67	AA-814 AA-824 AA-836
AA-1014 AA-1024 AA-1036	5.125	11.12 21.12 33.12	6.50	11.75 21.75 33.75	3.75	5.00	4.00	.50ex.88	(8) .38	1.50	3.62	45 60 82	AA-1014 AA-1024 AA-1036
AA-1224 AA-1236 AA-1248 AA-1260 AA-1272	6.125	20.50 32.50 44.50 56.50 68.50	7.50	21.50 33.50 45.50 57.50 69.50	4.12	6.00	5.00	.50ex.88	(8) .38	2.00	4.25	90 110 130 150 180	AA-1224 AA-1236 AA-1248 AA-1260 AA-1272
AA-1624 AA-1636 AA-1648 AA-1660 AA-1672 AA-1684	8.00	19.00 31.00 43.00 55.00 67.00 79.00	9.75	20.50 32.50 44.50 56.50 68.50 80.50	5.38	8.25	7.00	.62ex1.12	(8) .38	3.00	5.62	160 185 205 235 280 320	AA-1624 AA-1636 AA-1648 AA-1660 AA-1672 AA-1684

Note: AIHTI reserves the right to make reasonable design changes without notice.

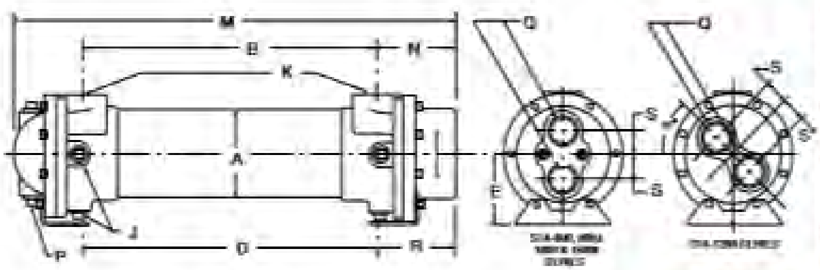
Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

STA Series



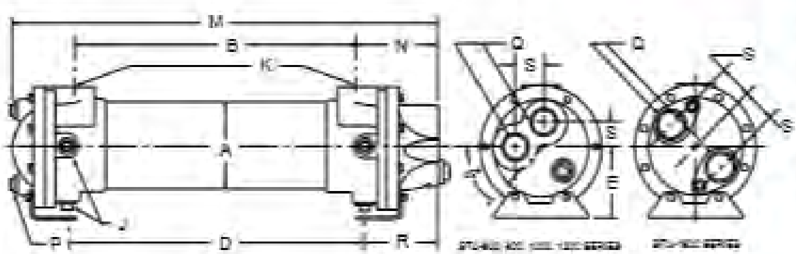
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT	R	S
STA-408	11.00	2.38	-	1.00	-	-
STA-508	11.25	2.56	(2) .38	1.50	3.06	0.38
STA-514	17.25					
STA-524	27.25					
STA-814	18.00	3.44	(2) .38	2.00	2.56	0.50
STA-824	28.00					
STA-836	40.00					
STA-1014	16.50	3.69	(4) .38	2.50	3.38	-
STA-1024	28.50					
STA-1036	40.50					
STA-1224	29.25	4.25	(4) .38	3.00	3.75	-
STA-1236	41.25					
STA-1248	53.25					
STA-1260	65.25					
STA-1272	77.25					
STA-1624	31.25	5.62	(4) .50	4.00	5.25	-
STA-1636	43.25					
STA-1648	55.25					
STA-1660	67.25					
STA-1672	79.25					
STA-1684	91.25					



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R	S
STA-508	10.75	2.44	(2) .38	1.00	2.34	1.00
STA-514	16.75					
STA-524	26.75					
STA-814	17.62	3.44	(2) .38	1.25	2.56	1.13
STA-824	27.62					
STA-836	39.62					
STA-1014	16.50	3.69	(2) .38	1.50	3.50	1.50
STA-1024	28.50					
STA-1036	40.50					
STA-1224	28.75	4.25	(2) .38	2.00	3.75	1.56
STA-1236	40.75					
STA-1248	52.75					
STA-1260	64.75					
STA-1272	76.75					
STA-1624	30.50	5.00	(2) .50	2.50	5.25	2.25
STA-1636	42.50					
STA-1648	54.50					
STA-1660	66.50					
STA-1672	78.50					
STA-1684	90.50					



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
STA-508	10.88	2.44	(2) .38	.75	2.31	1.00
STA-514	16.88					
STA-524	26.88					
STA-814	17.62	3.44	(2) .38	.75	2.56	1.06
STA-824	27.62					
STA-836	39.62					
STA-1014	16.50	3.80	(2) .38	1.00	3.25	1.69
STA-1024	28.50					
STA-1036	40.50					
STA-1224	29.50	4.56	(2) .50	1.50	3.75	2.00
STA-1236	41.50					
STA-1248	53.50					
STA-1260	65.50					
STA-1272	77.50					
STA-1624	30.75	5.08	(4) .50	2.00	5.25	3.62
STA-1636	42.75					
STA-1648	54.75					
STA-1660	66.75					
STA-1672	78.75					
STA-1684	90.75					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K	L	Approx. Weight	Model
STA-408	2.125	6.25	-	-	-	-	-	-	-	.50	1.68	7	STA-408
STA-508	3.125	6.12	4.19	5.12	2.44	3.50	2.50	.38x.88	(2) .25	1.00	2.44	12	STA-508
STA-514		12.12		11.12								16	STA-514
STA-524		22.12		21.12								20	STA-524
STA-814	4.125	11.12	5.88	12.88	3.50	4.75	3.50	.50x1.62	(8) .38	1.50	3.12	37	STA-814
STA-824		21.12		22.88								47	STA-824
STA-836		33.12		34.88								57	STA-836
STA-1014	5.125	11.12	6.50	11.75	3.75	5.00	4.00	.50x.88	(8) .38	1.50	3.62	45	STA-1014
STA-1024		21.12		21.75								60	STA-1024
STA-1036		33.12		33.75								82	STA-1036
STA-1224	6.125	20.50	7.50	21.50	4.12	6.00	5.00	.50x.88	(8) .38	2.00	4.25	90	STA-1224
STA-1236		32.50		33.50								110	STA-1236
STA-1248		44.50		45.50								130	STA-1248
STA-1260		56.50		57.50								150	STA-1260
STA-1272		68.50		69.50								180	STA-1272
STA-1624	8.00	19.00	9.75	20.50	5.38	8.25	7.00	.62x1.12	(8) .38	3.00	5.62	150	STA-1624
STA-1636		31.00		32.50								185	STA-1636
STA-1648		43.00		44.50								205	STA-1648
STA-1660		55.00		56.50								235	STA-1660
STA-1672		67.00		68.50								280	STA-1672
STA-1684		79.00		80.50								320	STA-1684

Note: AIHTI reserves the right to make reasonable design changes without notice.

 Copyright © 2011 American Industrial Heat Transfer, Inc. 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

AA & STA Series *installation & maintenance*

PIPING HOOK-UP*

A .... Hot fluid to be cooled
B .... Cooled fluid
C .... Cooling water in
D .... Cooling water out

SP* .... Single Pass
TP* .... Two Pass
FP* .... Four Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

*) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

note: AIHTI reserves the right to make reasonable design changes without notice.

Copyright © 2011, American Industrial Heat Transfer, Inc.

AA & STA Series *installation & maintenance*

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, hot fluid in the tubes and cold fluid in the shell the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of single pass, two pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and/or internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

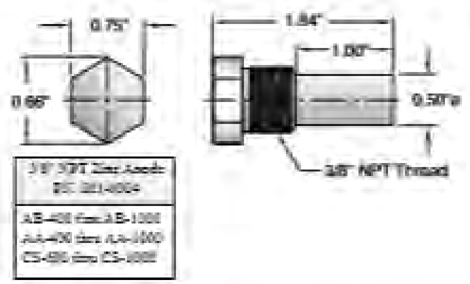
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

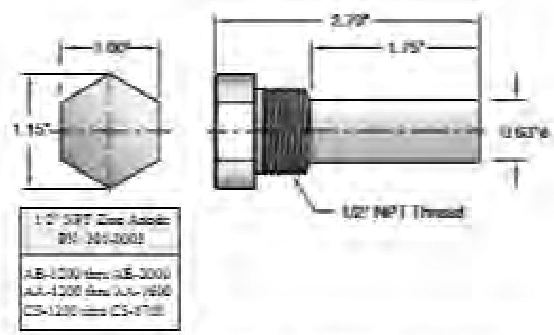
Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc.... Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*

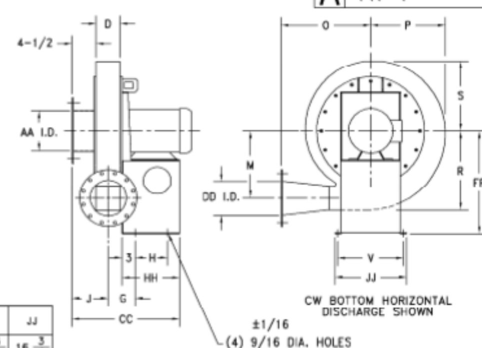




Appendix 8. Cincinnati Fan ISTR Blower

A HP4

BF-1a&b



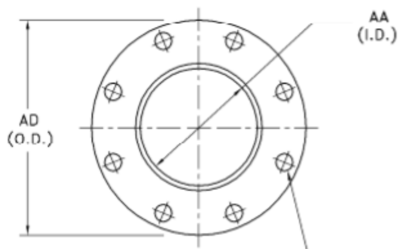
	MODEL*	MOTOR FRAME	D	G ④	H	J	M	O	P	R	S	V	AA	CC ④	DD	FF	HH	JJ
	HP-4A	143T-184T	4	5	$6\frac{3}{4}$	$6\frac{1}{2}$	$11\frac{3}{4}$	18	$13\frac{9}{16}$	$14\frac{7}{16}$	$12\frac{3}{4}$	$14\frac{3}{4}$	6	$21\frac{1}{4}$	4	21	$12\frac{3}{4}$	$16\frac{3}{4}$
	HP-4C	143T-215T			9		$14\frac{13}{16}$	$17\frac{15}{16}$	$16\frac{7}{16}$	$17\frac{7}{16}$	$15\frac{7}{16}$	17		$23\frac{1}{2}$		25	15	19
		254T-256T			14									$28\frac{1}{2}$			20	
	HP-6B	143T-184T	$6\frac{3}{8}$	$6\frac{3}{16}$	$6\frac{3}{4}$	$7\frac{11}{16}$	$11\frac{3}{4}$	18	$13\frac{9}{16}$	$14\frac{7}{16}$	$12\frac{3}{4}$	$14\frac{3}{4}$	8	$23\frac{5}{8}$	6	21	$12\frac{3}{4}$	$16\frac{3}{4}$
		213T-215T			$12\frac{1}{2}$									$29\frac{3}{8}$			$18\frac{1}{2}$	
	HP-6C	143T-215T	4	5	9	$6\frac{1}{2}$	$14\frac{13}{16}$	$17\frac{15}{16}$	$16\frac{7}{16}$	$17\frac{7}{16}$	$15\frac{7}{16}$	17	6	$23\frac{1}{2}$		25	15	19
		254T-256T			14									$28\frac{1}{2}$			20	
	HP-6E	184T-256T	$5\frac{3}{8}$	$5\frac{11}{16}$	13	$7\frac{3}{16}$	$17\frac{7}{16}$	$19\frac{3}{16}$	$19\frac{3}{8}$	$20\frac{9}{16}$	$18\frac{3}{16}$	19	8	$28\frac{7}{8}$		29	19	21
	HP-8B	143T-184T	$6\frac{3}{8}$	$6\frac{3}{16}$	$6\frac{3}{4}$	$7\frac{11}{16}$	$11\frac{3}{4}$	$19\frac{13}{16}$	$13\frac{9}{16}$	$14\frac{7}{16}$	$12\frac{3}{4}$	$14\frac{3}{4}$		$23\frac{5}{8}$	8	21	$12\frac{3}{4}$	$16\frac{3}{4}$
		213T-256T			$12\frac{1}{2}$									$29\frac{3}{8}$			$18\frac{1}{2}$	
X	HP-8D	182T-215T			9		$14\frac{13}{16}$	$19\frac{3}{4}$	$16\frac{7}{16}$	$17\frac{7}{16}$	$15\frac{7}{16}$	17		$25\frac{7}{8}$		25	15	19
		254T-286TS			14									$30\frac{7}{8}$			20	
	HP-8E	184T-256T	$5\frac{3}{8}$	$5\frac{11}{16}$	13	$7\frac{3}{16}$	$17\frac{7}{16}$	21	$19\frac{3}{8}$	$20\frac{9}{16}$	$18\frac{3}{16}$	19		$28\frac{7}{8}$		29	19	21
		284TS-324TS			$15\frac{1}{2}$									$31\frac{3}{8}$			$21\frac{1}{2}$	
	HP-10D	184T-215T	$6\frac{3}{8}$	$6\frac{3}{16}$	9	$7\frac{11}{16}$	$14\frac{13}{16}$	$21\frac{3}{4}$	$16\frac{7}{16}$	$17\frac{7}{16}$	$15\frac{7}{16}$	17		$25\frac{7}{8}$	10	25	15	19
		254T-286TS			14									$30\frac{7}{8}$			20	
	HP-10F	215T-256T	$7\frac{3}{8}$	$6\frac{11}{16}$	13	$8\frac{3}{16}$	$17\frac{7}{16}$	23	$19\frac{3}{8}$	$20\frac{9}{16}$	$18\frac{3}{16}$	19	10			29	19	21
		284TS-326TS			$15\frac{1}{2}$									$33\frac{3}{8}$			$21\frac{1}{2}$	
		364TS-365TS			22									$39\frac{7}{8}$			28	
	HP-12F	184T-256T			13									$30\frac{7}{8}$	12		19	
		284TS-326TS			$15\frac{1}{2}$									$33\frac{3}{8}$			$21\frac{1}{2}$	
		364TS-365TS			22									$39\frac{7}{8}$			28	

* COMPLETE MODEL NUMBER INCLUDES WHEEL DIA.

NOTES:
1. TEFLON SHAFT SEAL IS STANDARD.
2. MOTOR MAY EXTEND PAST END OF BASE.
3. FAN HOUSINGS ARE REVERSIBLE AND ROTATABLE IN 45° INCREMENTS.
4. IF AMCA "C" ADD 1/8 INCH TO DIMENSIONS "G" AND "CC".
5. SEE DRAWING A27338 FOR FLANGE DETAILS.
6. DISCHARGE FLANGE NOT AVAILABLE WITH DOWNBLAST DISCHARGE ON FOLLOWING MODELS: HP-8B, HP-10D, & HP-12F.

cincinnati fan 7697 SNIDER ROAD MASON, OHIO 45040	TOLERANCES: ANGLES: ± 1° FRACTIONS ±1/8 — ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	SUPERSEDES:	CERTIFIED DRAWING	TITLE HP BLOWERS, SERIES II, ARR. 4	A DRAWING NO. HP4	REV. 11

A 27338

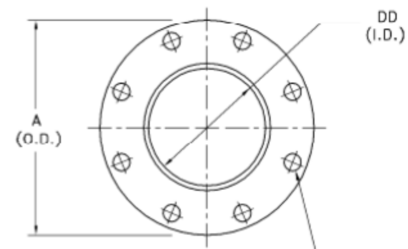


C-DIA. HOLES
D-NO. OF HOLES
BD-BOLT CIRCLE DIA.

INLET FLANGE

☐ OPTIONAL HOLE PATTERN:
FLANGE HOLES ON
MAJOR CENTERLINES

NOTES:
1. STANDARD HOLE PATTERN IS FOR FLANGE HOLES TO STRADDLE CENTERLINES.
2. DRILL PATTERNS SHOWN MATCH ANSI CLASS 150.
3. FLANGE THICKNESS IS NOT ANSI.



C-DIA. HOLES
D-NO. OF HOLES
BD-BOLT CIRCLE DIA.

DISCHARGE FLANGE

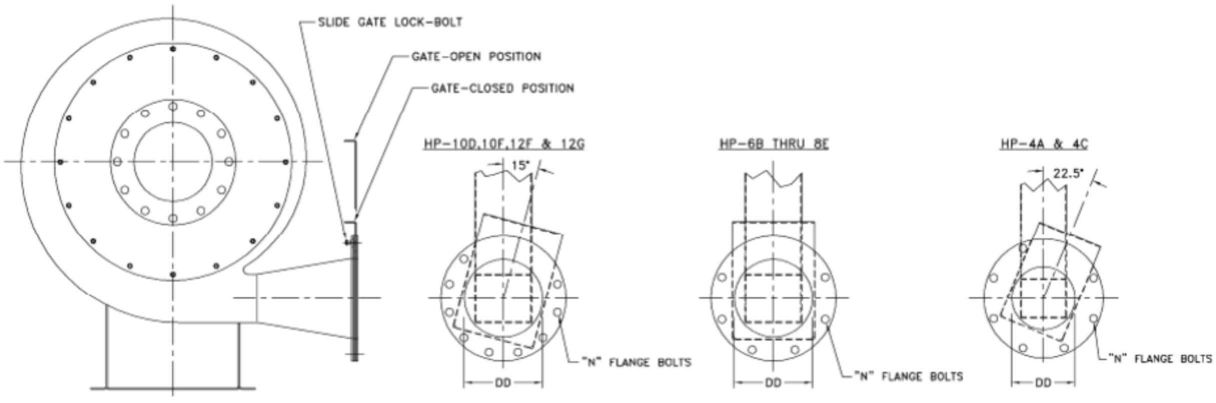
☐ OPTIONAL HOLE PATTERN:
FLANGE HOLES ON
MAJOR CENTERLINES

			DIMENSIONS				
	MODEL	INLET SIZE	AD O.D.	AA I.D.	BD B.C.	C DIA.	D
	HP-4A,4C,6C	6	11	6	9-1/2	7/8	8
X	HP-6B,6E,8B 8D,8E,10D	8	13-1/2	8	11-3/4	7/8	8
	HP-10F,12F	10	16	10	14-1/4	1	12
	HP-12G	14	21	14	18-3/4	1-1/8	12

			DIMENSIONS				
	MODEL	DISCHARGE SIZE	A O.D.	DD I.D.	BD B.C.	C DIA.	D
	HP-4A,4C	4	9	4	7-1/2	3/4	8
	HP-6B,6C,6E	6	11	6	9-1/2	7/8	8
X	HP-8B,8D,8E	8	13-1/2	8	11-3/4	7/8	8
	HP-10D,10F	10	16	10	14-1/4	1	12
	HP-12F,12G	12	19	12	17	1	12

cincinnati fan 7697 SNIDER ROAD MASON, OHIO 45040	TOLERANCES: ANGLES: ± 1° FRACTIONS ± 1/8 ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	SUPERSEDES:	CERTIFIED DRAWING	TITLE SERIES II HP INLET AND DISCHARGE FLANGES	A	DRAWING NO. 27338	REV. 6

A 17134



	MODEL	DD	N
	HP-4A,4C	4	7
	HP-6B,6C,6E	6	6
X	HP-8B,8D,8E	8	6
	HP-10D,10F	10	9
	HP-12F,12G	12	9

NO.	DESCRIPTION	DATE	INITIALS
4	WAS B-SIZE. ADD (12G) TO CHART, ETC.	12/2/04	SPC
3	CHANGED FLANGE BOLTS LOCATIONS TO STRADDLE C.L.'S	10/5/00	JJM
2	CHANGED HP-4A & 4C TO ON MAJOR CENTERLINES	6/13/94	TJP
1	ADDED NO. FLANGE BOLTS & LOCATIONS; REVISED TITLE	10/21/93	TJP

REVISIONS

SUPERSEDES:

SIMILAR TO:

CERTIFIED

TOLERANCES:
FRACTIONS ±1/8
ANGLES: ± 1°
DECIMALS: X.XXX = ±0.005
X.XX = ±0.060
X.X = ±0.120
ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

MATERIAL:

SCALE: FULL IN CAD
DATE: 11/20/91
DR. BY: TJP
CHK. BY:

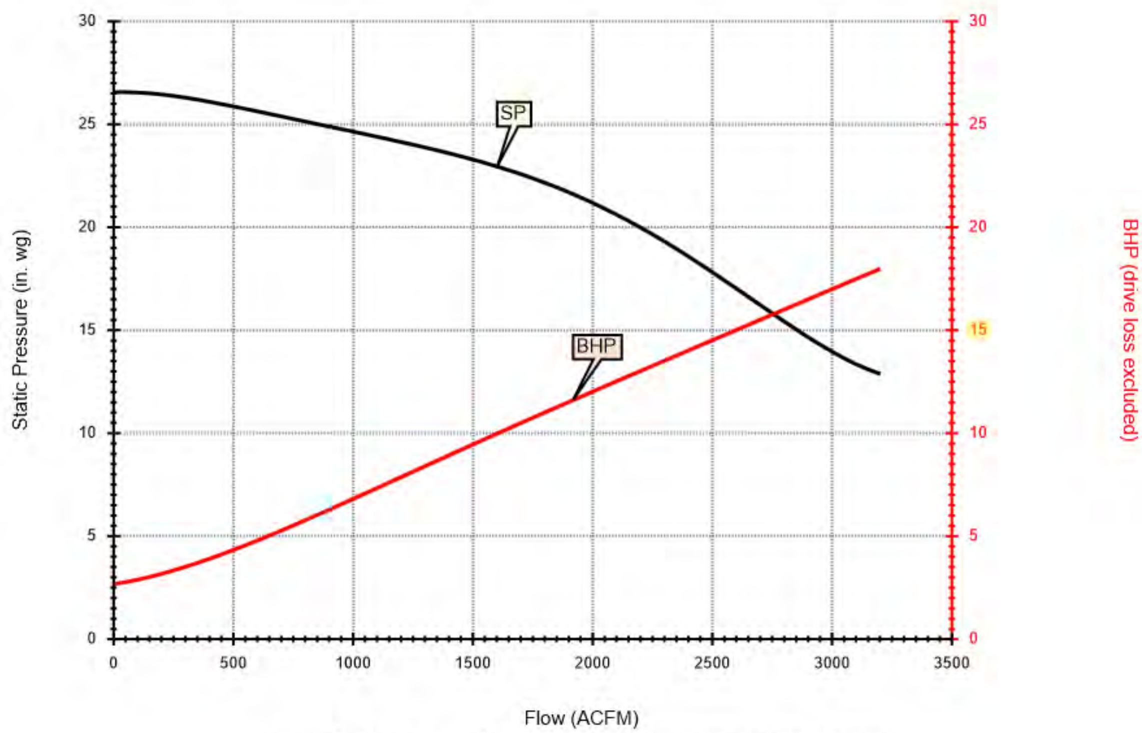
ASSEMBLY

cincinnati fan
7697 SNIDER ROAD MASON, OHIO 45040

TITLE DISCHARGE SLIDE GATE DAMPER FOR HP (SERIES II) FANS

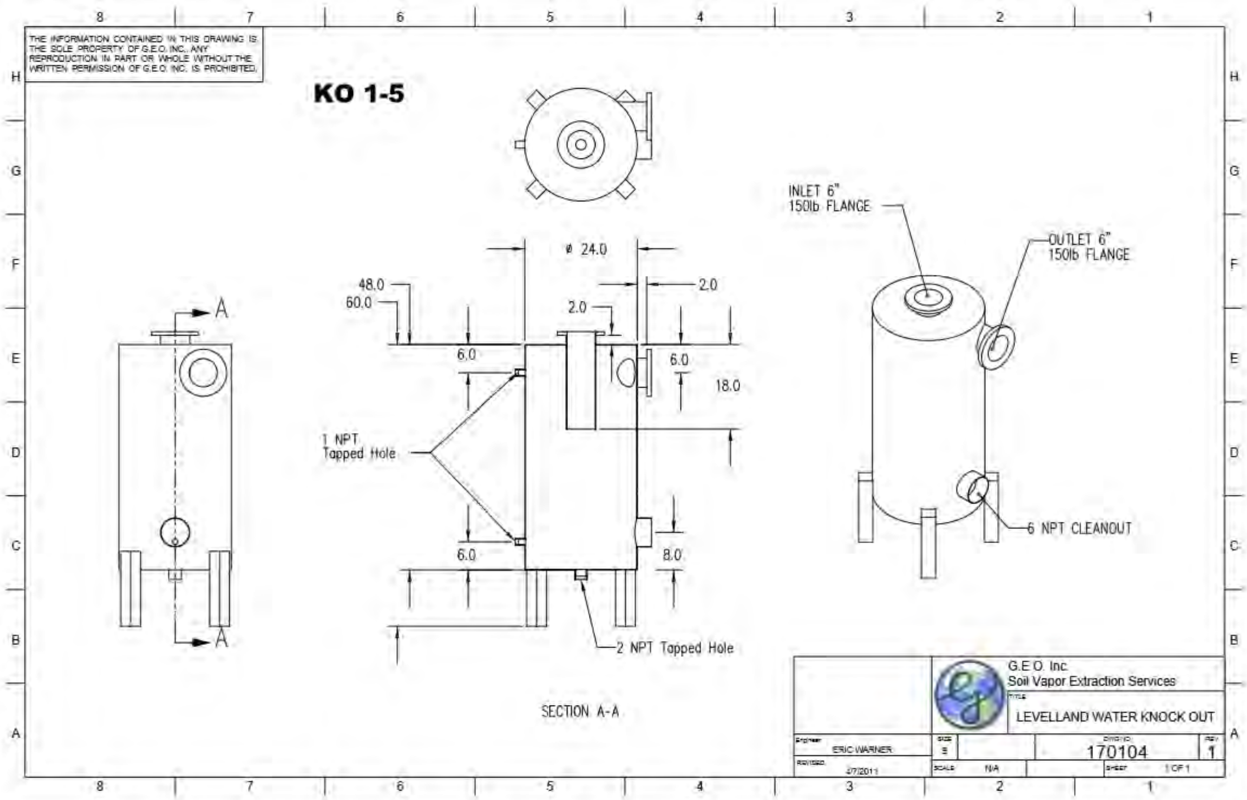
A | DRAWING NO. 17134 | SHEET 1 of 1 | REV. 4

Cincinnati Fan Model HP-8D19 with 19 CR Wheel (Full Width) @ 3,500 RPM
0.075lb./ft.³ Density



Cincinnati Fan Selector - Copyright © 1998-2009 by Cincinnati Fan and Ventilator Co. All Rights Reserved.

Appendix 9. Water Knock Out Tank


THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF G.E.O. INC. ANY REPRODUCTION IN PART OR WHOLE WITHOUT THE WRITTEN PERMISSION OF G.E.O. INC. IS PROHIBITED.
KO 1-5
INLET 6" 150lb FLANGE
OUTLET 6" 150lb FLANGE
ø 24.0
48.0
60.0
2.0
6.0
18.0
8.0
1 NPT Tapped Hole
2 NPT Tapped Hole
6 NPT CLEANOUT
SECTION A-A
G.E.O. Inc.
Soil Vapor Extraction Services
LEVELLAND WATER KNOCK OUT
ERIC WARNER
170104
1
N/A
1 OF 1

Appendix 10. Lakos High Performance liquid-solids separation systems

F2

High performance liquid-solids separation systems

JPX

Exclusive internal acceleration creates maximum performance to achieve maximum protection of fluid handling systems from unwanted solids (see illustration inside for details). Its advanced & patented design, building upon the performance LAKOS is known for, now also removes 50% more of the finer solids (< 40 microns), resulting in higher aggregate solids removal. Independently tested. Proven superior for today's demanding filtration requirements. For settlable solids only.

- Trouble-free operation & advanced purging/solids-handling concepts keep fluids clean and concentrate separated solids
- No screens or filter elements to clean or replace; no messy servicing routines
- No backwashing; zero fluid loss options
- Low & steady pressure loss
- Choice of profiles to accommodate space/piping limitations
- Rigid couplings for fast and easy internal access
- Swirlex internal accelerating slots for optimum solids-removal performance; patented; optional annular transfer ring for handling larger solids/fibrous materials
- Vortube for enhanced solids separation/collection; patented
- Grooved inlet/outlet connections for easy installation; optional flanged connections also available
- In-line inlet/outlet configuration for simplified piping (low-profile models only)
- Unishell construction for easy installation
- Optional material construction & ASME code

Flow range:
4 - 12,750 U.S. gpm
(1 - 2895 m^3/hr) per unit

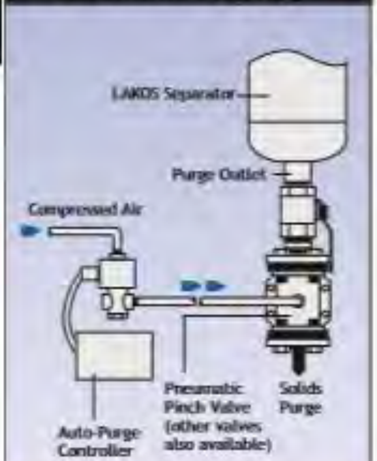
Maximum standard pressure rating:
150 psi (10.3 bar)

JPX Series includes inlet/outlet pressure gauges with petcock valves.

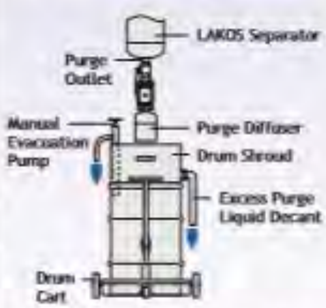
Also available with weld-on flanges. See page 3 for other details.

LAKOS
Liquid • Solids Separation Systems

Automatic Purging



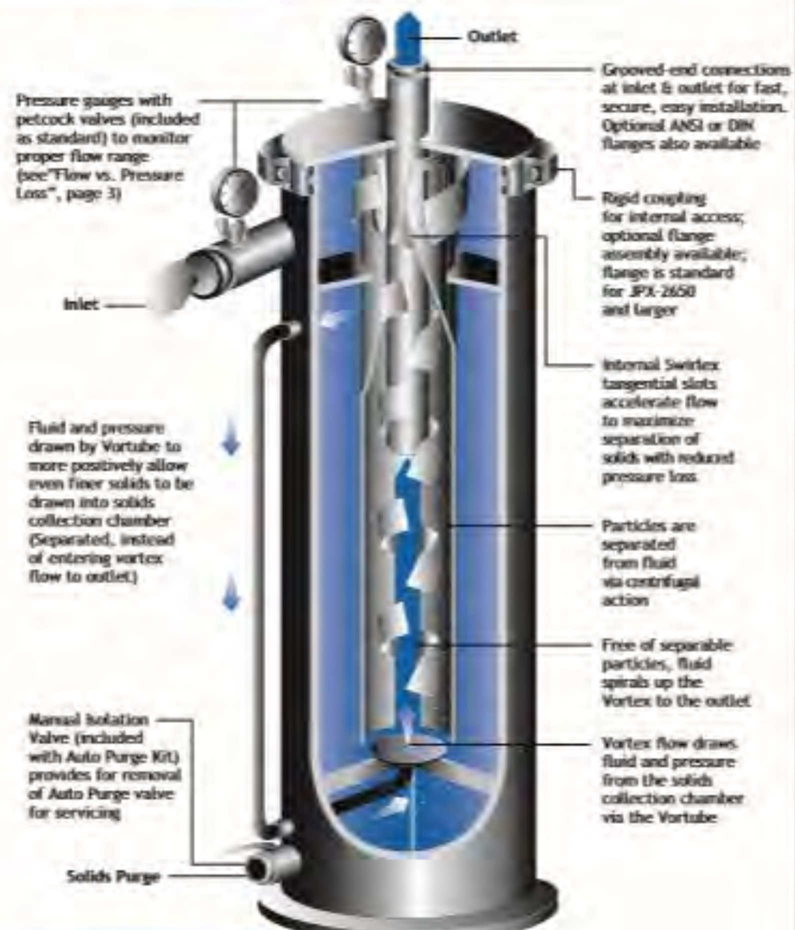
Solids Handling Options



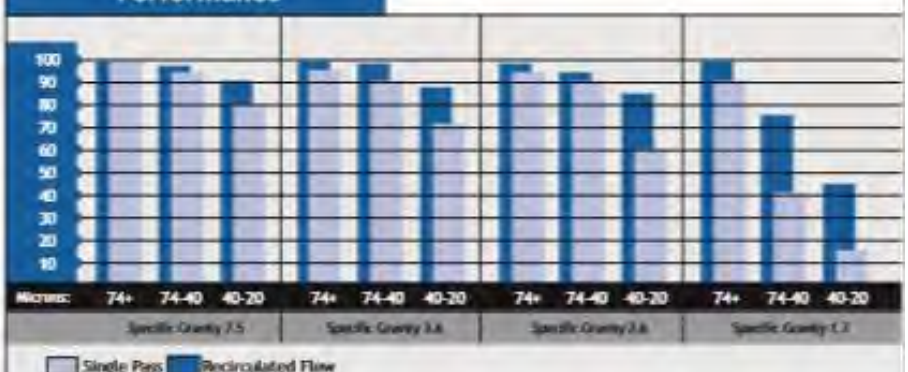
Systems also available with a tilt-style hopper.

Lakos Separators are manufactured and sold under one or more of the following U.S. Patents: 3,289,608; 3,512,651; 3,568,837; 3,701,425; 3,947,364; 3,963,073; 4,027,481; 4,120,795; 4,123,800; 4,140,638; 4,147,630; 4,148,735; 4,305,825; 4,555,333; 5,320,747; 5,338,341; 5,368,735; 5,425,876; 5,571,416; 5,578,203; 5,622,545; 5,653,874; 5,894,995; 6,090,276; 6,143,175; 6,167,960; 6,202,543; Des. 327,693; and corresponding foreign patents, including 600 12 329.4-08 (Germany) and EP 1 198 276 B1 (EU); other U.S. and foreign patents pending.

How It Works



Performance



Specifications

Model*	Flow Range U.S. gpm	Flow Range m³/hr	Inlet/Outlet Grooved Coupling**	Purge Size Male N.P.T.	Collection Chamber Capacity gal	Collection Chamber Capacity liters	Weight lbs.	Weight kg	Weight with Water lbs	Weight with Water kg
JPX-0004	4-10	1-2.5	1/2" NPT**	1"	0.09	0.3	22	10	25	11
JPX-0010	10-20	2.5-4.5	3/4" NPT**	1"	0.11	0.4	31	14	37	17
JPX-0016	16-30	4-7	1"	1"	0.15	0.6	40	18	51	23
JPX-0028	28-45	7-10	1-1/4"	1-1/2"	0.27	1.0	59	27	77	35
JPX-0038	38-65	9-15	1-1/2"	1-1/2"	0.4	1.5	85	39	115	52
JPX-0060	60-100	14-23	2"	1-1/2"	0.8	3.0	150	68	221	101
JPX-0085	85-145	19-33	2-1/2"	1-1/2"	0.8	3.0	194	88	278	126
JPX-0130	130-225	30-51	3"	1-1/2"	0.8	3.0	202	92	290	132
JPX-0200	200-325	45-74	4"	1-1/2"	1.6	6.1	327	149	507	231
JPX-0285-L JPX-0285-V	285-525	65-120	4"	1-1/2"	2.1 5.4	7.9 20.5	510 474	232 216	820 758	373 345
JPX-0450-L JPX-0450-V	450-825	102-187	6"	1-1/2"	2.8 6.7	10.6 25.4	738 697	336 317	1202 1132	546 515
JPX-0650-L JPX-0650-V	650-1200	150-275	6"	1-1/2"	4.3 10.4	16.3 39.4	979 898	427 408	1677 1554	740 706
JPX-1160-L JPX-1160-V	1160-2150	265-490	8"	1-1/2"	8.6 20.5	32.6 77.6	1391 1411	632 641	2716 2665	1235 1211
JPX-1850-L JPX-1850-V	1850-3400	420-775	10"	2"	15.0 31.5	56.8 119.2	1853 1937	842 880	3991 3951	1814 1796
JPX-2650-L JPX-2650-V	2650-4900	600-1115	12"	2"	23.5 51.1	89.0 193.4	3077 3254	1399 1479	6269 6287	2850 2858
JPX-4200-L JPX-4200-V	4200-7800	950-1775	16"	3"	52.2 99.3	197.6 375.9	5074 5574	2306 2534	11791 11944	5360 5430
JPX-6700-L JPX-6700-V	6700-12750	1520-2895	20"	3"	81.0 162.3	306.6 614.4	7808 8527	3549 3876	18660 18855	8482 8571

* Models ending with "L" are low profile; "V" for vertical profile

** Inlet/Outlet may also be specified with ANSI flanges or DIN flanges; JPX-0004 and JPX-0010 are standard male, N.P.T. (BSP or JIS threads available); other models also available with optional threading

Maximum pressure rating: 150 psi (10.3 bar); consult factory for higher pressure requirements

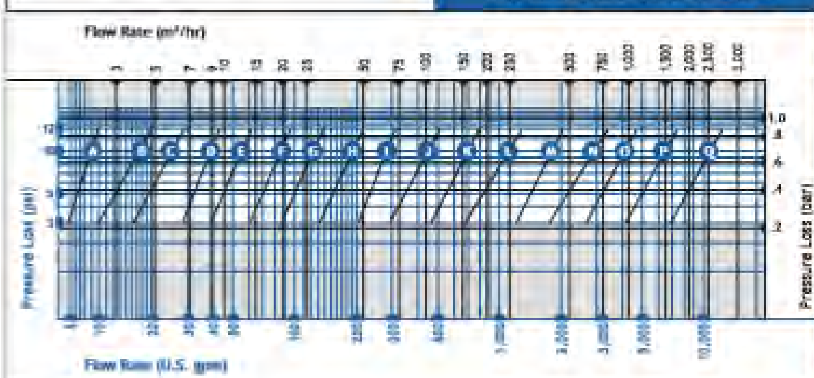
Pressure loss range: 3 - 12 psi (.2 - .8 bar)

Maximum particle size: JPX-0016 and smaller - .25 inch (6 mm); all other models - .375 inch (9 mm)

Material (standard carbon steel): Domes - A 285C/516 GR70, .25 inch (6 mm) minimum thickness. Other parts - A-36, A-538 or other quality grade, .25 inch (6 mm) minimum thickness; special coatings and other materials available - consult factory

Paint coating: Acrylic urethane, spray-on royal blue

Flow vs. Pressure Loss



- A JPX-0004
- B JPX-0010
- C JPX-0016
- D JPX-0028
- E JPX-0038
- F JPX-0060
- G JPX-0085
- H JPX-0130
- I JPX-0200
- J JPX-0285
- K JPX-0450
- L JPX-0650
- M JPX-1160
- N JPX-1850
- O JPX-2650
- P JPX-4200
- Q JPX-6700

Installation Instructions

Maintenance/Purging

1. LAKOS JPX Separators must be purged regularly to remove the separated solids from the temporary collection chamber.

2. All purge hardware should be installed prior to any elbows or turns in the purge piping. Avoid "uphill" purging, which can clog purge piping and hinder effective solids evacuation.

3. For best results, purging is recommended while the LAKOS Separator is in operation, utilizing system pressure to enhance solids evacuation.

4. LAKOS provides a full selection of rugged, durable automatic purging and solids-handling systems to optimize the performance of your separation system.
CAUTION: Economy-type valves typically fail prematurely in the harsh/abrasive environment of solids purging.

5. Be sure to install a manual isolation valve (provided with LAKOS AutoPurge kits) prior to the automatic valve (available from LAKOS at additional cost) in order to facilitate servicing of the automatic valve without system shutdown.

6. Internal Access Feature:
To inspect or clear an unusual blockage in the upper or lower chamber, interrupt flow to the LAKOS Separator and relieve pressure (via the purge valve). For upper chamber access, remove the spool from the separator's outlet (or, if no spool has been installed, disconnect and remove piping on the outlet) to make space for removing the separator's upper section. Disconnect the rigid coupling or flange and carefully pull out the separator's vortex outlet assembly. Inspect or clean the inlet chamber as necessary. Lubricate the coupling's seal before re-installing the vortex assembly. Re-install piping and gaskets as necessary.

1. LAKOS JPX Separators are shipped on skids or in wooden crates. Support legs (when applicable) are detached for shipping. A large ring, located on the unit's side or upper chamber, is provided for hoisting as necessary.

2. A suitable foundation is necessary to accommodate the LAKOS Separator's weight including liquid (see data, page 3). Anchor bolts are recommended in the base of the legs (low profile) or skirt (vertical profile).

3. Prior to installation, inspect the inlet/outlet/purge connections for foreign objects incurred during shipping/storage.

4. Inlet/outlet pipe connections to the LAKOS Separator should be a straight run of at least five pipe diameters to minimize turbulence and enhance performance.

5. Proper purge hardware and/or solids-handling equipment is required to flush separated solids from the separator (see details, page 2).

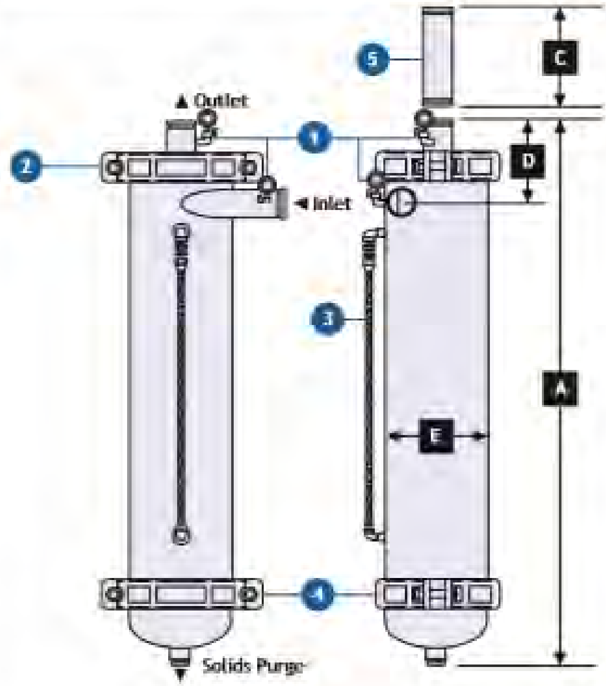
6. All LAKOS Separators operate within a prescribed flow range (see data, page 3). Pipe size is not a factor in model selection. Use appropriate hardware to match the inlet/outlet size. Grooved couplings are not included with the separator. Optional flanged connections are available upon request.

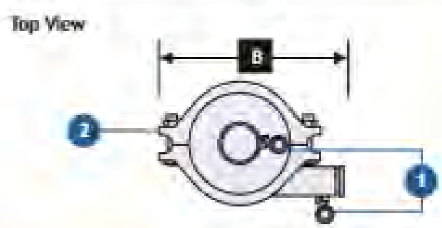
7. Inlet pressure to the LAKOS Separator must be at least equal to or greater than the anticipated pressure loss through the separator (see pressure loss chart, page 3) plus 15 psi (1 bar) plus whatever downstream pressure is required.

8. Pressure gauges (provided as standard, with petcock valves) are required at both the inlet and outlet of the separator in order to monitor pressure loss and proper system flow (see "Flow vs. Pressure Loss" chart, page 3). If separator operates with an open discharge, a valve should be installed to create a back pressure of at least 5 psi (.3 bar).

9. Winterizing is important if the LAKOS Separator is to remain idle in freezing temperatures. Drain liquid as necessary to avoid expansion of water to ice and related damages.

Low Flow Rates





1. **Inlet/Outlet Pressure Gauges with Petcock Valves**

   Included as standard; install at both inlet and outlet for proper flow verification (see "Flow vs. Pressure Loss", page 3)

2. **Rigid Coupling Connection**

   Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; 2-piece; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer or White Nitrile

3. **Vortube**

   Piping provided by LAKOS

4. **Rigid Coupling Access**

   Provides full access to collection chamber area for inspection/serving; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer or White Nitrile

5. **Connection Spool**

   When removed, provides space for accessing internals of separator via rigid coupling. Not included with separator, available separately

Note: These units may also be specified with optional support skirt or legs. Consult factory for details.

Dimensions

Model	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
JPX-0004	28-1/8	714	7 1/4	184	6	152	6-3/8	162	3-1/2	89
JPX-0010	32-3/8	882	7 1/2	191	7	178	6-3/8	162	4	102
JPX-0016	33-7/8	860	8 3/4	222	7	178	7	178	4-1/2	114
JPX-0028	33-1/2	851	10 7/8	276	7	178	7	178	5-9/16	141
JPX-0038	37-3/8	949	12 3/8	314	8	203	7	178	6-5/8	168
JPX-0060	46-1/2	1181	15 3/4	400	11	279	7-1/4	184	8-5/8	219
JPX-0085	53-7/8	1368	15 3/4	400	15	381	8	203	8-5/8	219
JPX-0130	55-7/8	1419	15 3/4	400	16	406	7-7/8	200	8-5/8	219

Dimensions for reference only. Consult factory when pre-plumbing.

Page 5

Low Profile

High Flow Rates

Inlet/Outlet Pressure Gauges with Petcock Valves 1

Included as standard; install at both inlet and outlet for proper flow verification (see "Flow vs. Pressure Loss", page 3)

Inspection/Drain Plug 2

1/2-inch NPT female; provides access to upper chamber for inspection of slot area; also allows for draining the upper chamber if necessary

Rigid Coupling Connection 3

Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer, Black Neoprene or White Nitrile; model JPX-2650 and larger uses flange

Lifting Ring 4

For installation purposes

Connection Spool 5

When removed, provides space for accessing internal of separator via rigid coupling. Not included with separator, available separately

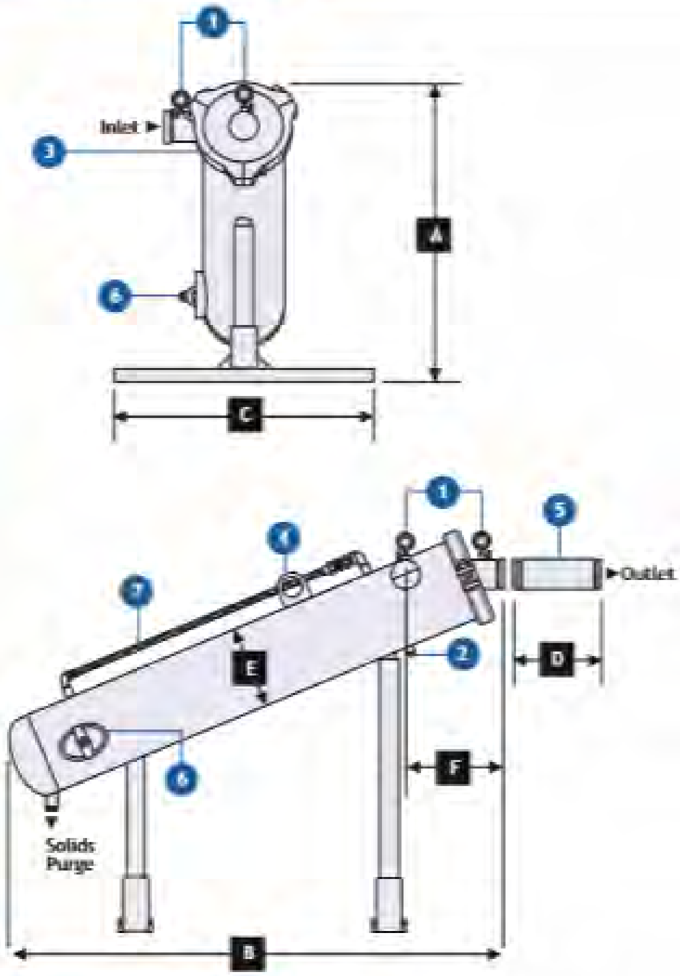
Hand-Hole Inspection Port 6

Provides access to collection chamber; Neoprene gasket

Vortube 7

Piping provided by LAKOS

Dimensions for reference only. Consult factory when pre-plumbing.



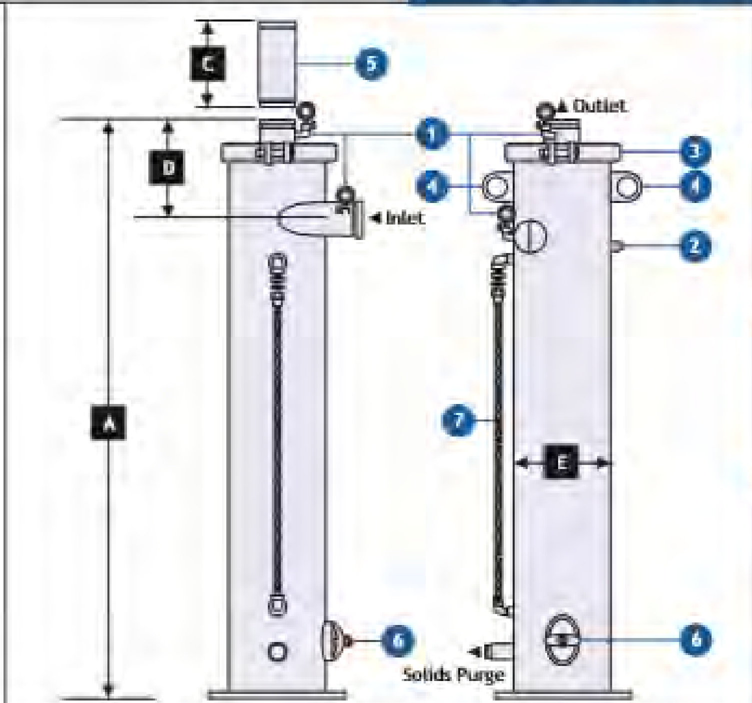
Dimensions

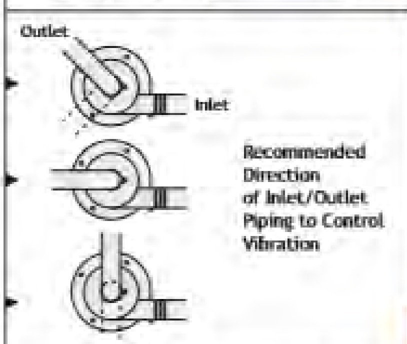
Model	A in	A mm	B in	B mm	C in	C mm	D in	D mm	E in	E mm	F in	F mm
JPX-0200-L	71-7/16	1815	64-5/8	1641	40	1016	21	533	10-3/4	273	12-3/8	314
JPX-0285-L	77-1/4	1962	78	1981	40	1016	21	534	12-3/4	324	15	381
JPX-0450-L	84-1/4	2140	94-1/2	2400	40	1016	24	610	14	356	16	406
JPX-0650-L	90-3/4	2305	105-3/4	2686	40	1016	24	610	16	406	18	457
JPX-1160-L	104-1/4	2648	126-3/4	3219	40	1016	30	762	20	508	22	559
JPX-1850-L	113-1/2	2883	141-5/8	3597	40	1016	33	838	24	610	26	660
JPX-2650-L	123-1/2	3137	158	4013	60	1524	38	965	28	711	30	762
JPX-4200-L	147	3734	198	5029	60	1524	51	1295	36	914	38-1/2	978
JPX-6700-L	166-1/4	4223	234	5944	60	1524	60	1524	42	1067	44	1118

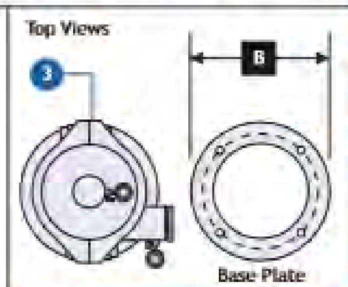
Page 6

High Flow Rates

Vertical Profile







1. **Inlet/Outlet Pressure Gauges with Petcock Valves**

   Included as standard; install at both inlet and outlet for proper flow verification (see "Flow vs. Pressure Loss", page 3)

2. **Inspection/Drain Plug**

   1/2-inch NPT female; provides access to upper chamber for inspection of slot area; also allows for draining the upper chamber if necessary

3. **Rigid Coupling Connection**

   Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer, Black Neoprene or White Nitrile; model JPX-2650 and larger uses flange

4. **Lifting Rings**

   For installation purposes

5. **Connection Spool**

   When removed, provides space for accessing internal of separator via rigid coupling. Not included with separator, available separately

6. **Hand-Hole Inspection Port**

   Provides access to collection chamber; Neoprene gasket

7. **Vortube**

   Piping provided by LAKOS

Dimensions for reference only. Consult factory when pre-plumbing.

Dimensions

Model	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
JPX-0200-V	72	1829	16	406	21	533	10-9/16	268	10-3/4	273
JPX-0285-V	78	1930	18	457	21	534	13	330	12-3/4	324
JPX-0450-V	93-1/2	2375	20	508	24	610	12-1/2	318	14	356
JPX-0650-V	105-3/4	2686	22	559	24	610	14-7/8	378	16	406
JPX-1160-V	126-3/8	3210	26	660	30	762	17-3/4	451	20	508
JPX-1850-V	139-3/4	3351	32	813	33	838	20	508	24	610
JPX-2650-V	155-1/2	3950	36	914	38	965	23	584	28	711
JPX-4200-V	194-1/2	4940	44	1118	51	1295	29	734	36	914
JPX-6700-V	229	5817	48	1219	60	1524	32-3/4	832	42	1067

Limited Warranty

All products manufactured and marketed by this corporation are warranted to be free of defects in material or workmanship for a period of at least one year from date of delivery. Extended warranty coverage applies as follows:

All LAKOS Separators: Five year warranty

All other components: 12 months from date of installation; if installed 6 months or more after ship date, warranty shall be a maximum of 18 months from ship date.

If a fault develops, notify us, giving a complete description of the alleged malfunction. Include the model number(s), date of delivery and operating conditions of subject product(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instruction and returned materials authorization. Upon prepaid receipt of subject product(s) at the instructed destination, we will then either repair or replace such product(s), at our option, and if determined to be a warranted defect, we will perform such necessary product repairs or replace such product(s) at our expense.

This limited warranty does not cover any products, damages or injuries resulting from misuse, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or costs resulting from any such defective product(s).

1365 North Clovis Avenue
Fresno, California 93727 USA
Telephone: (559) 255-1601
FAX: (559) 255-8093
Toll Free: (800) 344-7205
(USA, Mexico & Canada)
Internet: www.lakos.com
E-mail: info@lakos.com

Sample Specifications

Separator Type & Performance
The removal of specific unwanted solids from a pumped/pressurized fluid flow system shall be accomplished with a centrifugal-action vortex separator. Solids removal efficiency is principally predicated on the difference in specific gravity between the liquid and the solids. Fluid viscosity must be 100 SSU or less.

In a single pass through the separator, given solids with a specific gravity of 2.6 and water at 1.0, performance is predictably 98% of 74 microns and larger. Additionally, particles finer in size, heavier by specific gravity and some lighter by specific gravity will also be removed, resulting in an appreciable aggregate removal of particles (up to 75%) as fine as 5 microns.

In a recirculating system, 98% performance is predictable to as fine as 40 microns (given solids with a specific gravity of 2.6), with correspondingly higher aggregate performance percentages (up to 90%) of solids as fine as 5 microns.

Performance Requirement
Separator performance must be supported by published independent test results from a recognized and identified test agency. Standard test protocol of upstream injection, downstream capture and separator purge recovery is allowed with 50-200 mesh particles to enable effective, repeatable results. Single-pass test performance must not be less than 95% removal. Model tested must be of the same flow design series as specified unit.

Separator Design & Function
A tangential inlet and mutually tangential internal accelerating slots shall be employed to promote the proper velocity necessary for the removal of the separable solids. The internal accelerating slots shall be spiral-cut (Swirlex) for optimum flow transfer, laminar action and particle influence into the separation barrel. The separator's internal vortex shall allow this process to occur without wear to the accelerating slots.

Separated particle matter shall spiral downward along the perimeter of the inner separation barrel, in a manner that does not promote wear of the separation barrel, and into the solids collection chamber, located below the vortex deflector shield.

To insure maximum particle removal characteristics, the separator shall incorporate a vortex-induced pressure relief line (Vortube), drawing specific pressure and fluid from the separator's solids collection chamber via the outlet flow's vortex/venturi effect, thereby efficiently encouraging solids into the collection chamber without requiring a continuous underflow or excessive system fluid loss.

System fluid shall exit the separator by following the center vortex in the separation barrel and spiral upward to the separator outlet.

Purging (as a specified option)
Evacuation of separated solids shall be accomplished automatically, employing a dedicated solid-state controller in a NEMA 4 housing. Available for worldwide single-phase voltages of 24VAC to 250VAC. Programming options to include a purge frequency range of every 60 seconds to every 23 hours, 59 minutes. Purge duration options range from 2 seconds to 59 minutes, 59 seconds. Non-volatile memory. Meets CSA requirements. This controller shall automatically operate one of the following techniques:
Motorized Ball Valve – A full-port, electrically-actuated valve shall be programmed at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. Valve body shall be bronze (optional stainless steel also available). Valve ball shall be stainless steel with teflon seal. Valve size: ______
Pneumatic Pinch Valve – Compressed air shall be provided to actuate this full-port valve at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. System shall include a pressure regulator for proper modulation of air pressure. Valve liner is natural gum rubber (other liner materials available). Valve size: ______
Pneumatic Ball Valve – A fail-safe valve shall be programmed at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. A spring control shall provide that this full port valve closes in the event that compressed air or electricity is interrupted. Valve body shall be bronze (optional stainless steel also available). Valve ball shall be stainless steel with teflon seal. Valve size: ______
Purge Liquid Concentrator – A dual pneumatic pinch-valve package shall be employed in order to effectively minimize the fluid loss when purging. The controller shall provide proper sequential valve actuation at appropriate intervals and duration in order to efficiently and regularly evacuate solids from the separator's collection chamber. Liners for the pinch valves shall be natural gum rubber (optional, at extra cost: neoprene, butyl, buna-N and [illegible]) also may be specified. System shall also include a pressure regulator to modulate air pressure to the valves, a full-size sightglass for inspection of solids accumulation during operation and a manual isolation valve for servicing requirements. Valve size: ______

Solids Handling (as a specified option)
An appropriate solids collection device shall be provided with the separator, suitable for capturing solids and returning all excess purged liquid to system use. Size and type of collection device shall be determined according to the application requirements, selected from the following options (or custom, as specified):
Solids Collection Drum – In conjunction with the appropriate automatic purge valve, this package shall be employed to capture and concentrate separated solids (up to 90% solids by volume) from the separator directly into a standard 55-gallon drum, returning excess purged liquid to system use via an integral decant line on the drum shroud. Solids collection capacity: 12,700 cubic inches (208 liters). Package includes two drums, two shroud clamps, two drum carts for transporting the drums and a manual liquid evacuation pump. Recommended option: A Purge Diffuser shall be installed on the discharge of the automatic purge valve in order to reduce the velocity of the purge flow and enhance the settling of solids within the drum.
Solids Collection Hopper – In conjunction with the appropriate automatic purge valve, a one cubic-yard (764 liter) hopper shall be employed to capture and concentrate separated solids (up to 90% by volume) from the separator, returning excess purged liquid to system use via an integral decant line installed directly on the hopper. The hopper shall feature a manually-actuated tilting mechanism for dumping accumulated solids as necessary. Recommended option: A Purge Diffuser shall be installed on the discharge of the automatic purge valve in order to reduce the velocity of the purge flow and enhance the settling of solids within the hopper.

Systemization (as a specified option)
The separator and its accessories shall be packaged as a complete system, with all components from a single source. In addition to the equipment already specified, the system shall also include an appropriate support frame for positioning the separator accessibly and effectively for solids purging/handling. Connection spool shall be provided. If the specified purging technique is a pneumatic pinch valve, a spare pinch valve liner shall also be included.

Separator Details
A. Inlet & outlet shall be grooved couplings, size: ______
B. Purge outlet shall be threaded with screw-on flange, size: ______
C. The separator shall operate within a flow range of: ______
D. Pressure loss shall be between 3-12 psi (.2 - .8 bar), remaining constant, varying only when the flow rate changes.
E. Included shall be pressure gauges with petcock valves for both the inlet and outlet of the separator.

Separator Construction
The separator shall feature the following access capabilities for either inspection or the removal of unusual solids/debris:
- An upper chamber full-size grooved coupling (flange for JPX-2600 and larger), allowing complete access to the inlet chamber, acceleration slots and internal separation barrel
- A hand-hole port at the collection chamber, with neoprene gasket (low flow rate models to feature full-size coupling at collection chamber)
- An inspection port, located at the lowest point of the upper chamber

The separator shall be of welded construction with A-36, A-53B or equivalent quality carbon steel, minimum thickness of .25 inches (6mm). Maximum operating pressure shall be 150 psi (10.3 bar), unless specified otherwise.

Paint coating shall be oil-based enamel, spray-on, royal blue.

As a specified option only: The separator shall be constructed in accordance with the standards of the American Society of Mechanical Engineers (ASME), Section VIII, Division 1 for pressure vessels. Certification shall be confirmed with the registered "U-stamp" on the body of the separator. Weld-on flanges also available.

Separator Source & Identification
The separator shall be manufactured by LAKOS Filtration Systems, a division of Claude Laval Corporation in Fresno, California USA. Specific model designation is: __________

Printed on recycled paper LS-635G (Rev. 02/06)

LAKOS
Liquid • Solids Separation Systems

GEO Environmental Remediation Company

Appendix 11. Roots Universal Blower

GEO Environmental Remediation Company

B-1

GE Energy

Roots* Universal RAI*, URAI-DSL, URAI-G* & Metric Series

Installation Operation & Maintenance Manual

imagination at work

Contents

Do these things to get the most from your Roots® Blower

- ☐ Check shipment for damage. If found, file claim with carrier and notify GE.
- ☐ Unpack shipment carefully, and check contents against Packing List. Notify GE if a shortage appears.
- ☐ Store in a clean, dry location until ready for installation. Lift by methods discussed under INSTALLATION to avoid straining or distorting the equipment. Keep covers on all openings. Protect against weather and corrosion if outdoor storage is necessary.
- ☐ Read OPERATING LIMITATIONS and INSTALLATION sections in this manual and plan the complete installation.
- ☐ Provide for adequate safeguards against accidents to persons working on or near the equipment during both installation and operation. See SAFETY PRECAUTIONS.
- ☐ Install all equipment correctly. Foundation design must be adequate and piping carefully done. Use recommended accessories for operating protection.
- ☐ **Make sure both driving and driven equipment is correctly lubricated before start-up. See LUBRICATION.**
- ☐ Read starting check points under OPERATION. Run equipment briefly to check for installation errors and make corrections. Follow with a trial run under normal operating conditions.
- ☐ In event of trouble during installation or operation, do not attempt repairs of GE furnished equipment. Notify GE, giving all nameplate information plus an outline of operating conditions and a description of the trouble. Unauthorized attempts at equipment repair may void GE warranty.
- ☐ Units out of warranty may be repaired or adjusted by the owner. Good inspection and maintenance practices should reduce the need for repairs.

NOTE: Information in this manual is correct as of the date of publication. GE reserves the right to make design or material changes without notice, and without obligation to make similar changes on equipment of prior manufacture.

For your nearest GE Office, dial our Customer Service Hot Line toll free; 1 877 363 7668 or direct 832-590-2600.

Roots products are sold subject to the current General Terms of Sale, ES104 and Warranty Policy WP-5020. Copies are available upon request.
Contact your local GE Office or GE Customer Service Hot Line 1-877-363-7668 or direct 281-966-4700.

Safety Precautions

It is important that all personnel observe safety precautions to minimize the chances of injury. Among many considerations, the following should be particularly noted:

- Blower casing and associated piping or accessories may become hot enough to cause major skin burns on contact.
- Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. Do not reach into any opening in the blower while it is operating, or while subject to accidental starting. Protect external moving parts with adequate guards.
- Disconnect power before doing any work, and avoid bypassing or rendering inoperative any safety or protective devices.
- If blower is operated with piping disconnected, place a strong coarse screen over the inlet and avoid standing in the discharge air stream.

CAUTION: Never cover the blower inlet with your hand or other part of body.

- Stay clear of the blast from pressure relief valves and the suction area of vacuum relief valves.
- Use proper care and good procedures in handling, lifting, installing, operating and maintaining the equipment.
- Casing pressure must not exceed 25 PSI (1725 mbar) gauge. Do not pressurize vented cavities from an external source, nor restrict the vents without first consulting Roots.
- Do not use air blowers on explosive or hazardous gases.
- Other potential hazards to safety may also be associated with operation of this equipment. All personnel working in or passing through the area should be trained to exercise adequate general safety precautions.

Operating Limitations

A Roots blower or exhauster must be operated within certain approved limiting conditions to enable continued satisfactory performance. Warranty is contingent on such operation.

Maximum limits for pressure, temperature and speed are specified in Table 1 for various models & sizes of blowers and exhausters. These limits apply to all units of normal construction, when operated under standard atmospheric conditions. Be sure to arrange connections or taps for instruments, thermometers and pressure or vacuum gauges at or near the inlet and discharge connections of the unit. These, along with a tachometer, will enable periodic checks of operating conditions.

PRESSURE – The pressure rise, between inlet and discharge, must not exceed the figure listed for the specific unit frame size concerned. Also, in any system where the unit inlet is at a positive pressure above atmosphere a maximum case rating of 25 PSI gauge (1725 mbar) should not be exceeded without first consulting Roots. Never should the maximum allowable differential pressure be exceeded.

On vacuum service, with the discharge to atmospheric pressure, the inlet suction or vacuum must not be greater than values listed for the specific frame size.

TEMPERATURE – Blower & exhauster frame sizes are approved only for installations where the following temperature limitations can be maintained in service:

- Measured temperature rise must not exceed listed values when the inlet is at ambient temperature. Ambient is considered as the general temperature of the space around the unit. This is not outdoor temperature unless the unit is installed outdoors.
- If inlet temperature is higher than ambient, the listed allowable temperature rise values must be reduced by 2/3 of the difference between the actual measured inlet temperature and the ambient temperature.
- The average of the inlet and discharge temperature must not exceed 250°F. (121°C).
- The ambient temperature of the space the blower/motor is installed in should not be higher than 120°F (48.8°C).

SPEED – These blowers & exhausters may be operated at speeds up to the maximum listed for the various frame sizes. They may be direct coupled to suitable constant speed drivers if pressure/temperature conditions are also within limits. At low speeds, excessive temperature rise may be a limiting factor.

Special Note: The listed maximum allowable temperature rise for any particular blower & exhauster may occur well before its maximum pressure or vacuum rating is reached. This may occur at high altitude, low vacuum or at very low speed. The units' operating limit is always determined by the maximum rating reached first. It can be any one of the three: Pressure, Temperature or Speed.

Installation

Roots blowers & exhausters are treated after factory assembly to protect against normal atmospheric corrosion. The maximum period of internal protection is considered to be one year under average conditions, if shipping plugs and seals are not removed. Protection against chemical or salt water atmosphere is not provided. Avoid opening the unit until ready to start installation, as corrosion protection will be quickly lost due to evaporation.

If there is to be an extended period between installation and start up, the following steps should be taken to ensure corrosion protection.

- ☐ Coat internals of cylinder, gearbox and drive end bearing reservoir with Nox-Rust VCI-10 or equivalent. Repeat once a year or as conditions may require. Nox-Rust VCI-10 is petroleum soluble and does not have to be removed before lubricating. It may be obtained from Daubert Chemical Co., 2000 Spring Rd., Oak Brook, Ill. 60521.
- ☐ Paint shaft extension, inlet and discharge flanges, and all other exposed surfaces with Nox-Rust X-110 or equivalent.
- ☐ Seal inlet, discharge, and vent openings. It is not recommended that the unit be set in place, piped to the system, and allowed to remain idle for extended periods. If any part is left open to the atmosphere, the Nox-Rust VCI-10 vapor will escape and lose its effectiveness.
- ☐ Protect units from excessive vibration during storage.
- ☐ Rotate shaft three or four revolutions every two weeks.
- ☐ Prior to start up, remove flange covers on both inlet and discharge and inspect internals to insure absence of rust. Check all internal clearances. Also, at this time, remove gearbox and drive end bearing cover and inspect gear teeth and bearings for rust.

Because of the completely enclosed unit design, location of the installation is generally not a critical matter. A clean, dry and protected indoor location is preferred. However, an outdoor location will normally give satisfactory service. Important requirements are that the correct grade of lubricating oil be provided for expected operating temperatures, and that the unit be located so that routine checking and servicing can be performed conveniently. Proper care in locating driver and accessory equipment must also be considered.

Supervision of the installation by a GE Service Engineer is not usually required for these units. Workmen with experience in installing light to medium weight machinery should be able to produce satisfactory results. Handling of the equipment needs to be accomplished with care, and in compliance with safe practices. Unit mounting must be solid, without strain or twist, and air piping must be clean, accurately aligned and properly connected.

Bare-shaft Units: Two methods are used to handle a unit without base. One is to use lifting lugs bolted into the top of the unit headplates. Test them first for tightness and fractures by tapping with a hammer. In lifting, keep the direction of cable pull on these bolts as nearly vertical as possible. If lifting lugs are not available, lifting slings may be passed under the cylinder adjacent to the headplates. Either method prevents strain on the extended drive shaft.

Packaged Units: When the unit is furnished mounted on a baseplate, with or without a driver, use of lifting slings passing under the base flanges is required. Arrange these slings so that no strains are placed on the unit casing or mounting feet, or on any mounted accessory equipment. DO NOT use the lifting lugs in the top of the unit headplates.

Before starting the installation, remove plugs, covers or seals from unit inlet and discharge connections and inspect the interior completely for foreign material. If cleaning is required, finish by washing the cylinder, headplates and impeller thoroughly with an appropriate solvent. Turn the drive shaft by hand to make sure that the impellers turn freely at all points. Anti-rust compound on the connection flanges and drive shaft extension may also be removed at this time with the same solvent. Cover the flanges until ready to connect piping.

Mounting

Care will pay dividends when arranging the unit mounting. This is especially true when the unit is a "bare-shaft" unit furnished without a baseplate. The convenient procedure may be to mount such a unit directly on a floor or small concrete pad, but this generally produces the least satisfactory results. It definitely causes the most problems in leveling and alignment and may result in a "Soft Foot" condition. Correct soft foot before operation to avoid unnecessary loading on the casing and bearings. Direct use of building structural framing members is not recommended.

For blowers without a base, it is recommended that a well anchored and carefully leveled steel or cast iron mounting plate be provided. The plate should be at least 1 inch (25 mm) thick, with its top surface machined flat, and large enough to provide leveling areas at one side and one end after the unit is mounted. It should have properly sized studs or tapped holes located to match the unit foot drilling. Proper use of a high quality machinist's level is necessary for adequate installation.

With the mounting plate in place and leveled, set the unit on it without bolting and check for rocking. If it is not solid, determine the total thickness of shims required under one foot to stop rocking. Place half of this under each of the diagonally-opposite short feet, and tighten the mounting studs or screws. Rotate the drive shaft to make sure the impellers turn freely. If the unit is to be direct coupled to a driving motor, consider the height of the motor shaft and the necessity for it to be aligned very accurately with the unit shaft. Best unit arrangement is directly bolted to the mounting plate while the driver is on shims of at least 1/8 inch (3mm) thickness. This allows adjustment of motor position in final shaft alignment by varying the shim thickness.

Aligning

When unit and driver are factory mounted on a common baseplate, the assembly will have been properly aligned and is to be treated as a unit for leveling purposes. Satisfactory installation can be obtained by setting the baseplate on a concrete slab that is rigid and free of vibration, and leveling the top of the base carefully in two directions so that it is free of twist. The slab must be provided with suitable anchor bolts. The use of grouting under and partly inside the leveled and shimmed base is recommended.

It is possible for a base-mounted assembly to become twisted during shipment, thus disturbing the original alignment. For this reason, make the following checks after the base has been leveled and bolted down. Disconnect the drive and rotate the unit shaft by hand. It should turn freely at all points. Loosen the unit foot hold-down screws and determine whether all feet are evenly in contact with the base. If not, insert shims as required and again check for free impeller rotation. Finally, if unit is direct coupled to the driver, check shaft and coupling alignment carefully and make any necessary corrections.

In planning the installation, and before setting the unit, consider how piping arrangements are dictated by the unit design and assembly. Drive shaft rotation must be established accordingly and is indicated by an arrow near the shaft.

Typical arrangement on vertical units has the drive shaft at the top with counterclockwise rotation and discharge to the left. Horizontal units are typically arranged with the drive shaft at the left with counterclockwise rotation and discharge down. See Figure 4 for other various unit arrangements and possible conversions.

When a unit is DIRECT COUPLED to its driver, the driver RPM must be selected or governed so as not to exceed the maximum speed rating of the unit. Refer to Table 1 for allowable speeds of various unit sizes.

A flexible type coupling should always be used to connect the driver and unit shafts.

When direct coupling a motor or engine to a blower you must insure there is sufficient gap between the coupling halves and the element to prevent thrust loading the blower bearings. When a motor, engine or blower is operated the shafts may expand axially. If the coupling is installed in such a manner that there is not enough room for expansion the blower shaft can be forced back into the blower and cause the impeller to contact the gear end headplate resulting in damage to the blower. The two shafts must be in as near perfect alignment in all directions as possible, and the gap must be established with the motor armature on its electrical center if end-play exists. Coupling manufacturer's recommendations for maximum misalignment, although acceptable for the coupling, are normally too large to achieve smooth operation and maximum life of the blower.

The following requirements of a good installation are recommended. When selecting a coupling to be fitted to the blower shaft GE recommends a taper lock style coupling to insure proper contact with the blower shaft. If the coupling must have a straight bore the coupling halves must be fitted to the two shafts with a line to line thru .001" interference fit. Coupling halves must be warmed up per coupling manufacturer's recommendations. Maximum deviation in offset alignment of the shafts should not exceed .005" (.13 mm) total indicator reading, taken on the two coupling hubs. Maximum deviation from parallel of the inside coupling faces should not exceed .001" (.03 mm) when checked at six points around the coupling.

When a unit is BELT DRIVEN, the proper selection of sheave diameters will result in the required unit speed. When selecting a sheave to be fitted to the blower shaft GE recommends a taper lock style sheave to insure proper contact with the blower shaft. This flexibility can lead to operating temperature problems caused by unit speed being too low. Make sure the drive speed selected is within the allowable range for the specific unit size, as specified under Table 1.

Belt drive arrangements usually employ two or more V-belts running in grooved sheaves. Installation of the driver is less critical than for direct coupling, but its shaft must be level and parallel with the unit shaft. **The driver should be mounted on the inlet side of a vertical unit (horizontal piping) and on the side nearest to the shaft on a horizontal unit. SEE PAGE 6 - Acceptable Blower Drive Arrangement Options.** The driver must also be mounted on an adjustable base to permit installing, adjusting and removing the V-belts. To position the driver correctly, both sheaves need to be mounted on their shafts and the nominal shaft center distance known for the belt lengths to be used.

CAUTION: Drive couplings and sheaves (pulleys) should have an interference fit to the shaft of the blower (set screw types of attachment generally do not provide reliable service.) It is recommended that the drive coupling or sheave used have a taper lock style bushing which is properly sized to provide the correct interference fit required. Drive couplings, that require heating to fit on the blower shaft, should be installed per coupling manufacturer recommendations. A drive coupling or sheave should not be forced on to the shaft of the blower as this could affect internal clearances resulting in damage to the blower.

Engine drive applications often require special consideration to drive coupling selection to avoid harmful torsional vibrations. These vibrations may lead to blower damage if not dampened adequately. It is often necessary to install a fly-wheel and/or a torsionally soft elastic element coupling based on the engine manufacturer recommendations.

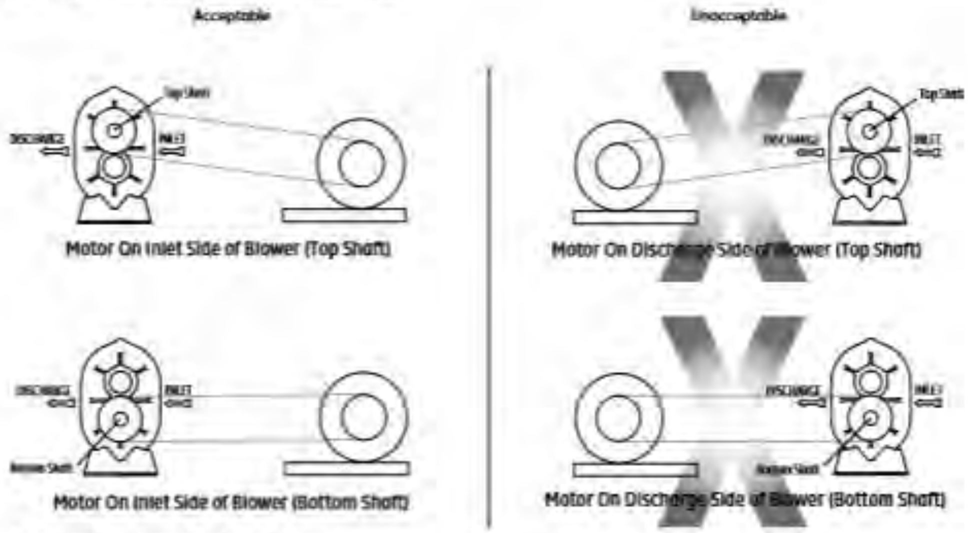
The driver sheave should also be mounted as close to its bearing as possible, and again should fit the shaft correctly. Position the driver on its adjustable base so that 2/3 of the total movement is available in the direction away from the unit, and mount the assembly so that the face of the sheave is accurately in line with the unit sheave. This position minimizes belt wear, and allows sufficient adjustment for both installing and tightening the belts. After belts are installed, adjust their tension in accordance with the manufacturer's instructions. However, only enough tension should be applied to prevent slippage when the unit is operating under load. Excessive tightening can lead to early bearing concerns or shaft breakage.

Before operating the drive under power to check initial belt tension, first remove covers from the unit connections. Make sure the interior is still clean, then rotate the shaft by hand. Place a coarse screen over the inlet connection to prevent anything being drawn into the unit while it is operating, and avoid standing in line with the discharge opening. Put oil in the sumps per instructions under **LUBRICATION**.

Piping

Before connecting piping, remove any remaining anti-rust compound from unit connections. Clean pipe should be no smaller than unit connections. In addition, make sure it is free of scale, cuttings, weld beads, or foreign material of any kind. To further guard against damage to the unit, especially when an inlet filter is not used, install a substantial screen of 16 mesh backed with hardware cloth at or near the inlet connections. Make provisions to clean this screen of collected debris after a few hours of operation. It should be removed when its usefulness has ended, as the wire will eventually deteriorate and small pieces going into the unit may cause serious damage.

Fig. 1 - Acceptable Blower Drive Arrangement Options



Above are suggested locations for available accessories.

Pipe flanges or male threads must meet the unit connections accurately and squarely. DO NOT attempt to correct misalignment by springing or cramping the pipe. In most cases this will distort the unit casing and cause impeller rubbing. In severe cases it can prevent operation or result in a broken drive shaft. For similar reasons, piping should be supported near the unit to eliminate dead weight strains. Also, if pipe expansion is likely to occur from temperature change, installation of flexible connectors or expansion joints is advisable.

Figure 3 represents an installation with all accessory items that might be required under various operating conditions. Inlet piping should be completely free of valves or other restrictions. When a shut-off valve can not be avoided, make sure a full size vacuum relief is installed nearest the unit inlet. This will protect against unit overload caused by accidental closing of the shut-off valve.

Need for an inlet silencer will depend on unit speed and pressure, as well as sound-level requirements in the general surroundings. An inlet filter is recommended, especially in dusty or sandy locations. A discharge silencer is also normally suggested, even though WHISPAIR* units operate at generally lower noise levels than conventional rotary blowers. Specific recommendations on silencing can be obtained from your local GE distributor.

Discharge piping requires a pressure relief valve, and should include a manual unloading valve to permit starting the unit under no-load conditions. Reliable pressure/vacuum gauges and good thermometers at both inlet and discharge are recommended to allow making the important checks on unit operating conditions. The back-pressure regulator shown in Figure 3 is useful mainly when volume demands vary while the unit operates at constant output. If demand is constant, but somewhat lower than the unit output, excess may be blown off through the manual unloading valve.

In multiple unit installations where two or more units operate with a common header, use of check valves is mandatory. These should be of a direct acting or free swinging type, with one valve located in each line between the unit and header. Properly installed, they will protect against damage from reverse rotation caused by air and material back-flow through an idle unit.

After piping is completed, and before applying power, rotate the drive shaft by hand again. If it does not move with uniform freedom, look for uneven mounting, piping strain, excessive belt tension or coupling misalignment.

DO NOT operate the unit at this time unless it has been lubricated per instructions.

Technical Supplement for URAI-G Gas Blowers

Technical Supplement for 32, 33, 36, 42, 45, 47, 53, 56, 59, 65, 68, 615 Universal RAI-G blowers

Precaution: URAI-G blowers: Care must be used when opening the head plate seal vent chamber plugs (43) as some gas will escape-if it is a pressure system, or the atmospheric air will leak into the blower if the system is under vacuum. There is a possibility of some gas leakage through the mechanical seals. This leakage on the gear end will escape through the gear box vent, and on the drive end, through the grease release fittings. If the gas leakage is undesirable, each seal chamber must be purged with an inert gas through one purge gas hole (43) per seal. There are two plugged purge gas holes (1/8 NPT) provided per seal. The purge gas pressure must be maintained one PSI above the discharge gas pressure. Also, there exists a possibility of gear end oil and drive end grease leakage into the gas stream.

Roots Universal RAI-G rotary positive gas blowers are a design extension of the basic Roots Universal RAI blower model. URAI-G blower uses (4) mechanical seals in place of the standard inboard lip seals to minimize gas leakage into the atmosphere.

These units are intended for gases which are compatible with cast iron case material, steel shafts, 300/400 series stainless steel and carbon seal components, viton o-rings and the oil/grease lubricants. If there are any questions regarding application or operation of this gas blower, please contact factory.

A simple but very effective lubrication system is employed on the drive shaft end bearings. Hydraulic pressure relief fittings are provided to vent any excess grease, preventing pressure build-up on the seals. A restriction plug and metering orifice prevent loss of lubricant from initial surges in lubricant pressure but permit venting excess lubricant under steadily rising pressures.

Using a pressure gun, slowly force new lubricant into each drive end bearing housing until traces of clean grease comes out of the relief fitting. The use of an electric or pneumatic grease gun could force the grease in too rapidly and thus invert the seals and should not be used.

Gear end bearings, gears and oil seals are lubricated by the action of the timing gears which dip into the main oil sumps causing oil to splash directly on gears and into bearings and seals. A drain port is provided below each bearing to prevent an excessive amount of oil in the bearings. Seals located inboard of the bearings in each headplate effectively retain oil within the sumps. Any small weepage that may occur should the seals wear passes into a cavity in each vented headplate and is drained downward.

Proper lubrication is usually the most important single consideration in obtaining maximum service life and satisfactory operation from the unit. Unless operating conditions are severe, a weekly check of oil level and necessary addition of lubricant should be sufficient.

During the first week of operation, check the oil levels in the oil sumps about once a day, and watch for leaks. Replenish as necessary. Thereafter, an occasional check should be sufficient.

More frequent oil service may be necessary if the blower is operated in a very dusty location.

Lubrication

Due to sludge build-up and seal leakage problems, GE recommendation is DO NOT USE Mobil SHC synthetic oils in Roots blowers.

Proper lubrication is usually the most important single consideration in obtaining maximum service life and satisfactory operation from the unit.

URAI Air and Gas gear end bearing lubrication/oil with splash lubrication on the gear end only (Drive end grease lubricated).

- The specified and recommended oil is Roots Synthetic Oil of correct viscosity per Table 2, page 16.
- To fill the gearbox, remove the breather plug (25) and the oil overflow plug (21) - see page 15. Fill the reservoir up to the overflow hole. **DO NOT OVERFILL.** Place the breather and the overflow plug back into their respective holes.
- The lubrication should be changed after initial 100 hours of operation.
- Proper service intervals of the oil thereafter are based on the discharge air temperature of the blower. Please refer to the information below to "How to properly determine the oil service intervals" shown on this page.
- Unless operating conditions are quite severe, a weekly check of the oil level and necessary addition of lubricant should be sufficient. During the first week of operation, check the oillevels in the oil sumps about once a day, and watch for leaks. Replenish as necessary.
- If you choose to use another oil other than the specified and recommended ROOTS Synthetic, use a good grade of industrial type non-detergent, rust inhibiting, anti-foaming oil and of correct viscosity per Table 2, page 16.
- GE does NOT recommend the use of automotive type lubricants, as they are not formulated with the properties mentioned above.

Roots URAI-DSL blowers with splash lubrication/oil on each end. No grease.

- The specified and recommended oil is Roots Synthetic Oil of correct viscosity per Table 2, page 16.
- The lubrication should be changed after initial 100 hours of operation.
- The proper oil level should be half way or middle of the sight gauge when the blower is not operating. **DO NOT OVERFILL OIL SUMP/S** as damage to the blower may occur.

- The oil level should not fall below the middle of the site gauge when the blower is idle.
- The lubrication/oil level may rise or fall in the gauge during operation to an extent depending somewhat on oil temperature and blower speed.Proper service intervals of the oil thereafter are based on the discharge air temperature of the blower. Please refer to the information below to "How to properly determine the oil service intervals" shown on this page.
- Unless operating conditions are quite severe, a weekly check of the oil level and necessary addition of lubricant should be sufficient. During the first week of operation, check the oil levels in the oil sumps about once a day, and watch for leaks. Replenish as necessary.
- If you choose to use another oil other than the specified and recommended Roots Synthetic Oil, use a good grade of **industrial type** non-detergent, rust inhibiting, anti-foaming oil and of correct viscosity per Table 2, page 16.
- Roots does **NOT** recommend the use of automotive type lubricants, as they are not formulated with the properties mentioned above.

How to properly determine the oil service intervals.

Normal life expectancy of the specified and recommended Roots Synthetic Oil is approximately 6000 hours with an oil temperature of 180°F (82°C) or less. As the oil temperature increases by increments of 15°F (8°C), the oil life is reduced by half for each 15°F (8°C) increase. Example: Oil temperatures of 195°F (90.5°C) will produce a life expectancy reduced by half or 3000 hours oil service life.

Normal life expectancy of petroleum based oils is about 2000 hours with an oil temperature of about 180°F (82°C). As the oil temperature increases by increments of 15°F (8°C), the life is reduced by half for each 15°F (8°C) increase. Example: Oil temperatures of 195°F (90.5°C) will produce life expectancy reduced by half or 1000 hours oil service life.

NOTE: To estimate oil temperature, multiply the discharge temperature of the blower by 0.80. Example: If the discharge air temperature of the blower is 200° F, it is estimated that the oil temperature is 160° F

For Units with grease lubricated drive end bearings.

URAI AIR (Non GAS) blower grease specifications.

- When servicing drive end bearings of a AIR (Non Gas) blower, use the specified and recommended Shell Darina SD 2 NLGI #2 product code 5067628.
- For grease lubricated drive end blowers see page 16, table 4, regarding specified greasing intervals.
- Lithium based greases are not compatible with the specified and recommended Shell Darina SD 2 grease used when assembling the blower. **Lithium based grease is not approved for any ROOTS blowers.**
- Table 4 page 16 has been prepared as a general greasing schedule guide based on average operating conditions. More frequent intervals may be necessary depending on the grease operating temperature and unusual circumstances.

URAI-G blower grease specifications.

- When servicing drive end bearings of a URAI-G blower, use the specified NLGI #2 premium grade aluminum complex[1] grease, GE P/N T20019001. Lithium based greases are not compatible with the specified and recommended Roots Synthetic Grease used when assembling a GAS blower. **Lithium based grease is not approved for any Roots blowers.**
- The lubricants selected must be compatible with the gas.

[1]Roots Synthetic Oil is superior in performance to petroleum based products. It has high oxidation stability, excellent corrosion protection, extremely high film strength and low coefficient of friction. Typical oil change intervals are increased 2-3 times over petroleum based lubricants. Also, Roots Synthetic Oil is 100% compatible with petroleum based oils. Simply drain the oil in the blower and refill the reservoirs with Roots Synthetic Oil to maintain optimum performance of your Roots blower.

Operation

Before operating a blower under power for the first time, recheck the unit and the installation thoroughly to reduce the likelihood of avoidable troubles. Use the following procedure check list as a guide, but consider any other special conditions in the installation.

- ☐ Be certain that no bolts, tools, rags, or debris have been left in the blower air chamber or piping.
- ☐ If an outdoor intake without filter is used, be sure the opening is located so it cannot pick up dirt and is protected by a strong screen or grille. Use of the temporary protective screen as described under INSTALLATION is strongly recommended.
- ☐ Recheck blower leveling, drive alignment and tightness of all mounting bolts if installation is not recent. If belt drive is used, adjust belt tension correctly.
- ☐ Turn drive shaft by hand to make sure impellers still rotate without bumping or rubbing at any point.
- ☐ Ensure oil levels in the main oil sumps are correct.
- ☐ Check lubrication of driver. If it is an electric motor, be sure that power is available and that electrical overload devices are installed and workable.
- ☐ Open the manual unloading valve in the discharge air line. If a valve is in the inlet piping, be sure it is open.
- ☐ Bump blower a few revolutions with driver to check that direction of rotation agrees with arrow near blower shaft, and that both coast freely to a stop.

After the preceding points are cleared, blower is ready for trial operation under "no-load" conditions. The following procedure is suggested to cover this initial operation test period.

a. Start blower, let it accelerate to full speed, then shut off. Listen for knocking sounds, both with power on and as speed slows down.

b. After blower comes to a complete stop, repeat above, but let blower run 2 or 3 minutes. Check for noises, such as knocking sounds.

c. After blower comes to a complete stop, operate blower for about 10 minutes unloaded. Check oil levels. Observe cylinder and headplate surfaces for development of hot spots such as burned paint, indicating impeller rubs. Be aware of any noticeable increase in vibration.

Assuming that all trials have been satisfactory, or that necessary corrections have been made, the blower should now have a final check run of at least one hour under normal operating conditions. After blower is restarted, gradually close the discharge unloading valve to apply working pressure. At this point it is recommended that a pressure gauge or manometer be connected into the discharge line if not already provided, and that thermometers be in both inlet and discharge lines. Readings from these instruments will show whether pressure or temperature ratings of the blower are being exceeded.

During the final run, check operating conditions frequently and observe the oil levels at reasonable intervals. If excessive noise or local heating develops, shut down immediately and determine the cause. If either pressure rise or temperature rise across the blower exceeds the limit specified in this manual, shut down and investigate conditions in the piping system. Refer to the TROUBLESHOOTING CHECKLIST for suggestions on various problems that may appear.

The blower should now be ready for continuous duty operation at full load. During the first few days make periodic checks to determine whether all conditions remain steady, or at least acceptable. This may be particularly important if the blower is supplying air to a process system where conditions can vary. At the first opportunity, stop the blower and clean the temporary inlet protective screen. If no appreciable amount of debris has collected, the screen may be removed. See comments under INSTALLATION. At this same time, verify leveling, coupling alignment or belt tension, and mounting bolt tightness.

Should operating experience prove that blower capacity is a little too high for the actual air requirements, a small excess may be blown off continuously through the manual unloading or vent valve. Never rely on the pressure relief valve as an automatic vent. Such use may cause the discharge pressure to become excessive, and can also result in unsafe operation of the valve itself. If blower capacity appears to be too low, refer to the TROUBLESHOOTING CHECKLIST.

Vibration Assessment Criteria

With measurements taken at the bearing locations on the housings, see chart below for an appropriate assessment guide for rotary lobe blowers rigidly mounted on stiff foundations.

In general, blower vibration levels should be monitored on a regular basis and the vibration trend observed for progressive or sudden change in level. If such a change occurs, the cause should be determined through spectral analysis.

As shown on the chart below, the level of all pass vibration will determine the need to measure discrete frequency vibration levels and the action required.

All Pass Vibrations (in/sec)	Discrete Frequency Vibration (in/sec)	Action
0.45 or less	N/R	Acceptable
Greater than 0.45 but 1.0 or less	0.45 or less @ any frequency	Acceptable
	Greater than 0.45 @ any frequency	Investigate
Greater than 1.0	Less than 1.0	Investigate
	Greater than 1.0	Investigate

Troubleshooting Checklist

Trouble	Item	Possible Cause	Remedy
No flow	1	Speed too low	Check by tachometer and compare with published performance.
	2	Wrong rotation	Compare actual rotation with Figure 1, change driver if wrong.
	3	Obstruction in piping	Check piping, valves, silencer to assure open flow path.
Low capacity	4	Speed too low	See item 1, if belt drive, check for slippage and re-adjust tension.
	5	Excessive pressure rise	Check inlet vacuum and discharge pressure and compare with published performance.
	6	Obstruction in piping	See item 3.
	7	Excessive slip	Check inside of casing for worn or eroded surfaces causing excessive clearances.
Excessive power	8	Speed too high	Check speed and compare with published performance.
	9	Excessive pressure rise	See item 5
	10	Impeller rubbing	Inspect outside of cylinder for high temperature areas, then check for impeller contact at these points. Correct blower mounting, drive alignment.
	11	Scale , sludge, rust or product build up	Clean blower appropriately
Damage to bearings or gears	12	Inadequate lubrication	Check oil sump levels in gear and drive end headplates.
	13	Excessive lubrication	Check oil levels. If correct, drain and refill with clean oil of recommended grade.
	14	Excessive pressure rise	See item 5.
	15	Coupling misalignment	Check carefully. Re-align if questionable.
	16	Excessive belt tension	Re-adjust for correct tension
Vibration	17	Misalignment	See item 15
	18	Impellers rubbing	See item 10
	19	Worn bearings/gears	Check gear backlash and conditions of bearings and replace as indicated.
	20	Unbalanced or rubbing impeller	Scale or process material may build up on casing and impellers, or inside impellers. Remove build-up to restore original clearances and impeller balance.
	21	Driver or blower loose	Tighten mounting bolts securely.
	22	Piping resonances	Determine whether standing wave pressure pulsations are present in the piping.
	23	Scale/sludge build-ups	Clean out interior of impeller lobes to restore dynamic balance.
Driver stops, or will not start	24	Casing strain	Re-work piping alignment to remove excess strain
	25	Impeller stuck	Check for excessive hot spot on headplate or cylinder. See item 10. Look for defective shaft bearing and/or gear teeth.
	26	Scale, sludge, rust or product build-up	Clean blower appropriately
Excessive breather	27	Broken seal	Replace seals
Blow-by or excessive oil leakage to vent area	28	Defective O-ring	Replace seals and O-ring
Excessive oil leakage in vent area	29	Defective/plugged breather	Replace breather and monitor oil leakage
	30	Oil level too high	Check sump levels in gear and drive headplates
	31	Oil type or viscosity incorrect	Check oil to ensure it meets recommendations. Drain then fill with clean oil of recommended grade.
	32	Blower running hot	Check blower operating conditions to ensure they are within the operating limitations defined in this manual

Inspection & Maintenance : Roots Universal RAI series blowers

A good program of consistent inspection and maintenance is the most reliable method of minimizing repairs to a blower. A simple record of services and dates will help keep this work on a regular schedule. Basic service needs are:

- Lubrication
- Checking for hot spots
- Checking for increases or changes in vibration and noise
- Recording of operating pressures and temperatures

Above all, a blower must be operated within its specified rating limits, to obtain satisfactory service life.

A newly installed blower should be checked often during the first month of full-time operation. Attention there after may be less frequent assuming satisfactory performance. Lubrication is normally the most important consideration and weekly checks of lubricant levels in the gearbox and bearing reservoirs should be customary. Complete oil change schedules are discussed under **LUBRICATION.**

Driver lubrication practices should be in accordance with the manufacturer's instructions. If direct connected to the blower through a lubricated type coupling, the coupling should be checked and greased each time blower oil is changed. This will help reduce wear and prevent unnecessary vibration. In a belted drive system, check belt tension periodically and inspect for frayed or cracked belts.

In a new, and properly installed, unit there is no contact between the two impellers, or between the impellers and cylinder or headplates. Wear is confined to the bearings (which support and locate the shafts) the oil seals, and the timing gears. All are lubricated and wear should be minimal if clean oil of the correct grade is always used. Seals are subject to deterioration as well as wear, and may require replacement at varying periods.

Shaft bearings are designed for optimum life under average conditions with proper lubrication and are critical to the service life of the blower. Gradual bearing wear may allow a shaft position to change slightly, until rubbing develops between impeller and casing. This will cause spot heating, which can be detected by observing these surfaces. Sudden bearing failure is usually more serious. Since the shaft and impeller are no longer supported and properly located, extensive general damage to the blower casing and gears is likely to occur.

Oil seals should be considered expendable items, to be replaced whenever drainage from the headplate vent cavity becomes excessive or when the blower is disassembled for any reason. Some oil seal leakage may occur since an oil film under the lip is required for proper operation. Periodically leaked oil should be wiped off from surfaces. Minor seal leakage should not be considered as indicating seal replacement.

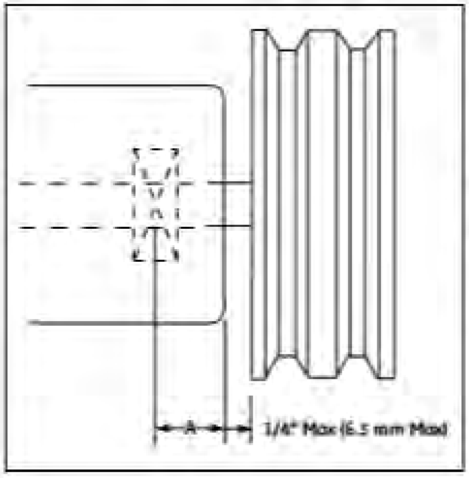
Timing gear wear, when correct lubrication is maintained, should be negligible. Gear teeth are cut to provide the correct amount of backlash, and gears correctly mounted on the shafts will accommodate a normal amount of tooth wear without permitting contact between lobes of the two impellers. However, too high an oil level will cause churning and excessive heating. This is indicated by unusually high temperature at the bottom of the gear housing. Consequent heating of the gears will result in loss of tooth-clearance , backlash and rapid wear of the gear teeth usually will develop. Continuation of this tooth wear will eventually produce impeller contacts (knocking), and from this point serious damage will be unavoidable if blower operation is continued. A similar situation can be produced suddenly by gear tooth fracture, which is usually brought on by sustained overloading or momentary shock loads.

Problems may also develop from causes other than internal parts failure. Operating clearances within a blower are only a few thousandths of an inch. This makes it possible for impeller interference or casing rubs to result from shifts in the blower mounting, or from changes in piping support. If this type of trouble is experienced, and the blower is found to be clean, try removing mounting strains. Loosen blower mounting bolts and reset the leveling and drive alignment. Then tighten mounting again, and make sure that all piping meets blower connections accurately and squarely Foreign materials in the blower will also cause trouble, which can only be cured by disconnecting the piping and thoroughly cleaning the blower interior.

A wide range of causes and solutions for operating troubles are covered in the **TROUBLE SHOOTING CHECKLIST.** The remedies suggested should be performed by qualified mechanics with a good background. Major repairs generally are to be considered beyond the scope of maintenance, and should be referred to an authorized GE distributor.

Warranty failures should not be repaired at all, unless specific approval has been obtained through GE before starting work. Unauthorized disassembly within the warranty period may void the warranty.

Figure 2 - Allowable Overhung Loads for V-belt Drives Roots Universal RAI/URAI-J Units



$$\text{Belt Pull lbs} = \frac{252100 \cdot \text{Motor HP}}{\text{Blower RPM} \cdot \text{Sheave Diameter in Inches}}$$

$$\text{Shaft Load (lb.in)} = \text{Belt Pull} \cdot (A" + ¼" + \frac{\text{Sheave Width (")}}{2})$$

Based on SF = 1.4 min. for belt drives. If higher SF belt is used, belt load should be increased proportionally and may exceed limits of the blower.

Frame Size	Dim "A"	Max. Allow. Shaft Load (lb.in)	Min Sheave Diameter
22, 24	0.61	150	4.00
32, 33, 36	0.80	400	5.00
42, 45, 47	1.02	750	5.00
53, 56, 59	1.13	1,325	6.00
65, 68, 615	1.36	2,250	8.00
76, 711, 718	1.16	3000	9.50

Note:

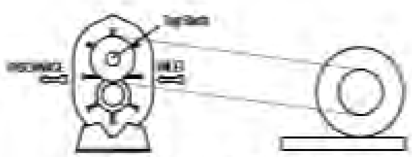
Arc of sheave belt contact on the smaller sheave not to be less than 170°.

Driver to be installed on the inlet side for vertical units, and on the drive shaft side for horizontal units.

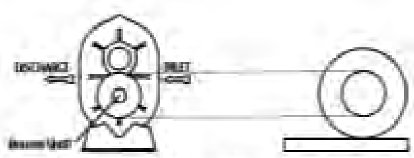
GE recommends the use of two or more 3VX, 5VX or 8VX belts and sheaves.

Acceptable Blower Drive Arrangement Options

Acceptable

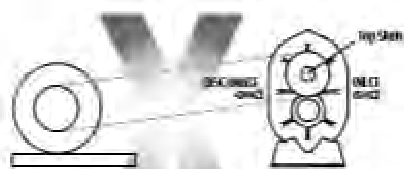


Motor On Inlet Side of Blower (Top Shaft)



Motor On Inlet Side of Blower (Bottom Shaft)

Unacceptable

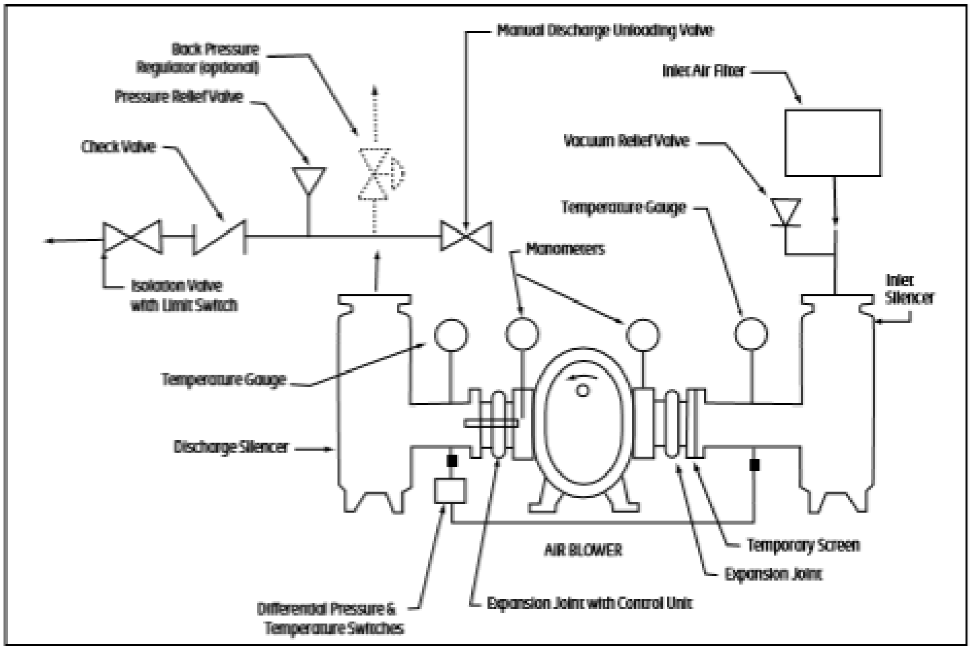


Motor On Discharge Side of Blower (Top Shaft)

Motor On Discharge Side of Blower (Bottom Shaft)

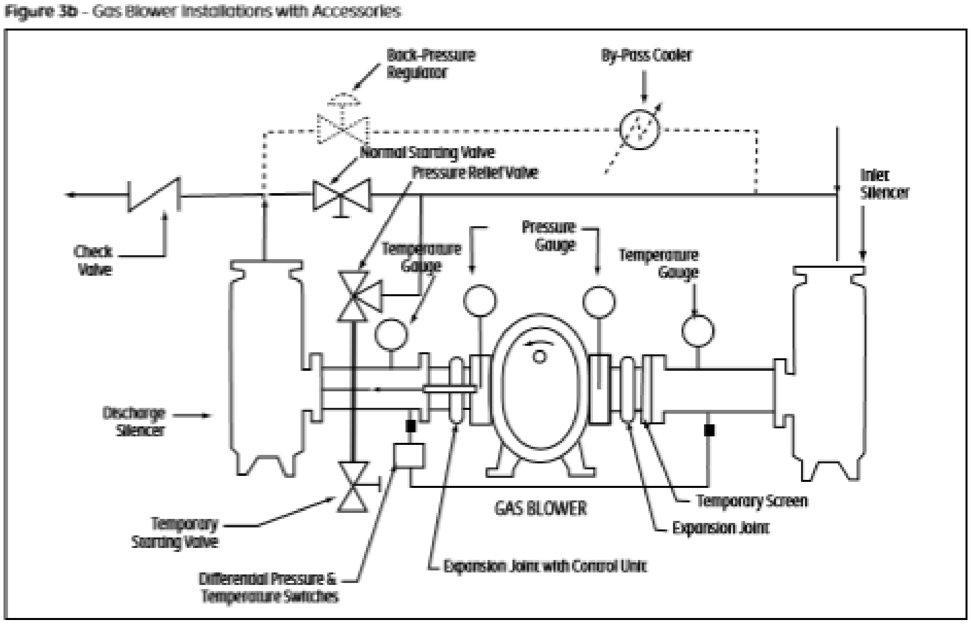
Above are suggested locations for available accessories.

Figure 3a - Air Blower Installations with Accessories



Above are suggested locations for available accessories.

Figure 3b - Gas Blower Installations with Accessories



13

Figure 4 - Blower Orientation Conversion

Model	Reversible Rotation	WHISPAIR Design
Roots Universal RAI	Yes	No
Roots URAI J WHISPAIR	No	Yes
Roots URAI-G	Yes	No

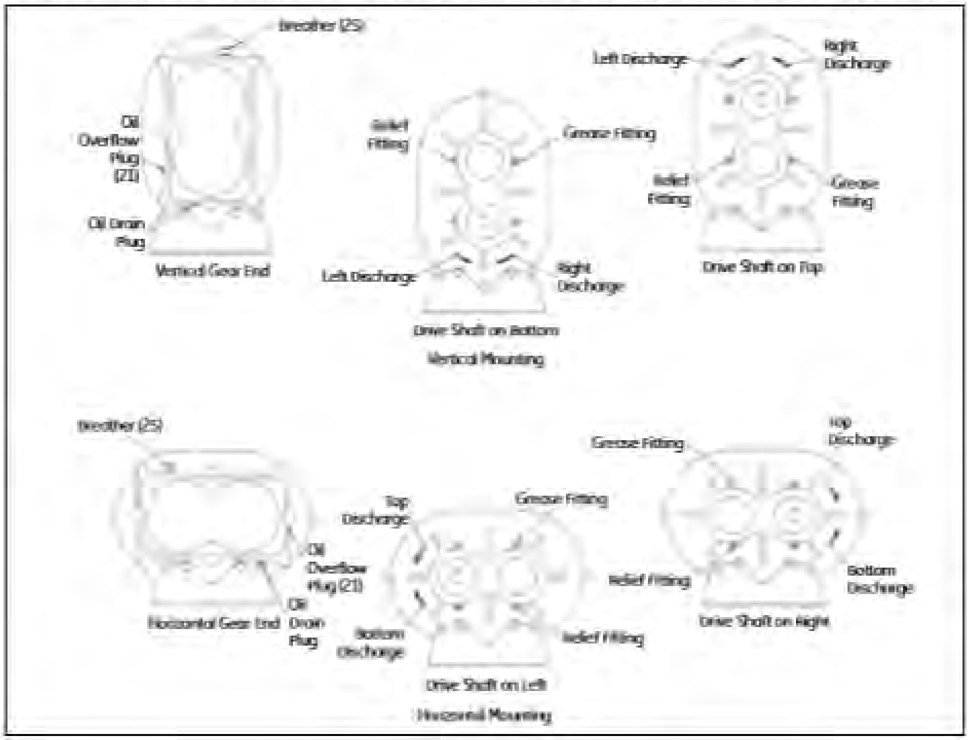
Special Note: WHISPAIR models are designed to operate with only one shaft rotation direction to take full advantage of the WHISPAIR feature. Therefore, a WHISPAIR blower may be operated in the following combinations.

- CCW Rotation: Bottom Shaft; Right side discharge or a Left Shaft; Bottom discharge
- CCW Rotation: Top Shaft; Left side discharge or a Right Shaft; Top discharge

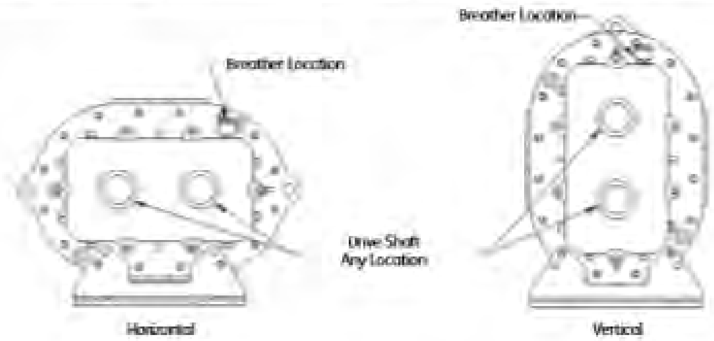
or

- CW Rotation: Bottom Shaft; Left side discharge or a Right Shaft Bottom discharge
- CW Rotation: Top Shaft; Right side discharge or a Left Shaft Top discharge

Blower Orientation and Lubrication Points: Grease Lubricated Drive End Roots Universal RAI series & URAI-G gas blowers



Drive End Breather Orientation for Roots Universal RAI Series – DSL with Oil Lube



Universal RAI DSL Breather Orientation

Revised Date: 1/11/05

Table 1 – Universal RAI series, Universal RAI-DSL & URAI-G gas blower, Maximum Allowable operating Conditions

Frame Size	Gear Dia. (inch)	Speed RPM	Temperature Rise		Delta Pressure		Inlet Vacuum	
			F°	C°	PSI	mbar	INHG	mbar
22	2.5	5275	225	125	12	827	15	500
24	2.5	5275	210	117	7	483	15	500
32	3.5	3600	240	133	15	1034	16	539
33	3.5	3,600	225	125	12	827	15	500
36	3.5	3,600	225	125	7	483	15	500
42	4.0	3,600	240	133	15	1034	16	539
45	4.0	3600	275	175	10	690	16	539
47	4.0	3600	225	125	7	483	15	500
53	5.0	2850	225	125	15	1034	16	539
56	5.0	2850	225	125	13	896	16	539
59	5.0	2850	225	125	7	483	15	500
65	6.0	2350	250	130	15	1034	16	539
68	6.0	2350	240	133	14	965	16	539
615	6.0	2350	130	72	7	483	14	472
76	7.0	2050	250	139	15	1034	16	539
711	7.0	2050	225	125	10	690	16	539
718	7.0	2050	130	72	6	414	12	405

15

Table 2 - Recommended Oil Grades

Ambient[1] Temperature °F (°C)	ISO Viscosity No.
Above 90° (32°)	320
32° to 90° (0° to 32°)	220
0° to 32° (-18° to 0°)	150
Below 0° (-18°)	100

[1]Ambient temperature is defined as the temperature of the space in which the blower and drive are located.

Roots URAI Gas Blower Oil and Grease Specifications

The specified oil should be Roots Synthetic Oil P/N 613-106-xxx of the proper viscosity.

Table 3 - Approximate Oil Sump Capacities

These capacities are provided to assist in stocking the correct amount of oil. Exact sump capacities may differ slightly. See "Lubrication" section for proper filling instructions.

Roots Universal RAI, URAI-J, URAI-G

Model No./Drive shaft location	Gear End Approx. Oil Sump Capacities	
	Fl. Oz	Liters
22, 24 (left or right)	6.1	0.18
22, 24 (top or bottom)	3.4	0.1
32, 33, 36 (left or right)	10.5	0.31
32, 33, 36 (top or bottom)	8.5	0.25
42, 45, 47 (left or right)	14.5	0.43
42, 45, 47 (top or bottom)	12.7	0.37
53, 56, 59 (left or right)	27.6	0.82
53, 56, 59 (top or bottom)	16	0.47
65, 68, 615 (left or right)	52.1	1.54
65, 68, 615 (top or bottom)	28.3	0.84
76, 711, 718 (left or right)	59.5	1.76
76, 711, 718 (top or bottom)	32.3	0.96

See page 14 and 15 for illustration of vertical and horizontal configurations.

Roots Universal RAI Series - DSL Splash Lubricated Drive End
Note that the gear end sump capacity is provided on the adjacent table.

Model No./Drive shaft location	Drive End Capacity	
	Fl. Oz	Liters
32, 33, 36 (left or right)	6.5	0.19
32, 33, 36 (top or bottom)	4	0.12
42, 45, 47 (left or right)	10.8	0.32
42, 45, 47 (top or bottom)	5.5	0.16
53, 56, 59 (left or right)	14.8	0.44
53, 56, 59 (top or bottom)	7.5	0.22
65, 68, 615 (left or right)	31	0.91
65, 68, 615 (top or bottom)	16	0.47

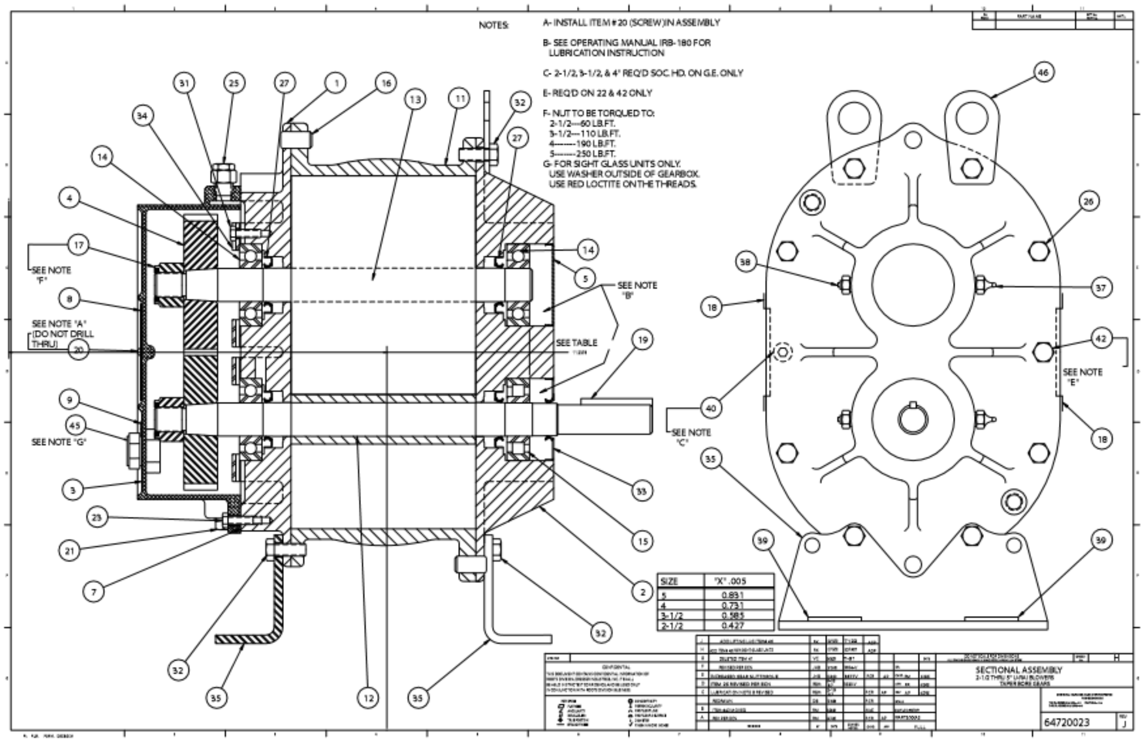
Table 4 - Roots Universal RAI series with Grease Lubricated Drive End: Specified Bearing Greasing Intervals

Speed in RPM	Operating Hours Per Day		
	8	16	24
	Greasing Interval in Weeks		
750-1000	7	4	2
1000-1500	5	2	1
1500-2000	4	2	1
2000-2500	3	1	1
2500-3000	2	1	1
3000 and up	1	1	1

The specified grease for servicing drive end bearings of a gas blower, use a NLGI #2 premium grade aluminum complex* grease, GE P/N T20019001 with 300°F (149°C) service temperature and moisture resistance and good mechanical stability.

When servicing drive end bearings of non gas blower, use a NLGI #2 premium grade microgel grease with 250°F (121°C) service temperature and moisture resistance and good mechanical stability. GE specifies Shell Darina SD2 NLGI#2. Product Code 5067626.

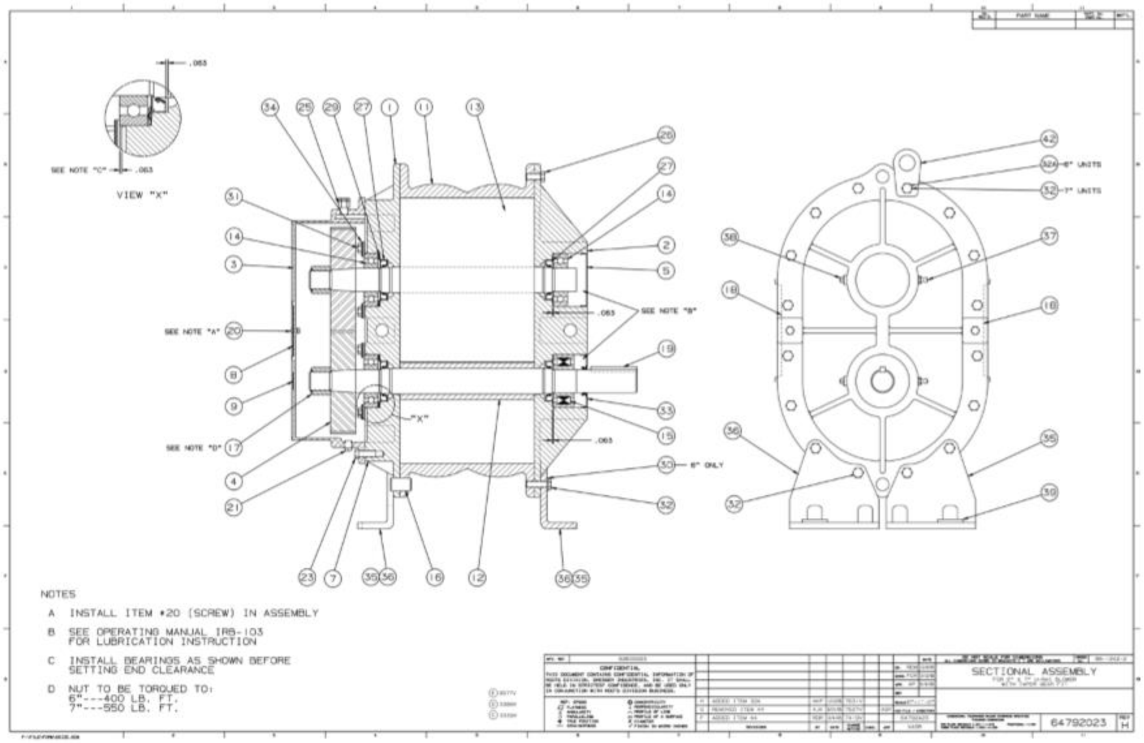
NOTE: Lithium based greases are not compatible with the Roots Synthetic Grease used when assembling a gas blower or the non-soap base grease used when assembling a standard Roots URAI blower. Lithium based grease is not approved for any Roots blowers.



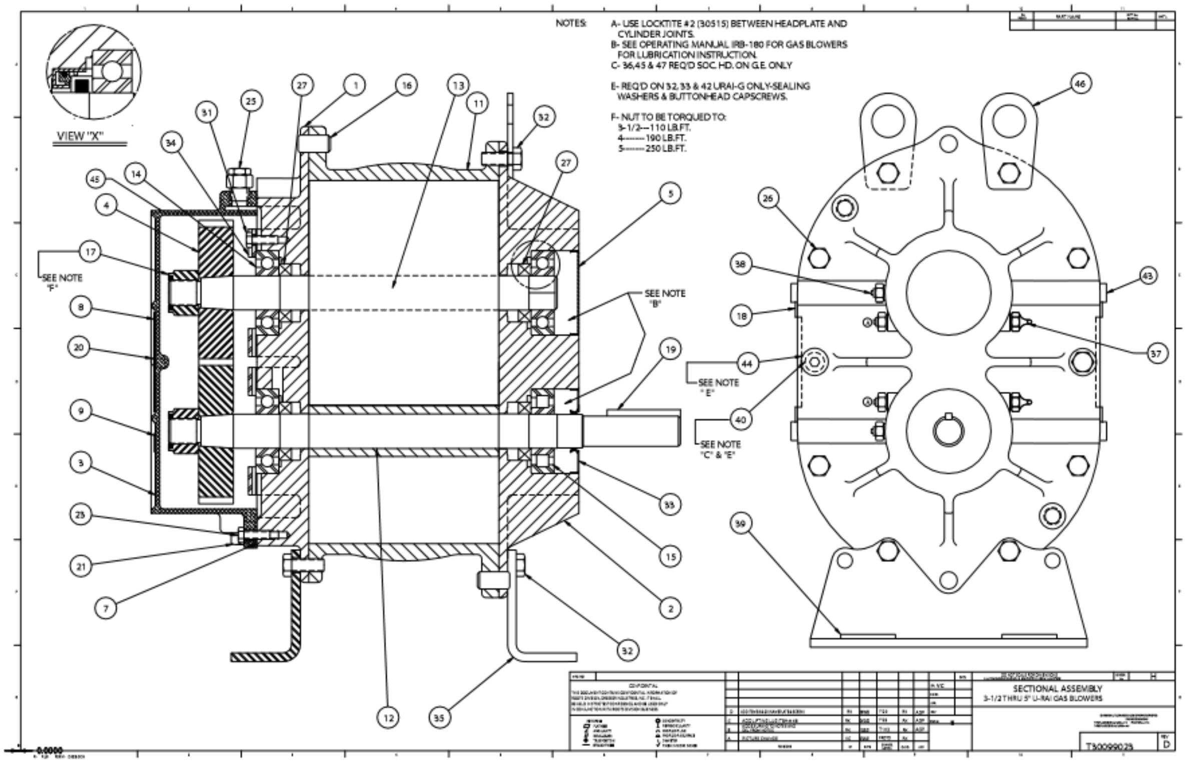
Assembly of Roots Universal RAI Series, Air Blowers, 2-1/2" Through 5" Gear Diameter

17

18



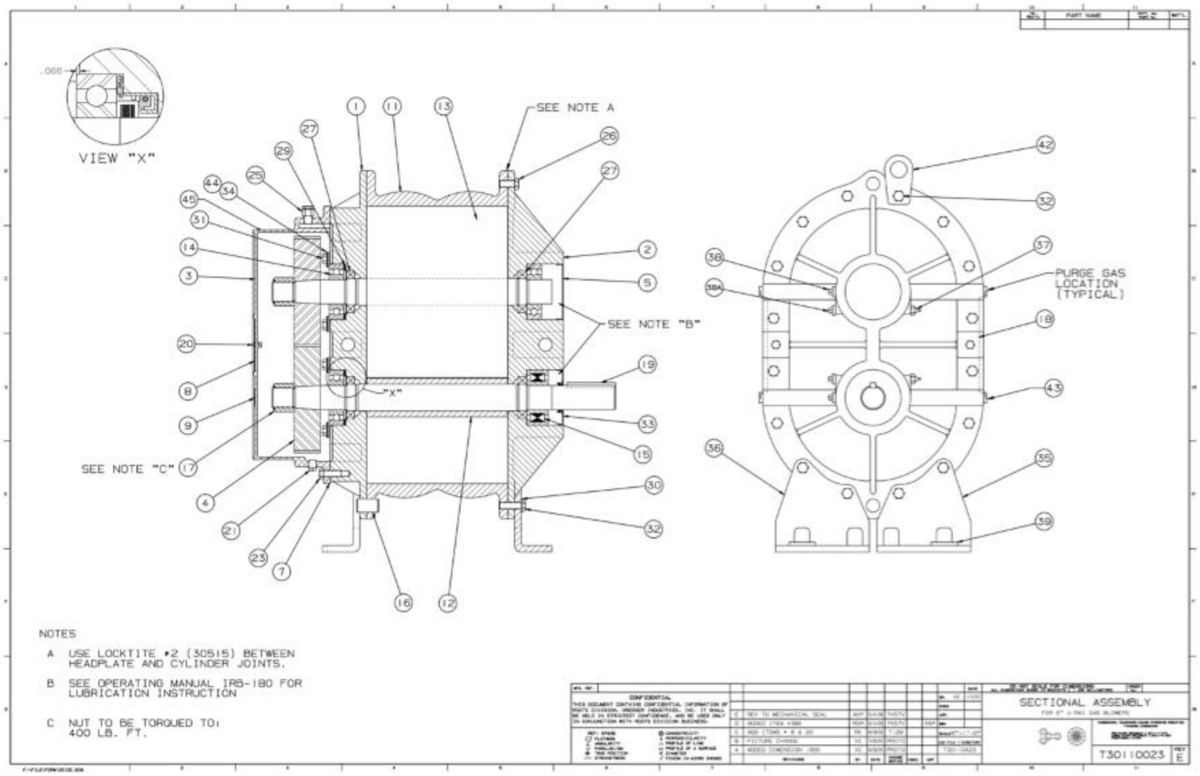
Assembly of Roots Universal RAI Blowers, 6" and 7" Diameter



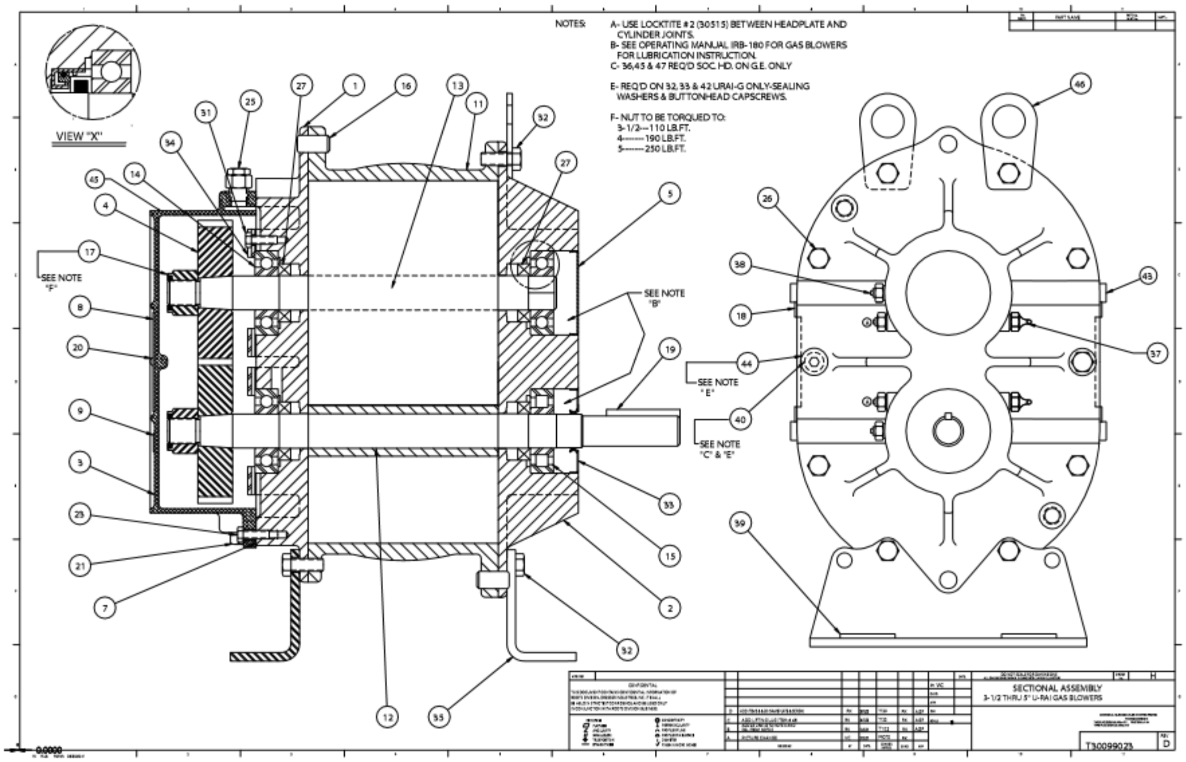
Assembly of Roots Universal RAI-G Series Gas Blowers, 3-1/2" through 5" Gear Diameter

19

20

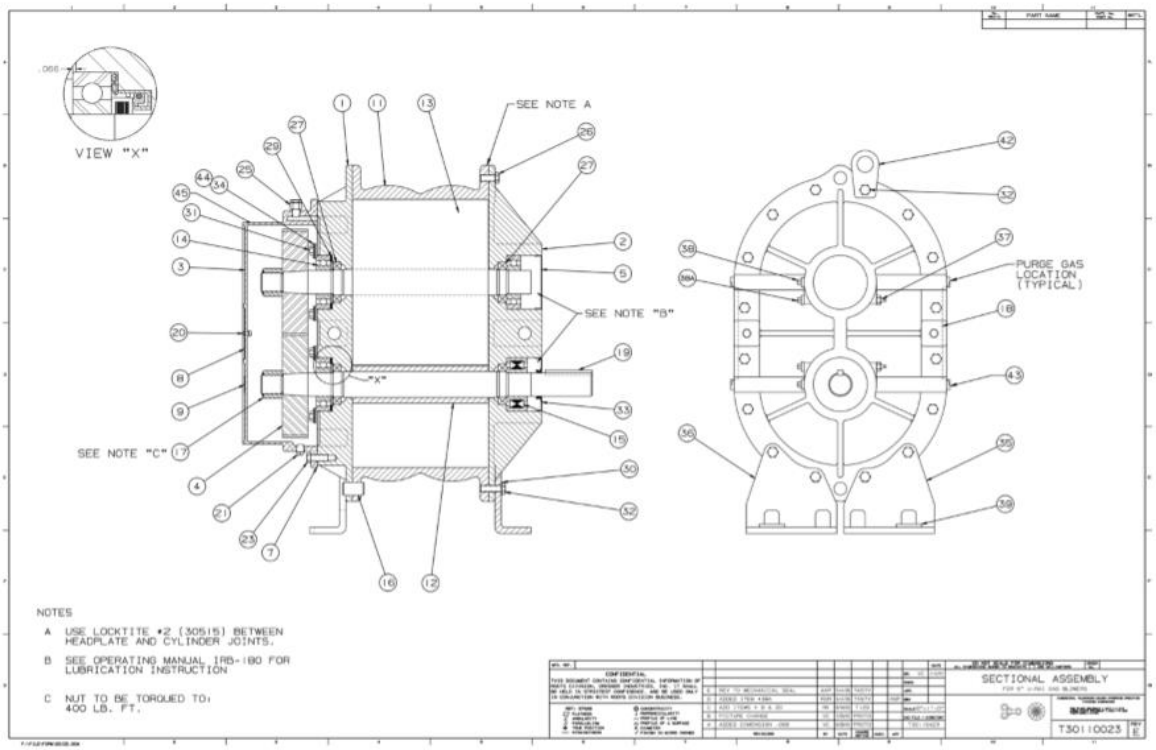


Assembly of Roots Universal RAI Series Gas Blowers, 6" Gear Diameter



Assembly of Roots Universal RAI-G Series Gas Blowers, 3-1/2" through 5" Gear Diameter

21



Assembly of Roots Universal RAI Series Gas Blowers, 6" Gear Diameter

Roots Universal RAI Series Blowers Parts List 2-1/2" – 5" Gear Diameter
(Refer to drawing #64720023)

Item #	Part Name	Qty.
1	Headplate Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
5	Cover-Blind (Plug Opening)	1
7	Gasket, Gear Box	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	1
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3
23	Screw Hex	6
25	Breather (Plug Vent)	1
26	Screw, Hex	†
27	Seal, Lip Bearing	4
31	Screw, Hex, Nylock	4
32	Screw, Hex	6
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
37	Fitting, Grease	2
38	Fitting, Relief	2
39	Washer Mounting	4
40	Screw Socket	2
42	Screw Hex	2

†Quantities vary by blower.

Roots Universal RAI Series Blowers Parts List 6" & 7" Gear Diameter
(Refer to drawing #64750023)

Item #	Part Name	Qty.
1	Headplate Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
5	Cover-Blind (Plug Opening)	1
7	Gasket, Gear Box	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	3
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3
23	Screw Hex Nylock	8
25	Breather (Plug Vent)	1
26	Screw, Hex	†
27	Seal, Lip Bearing	4
29	Washer, Spring Wavy	2
31	Screw, Hex, Nylock	4
32	Screw, Hex	10
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
37	Fitting, Grease	2
38	Fitting, Relief	2
39	Washer Mounting	4

†Quantities vary by blower.

Roots Universal RAI-DSL Series Blowers Parts List 3-1/2" – 5" Gear Diameter
(Refer to drawing #T30356023)

Item #	Part Name	Qty.
1	Headplate Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
7	Gasket, Gear Box, DE Cover	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	3
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3
23	Screw Hex	6
25	Breather (Plug Vent)	1
26	Screw, Hex	†
27	Seal, Lip Bearing	4
31	Screw, Hex, Nylock	4
32	Screw, Hex	6
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
39	Washer Mounting	4
40	Screw Socket	2
42	Screw Hex	2
48	DE Oil Slinger Set Screw	4
50	Drive End Cover	1
52	Drive End Oil Slinger	2
53	Oil Sight Glass	2

†Quantities vary by blower.

Roots Universal RAI DSL Series Blowers Parts List 6" Gear Diameter
(Refer to drawing #C30352023)

Item #	Part Name	Qty.
1	Headplate Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
7	Gasket, Gear Box	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	3
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3

Item #	Part Name	Qty.
23	Screw Hex Nylock	8
25	Breather (Plug Vent)	1
26	Screw, Hex	†
27	Seal, Lip Bearing	4
31	Screw, Hex, Nylock	4
32	Screw, Hex	10
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
39	Washer Mounting	4
48	DE Oil Slinger Set Screw	4
50	Drive End Cover	1
52	Drive End Oil Slinger	2
53	Oil Sight Glass	2

†Quantities vary by blower.

26

Roots Universal RAI Series Gas Blowers Parts List
3-1/2" & 5" Gear Diameter
(Refer to drawing #T30099023)

Item Number	Part Name	Quantity
1	Headplate-Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
5	Cover-Blind (Plug Opening)	1
7	Gasket, Gear Box	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	5
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	5
23	Screw Hex	8
25	Breather (Plug Vent)	1
26	Screw, Hex	14
27	Seal, Bearing	4
31	Screw, Hex	4
32	Screw, Hex	4
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
37	Fitting, Grease	2
38	Fitting, Relief	2
39	Washer Mounting	4
40	Screw Socket	2
42	Screw Hex	2

†Quantity varies by blower.

Specified Lubricants

Roots Synthetic Oil: ISO-VG-220 Grade	
	Part Number
Quart	813-106-001
Gallon	813-106-002
Case (12 qts)	813-106-008

Roots Synthetic Oil: ISO-VG-320 Grade	
	Part Number
Quart	813-106-004
Gallon	813-106-005
Case (12 qts)	813-106-007

Roots Synthetic Grease: NLGI #2	
	Part Number
14.5 oz. Tube	T200019-001
5 Gallon Pail	T200019-003
Case (30 tubes)	T200019-002

Roots Universal RAI Series Gas Blowers Parts List
6" Gear Diameter
(Refer to drawing #T30113023)

Item Number	Part Name	Quantity
1	Headplate-Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
5	Cover-Blind (Plug Opening)	1
7	Gasket, Gear Box	1
7†	Gasket DE Cover	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	3
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3
23	Screw Hex Nylock	8
25	Breather (Plug Vent)	1
26	Screw, Hex	14††
27	Seal, Bearing	4
31	Screw, Hex	4
32	Screw Hex	10
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
37	Fitting, Grease	2
38	Fitting, Relief	2
39	Washer Mounting	4
40	Screw Socket	2
42	Screw Hex	2
43	Plug	8
51	Shoulder Bolt	2
53	Oil Sight Glass	2

†DE cover gasket is not the same as the gasket used on the GE model. You must specify the gasket required when ordering.
††Quantities vary by blower.

Basic Connection & Drive Shaft Information

Roots Universal RAI (URAI) Air Blowers with Grease Lubricated Drive End

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (in.)	Bare Weight
65102020	22	1" NPT	0.625	32
65103020	24	2" NPT	0.625	43
71048020	32	1.25" NPT	0.750	69
65105020	33	2" NPT	0.750	74
65106020	36	2.5" NPT	0.750	102
65108020	42	1.5" NPT	0.875	88
65109020	45	2.5" NPT	0.875	109
65110020	47	3" NPT	0.875	128
65112020	53	2.5" NPT	1.125	143
65113020	56	4" NPT	1.125	170
65114020	59	4" NPT	1.125	204
65116020	65	3" NPT	1.375	245
65117020	68	5" NPT	1.375	285
65118020	615	6" Flange	1.375	425
65120020	76	4" NPT	1.562	400
65121020	711	6" Flange	1.562	530
65122020	718	8" Flange	1.562	650

Refer to Specification Sheet S-12K84

Roots URAI DSL Air Blowers with Dual Splash Lubrication

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (in.)	Bare Weight
T30378020	32	1.25" NPT	0.750	72
T30379020	33	2" NPT	0.750	77
T30380020	36	2.5" NPT	0.750	105
T30352020	42	1.5" NPT	0.875	92
T30351020	45	2.5" NPT	0.875	113
T30354020	47	3" NPT	0.875	132
T30359020	53	2.5" NPT	1.125	148
T30360020	56	4" NPT	1.125	175
T30361020	59	4" NPT	1.125	209
T30384020	65	3" NPT	1.375	250
T30385020	68	5" NPT	1.375	290
T30386020	615	6" Flange	1.375	430

Refer to Specification Sheet S-27503

Roots Universal RAI air blowers include detachable mounting feet which permit vertical or horizontal installation. The units are center timed for rotation in either direction. The bearings on the URAI are grease lubricated on the drive end and splash lubricated on the gear end. The URAI-DSL is splash lubricated on BOTH ends.

Roots Universal RAI-G Gas Blowers with Grease Lubricated Drive End

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (in.)	Bare Weight
71048060	32	1.25" NPT	0.750	69
65105060	33	2" NPT	0.750	74
65106060	36	2.5" NPT	0.750	102
65108060	42	1.5" NPT	0.875	88
65109060	45	2.5" NPT	0.875	109
65110060	47	3" NPT	0.875	128
65112060	53	2.5" NPT	1.125	143
65113060	56	4" NPT	1.125	170
65114060	59	4" NPT	1.125	204
65116060	65	3" NPT	1.375	245
65117060	68	5" NPT	1.375	285
65118060	615	6" NPT	1.375	425

Refer to Specification Sheet S-60A01

Roots Universal RAI-G gas blowers include detachable mounting feet which permit vertical or horizontal installation. **Feet are different for vertical and horizontal mounting.** The units are center timed for rotation in either direction. The bearings on the Universal RAI-G are grease lubricated on the drive end and splash lubricated on the gear end. Roots Synthetic Lubricant is recommended.

Basic Connections and Drive Shaft Information

Roots Universal RAI (URAI-J) WHISPAIR Air Blowers

Roots Universal RAI-J WHISPAIR Air Blowers with Grease Lubricated Drive End

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (in.)	Bare Weight
74065020	33J	2" NPT	0.750	84
74086020	36J	2.5" NPT	0.750	112
74066020	45J	2.5" NPT	0.875	119
74087020	47J	3" NPT	0.875	138
74067020	56J	4" NPT	1.125	183

Refer to Specification Sheet S-13A90

Roots URAI-J-DSL WHISPAIR Air Blowers with Dual Splash Lubrication

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (in.)	Bare Weight
T30A17020	33J	2" NPT	0.750	87
T30A18020	36J	2.5" NPT	0.750	115
T30A10020	45J	2.5" NPT	0.875	122
T30A11020	47J	3" NPT	0.875	141
T30A15020	56J	4" NPT	1.125	186

Refer to Specification Sheet S-13A91

Roots URAI-J Metric WHISPAIR Air Blowers with Grease Lubricated Drive End

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (mm)	Bare Weight
TBD	33J	2" BSP	19	84
740660M0	36J	2.5" BSP	19	112
TBD	45J	2.5" BSP	24	119
TBD	47J	3" BSP	24	138
TBD	56J	4" BSP	28	180

Roots URAI-J-DSL Metric WHISPAIR Air Blowers with Dual Splash Lubrication

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (mm)	Bare Weight
TBD	33J	2" BSP	19	87
T30A660M0	36J	2.5" BSP	19	115
TBD	45J	2.5" BSP	24	122
T30A550M0	47J	3" BSP	24	141
TBD	56J	4" BSP	28	185

Roots Universal RAI-J air blowers incorporate the patented WHISPAIR design in addition to the same features as the original URAI blowers. Roots URAI-J's are rotational timed, however the WHISPAIR benefits can only be realized when the jet is located in the discharge position.

GEO Environmental Remediation Company

Basic Connections and Drive Shaft Information

Roots Universal RAI Metric (URAI-M) Air Blowers with Grease Lubricated Drive End
NOTE: Metric URAI product has metric shaft diameter and connection sizes.

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (mm)	Bare Weight
651020M0	22	1" BSP	16	32
651030M0	24	2" BSP	16	43
710460M0	32	1.25" BSP	19	69
651050M0	33	2" BSP	19	74
651060M0	36	2.5" BSP	19	102
651080M0	42	1.5" BSP	24	88
651090M0	45	2.5" BSP	24	109
651100M0	47	3" BSP	24	128
651120M0	53	2.5" BSP	28	141
651130M0	56	4" BSP	28	170
651160M0	59	4" BSP	28	206
T30192060	65	3" BSP	32	246
T30194060	68	5" BSP	32	285
T30190060	615	150 NP10	42	425
T30196060	76	4" BSP	38	400
T30198060	711	150 NP10	38	530
T30240060	718	200 NP10	38	650

Roots URAI-DSL Metric Air Blowers with Dual Splash Lubrication

BOM#*	Frame Size	Inlet/Disch Connection	Shaft Diameter (mm)	Bare Weight
T30463060	32	1.25" BSP	19	72
T30464060	33	2" BSP	19	77
T30465060	36	2.5" BSP	19	105
T30451060	42	2.5" BSP	24	92
T30452060	45	2.5" BSP	24	113
T30453060	47	3" BSP	24	132
T30459060	53	2.5" BSP	28	148
T30460060	56	4" BSP	28	175
T30461060	59	4" BSP	28	208
T30467760	65	3" BSP	32	250
T30467560	68	5" BSP	32	290
T30467460	615	150 NP 10	32	430

Roots Universal RAI air blowers include detachable mounting feet which permit vertical or horizontal installation. The units are center timed for rotation in either direction. The bearings on the URAI are grease lubricated on the drive end and splash lubricated on the gear end. The Roots URAI-DSL is splash lubricated on BOTH ends.

GE Energy

Roots Blowers, Compressors & Controls
Houston, Texas Headquarters | U.S. Toll Free T: 1 877-363-ROOT(S) (7668) | T: +1 832-590-2600
Connersville, Indiana Operations | U.S. Toll Free T: 1 877-442-7910 | T: +1 765-827-9285
Waukesha, Wisconsin Operations | T: +1 262-650-5965 | Email: Rootscontrols@dresser.com
European Operations | T: +44 (0) 1695 52600 | Email: roots.europe@dresser.com
USA/Canada Sales | T: +1 773-444-3360
Houston, Texas Factory Service | T: +1 713-896-4810
Mexico City Sales and Factory Service | T: +52 55 5889 5811
Dubai Sales and Factory Service | T: +971 4-8855481
Malaysia Sales | T: +60 3 2267 2600
China Sales | T: +86 10 8486 2440
Shanghai Factory Service | T: +86 21 5858 7638

Visit us online at:
www.ge.com/energy

2011 General Electric Company
All Rights Reserved
*Denotes trademarks of General Electric Company

GEA19171 ES85_2007 rev_11.11

Appendix 12. Solberg Inlet Vacuum Filter

F1a,b&c

Inlet Vacuum Filters

"CSL" Series 3" - 6" MPT

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Remote install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

- **Vacuum level:** Typically $1x10^{-2}$ mmHg ($1.3x10^{-2}$ mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Heavy duty T bolts for easy maintenance
- Hydrostatically tested to 0.5 bar pressure for vacuum tightness
- Low pressure drop
- Positive engagement O-ring seal system
- **Large** dirt holding capacity and **Easy** field cleaning, especially when mounted horizontally or inverted
- Inlet/outlet 1/4" gauge taps standard
- Rugged all steel construction w/baked enamel finish
- Temp (continuous): min -15°F (-26°C) 220°F (max 104°C)
- Filter change out differential: 10" - 15" H_2O over initial delta P
- Pressure drop graphs available upon request

OPTIONS (Inquiries Encouraged)

- Various media
- Larger sizes available
- Straight-Through Configurations
- Available in *Stainless Steel*
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION

DRAWING

Dimension tolerance ± 1/4"

I = Industrial Duty S = Severe Duty E = Extreme Duty

	with Polyester Element	with Paper Element	MPT Inlet & Outlet	DIMENSIONS - inches A	B	C	D	E	Rated Flow SCFM Nominal Rating	Element Rating	Approx. Wt. lbs
I	CSL-235P-300	CSL-234P-300	3"	27 1/8	9	14	18 1/2	10	300	570	47
S	CSL-335P-300	CSL-334P-300	3"	27 1/8	9	14	18 1/2	15	300	800	52
I	CSL-235P-400	CSL-234P-400	4"	27 1/8	9	14	18 1/2	10	520	570	52
S	CSL-335P-400	CSL-334P-400	4"	27 1/8	9	14	18 1/2	15	520	800	60
I	CSL-245P-500	CSL-244P-500	5"	28 1/8	11	13 1/2	19 1/2	10	800	800	80
S	CSL-345P-500	CSL-344P-500	5"	28 1/8	11	13 1/2	19 1/2	15	800	1100	88
I	CSL-275P-600	CSL-274P-600	6"	29 1/2	12	18 1/2	20 1/2	10	1100	1100	95
S	CSL-375P-600	CSL-374P-600	6"	28 1/8	12	18 1/2	20 1/2	15	1100	1500	97

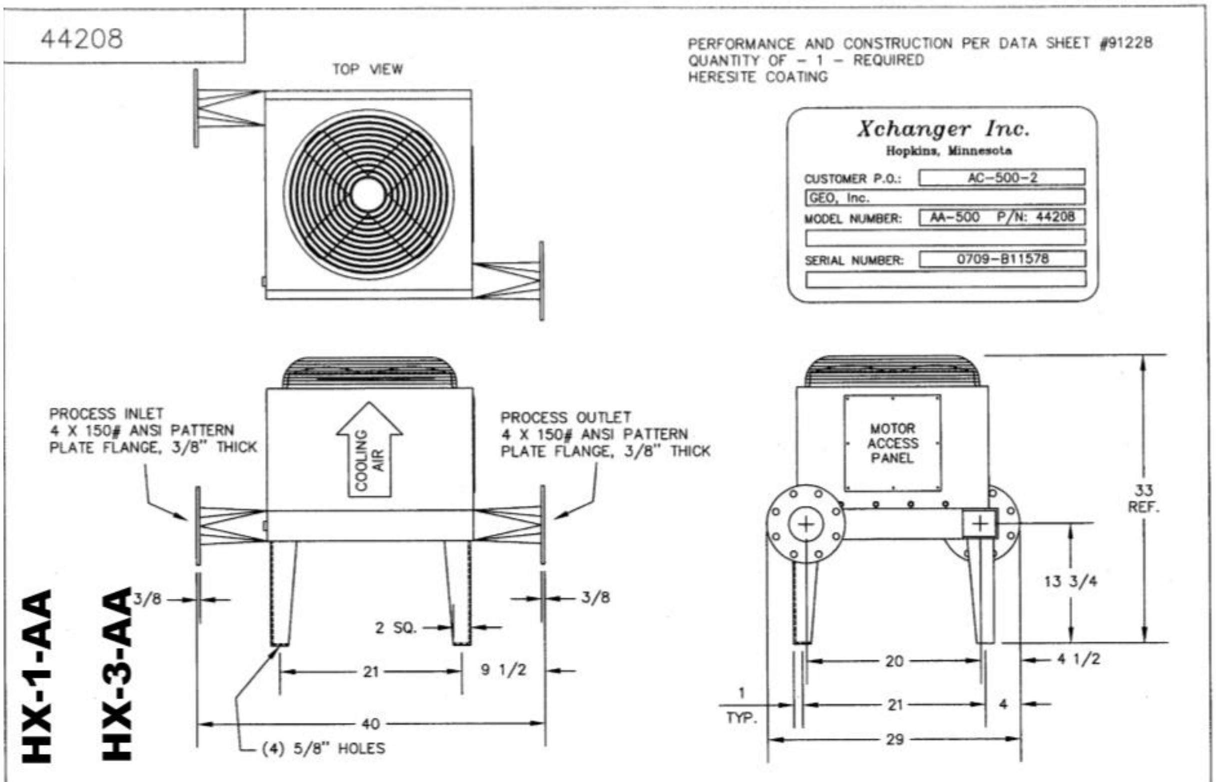
INLET VACUUM FILTERS
CSL, ST, CT, VL, VF, LRS Series

Note: Model offerings and design parameters may change without notice.

1151 Ardmore Ave. • Itasca, IL 60143 USA
Sales/Service: 630.773.1363 • Fax 630.773.0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

Appendix 13. Xchanger Inc. Heat Exchanger Assembly

CERTIFIED DRAWING Date: 07/06/09



TOLERANCES (UNLESS OTHERWISE NOTED)		Xchanger Inc. 1401 SOUTH 7TH ST HOPKINS, MN 55343		MODEL AA-500 HEAT EXCHANGER ASSEMBLY			
DECIMAL ± .25	FRACTIONAL ± 1/4	DRAWN BY: MHA REVIEWED BY: [illegible]	SCALE: NONE DATE: 07/06/09	JOB NUMBER B11578	SHEET 1 OF 1	DRAWING NUMBER 44208	REV. .

Xchanger, Inc.	Rating for Model AA-500 ref #91228	Page 1 of 1
Engineer: David Wangensteen		September 15, 2008

Prepared for:

GEO, Inc.
Carol Winell

PERFORMANCE	PROCESS AIR	AMBIENT AIR
Fluid Circulated	Air	Air
Volumetric Flow Rate	500 Std. ft^3/min	1,764 Std. ft^3/min
Total Fluid Entering	2,250 lb/hr	7,938 lb/hr
Liquid		
Vapor		
Non-Condensibles	2,250 lb/hr	7,938 lb/hr
Vaporized or (Cond.)		
Temperature In	250 °F	90 °F
Temperature Out	126 °F	125 °F
Inlet Pressure (Absolute)	19.557 lb/in²	14.557 lb/in²
Velocity (Standard)	2,794 ft/min	1,276 ft/min
Pressure Loss	0.19 lb/in²	0.7 in. water
Fouling Factor	0.0001 ft²-°F-hr/BTU	0.0001 ft²-°F-hr/BTU
Total Heat Exchanged: 66,771 BTU/hr		

PROPERTIES		
Thermal Conductivity	0.018 BTU/hr-ft-°F	0.016 BTU/hr-ft-°F
Specific Heat	0.240 BTU/lb-°F	0.240 BTU/lb-°F
Viscosity	0.051 lb/ft-hr	0.047 lb/ft-hr
Density	0.082 lb/ft^3	0.069 lb/ft^3
Latent Heat of Vapor		

CONSTRUCTION		
Design Temperature	250 °F	Not Applicable
Design Pressure (Gauge)	15 lb/in²	Not Applicable
Test Pressure (Gauge)	15 lb/in²	Not Applicable
Cyclic Pressure	No	Not Applicable
Flow Direction	Right Hand Horizontal	Vertical Up
Coating	Heresite	Heresite

Plate-Fin Core	: Aluminum	Exhaust Hood	: Galvanized Steel
Fan Guard	: Coated Carbon Steel	Venturi Frame	: Coated Carbon Steel
Drawing Number	:	Weight	: 160 lb

CONNECTIONS

Process Inlet	: 4 inch 150 lb. ANSI pattern FFF, 3/8" thick
Process Outlet	: 4 inch 150 lb. ANSI pattern FFF, 3/8" thick
Instrument	:

MECHANICAL EQUIPMENT			
Fan Diameter	: 18 inch	Motor	: 1.00 HP TEFC
Fan Qty/Speed	: 1 / 1725 RPM	Motor Qty/Speed	: 1 / 1725 RPM
Fan Type	: 4 Blade Mill Galv. St	Motor Electrical:	208-230/460/3/60

NOTES

Approximate unit dimensions (inches): A = 33, B = 40, C = 24, D = 14
Construction material suitability must be determined by customer.
The process flow must be uniform, smooth and free of pulsation.
This unit is not designed for cycling process gas pressure.
The cooling air data is based on the ASHRAE 1% summer design point for:
Santa Paula, California, United States.

Xchanger, Inc. Tel: (952) 933-2559, Fax: (952) 933-5647, Web: www.xchanger.com

Xchanger

Heat Exchangers

Installation

Operation

Maintenance

The information supplied in this manual is based on many years of field experience with our heat exchangers. Following the instructions of this manual will extend the service life of your heat exchanger.

Please note that all heat exchangers will eventually fail, even if they have been properly installed and well maintained. Our experience shows that some of the most common reasons for failure are: over-pressurization, water hammer, freezing, corrosion, and vibration induced metal fatigue.

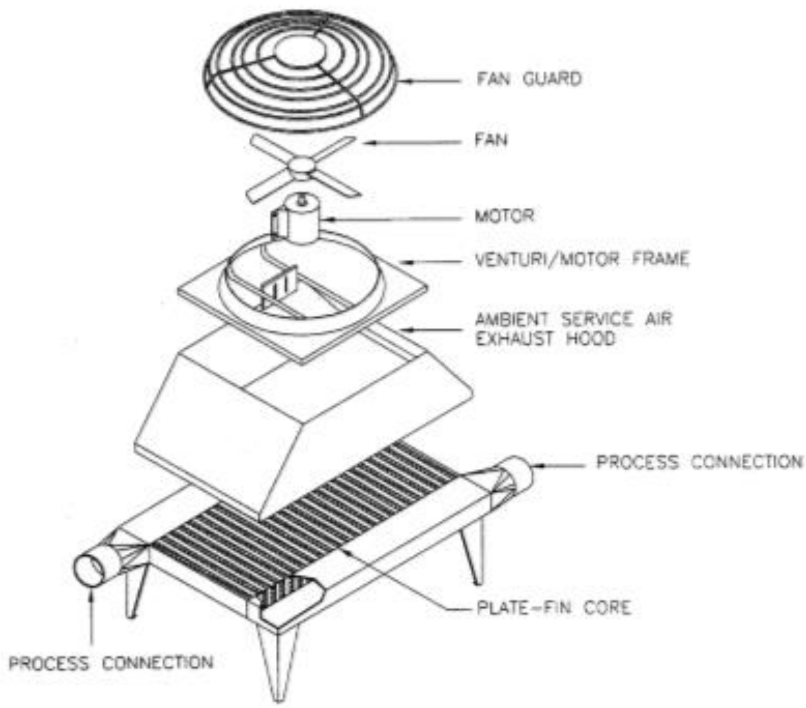
When a heat exchanger fails, the likely result is contamination of the process and/or service fluids. If this would be a serious problem for your system, steps should be taken to protect your system to eliminate or reduce the impact of such contamination. Depending on the type of failure, it is also possible that one or both fluids could leak into the atmosphere.

TABLE OF CONTENTS

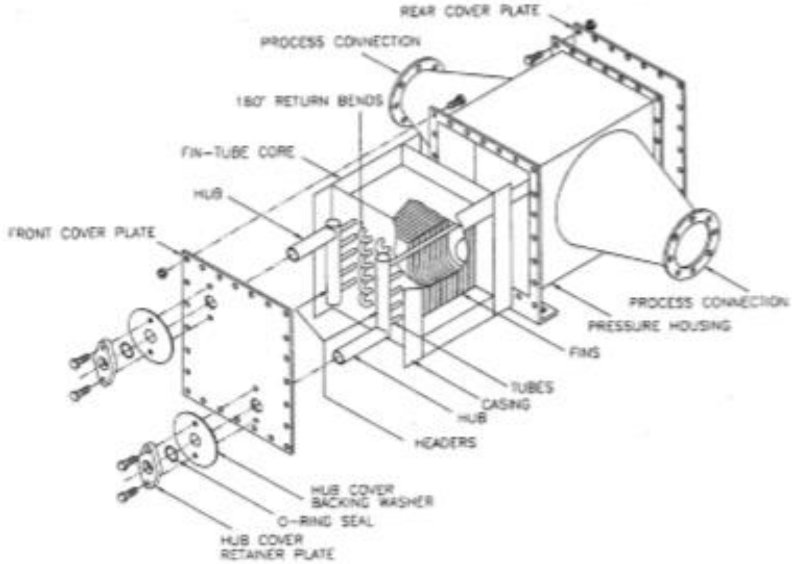
1.0 SCOPE OF THIS MANUAL

This manual describes the appropriate procedures for the use and care of Xchanger AA, C, HP, HR, LC, and TV Series heat exchangers. Warranty and service contact information is also included.

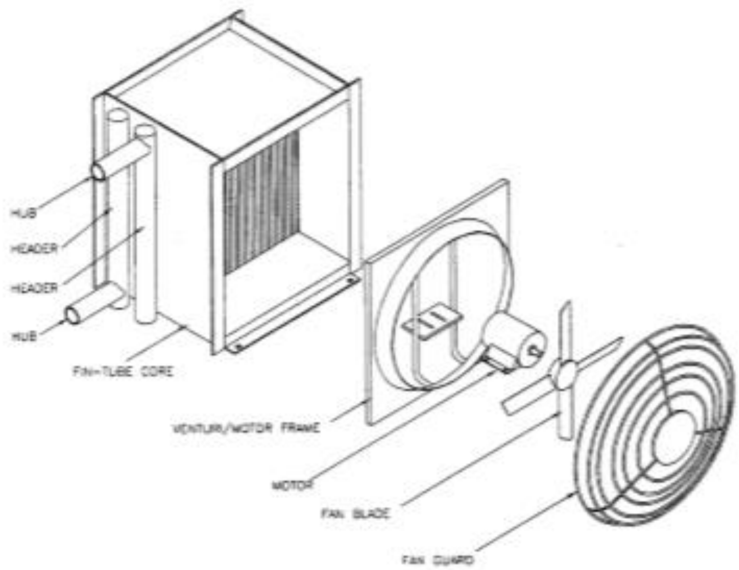
Due to the custom nature of all Xchanger heat exchangers, this manual discusses the characteristics and procedures that are common to all exchangers. Unit specific information not included in this manual will be shown on or included with the data sheet and certified drawing that characterize each distinct exchanger design. Information about any accessories provided with an exchanger would also be separate from this manual.



AA Series Heat Exchangers

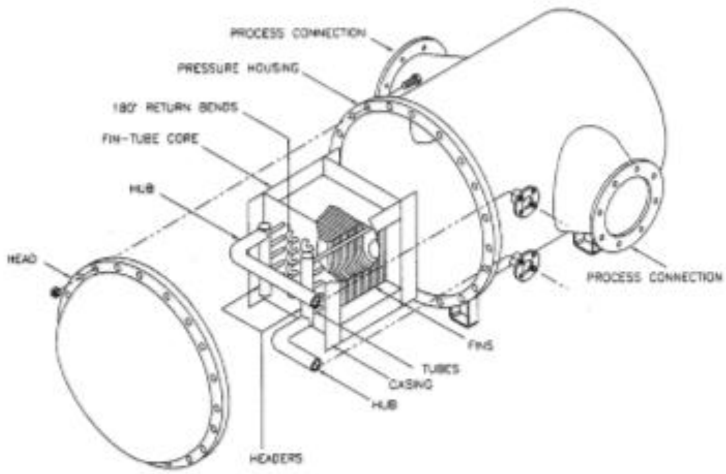


C/TV Series Heat Exchangers

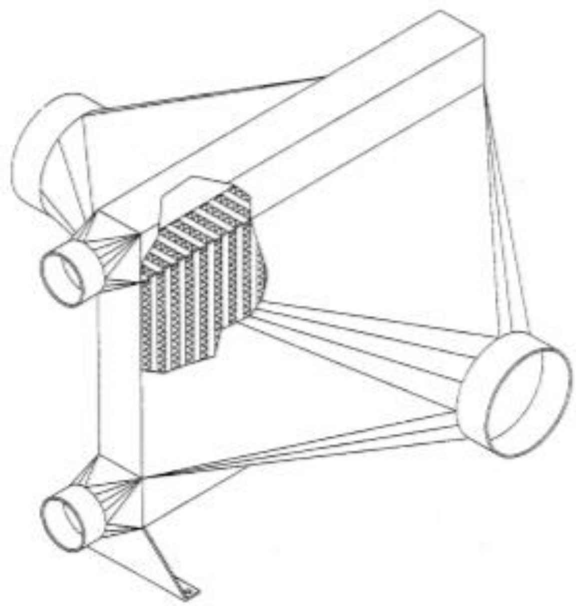


LC Series Heat Exchangers

2



HP Series Heat Exchangers



HR Series Heat Exchangers

3

2.0 RECEIVING THE HEAT EXCHANGER

The unit should be examined thoroughly upon receipt. The unit should have no cracks, dents or deformations.

Damage to either the unit or its crating should be immediately noted on the freight receipt. If the shipment was made F.O.B. our factory, damage claims should be filed with the responsible carrier.

Accessories are sometimes shipped loose on the same skid as the exchanger. If so, the Bill of Lading and/or Packing Slip would reflect the loose parts. Check for any accessories before discarding the skid.

2.1 STORAGE

If the unit will not be placed into operation for an extended period of time, it should be left on the shipping skid. Store in a clean, dry, and protected area. All openings should be covered to protect interior surfaces. Unprotected carbon steel should be sprayed with a light coating of a rust inhibitor.

3.0 MOUNTING LOCATION

If the heat exchanger is located at the inlet or discharge of a blower with a pulsating flow, such as a Roots type rotary lobe blower, the heat exchanger must be protected from the pulsation by a chambered silencer.

The heat exchanger must be isolated from system vibrations using flexible piping connections and isolation pads on the mounting feet. Vibration can cause work-hardening, and failure of the heat exchanger.

The process gas stream should be free of particulate. If there is a possibility of particulate passing through the heat exchanger, a filter should be installed upstream of the heat exchanger.

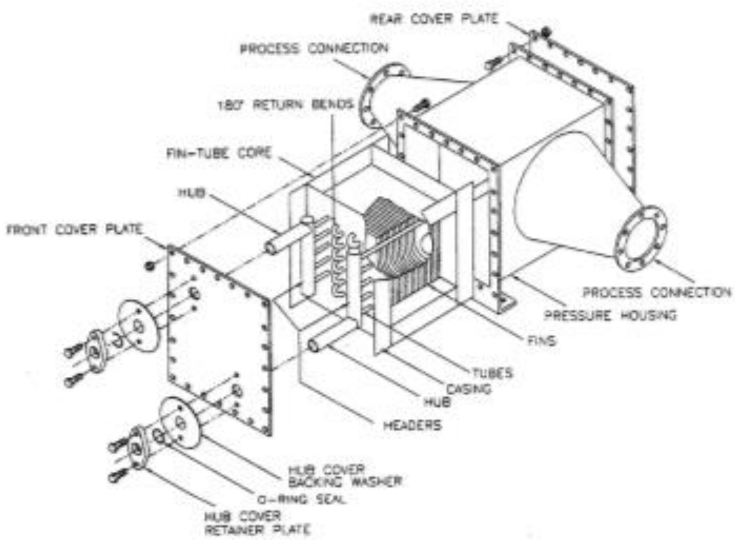
Ample space should be provided on all sides to allow servicing when required.

3.1 C/HP/TV SERIES

To facilitate servicing a unit with a removable core, provide enough clear space to remove the core through the bolted access panel.

For cooling applications where vapors may condense from the gas stream, a proper drain trap arrangement is necessary (see section 4.1.5 titled C/HP/TV SERIES Housing Drain Trap for more information).

The service fluid must not be allowed to freeze or damage to the core will result (see section 6.4 titled FREEZING PROTECTION - C/HP/TV SERIES for more information). Heating of the service fluid beyond its boiling point may also damage the core.



3.2 AA/LC SERIES

The heat exchanger should be mounted in a well ventilated area, preferably outdoors, as these units dissipate heat to the ambient air. If the unit is installed indoors and ducting of the service air is required, a booster fan should be used to convey the air through the duct.

A minimum clearance of 2 feet around the heat exchanger base is essential for proper cooling air flow.

3.3 HR SERIES

If installed in a very warm or very cool location, the ambient conditions could interfere with the intended heat transfer. The effects of the ambient conditions can be minimized by insulating the exchanger after installation.

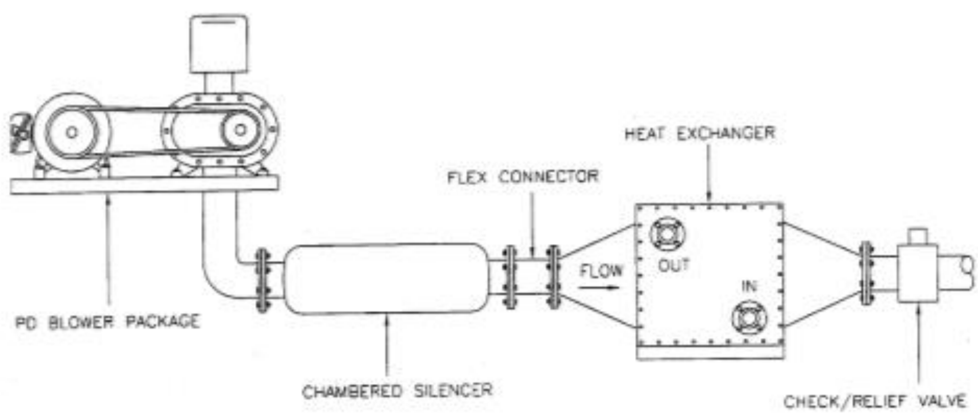
4.0 INSTALLATION

The heat exchanger should be supported and secured by the mounting feet. All piping should be supported independently of the heat exchanger, and any flex connectors present should not add loads or moments to the heat exchanger process connections. Any debris in the piping should be removed before the heat exchanger is installed, as the core of the exchanger could trap any particles, causing reduced performance or damage to the core.

The unit is equipped with labels indicating gas flow direction and service fluid inlets and outlets. Connections must be installed as labeled. The certified drawing also indicates the flow direction, and should be consulted during installation.

If the gas flow through the unit is pulsating and/or vibrations are present in the system piping, a chambered silencer and/or flexible connections should be used. If vibrations may pass through the mounting skid, isolation pads should be used between the skid and the mounting feet of the heat exchanger. Pulsation and/or vibration can cause metal fatigue, and lead to failure of the heat exchanger.

If the heat exchanger is used in a pneumatic conveying system, a check valve should be placed between the air lock and the heat exchanger. This will help to prevent clogging the heat exchanger with the product being conveyed.



4.1 C/HP/TV SERIES

The orientation for which the heat exchanger is designed is noted on the certified drawing. A unit that is designed for horizontal gas flow may not perform to specification if it is installed in a vertical flow orientation.

Attachment to the service connections should be made using industry standard practices. If special valves, controls, traps, etc., are provided by Xchanger, separate instructions may be attached. If shut off valves are installed on both of the service lines, a pressure relief valve should be installed on the heat exchanger side of one of the shut off valves to prevent over pressurizing the unit. A pressure relief valve similar to a domestic water heater valve is usually adequate.

On standard heat exchangers, there is a 3/4 inch female NPT drain coupling in the bottom of the housing. Condensate that forms on the outside of the fins can be drained though this coupling to a drain leg or trap.

4.1.1 Drainable Tube Circuits

These units should be installed with a slight slope toward the service connection side of the exchanger.

4.1.2 Steam Piping

Proper installation, piping, and trapping is necessary to insure satisfactory operation and prevent damage under normal operating conditions. These installation recommendations must be followed to assure trouble free operation:

- Provide swing joints or flexible fittings in all piping connections adjacent to the heat exchanger. This absorbs the thermal expansion and contraction of the piping.
- Condensate must flow freely from the heat exchanger at all times to prevent physical damage to the core caused by water hammer, unequal thermal stresses, freeze-up, or corrosion.
- Do not pitch the heat exchanger. The mounting position should be level.
- Control each heat exchanger core separately when installing multiple cores.
- Do not modulate systems with overhead or pressurized returns unless the condensate is drained by gravity to a receiver, vented to atmosphere, and returned to the steam main by a condensate pump.
- Pitch all supply and return piping down a minimum of 1 inch per 10 feet in the direction of steam flow.
- Do not drain steam mains or take-offs through the heat exchanger. Drain steam mains ahead of the heat exchanger through a steam trap into the steam return line.

- Do not bush or reduce the steam condensate return piping smaller than the heat exchanger connection. Run return pipe full size to a steam trap (except for a short nipple screwed directly into the condensate connection of the steam trap).
- Overhead steam return lines require 1 PSIG pressure at the steam trap discharge for each 2 feet of elevation to assure continuous condensate removal.
- When an overhead steam return line is installed, provisions should be incorporated into the piping system to allow condensate to drain from the heat exchanger during down time.
- The end of the steam supply main must be trapped.
- A vacuum breaker must be installed if there is any possibility that the heat exchanger will see a vacuum resulting from a fast acting valve operation.

4.1.3 Steam Trap Selection

Proper steam trap selection and installation is necessary for satisfactory heat exchanger performance and service life:

- Select a steam trap based on the maximum possible condensate flow rate along with the recommended load factors.
- Locate the steam trap discharge at least 12 inches below the heat exchanger condensate return connection. This will provide sufficient hydrostatic head pressure to overcome trap losses and assure complete removal of the condensate from the heat exchanger.
- Float and thermostatic type steam traps are preferred because of their gravity drain and continuous discharge operation.
- Use a float and thermostatic type steam trap with gravity condensate return and automatic controls where there is a possibility of a low pressure steam supply.
- Use bucket traps only when steam supply is not modulated and is over 25 PSIG.
- When installed for series airflow, size steam traps for each heat exchanger core using the capacity of the first heat exchanger core (in airflow direction).
- Trap each heat exchanger separately. This will prevent condensate holdup in the heat exchanger cores.
- Install strainers as close as possible to the inlet side of a steam trap.

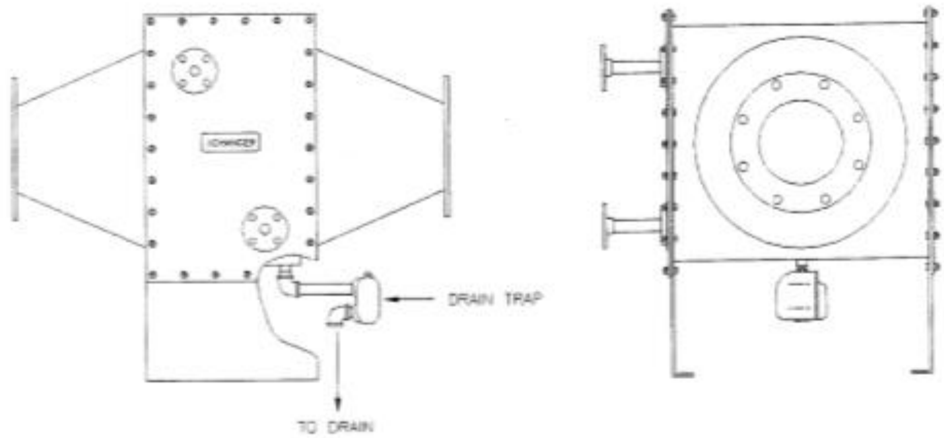
4.1.4 Refrigerant Circuit

Direct expansion refrigerant circuits are shipped open and uncharged. They must be evacuated and charged. If you need assistance, contact a local refrigeration contractor.

4.1.5 Housing Drain Trap

In applications where vapors are expected to condense from a horizontal gas flow, an automatic drain trap should be installed. Approximately 12 inches total clearance under the housing box is required, or 9 inches below the standard mounting feet.

For installations where the gas flow is vertical, any condensed vapors will fall out of the low side transition, due to gravity.



4.2 AA/LC SERIES

The electric motor must be wired on site. On many air cooled heat exchangers, the electrical service must be brought through the exhaust hood. Any holes in the exhaust hood should be sealed to prevent air that has not passed through the core from entering, thereby short-circuiting the core. Refer to the motor name plate for electrical requirements.

5.0 START-UP

After carefully observing all the points listed under Section 4.0 INSTALLATION, the unit is ready for start-up. After the process/service fluids have been directed to the unit, check for leaks.

5.1 C/HP/TV SERIES STEAM HEATERS

Steam should be turned on full for at least ten minutes before the airflow is started to prevent water hammer, freezing, and excessive thermal stresses on the heat exchanger.

5.2 AA/LC SERIES

Before starting the electric fan, the following checklist should be used:

- The propeller hub should be secure on the motor shaft.
- The propeller should rotate freely.
- Electrical wiring should be safely secured.
- The air flow path should be open (i.e. packing material removed).

After starting the motor, verify that the propeller is rotating in the proper direction. The data sheet and certified drawing should state the design flow direction for the ambient air.

6.0 MAINTENANCE

Depending on the model, and your operating environment, the maintenance requirements may vary.

6.1 LUBRICATION

6.1.1 C/HP/HR/TV SERIES

No lubrication is required for the heat exchangers. Accessories may require lubrication, per their manuals.

6.1.2 AA/LC SERIES

Refer to the maintenance instructions provided with the motor(s).

6.2 C/HP/TV SERIES CORE REMOVAL AND INSTALLATION

It may be necessary to occasionally remove the fin-tube core from the housing for inspection or cleaning.

For units with removable cores, the following steps describe the procedure for removing the fin-tube core from the heat exchanger housing. Units which are all-welded will need to be returned to the factory for service. [See page 2 & 3 for reference to terminology.]

6.2.1 C/TV SERIES Core Removal

1. Disconnect service fluid and remove any connections from the service hubs (i.e. sweat on bronze flanges, screwed on threaded flanges, etc.). If the core and cover are welded together, the flanges do not need to be removed, as the cover will remain with the core.
2. Remove the bolts securing the hub plate assemblies to the front cover.
3. Remove the hub plate assembly (hub plate, O-ring, and backing washer). Some prying with a screwdriver or similar tool may be required to break the bond of the sealant.
4. Remove the bolts securing the front and rear housing covers to the housing.
5. Remove the front and rear covers. Some prying with a screwdriver or similar tool may be required to break the bond of the sealant.
6. Remove the bolts securing the core to the housing. Check both sides.
7. Remove the core from the housing by pulling evenly on the headers or the casing and/or pushing evenly on the 180° tube return bends on the back side of the core. Take care not to damage the headers or return bends.

6.2.2 HP SERIES Core Removal

1. Remove the flange bolts around the removable dished head cover.
2. Disconnect the core connections from the internal service connections.
3. Remove the bolts holding the core to the side of the housing.
4. Remove the core from the housing.

6.2.3 C/HP/TV SERIES Core Installation

Install the core in the reverse order of removal, noting the following:

1. Slide the core into the housing and attach the casing to the side of the housing.

   For replacement cores, the holes in the casing which hold the core against the side of the housing may not match the holes on the original core. If not, new holes will need to be drilled as follows:

   a. Slide the core into the housing such that the core face is centered in the transition opening.
   b. Mark the locations of the housing holes on the casing.
   c. Remove the core and drill the holes where marked. When drilling the holes, place a wooden block behind the casing to prevent damage to the core's tubing.
   d. Reinstall the core into the housing.

2. For HP Series exchangers, the internal service connections will need to be reattached.

3. Clean the sealing surfaces on the covers and housing flanges with solvent to remove any oils or residue.

4. Apply new gasket material to the housing flange. Refer to the data sheet supplied at the time of purchase for proper gasket material selection.

5. Install covers, cover bolts-washers-nuts and for C/TV Series exchanger, the hub cover assemblies. To facilitate installing the hub cover assemblies, do not tighten the cover bolts until after the hub cover assemblies are installed. All bolts should be finger tight at this point.

   For C/TV Series replacement cores, the hub locations may not be identical to those of the original core. To check for proper alignment, install the front cover with the four corner bolts. Slide on the hub cover assemblies to check for alignment over the hubs of the replacement core. If the hub and cover bolt holes do not match, new holes must be drilled and tapped into the cover. The hub covers may be rotated such that the old air holes will not interfere with the new holes. Fill in the old holes to prevent gas leakage.

6. Tighten the front and, if applicable, rear cover bolts.

7. Tighten the hub cover assembly bolts.

6.3 CLEANING

Xchanger heat exchangers perform best when clean. It is recommonded that they be prevented from becoming fouled since their design is such that once plugged or coated, it may not be possible to fully clean them. The sections below offer suggestions, where applicable, if cleaning is attempted.

6.3.1 AA/HR SERIES Internal Gas Passages

The internal process gas passages in these heat exchangers are not cleanable. Filtered air is absolutely required for these units. If plugging does occur, core replacement is recommended.

6.3.2 AA/HR/LC SERIES Service Gas Passages

For dirt/dust contamination, a soap and water wash is usually adequate to clean the service side of these units. If not, the use of an appropriate solvent or compressed air is recommended. Pressure washers can damage the fins, and should not be used.

6.3.3 C/HP/TV SERIES Gas Passages

These heat exchangers may require disassembly for cleaning. See Section 6.2 for disassembly instructions. Once access is obtained, the cleaning options described in Section 6.3.2 can be used.

6.3.4 C/HP/LC/TV SERIES Fluid Passages

The tube interior can become coated with sediment. This coating will reduce the thermal capacity of the heat exchanger. To try to restore a fouled heat exchanger to the original capacity, an appropriate solvent or cleaner compatible with the tube material can be circulated through the circuit to clean the tube interior.

6.4 FREEZING PROTECTION - C/HP/LC/TV SERIES

6.4.1 Drainable Circuits

If the heat exchanger is equipped with a drainable tube circuit, the tubes can be drained by simply opening the service and outlet to atmosphere. These units should be installed with a slight slope toward the service connection end to facilitate complete drainage.

6.4.2 Non-trapped Circuits

These tube circuits run horizontally and downward across the exchanger. If the exchanger is installed level, when the service inlet and outlet are opened to atmosphere, the service fluid may drain out of the low connection sufficiently to prevent freezing damage. If the exchanger is installed out of level, some service fluid will hang up in the now trapped points of the core. In this case, antifreeze should be added as discussed below.

6.4.3 Trapped Circuits
These circuits run downward and upward, like the trap under a sink, and therefore are not drainable. Antifreeze should be added as discussed below.

Antifreeze should be added to the core to provide freezing protection, per the following procedure.

1. Open the water inlet and outlet to atmosphere and allow the core to drain as completely as possible.

2. Add antifreeze to the core and circulate the solution through the core for approximately fifteen minutes.

3. Check the concentration for adequate freeze protection for your area. If the concentration is not sufficient, repeat steps 1 & 2 as necessary.

7.0 SPARE PARTS

7.1 C/HP/TV SERIES

Normally, no spare parts are recommended. If a specific exchanger includes special parts or accessories that could be a spare part, or if an accessory itself uses spare parts, they would be noted on the data sheet, certified drawing, or on accompanying documentation.

Please note that the manufacturing and shipping time for replacement cores is often 6 weeks. If this length of downtime would present a significant problem, it may be advisable to stock a spare core.

7.2 AA/LC SERIES

A spare electric motor is recommended.

7.3 HR SERIES

Normally, no spare parts are recommended. Similar to the C/HP/TV Series above, any special parts would be noted on a case by case basis.

8.0 GUARANTEE

8.1 DURATION

The sooner of either:

- 12 months from date of start-up.
- 18 months from date of shipment from Xchanger.

8.2 TERMS

Xchanger will replace or repair any part or parts free of charge, F.O.B. our factory, provided our examination shows the item to be defective by reason of inferior materials or workmanship.

The part or parts must have been used as intended and in accordance with our instructions. No allowance will be made for repairs or alterations made without our written consent.

8.3 EXCLUSIONS

This Guarantee does not cover damages resulting from misuse, neglect, alteration, or accident, specifically including operating at temperatures or pressures in excess of those for which the equipment was specified and furnished.

The liability of Xchanger is limited to our option of the repair or replacement at our factory of any part which has been found defective by our examination. Such repair or replacement shall constitute the extent of our obligation. Xchanger shall not be liable for any incidental or consequential damages resulting from the resolution of the warranty issue, or otherwise.

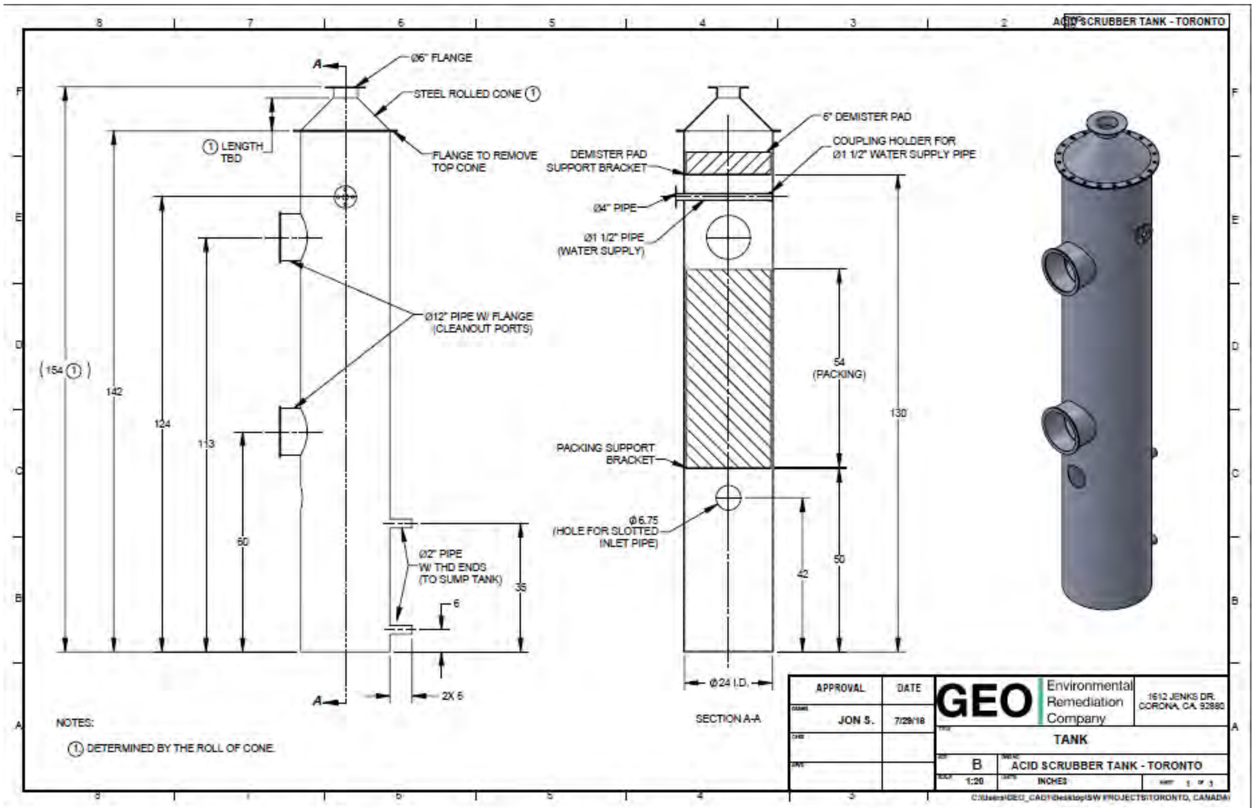
Motors, controls and other purchased parts are warranted by their original manufacturers. Such warranties will be carried out in accordance with the usual terms thereof.

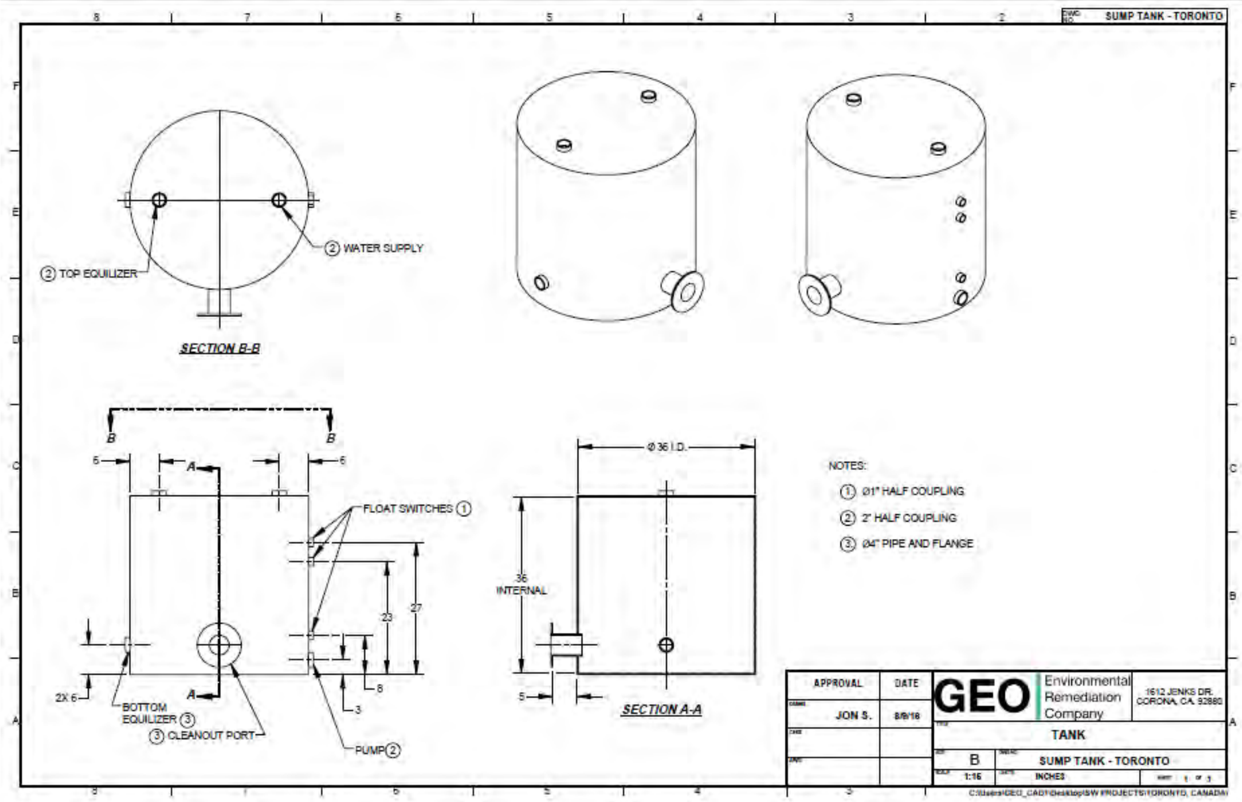
9.0 SERVICE

Should assistance in installation, demonstration, or repair of any equipment be required, please contact Xchanger at:

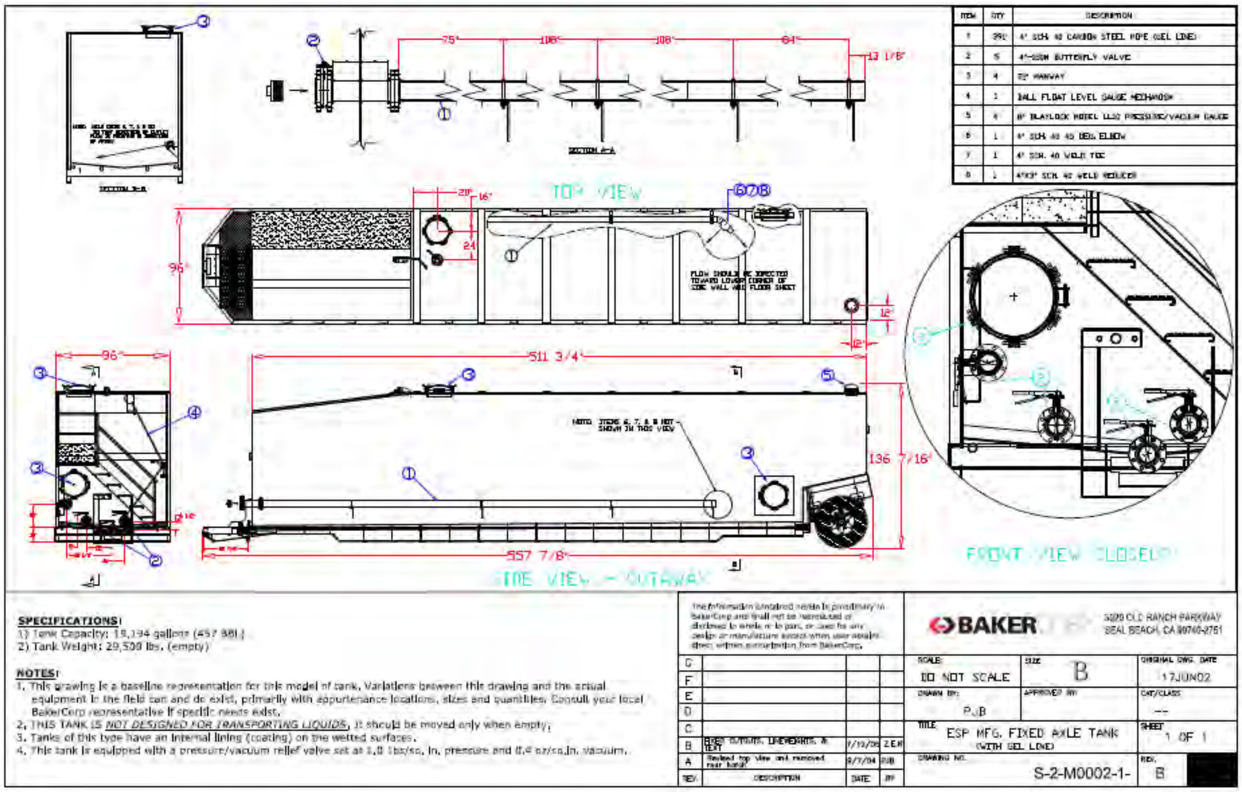
Mail:	1401 South 7th Street Hopkins, MN 55343 USA
Ph:	952-933-2559
Fax:	952-933-5647
E-mail:	info@xchanger.com

Appendix 14. GEO Inc. Acid Scrubber Package

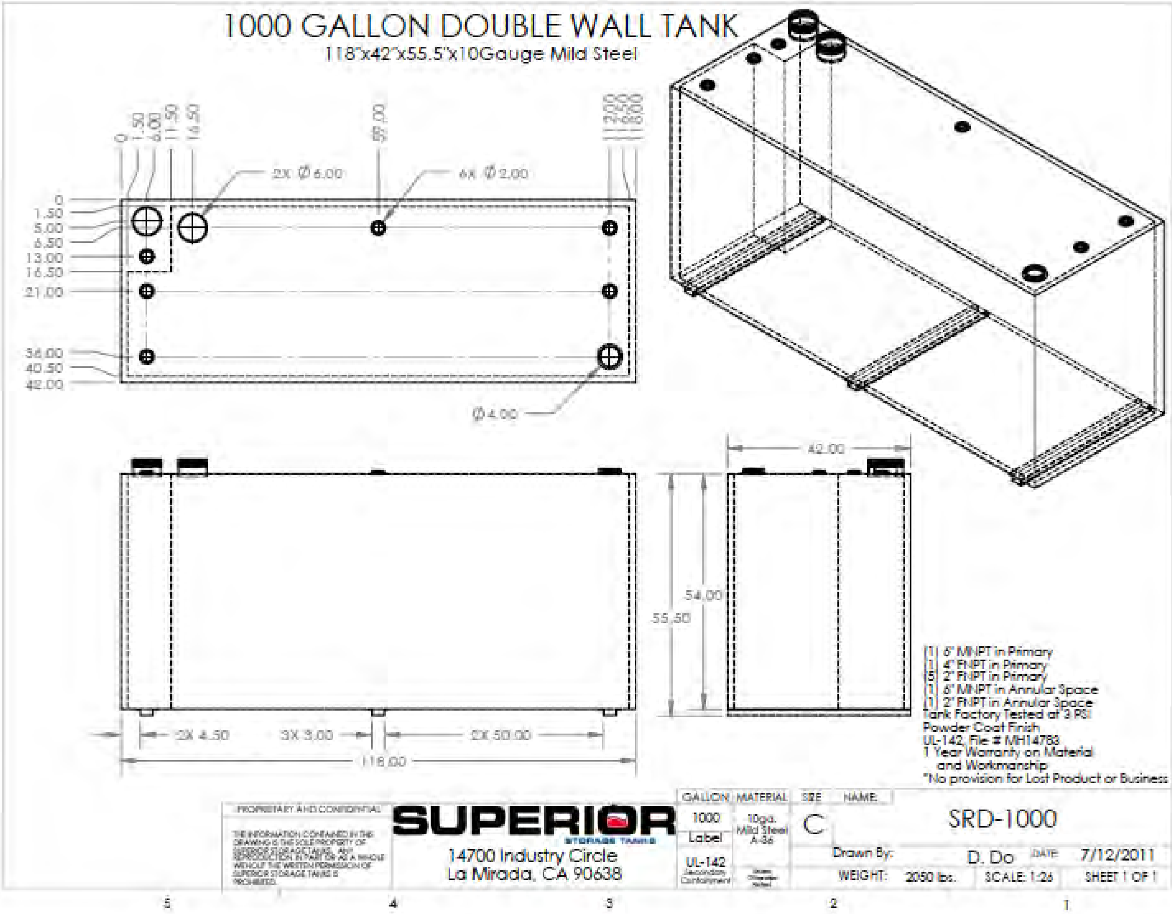

ACID SCRUBBER TANK - TORONTO
Ø6" FLANGE
STEEL ROLLED CONE (1)
(1) LENGTH TBD
FLANGE TO REMOVE TOP CONE
Ø12" PIPE W/ FLANGE (CLEANOUT PORTS)
(154 (1))
142
124
113
60
Ø2" PIPE W/ THD ENDS (TO SUMP TANK)
35
6
2X 5
NOTES:
(1) DETERMINED BY THE ROLL OF CONE.
DEMISTER PAD SUPPORT BRACKET
Ø4" PIPE
Ø1 1/2" PIPE (WATER SUPPLY)
6" DEMISTER PAD
COUPLING HOLDER FOR Ø1 1/2" WATER SUPPLY PIPE
54 (PACKING)
130
PACKING SUPPORT BRACKET
Ø6.75 (HOLE FOR SLOTTED INLET PIPE)
42
50
Ø24 I.D.
SECTION A-A
APPROVAL
DATE
JON S.
7/29/18
GEO Environmental Remediation Company
1612 JENKS DR. CORONA, CA 92880
TANK
B
ACID SCRUBBER TANK - TORONTO
1:20
INCHES


SUMP TANK - TORONTO
SECTION B-B
② TOP EQUILIZER
② WATER SUPPLY
B
B
A
A
6
6
FLOAT SWITCHES ①
23
27
2X 6
BOTTOM
EQUILIZER ③
③ CLEANOUT PORT
8
3
PUMP②
Ø 36 I.D.
36
INTERNAL
5
SECTION A-A
NOTES:
① Ø1" HALF COUPLING
② 2" HALF COUPLING
③ Ø4" PIPE AND FLANGE
APPROVAL
DATE
JON S.
8/8/16
GEO Environmental Remediation Company
1612 JENKS DR.
CORONA, CA. 92880
TANK
B
SUMP TANK - TORONTO
1:16
INCHES
1 OF 1

Appendix 15. Liquid Storage Tanks (T-1, T-3)


TOP VIEW
SIDE VIEW - CUTAWAY
FRONT VIEW CLOSEUP
SECTION A-A
SECTION B-B
75"
108"
108"
64"
13 1/8"
20"
16"
24
96"
96"
12"
12"
511 3/4"
136 7/16"
557 7/8"
FLOW SHOULD BE DIRECTED TOWARD LOWER CORNER OF END WALL AND FLOOR SHEET
NOTE: ITEMS 6, 7, & 8 NOT SHOWN IN THIS VIEW
ITEM | QTY | DESCRIPTION
1 | 39L' | 4" SCH. 40 CARBON STEEL PIPE (GEL LINE)
2 | 5 | 4"-150# BUTTERFLY VALVE
3 | 4 | 22" MANWAY
4 | 1 | BALL FLOAT LEVEL GAUGE MECHANISM
5 | 4 | 8" BLAYLOCK MODEL LL32 PRESSURE/VACUUM GAUGE
6 | 1 | 4" SCH. 40 45 DEG. ELBOW
7 | 1 | 4" SCH. 40 WELD TEE
8 | 1 | 4"X3" SCH. 40 WELD REDUCER
SPECIFICATIONS:
1) Tank Capacity: 19,194 gallons (457 BBL)
2) Tank Weight: 29,500 lbs. (empty)
NOTES:
1. This drawing is a baseline representation for this model of tank. Variations between this drawing and the actual equipment in the field can and do exist, primarily with appurtenance locations, sizes and quantities. Consult your local BakerCorp representative if specific needs exist.
2. THIS TANK IS NOT DESIGNED FOR TRANSPORTING LIQUIDS. It should be moved only when empty.
3. Tanks of this type have an internal lining (coating) on the wetted surfaces.
4. This tank is equipped with a pressure/vacuum relief valve set at 1.0 lbs/sq. in. pressure and 0.4 oz/sq.in. vacuum.
BAKER
3020 OLD RANCH PARKWAY
SEAL BEACH, CA 90740-2751
SCALE: DO NOT SCALE
SIZE B
ORIGINAL DWG. DATE 17JUN02
DRAWN BY: PJB
TITLE ESP MFG. FIXED AXLE TANK (WITH GEL LINE)
SHEET 1 OF 1
DRAWING NO. S-2-M0002-1-
REV. B

Appendix 16. Chemical Collection Tank


1000 GALLON DOUBLE WALL TANK
118"x42"x55.5"x10Gauge Mild Steel
2X Ø6.00
6X Ø2.00
Ø4.00
0
1.50
6.00
11.50
16.50
59.00
5.00
6.50
13.00
21.00
36.00
40.50
42.00
42.00
54.00
55.50
2X 4.50
3X 3.00
2X 50.00
118.00
(1) 6" MNPT in Primary
(1) 4" FNPT in Primary
(5) 2" FNPT in Primary
(1) 6" MNPT in Annular Space
(1) 2" FNPT in Annular Space
Tank Factory Tested at 3 PSI
Powder Coat Finish
UL-142, File # MH14783
1 Year Warranty on Material
and Workmanship
*No provision for Lost Product or Business
PROPRIETARY AND CONFIDENTIAL
SUPERIOR
STORAGE TANKS
14700 Industry Circle
La Mirada, CA 90638
GALLON
1000
Label
UL-142
Secondary Containment
MATERIAL
10ga. Mild Steel A-36
SIZE
C
NAME:
SRD-1000
Drawn By:
D. Do
DATE
7/12/2011
WEIGHT:
2050 lbs.
SCALE: 1:26
SHEET 1 OF 1

Appendix 17: C3 Commissioning

GEO Environmental Remediation Company

COMMISIONING MANUAL / SIGN OFF SHEET
SOIL VAPOR EXTRACTION AND RECOVERY SYSTEM

Prepared By:
G.E.O. Inc.
1612 Jenks Dr
Corona, California 92880

1.0 Introduction

The following tables are to be completed for the C3 unit prior to mobilization of the SVE system with the exception of the Field Alarms which will be tested on site.

2.0 Process Air Plumbing

C3 Process Air Plumbing			
Item(s)	Description	Initials/Date	Accept (Yes/No)
1	All welded/soldered fittings have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
2	All threaded fittings have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
3	All unions have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
4	All flanges have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
5	Upon completion of ALL process air plumbing, the system has been pressure tested with compressed air at or above 150 psi for at least 12 hours.		

2.1 Refrigeration Plumbing

C3 Refrigeration Plumbing			
Item(s)	Description	Initials/Date	Accept (Yes/No)
1	All soldered fittings have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
2	All threaded fittings have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
3	All unions have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
4	All flanges have been checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
5	All king valve packings have been **tightened** and then checked for leaks by either spraying with liquid leak detector or with ultrasonic leak detector.		
6	Upon completion of ALL refrigeration plumbing, the system has been pressure tested with nitrogen at or above 250 psi for at least 12 hours.		

2.2 Blowers/Compressors

Blowers and Compressors					
Item(s)	Description	Design Value	Actual Value	Initials/Date	Accept (Yes/No)
1	Compressor(s) are capable of providing specified flow as measured at the outlet of the VES with at least 130 psi at the DHs.	500 cfm			
2	Blowers are capable of feeding a specified minimum flow of air to the compressor(s) at the specified vacuum.	375 cfm at 24" Hg			

2.3 C3 Operating Parameters

The C3 operating parameters should be taken only after the system has reached steady state. To reach steady state, the primary side should reach -20°F or less, the cycle should be switched, and the secondary side should be at least midway (15 min) through its cycle.

C3 Operating Parameters					
Item(s)	Description	Design Values	Actual Values	Initials/Date	Accept (Yes/No)
1	Chiller In	150-160 psi 80-110°F			
2	Chiller Out	70-90°F			
3	Primary In	145-155 psi < 50°F			
4	Primary Out	140-150 psi < 50°F			
5	Secondary In	135-145 psi < -15°F			
6	Secondary Out	130-140 psi < -30°F			
7	System Out	≥ 130 psi 50-60°F			
8	DH In	125-135 psi 60-90°F			

2.4 Purge Air Calibration

The following table should be completed and the results graphed and then kept with this manual.

Pressure (psi)	500cfm DH Flow (cfm)	350cfm DH Flow (cfm)
0	0	0
10	44	33
20	51	45
30	63	56
40	75	67
50	93	77
60	103	89
70	116	98
80	130	106

Total Flow (cfm)	15% Regen (cfm)	20% Regen (cfm)	25% Regen (cfm)	30% Regen (cfm)
300	45	60	75	90
350	52.5	70	87.5	105
400	60	80	100	120
450	67.5	90	112.5	135
500	75	100	125	150

2.5 C3 Alarms

C3 System Alarms					
Item(s)	Location	Alarm	Set Point	Initials/Date	Accept (Yes/No)
1	Container	Lower explosive limit	50% LEL		
2	Container	Organic vapor analyzer	200 ppm		
3	Condensation System	High temperature	0°F		
4	Condensation System	Low pressure	100 psi		
5	Chemical Catch Can	Level sensor high high			
6	Regenerative Adsorber	Power input			
7	Compressor / C3	C3 power loss			
8	Refrigeration	Phase protection relay			

2.6 C3 Field Alarms

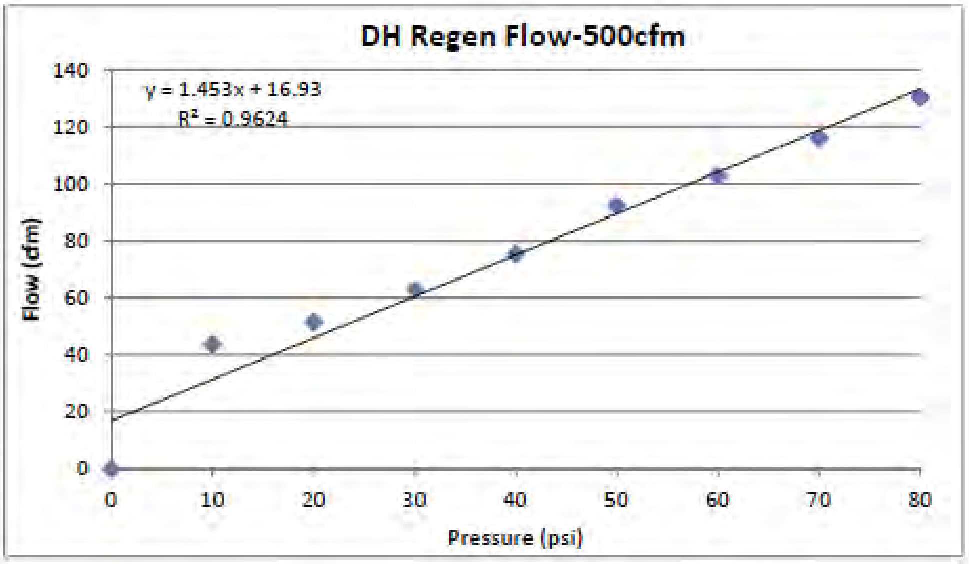
Field Alarms					
Item(s)	Location	Alarm	Set Point	Initials/Date	Accept (Yes/No)
1	System Out	Organic vapor analyzer	25 ppm		
2	Vapor/Liquid Separator	Level sensor high high	[redacted]		
3	Chemical Recovery Tank	Level sensor high high	[redacted]		
4	Chemical Recovery Tank	Pressure and Vacuum Relief	[redacted]		
5	Condensate Tank	Level sensor high high	[redacted]		
6	Condensate Tank	Pressure and Vacuum Relief	[redacted]		
7	Container	E-stop	[redacted]		

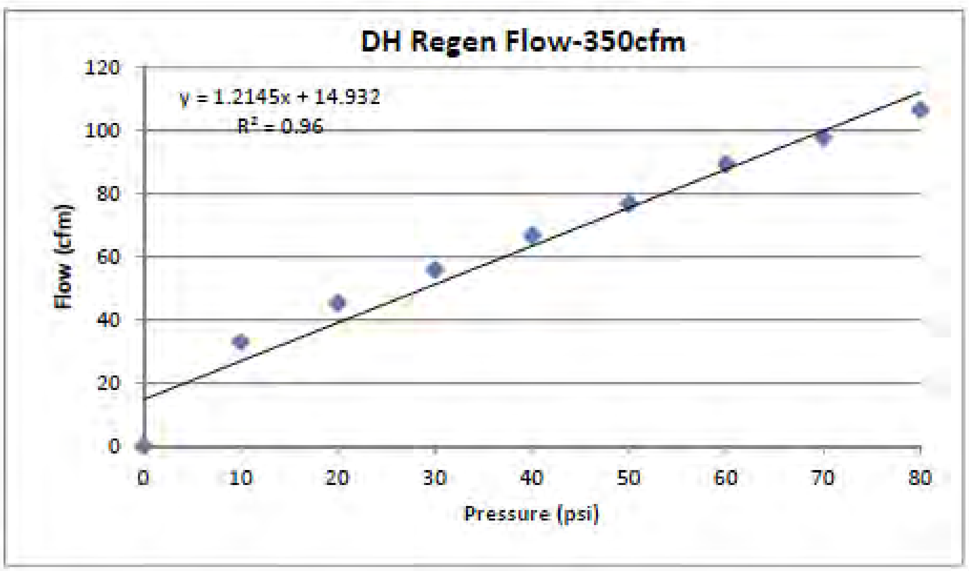
2.8 Calibrations

Calibrations			
Item(s)	Description	Volume	Initial/Date
1	Knock Out Drain		
2	Compressor Drain Cans		
3	Chiller Drain Can		
4	Demister Drain Can		
5	C3 Drain Cans		

2.7 Items to Remember

Item(s)	Description	Initials/Date
1	Laptop w/ daily site log	
2	Compact Flash Drive for HMI	
3	Battery for PLC	
4	Dip Stick	
5	Graduated Cylinder	


DH Regen Flow-500cfm
y = 1.453x + 16.93
R² = 0.9624
Flow (cfm)
Pressure (psi)
0
20
40
60
80
100
120
140
0
10
20
30
40
50
60
70
80


DH Regen Flow-350cfm
y = 1.2145x + 14.932
R² = 0.96
Flow (cfm)
Pressure (psi)
0
20
40
60
80
100
120
0
10
20
30
40
50
60
70
80

Monitoring Well Groundwater Sampling

1.0 Purpose and Scope of Work

1.1 This project-specific operating procedure (SOP) describes the general and specific procedures, equipment, methods and considerations to be used and observed for safe collection of groundwater samples from multiphase extraction (MPE) and conventional wells. The groundwater samples shall be collected prior to, during, or shortly after, the application of Thermal Conduction Heating (TCH) as part of the in situ thermal remediation (ISTR) process. Samples will be collected for field screening or laboratory analysis.

1.2 Groundwater sampling at the site will be conducted for two purposes; (1) to determine changes in groundwater concentrations over time in order to evaluate the progress of the ISTR process, and (2) to determine if hydraulic control of the contaminant plume is in effect. The first objective will be met by sampling MPE wells within the treatment area. The second will be met by sampling the down-gradient (conventional) monitoring wells.

1.3 MPE and downgradient wells each have specialized well heads designed for ISTR. Sampling methods for MPE wells and downgradient wells differ and are adapted to these construction details. Further, groundwater conditions will vary as treatment progresses. During the early phases of the ISTR, groundwater may not be hot, while later in the process the temperatures will be near boiling in the MPE wells and may also be elevated in the downgradient wells. Water levels in the treatment area (MPE wells) will drop as formation water (pore water and groundwater) is driven off by the heating process, and recovery in the downgradient wells may also be impacted. This SOP presents multiple procedures for groundwater sampling that are suited to the specialized well heads and designed to adapt to these changing conditions. Selection of the sampling procedure and equipment is discussed in the Procedures section below.

2.0 Safety

2.1 There are certain hazards associated with TCH during the remediation of soil and groundwater. These hazardous include possible contact with gas, steam, hot water, hot soil, other hot surfaces, or hazardous chemicals. Exposure to these hazardous can be mitigated through engineering controls and strict adherence to documented procedures and safety protocols. At a minimum, the thermal system should be de-energized (lock out/tag out) or deactivated in the immediate area of the well sampling activities, if not the entire well field. Consult the APP/SSHP for specific safety protocols during sampling. Field team should check well casing, wellhead, and tubing/valves with infrared thermometer and pressure relief valves for steam pressures to confirm safe conditions for handling, and/or use the proper personal protective equipment if necessary. Stay clear of all moving equipment and avoid wearing loose fitting clothing.

3.0 Terms and Definitions

Not applicable.

4.0 Interferences

4.1 Potential interferences could result from cross-contamination between samples or locations. Additionally, contaminants may sorb to or desorb from materials that are not sufficiently inert. Minimization of the cross-contamination will occur through the following:

- The use of clean sampling tools at each location as necessary.
- Use of inert material for equipment that will come into direct contact with the groundwater. Equipment with neoprene fittings, polyvinyl chloride (PVC) bailers, Tygon® tubing, silicon rubber bladders, neoprene impellers, polyethylene, and Viton® are not acceptable when sampling for organics. If bailers are used, an inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless-steel wire or cable) shall be used.
- Avoidance of material that is not representative of the media to be sampled.

4.2 Degassing of groundwater may occur during the purging and sampling procedures. Field personnel proceed with caution to avoid agitation of the groundwater column or groundwater flow through the purging and sampling equipment. Degassing will alter the groundwater chemistry and may lead to loss of VOCs. Degassing may be promoted by use of a vacuum pump (e.g., peristaltic pump), changes in pressure in MPE wells, changes in aperture along the sample tubing, pinches in the sample tubing, exposure of the tubing to elevated temperatures or direct sunlight (particularly with low flow rates), insufficient flow through the tubing, or forceful, non-laminar flow when filling sample containers. Gas bubbles present in the discharge tubing during purging and sampling are indicative of outgassing. Check all connections for bubbles. Remove pinches in the tubing, and make sure that the diameters of the tubing used are compatible. Avoid placing tubing and sampling equipment in direct sunlight. Do not allow the water level to drop below the pump intake.

4.3 Disturbance of material in the well may increase turbidity and impact the representativeness of the groundwater sampled.

4.4 Over-purging a well with insufficient yield may induce cascading of the sand pack or unwanted interaction of the groundwater with the casing and atmosphere, impacting the representativeness of the sample collected.

5.0 Training and Qualifications

5.1 The individual executing these procedures must have read, and be familiar with, the requirements of this POP.

5.2 The responsibilities of the project staff are defined as follows:

- The Environmental Manager is responsible for ensuring that monitoring well sampling activities comply with this procedure. The Environmental Manager is responsible for ensuring that all field sampling personnel involved in monitoring well sampling shall have the appropriate education, experience, and training to perform their assigned tasks.
- The on-site field sampler is expected to be familiar with the procedures presented in this SOP; to plan for the sampling conditions that may be encountered; and to follow the procedures in this SOP to obtain groundwater samples.

6.0 Equipment and Supplies

6.1 Equipment necessary includes specialized well heads for the MPE and downgradient wells. MPE wellheads (Figure 1) will be modified to prevent uncontrolled releases of contaminant vapors and superheated steam but allow for the sampling of groundwater during the in-situ treatment process. MPE wellheads must be modified prior to commissioning of the in-situ thermal process. Downgradient hydraulic monitoring wells outside of the thermal treatment zone are not anticipated to encounter hot conditions. Therefore, threaded well caps will be provided for these wells to allow direct sampling from them using standard well sampling procedures (Figure 2). As a safety measure, the well caps will be fitted with pressure relief valves and a thermocouple to allow samplers to check the water temperature and vent the well should temperatures become higher than expected. If elevated temperatures persist at a downgradient well, well caps will be replaced with steel pressure-rated caps.

Purging and sampling equipment:

- Peristaltic pump, pneumatic bladder pump, and bailer
- 12-volt Power source
- Teflon inlet and discharge tubing (3/8-inch outer diameter) rated to tolerate groundwater near the boiling point
- ¼-inch Stainless steel tubing is required for cooling coil
- Silicone tubing appropriate for peristaltic pump head
- Infrared Thermometer
- Water level meter
- Oil/water interface probe
- Portable 12-volt Air compressor

General equipment:

- Sample kit (i.e., bottles, labels, preservatives, custody records and tape, cooler, ice)
- Sample Chain-of-Custody (COC) forms, Sample Collection Records, Sample packaging and shipping supplies
- Waterproof marker or paint
- Deionized water supply, Water dispenser bottles
- Flow measurement cup or bucket
- 5-gallon buckets
- Instrument calibration solutions
- Stopwatch or watch
- Disposable nitrile gloves
- Paper towels
- Trash bags

- Zipper-lock bags
- Equipment decontamination supplies
- Well keys or combinations
- Monitoring well location map(s)
- Field project logbook/pen
- Safety glasses with side shields.
- Site specific PPE requirements. Refer to APP/SSHP

7.0 Calibration or Standardization

7.1 Field instruments will be calibrated daily according to manufacturer's specifications for each piece of equipment. Calibration records shall be recorded in the field logbook or appropriate field form.

7.2 If readings are suspected to be inaccurate, the equipment shall be checked with the calibration solutions and/or re-calibrated.

8.0 Procedures: Background Information

8.1 **Project Sampling Approach**

As noted in the introduction, sampling methods have been adapted to the specialized construction details of the MPE and downgradient wells as well as the dynamic conditions resulting from ISTR treatment. Construction details for the MPE and downgradient wells are presented in Figures 1 and 2, respectively.

Knowledge of the current stage of the ISTR and conditions encountered at the well during previous sampling efforts will be helpful in predicting the methods and equipment required. However, selection of the sampling method will be based mostly on the well type and the conditions encountered in the field at the well at the time of sampling. A flow-chart depicting the logic applied in selecting the appropriate sampling method is presented as Figure 3: Groundwater Sampling Decision Flowchart.

Low-flow sampling techniques will be used for the program during baseline sampling. Low-flow sampling will also be used during heating for the downgradient wells unless heating causes elevated temperatures at those locations, in which case modified low-flow procedures will be used.

An overview of the procedures to be used for the downgradient wells and MPE wells is provided in this section, followed by a general discussion of low-flow groundwater sampling techniques and equipment.

8.1.1 **Downgradient Wells.** Impacts to groundwater temperature and availability in the downgradient wells, if they occur, should be minimal in comparison to those in the MPE wells. Sampling of downgradient wells will follow low-flow sampling procedures unless temperatures become unexpectedly elevated, requiring hot sampling procedures and precluding safe removal of the well cap. Because data quality objectives require only comparison of results over time, purge times for low-flow-sampling will be abbreviated. Peristaltic pump will be used unless the pump cannot overcome the head pressure, in which case bladder pumps will be used. Bailers may be used if the standing water depth is not sufficient for use of a bladder.

Although temperature impact to downgradient wells during treatment should be minimal, as a precautionary measure, well heads will be fitted with a thermocouple to allow samplers to measure groundwater temperature and a pressure relief vent to allow for venting the well as needed prior to sampling. Hot groundwater sampling procedures will be applied as needed. Water quality parameters will not be monitoring if the cooling coil is required.

If temperatures indicate that the cap cannot be safely removed, sampling will be conducted using a peristaltic pump and the tubing installed in the well. Because draw-down cannot be measured, the low-flow approach will be modified. If the peristaltic pump cannot overcome the head pressure, alternative downgradient monitoring will be considered in conference with the USACE.

8.1.2 **MPE Wells.** For the MPE wells, impacts to groundwater temperature and availability will be substantial once treatment begins. Well head construction precludes monitoring the water level. Therefore, once the well head is permanently installed, draw-down cannot be monitored. It is anticipated that the baseline sampling event will be conducted prior to permanent installation of the well heads. Low-flow procedures should be possible for the MPE wells during the baseline event. Once well heads are permanently installed and treatment has begun, collection will consist of removing groundwater from the stinger tube in the well. Because water will be constantly purging as part of the treatment process, there is no need to purge the well prior to sampling from the stinger.

8.1.3 **Low-Flow Sampling Methodology.** Under normal aquifer conditions, such as those anticipated for the baseline event, the water present in a well prior to sampling may not be representative of in-situ groundwater quality. Therefore, some method of purging must be performed prior to collecting a representative groundwater sample. Note that this is not the case for MPE wells once heating has started because flow through the stinger tubes is constant during treatment.

Groundwater can be purged using low-flow techniques. According to the U.S. Environmental Protection Agency (EPA) (EPA, 1996), the rate at which groundwater is removed from the well during purging ideally should be less than 0.2 to 0.3 liters/minute. EPA further states that wells should be purged at rates below those used to develop the well to prevent further development of the well, to prevent damage to the well, and to avoid disturbing accumulated corrosion or reaction products in the well.

EPA indicates that wells should be purged at or below their recovery rate such that drawdown of the water level does not occur during purging. This minimizes the potential for migration of water in the formation above the well screen. Because the pump intake is within the screened interval, so long as the purge rate is at or below the recharge rate, the water purged is theoretically coming from the aquifer and not the standing water in the well casing.

In addition, a low purge rate will reduce the possibility of stripping volatile organic compounds (VOCs) from the water and will reduce the likelihood of increasing the turbidity of the sample due to mobilizing colloids in the subsurface that are immobile under natural flow conditions.

To determine when representative groundwater is being removed from the well, water quality parameters (temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction (redox) potential and turbidity) are monitored. These parameters are measured to demonstrate that the natural character of the formation waters has been restored. Once the readings stabilize to within specified criteria, sampling may begin.

Complexities arise when well recharge is slow and yields are not sufficient. This problem can be anticipated based on the results of either the well development task or historical sampling events, however these issues may increase as treatment progresses.

Wells should not be purged to dryness, particularly if recharge causes the formation water to cascade down the sides of the screen. This will cause an accelerated loss of volatiles. The field sampler shall ensure that purging does not cause formation water to cascade down the sides of the well screen.

Water shall be purged from the well at a rate that does not cause recharge water to be excessively agitated unless an extremely slow recharging well is encountered where complete evacuation is unavoidable.

For pumps placed in the well, water shall not be purged to a level that falls below the top of the pump. For water levels above the top of the well screen, water shall not be purged to a level that falls below the top of the well screen.

If the pumping rate cannot be maintained at a rate below the recharge rate and drawdown persists, options are to either stop purging, document the issue and collect the samples; or not collect the sample and document the issues.

If the well is dewatered to the point that there is insufficient volume to collect samples, the well is allowed to recharge until sufficient volume returns. In order to prevent groundwater interaction with the casing and atmosphere, sampling should commence as soon as the well recovered sufficiently to collect the appropriate volume for the anticipated samples.

8.1.4 **Low-Flow Sampling Equipment.** Sampling equipment shall be constructed of inert material. Equipment with neoprene fittings, polyvinyl chloride (PVC) bailers, Tygon® tubing, silicon rubber bladders, neoprene impellers, polyethylene, and Viton® are not acceptable when sampling for organics. If bailers are used, an inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless-steel wire or cable) shall be used to raise and lower the bailer.

8.1.4.1 **Peristaltic Pumps:** A peristaltic pump is a type of positive displacement pump that moves water via the process of peristalsis. The pump uses a flexible hose fitted inside a circular pump casing. A rotor with cams compresses the flexible tube as the rotor turns, which forces the water to be pumped to move through the tube. In peristaltic pumps, no moving parts of the pump are in contact with the water being pumped. Displacement is determined by tube size, so delivery rate can only be changed during operation by varying pump speed. Peristaltic pumps are simple and quite inexpensive for the flow rates they provide.

Samples typically can be collected directly from the discharge end of the Teflon tubing, after it has been disconnected from the flow through cell. For volatile analyses, the sampler should make sure that the pump is set such that a smooth laminar flow is achieved.

Peristaltic pump may be utilized to purge a well if the water level is within 20 feet of ground surface. New or dedicated tubing is inserted to a depth within the saturated screened interval of the well. Water should be purged at a rate that satisfies low-flow requirements (i.e., does not cause drawdown).

8.1.4.2 **Bladder Pumps:** A pneumatic stainless-steel bladder pump with adjustable flow control and equipped with a Teflon bladder and Teflon-lined tubing can be effectively utilized to collect a groundwater sample and is considered to be the best overall device for sampling inorganic and organic constituents. If only inorganics are being sampled, polyvinyl bladders and tubing may be used. Operate positive air displacement bladder pumps in a continuous manner so that they minimize discharge pulsation that can aerate samples in the return tube or upon discharge.

When using a compressor, take several precautions. Ground fault circuit interrupters (GFCIs) should always be used when using electric powered equipment. Do not connect the compression hose from the compressor to the pump controller until after the engine has been started.

When all precautions are completed and the compressor has been started, connect the compression hose to the pump controller. Slowly adjust the control knobs to discharge water in the shortest amount of time while maintaining a near constant flow. This does not mean that the compressor must be set to discharge the water as hard as possible. The optimal setting is one that produces the largest volume of purge water per minute (not per purge cycle) while maintaining a near constant flow rate.

Prior to sampling, adjust the flow rate (purge rate) to yield 100 to 300 mL/minute. Avoid settings that produce pulsating streams of water instead of a steady stream if possible. Operate the pump at this low flow rate for several minutes to ensure that drawdown is not occurring. At no time shall the sample flow rate exceed the flow rate used while purging.

8.1.4.3 **Bailers:** Although not considered applicable for low-flow sampling, use of a bailer may be required should groundwater depth and yield preclude use of a peristaltic or bladder pump.

A single- or double-check valve Teflon or stainless-steel bailer equipped with a bottom discharging device can be utilized to collect groundwater samples. Bailers have a number of disadvantages, however, including a tendency to alter the chemistry of groundwater samples due to degassing, volatilization, and aeration; the possibility of creating high groundwater entrance velocities; differences in operator techniques resulting in variable samples; and difficulty in determining where in the water column the sample was collected. Therefore, use bailers for groundwater sampling only when other types of sampling devices cannot be utilized for technical, regulatory, or logistical reasons.

Dedicated or disposable bailers should always be used in order to eliminate the need for decontamination and to limit the potential of cross-contamination. Each time the bailer is lowered to the water table, lower it in such a way as to minimize disturbance and aeration of the water column within the well.

9.0 Procedures

9.1 Overview

Groundwater sampling procedures shall include:

A. Premobilization activities,

B. evaluation of the well security and condition,

C. decontamination of equipment,

D. purging and sampling groundwater from the downgradient wells, and

E. purging and sampling groundwater from the MPE wells

Each step is discussed in sequence below. Depending upon specific field conditions, additional steps may be necessary. As a rule, at least 48 hours should separate well development and well sampling events.

9.2 **Premobilization Activities**

9.2.1 Establish a thorough understanding of the purposes of the sampling event prior to field activities.

9.2.2 Consult with the project team to gain an understanding of the current status of the ISTR and the expected field conditions as they pertain to groundwater temperatures and levels. Using Figure 2 and this information, determine all the groundwater sampling procedures that could be required for each type of well to be sampled.

9.2.3 Assemble the required equipment.

9.2.4 Review the project UFP-QAPP to become familiar with the requisite field and laboratory analyses.

9.2.5 Consult with the Project Chemist concerning sampling priorities in the event that the volume of water produced is not sufficient for all analyses required. Decide on the types and numbers of quality assurance/quality control (QA/QC) samples to be collected, as well as the type and volume of sample preservatives, the type and number of sample containers, the number of coolers required, and the quantity of ice or other chilling materials. The field sampling personnel shall ensure that the appropriate number and size sample containers are brought to the site, including extras in case of breakage or unexpected field conditions.

9.3 **Evaluation of Well Security and Condition**

At each monitoring well location, observe the conditions of the well and surrounding area. The following information may be noted on the in the field logbook or Example Groundwater Sample Collection Record (Attachment 1), which may need to be modified to accommodate details specific to this project:

A. Condition of the well’s identification marker.

B. Integrity of the well – well pad condition, protective outer casing, obstructions or kinks in the well casing

C. Condition of the general area surrounding the well.

9.4 **Decontamination of Equipment**

Where possible, dedicated supplies should be used at each well location to minimize the potential for cross contamination and minimize the amount of investigation derived waste (IDW) fluids resulting from the decontamination process. If decontamination is necessary, establish a decontamination station before beginning sampling. The station shall consist of an area of at least 4 feet by 2 feet covered with plastic sheeting and be located upwind of the well being sampled. The station shall be large enough to fit the appropriate number of wash and rinse buckets and have sufficient room to place equipment after decontamination. One central cleaning area may be used throughout the entire sampling event. The area around the well being sampled shall also be covered with plastic sheeting to prevent spillage.

Decontaminate each piece of equipment in accordance with SOP 1, Equipment Decontamination prior to use. Also, conduct decontamination prior to sampling at a site, even if the equipment has been decontaminated subsequent to its last usage. Additionally, decontaminate each piece of equipment used at the site prior to leaving the site. It is only necessary to decontaminate dedicated sampling equipment prior to installation within the well. Do not place clean sampling equipment directly on the ground or other contaminated surfaces prior to insertion into the well. Dedicated sampling equipment that has been certified by the manufacturer as being decontaminated can be placed in the well without on-site decontamination.

9.5 Purging and Sampling Downgradient Wells

Well construction details for downgradient wells are presented in Figure 2. However, well heads and therefore accessibility to each well may vary. The field staff may need to deviate from the sampling procedures in order to accommodate the different well heads.

During the ISTR process, formation water (pore water and groundwater) may boil off as steam and the groundwater table may become depressed. Although this is not likely to substantially impact the downgradient wells, documentation of such conditions and observations should be made in the field sampling records.

Prior to the start of heating, sampling will be conducted in accordance with low-flow groundwater sampling procedures. The low-flow procedures will have an abbreviated purge time of 15 minutes, once drawdown has stabilized, after which sampling will be conducted even if groundwater quality parameters have not stabilized. Peristaltic pump will be used unless the depth to water exceeds the lift capacity of the pump. If the water level is too deep, bladder pumps will be used.

For events conducted after heating has begun, if the higher of the groundwater or well temperature is <140°F, low-flow groundwater sampling will be performed while monitoring drawdown but water quality parameters will not be used to determine stabilization. Peristaltic pump will be used unless the depth to water exceeds the lift capacity, in which case bladder will be used. Purging will be conducted at a rate that does not cause drawdown. Purging will continue until twice the volume of the saturated well screen has been removed. If the standing water depth is not sufficient for use of a bladder, a bailer may be used.

If groundwater or well temperature ≥ 140°F, the well cannot be opened. A peristaltic pump will be connected to the dedicated tubing in the well and a cooling coil will be used. Drawdown cannot be monitored and water quality parameters will not be used to determine stabilization. Purging will continue until twice the volume of the saturated well screen has been removed. Purging rate will be as low as is feasible with the cooling coil and the pump required.

If the peristaltic pump cannot overcome the head pressure, alternative downgradient monitoring will be considered in conference with the USACE.

Enter all information obtained during the purging and sampling process into the field logbook or Example Groundwater Sample Collection Record (Attachment 1), which may need to be modified to accommodate details specific to this project.

Handle all groundwater removed from potentially contaminated wells in accordance with the IDW handling procedures in the Waste Management Plan.

9.6 Opening the Well

Once heating has begun, the temperature at the well head must be measured prior to opening the well cap.

Prior to opening the well cap, the staff shall vent the well cap using the valve located on top of the well cap as indicated on Figure 2. The staff shall use an infrared thermometer to measure the temperature of the well casing. The staff will also measure the groundwater temperature by connecting temperature meter to the thermocouple wire lead initially placed in the well.

If the higher of the well casing or groundwater temperature is < 140°F, the staff may open the well to being purging and sampling.

If the well casing or groundwater is ≥ 140°F, the well will not be opened.

9.7 Measurement of Static Water Level Elevation

Static water levels can only be measured in wells with well and groundwater temperature < 140 °F.

Before purging the well, measure water levels in the wells being sampled. Once the cap has been removed, wait several minutes before measuring the water level to allow water levels to equilibrate to atmospheric pressure.

Measure the depth to standing water and the total depth of the well to the nearest 0.01 foot to provide baseline hydrologic data, to calculate the volume of water in the well, and to provide information on the integrity of the well (e.g., identification of siltation problems). When sounding the well, take care not to contact the sides of the well or stir up sediment at the well bottom.

An electronic water level meter shall be used for the measurement of the water level surface depth of the well to the nearest 0.01 foot; however, if the well is highly contaminated, an inexpensive weighted tape measure can be used to determine well depth to prevent adsorption of contaminants onto the meter tape. The presence of non-aqueous phase liquid (NAPL) in a well requires measurement of the elevation of the top and the bottom of the product, generally using an interface probe. Water levels in such wells must be corrected for density effects to accurately determine the elevation of the water table.

At each location, measure water levels several times in quick succession to ensure that the well has equilibrated to atmospheric conditions prior to recording the measurement. If measurements change by more than 0.01 foot, allow more time for the water level to equilibrate. Measure all site wells prior to sampling whenever possible. This will provide a water level database that describes water levels across the site at one time (a synoptic sampling). Prior to sampling, measure the water level in each well immediately prior to purging the well to ascertain that static conditions have been achieved.

9.8 Purging and Sampling Downgradient Wells

9.8.1 Purging Downgradient Wells, <100°F

a. Samples will be collected from the mid-point of the submerged screen. If low recovery is anticipated, the collection point can be moved to within two feet of the bottom of the screen and the bottom of the well to minimize mobilization of sediment that may be present at the bottom of the well.

b. If using a bladder pump, carefully lower the pump to the desired sampling depth using the suspension cable. Take care to minimize disturbance and contact with the well walls which could knock rust or other deposits into the standing water. Secure the pump using the suspension cable and connect the ground from the pump.

c. Once the well has been completely vented, connect the necessary tubing to the pump, flow-through cell, turbidimeter and sample discharge line.

   i. For peristaltic, connect the necessary tubing to the pump. A Y-fitting and pinch valve can be used to split the flow prior to the flow-through cell in order to collect an aliquot for turbidity. Attach a section of pharmaceutical-grade, 3/16-inch inner diameter (ID) silicon tubing to the peristaltic pump head, keeping the length of silicon tubing to a minimum. Measure a new section of 3/16-inch inner diameter (ID) selected sample tubing to extend from the depth of the intended sampling location to the intake end of silicon tubing. Lower the tubing to the desired depth and immediately secure the free end of the sample tubing to prevent it dropping into the well. Connect the outflow end of the sample tubing to the High-Density Polyethylene (HDPE) Y-connector with a piece of silicon tubing. Then, using several pieces of sample tubing, connect the pinch value and check valve units to one end of the Y (through which samples for turbidity will be collected) and connect the other end of the Y to the intake of the flow-through cell.

   ii. For bladder, connect the purge water discharge line to the water quality meter using a splitter and pinch valve so that an aliquot of purge water can be obtained before the flow-through cell for turbidity measurements. Connect the outflow end of the purge water line to the High-Density Polyethylene (HDPE) Y-fitting using a short piece of silastic tubing if necessary. The length of tubing in contact with the sample should be kept to a minimum. Attach a piece of silastic tubing to one end of the Y and close it with a pinch value or check valve unit. Samples for turbidity measurements will be collected by opening this pinch valve. Connect the other end of the Y to the lower of the two openings in the flow-through cell using sample tubing (Teflon® or, if PFAS will be sampled, polyethylene) and short pieces of silastic tubing at the joints.

   iii. Connect a piece of sample tubing to the out flow of the flow-through cell to the purge bucket. Use a short piece of silastic tubing at the joint.

d. Connect the selected pump to the power source.

   i. For peristaltic, if using a 12-volt battery, note that reversing the connections will typically cause the pump to run in reverse, which could push air into the well and should be avoided.

   ii. For bladder, see precautions on use of generators in the Procedures: Background Information.

e. If possible, mount the sonde and flow-through cell assembly at a 45-degree angle with the ports facing upward in order to allow air bubbles to escape from the cell, and position the sonde such that any groundwater spills will be directed away from the sample.

f. Re-measure and record the static groundwater level after the tubing or pump has been placed in the well, and the water level has been allowed to stabilize again.

g. Consult the historical purging records and information concerning the treatment stage and surrounding water levels, if available. Commence purging at the slowest possible flow rate and slowly increase the speed until discharge occurs. The pump rate should be set to allow for maximum flow rate (0.5 liters per minute) with no drawdown. Once pumping is begun, it should not be interrupted until all sample volume has been collected. Collect all purge water in a graduated bucket or carboy and track the volume removed.

h. Measure the flow rate using a graduated cylinder and time piece and monitor the water level and pumping rate during purging. Under no circumstances should purging be interrupted until all sample volume has been collected.

i. Once an acceptable flow rate has been established, begin monitoring indicator parameters and continue monitoring flow rate and water level. Record readings every five minutes or as often as it takes to exchange the flow-through cell volume. Use the water quality meter to monitor the following: temperature, pH, specific conductance, DO, and ORP. Use a turbidimeter to monitor turbidity.

j. In the event that the well has extremely low recharge such that the lowest purge rate possible (0.1 L/min or more, if equipment cannot effectively purge that slowly) continues to dewater the well, do not allow a water level that was above the top of the screen to drop below it, do not allow a water level already below the top of the screen to drop further, do not allow the water level to drop below the pump intake, and do not pump the well dry under any circumstances. Allow the well to recharge to a level sufficient to allow for collection of the necessary sample volume and to sample the well immediately. Record detailed notes concerning the sampling of the well. Avoid withdrawing the sampling equipment prior to sampling. Record the water level prior to sample collection and document.

k. If a bladder pump is required, but the well recharge rate hinders the bladder pump from obtaining the appropriate water column height within a reasonable amount of time, then bailers shall be used. An inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless-steel wire or cable) shall be used to raise and lower the bailer.

    i. Lower the bailer below the water level of the well with as little disturbance of the water as possible to minimize aeration of the water in the well.

    ii. Remove the minimum purge volume prior to sampling.

l. Watch the flow-through cell for sediment build up and gas bubbles. If the cell needs to be cleaned during purging operations, continue pumping and disconnect the cell for cleaning, then reconnect after cleaning and continue monitoring activities. Record the start and stop times and document a brief description of the cleaning activities.

m. Purging is complete when all parameters have stabilized or if 15 minutes have passed since the desired flow rate was achieved. Parameters are considered to have stabilized if, over three consecutive readings, the following criteria are met:

pH ± 0.1 unit

specific conductance and temperature ± 3%

turbidity ± 10% down to a value of 5 NTU, or three consecutive readings > 5 NTU

DO ± 10% down to 0.5 mg/L, or 3 consecutive readings > 0.5 mg/L

ORP ± 10 mV

n. Once purging is complete, measure and record final water level, temperature, pH, specific conductance, DO, ORP, turbidity, and flow rate. Disconnect the purge tubing from the flow-through cell, such that sample water will be collected directly from the tubing. Follow directions in the section on Sample Collection for Downgradient Wells.

9.8.2 Purging Downgradient Wells, ≥ 100°F and <140°F

Follow the low-flow procedures for Downgradient Wells <100°F with the following exceptions:

a. Do not connect the flow-through cell or turbidimeter.

b. Connect the cooling coil.

   i. For peristaltic, place the cooling coil between the well tubing and the intake for the peristaltic pump.

   ii. For the bladder pump, connect the cooling coil to the pump outflow tubing and attach tubing to the outflow end of the coil.

c. Place the coil in a bucket/cooler with ice and minimal water to form an ice bath. Allow cooling coil to equilibrate in the ice bath for approximately 10 minutes prior to sampling.

d. Monitor drawdown and establish an acceptable purge rate.

e. Once an acceptable purge rate is established, monitor the purge volume removed.

f. If a bladder pump is required, but the well recharge rate hinders the bladder pump from obtaining the appropriate water column height within a reasonable amount of time, then bailers may be used ONLY IF the groundwater temperature and bailer cable can be comfortably handled (<110°F). An inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless-steel wire or cable) shall be used to raise and lower the bailer.

   i. Lower the bailer below the water level of the well with as little disturbance of the water as possible to minimize aeration of the water in the well.

   ii. Remove the minimum purge volume prior to sampling.

g. Purging is complete when the required purge volume has been removed. The required purge volume is twice the volume of the saturated well screen. The formula below is used to calculate the minimum purge volume:

$$V_{gal} = (2)\ (3.1416)\ (r^2)\ (L)$$

Where;

V = minimum purge volume (gallons);

r = radius of well casing (ft);

L = length of saturated well screen (ft)

Note: 1 gallon = 3.785 L

h. Once purging is complete, measure and record final water level. Follow directions in the section on Sample Collection for Downgradient Wells.

9.8.3 Purging Downgradient Wells, ≥ 140°F

a. Once the well has been completely vented, connect the cooling coil to the Teflon sampling valve in the well cap and connect the peristaltic pump to the outflow of the cooling coil.

b. Place the coil in a bucket/cooler with ice and minimal water to form an ice bath. Allow cooling coil to equilibrate in the ice bath for approximately 10 minutes prior to sampling.

c. Connect the pump to the power supply. If using a 12-volt battery, note that reversing the connections will typically cause the pump to run in reverse, which could push air into the well and should be avoided.

d. Commence purging at the slowest possible flow rate that provides steady laminar flow.

e. Monitor the purge volume removed.

f. Purging is complete when the required purge volume has been removed. The required purge volume is twice the volume of the saturated well screen. Since water depth may not be known, estimate the depth to water based on previous sampling events or water levels in nearby wells. The formula below is used to calculate the minimum purge volume:

$$V_{gal} = (2)\ (3.1416)\ (r^2)\ (L)$$

Where;

V = minimum purge volume (gallons);

r = radius of well casing (ft);

L = length of saturated well screen (ft)

Note: 1 gallon = 3.785 L

g. Once purging is complete, follow directions in the section on Sample Collection for Downgradient Wells.

9.8.4 Sample Collection for Downgradient Wells

9.8.4.1 Collect groundwater samples and place them in their proper containers in the order of decreasing volatility and increasing stability. VOCs followed by SVOCs.

9.8.4.2 During sample collection, allow the water to flow directly into and down the side of the sample container without allowing the tubing to touch the inside of the sample container or lid, in order to minimize aeration and maintain sample integrity.

9.8.4.3 When sampling for VOCs, collect water samples in vials or containers specifically designed to prevent loss of VOCs from the sample. Collect groundwater from the sampling device in vials by allowing the groundwater to slowly flow along the sides of the vial. Sampling equipment shall not touch the interior of the vial. Fill the vial above the top of the vial to form a positive meniscus with no overflow. No headspace shall be present in the sample container once the container has been capped. This can be checked by inverting the bottle once the sample is collected and tapping the side of the vial to dislodge air bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly water that has high concentrations of dissolved gasses. In these cases, the field sampling personnel shall document the occurrence in the field logbook and/or sampling worksheet at the time the sample was collected. Likewise, the analytical laboratory shall note in the laboratory analysis reports any headspace in the sample container(s) at the time of receipt by the laboratory.

9.8.4.4 If the bladder pump controller pumps water out of the sample tubing in a forceful manner, such that the gases and VOC samples may be compromised, the non-VOC samples should be collected first. Once the non-VOC samples are collected, adjust the flow rate on the bladder pump controller so that the water is no longer being pumped out of the sample tubing in a forceful manner, and collect the samples for analysis of gases and VOCs. Record the procedure and all samples collected in this manner.

9.8.4.5 If the tubing does not remain filled up to the sample point, collect non-VOC samples first, then increase the flow rate slightly until water completely fills the tubing and collect the VOC samples. Record the procedure and all samples collected in this manner. Record the new flow rate and the final water depth.

9.8.4.6 If sample volume is limited, the VOC samples will be prioritized and the remaining volume will be submitted for SVOC analysis.

9.8.4.7 Immediately label the sample containers with the sample collection date and time and place them on ice. Complete the chain of custody (COC) forms as soon as possible. Samples including quality control (QC) samples are labelled, preserved and shipped per the UFP-QAPP.

9.8.4.8 Cease pumping, disassemble the purging and sampling equipment and return well cap to original position.

9.8.4.9 Document all necessary field and sampling information as per UFP-QAPP in groundwater Chain of Custody form, field notebook, field logbook or Example Groundwater Sample Collection Record (Attachment 1), etc.

9.9 Purging and Sampling MPE Wells

9.9.1 Baseline Event

As discussed in the overview section, groundwater sampling from the MPE well during the baseline event is expected occur before the well heads are permanently installed. This should allow for the use of low-flow sampling techniques.

For baseline sampling of the MPE wells, procedures for opening the well and measuring static water levels are the same as for downgradient wells. Purging and sample collection procedures are the same as for Downgradient Wells < 100°F.

9.9.2 Non-Baseline Events

Once the well heads are permanently installed and heating has begun, samples will be collected from the stinger tubes. Because flow through the stinger tubes is constant during treatment, purging prior to sample collection will not be required. Hot groundwater sampling procedures will be incorporated.

During the ISTR process, formation water (pore water and groundwater) will boil off as steam. As treatment progresses, a cone of groundwater depression, lowest in the center of the treatment area, will develop and expand. It is expected that some or all of the MPE wells will become dry.

Additional approaches to obtain water from the system may be attempted. Alternative approaches and associated limitations to sample representativeness will be documented. If sampling is not possible, documentation of such conditions and observations will be made in the field sampling records.

Once an MPE well becomes dry, there will be no need to return to that well during subsequent events in the same stage of treatment.

It will not be possible to determine the depth to water or the static water level within each well during the ISTR process as all wells will need to remain sealed to prevent steam and contaminant vapors from escaping. Monitoring wells outside of the ISTR treatment area can be monitored, if available, to estimate the general depths to water over the site.

For each MPE sampling well on site, dedicated sampling equipment as shown in Figure 1 should be installed before remediation begins. The down-hole sample tube inlet will be the stinger tube in the MPE well which is set near the bottom of the well. Each shall have a 3/8-inch sample drain valve connected to stainless steel cooling coil using 3/8-inch Teflon tubing. The steps outlined below must be followed for hot groundwater sampling.

A. Alert thermal remediation operator at least 24 hours prior to groundwater sampling to schedule a shutdown for an appropriate duration prior to groundwater sampling.

B. An authorized person (trained and certified in lock-out and tag-out procedures, or equivalent) shall de-energize the applicable TCH wells in accordance with site-specific instructions.

C. The steps outlined below shall be followed for obtaining samples from the MPE wells:

   i. Connect the 3/8-inch sample tubing to both the influent and effluent ends of the cooling coil and place the coil in a bucket/cooler with ice and minimal water to form an ice bath. Allow cooling coil to equilibrate in ice bath for approximately 10 minutes prior to sampling.

ii. Connect the cooling coil to the peristaltic pump. Attach a section of pharmaceutical-grade, 3/16-inch inner diameter (ID) silicon tubing to the peristaltic pump head, keeping the length of silicon tubing to a minimum. Connect the cooling coil to the pump head tubing and cut a length of tubing for the outflow.

iii. Connect the peristaltic pump to the power source. If using a 12-volt battery, note that reversing the connections will typically cause the pump to run in reverse, which could push air into the well and should be avoided

iv. Sequence for sampling (see Figure 1): close Valves 1 and Valve 2, Open Valves 3 and 4. Open reservoir drain valve.

Start the pump and adjust the flow rate to achieve smooth laminar flow through the cooling coil and tubing. The flow should be suitable for filling VOA vials without agitation.

Depending on the depth of the water in the well, the peristaltic pump may not be able to pump water from the well. If such is the case, the field staff shall use a compressor to inject low pressure air through the top of the Valve 4 indicated on Figure 1. The injection of air into the stinger shall raise the water level which will allow the water to be pulled into the conveyance by vacuum at the wellhead at 8 inches Hg. If the air injection fails to draw water through the stinger, the field staff shall disconnect the sampling equipment and proceed to sample the next well. If there is sufficient water in the well, the staff shall proceed with sampling procedures below.

v. Once a suitable flow is achieved, begin sample collection. **For low yield wells, sampling commences as soon as the well recovered sufficiently to collect the appropriate volume for the anticipated samples.**

vi. VOCs are collected first as the sample is decanted into the sample vials from the pump end of the tubing. The process is repeated until the required sample volume is collected.

vii. Any other sample fractions (SVOCs, etc) are then sampled from the cooling coil tubing.

viii. Groundwater samples including quality control (QC) samples are labelled, preserved and shipped per the UFP-QAPP.

ix. After collection of samples, close the reservoir drain valve, return valves 2 and 3 to their original position, then open valve 1 to put the MPE well under vacuum. Confirm with ISTR system operations staff proper sequencing and positioning of the valves prior to relocating to next well.

x. Document all necessary field and sampling information as per UFP-QAPP in groundwater Chain of Custody form, sampling field form, field notebook, etc.

xi. When sampling is complete, contact ISTR system operator to allow re-energizing of well field or portion thereof to resume treatment.

10.0 Quality Control and Assurance

10.1 The goal of the QA program should be to ensure precision, accuracy, representativeness, completeness, and comparability in the project sampling program.

10.2 SOP 2, Documentation of Field Activities, will provide requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various QC samples such as trip blanks, field blanks, equipment rinse blanks, and field duplicate samples.

11.0 Data and Records Management

11.1 Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms may include:

- Sample Collection Records;
- Field logbook;
- Chain-of-custody forms; and
- Shipping labels.

11.2 Sample collection records will provide descriptive information for the purging process and the samples collected at each monitoring well. If the Example Groundwater Collection Record (Attachment 1) is used, then it shall be modified to accommodate project specific purging and sampling details,

11.3 The field logbook is kept as a general log of activities and should not be used in place of the sample collection record.

11.4 Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes.

11.5 Shipping labels are required if sample coolers are to be transported to a laboratory by a third party (courier service).

12.0 Attachments or References

Attachment 1 – Example Groundwater Sampling Collection Record

EPA. 1996. *Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA/540/S-95/504. Office of Solid Waste and Emergency Response. April.

SOP 1, *Equipment and Personnel Decontamination*.

SOP 2*, Documentation of Field Activities.*

Author	Reviewer	Revisions (Technical or Editorial)
Tony Ye Environmental Engineer	Constance Lapite Senior Scientist	Rev 0 – Initial Issue (April 2020)

Attachment 1

Example Groundwater Sample Collection Record

Well ID:

Groundwater Sample Collection Record

Client: ______ Date: ______ Time: Start ______ am/pm
Project No: ______ Finish ______ am/pm
Site Location: ______
Weather Conds: ______ Collector(s): ______

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length ______ c. Length of Water Column ______ (a-b)

b. Water Table Depth ______ d. Calculated Well Volume (see back) ______

Casing Diameter/Material ______

2. WELL PURGEABLE DATA

a. Purge Method: ______

b. Acceptance Criteria defined (see SAP or Work Plan)
- Minimum Required Purge Volume (@______ well volumes) ______
- Maximum Allowable Turbidity ______ NTUs
- Stabilization of parameters ______ %

c. Field Testing Equipment used: Make Model Serial Number

Time (min)	Volume Removed (gal)	Temp. (°C)	pH s.u.	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (m)	Color/Odor/etc.

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: ______

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time

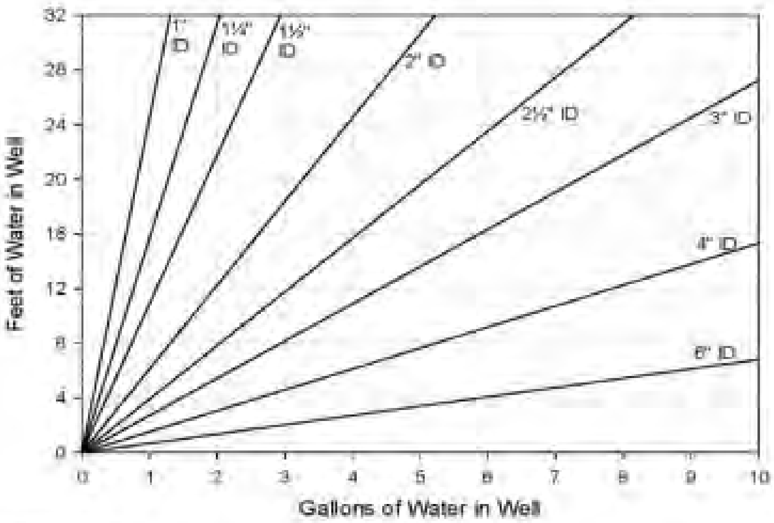
Comments ______

Signature ______ Date ______

Page 1 of 2

Purge Volume Computation

Well ID:



Volume / Linear Ft. of Pipe		
ID (in)	**Gallon**	**Liter**
¼	0.0025	0.0097
3/8	0.0057	0.0217
½	0.0102	0.0386
¾	0.0229	0.0869
1	0.0408	0.1544
1¼	0.0637	0.2413
1½	0.0918	0.3475
2	0.1632	0.6178
2½	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

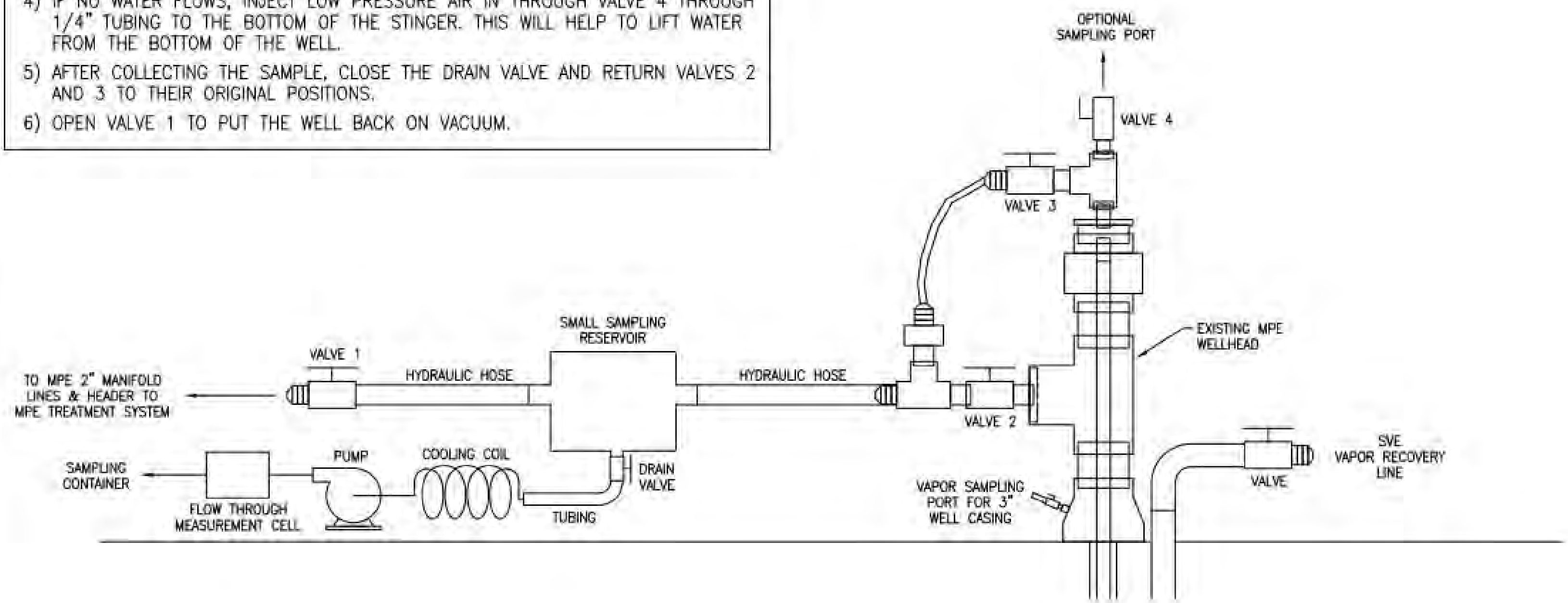
Time (min)	Volume Removed (gal)	Temp. (°C)	pH s.u.	Spec. Cond. (uS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (m)	Color/Odor/etc.

Signature ______________________ Date ____________

Page 2 of 2

METHOD

1) CLOSE VALVE 1, CLOSE VALVE 2, OPEN VALVE 3, OPEN VALVE 4.
2) ATTACH TUBING, COIL ETC. TO THE SAMPLING RESERVOIR DRAIN VALVE.
3) OPEN THE DRAIN VALVE AND PUMP WELL WATER TO THE SAMPLING CONTAINER.
4) IF NO WATER FLOWS, INJECT LOW PRESSURE AIR IN THROUGH VALVE 4 THROUGH 1/4" TUBING TO THE BOTTOM OF THE STINGER. THIS WILL HELP TO LIFT WATER FROM THE BOTTOM OF THE WELL.
5) AFTER COLLECTING THE SAMPLE, CLOSE THE DRAIN VALVE AND RETURN VALVES 2 AND 3 TO THEIR ORIGINAL POSITIONS.
6) OPEN VALVE 1 TO PUT THE WELL BACK ON VACUUM.



MATERIALS

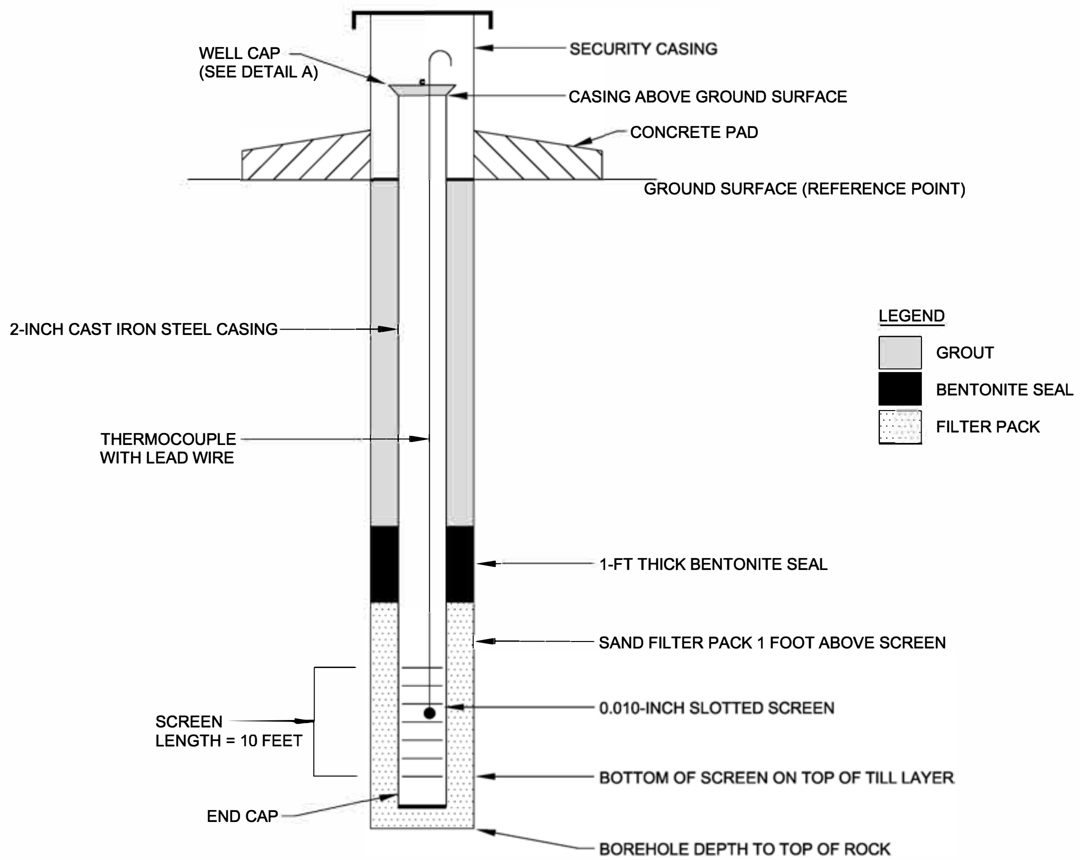
VALVES – BRASS
SAMPLING RESERVOIR – STAINLESS STEEL
NIPPLE – CARBON STEEL
MPE WELLHEAD – CARBON STEEL
HOSE BARBS – BRASS

PPE

FULL FACE MASK
THICK GLOVES
APRON
STEEL TOE BOOTS

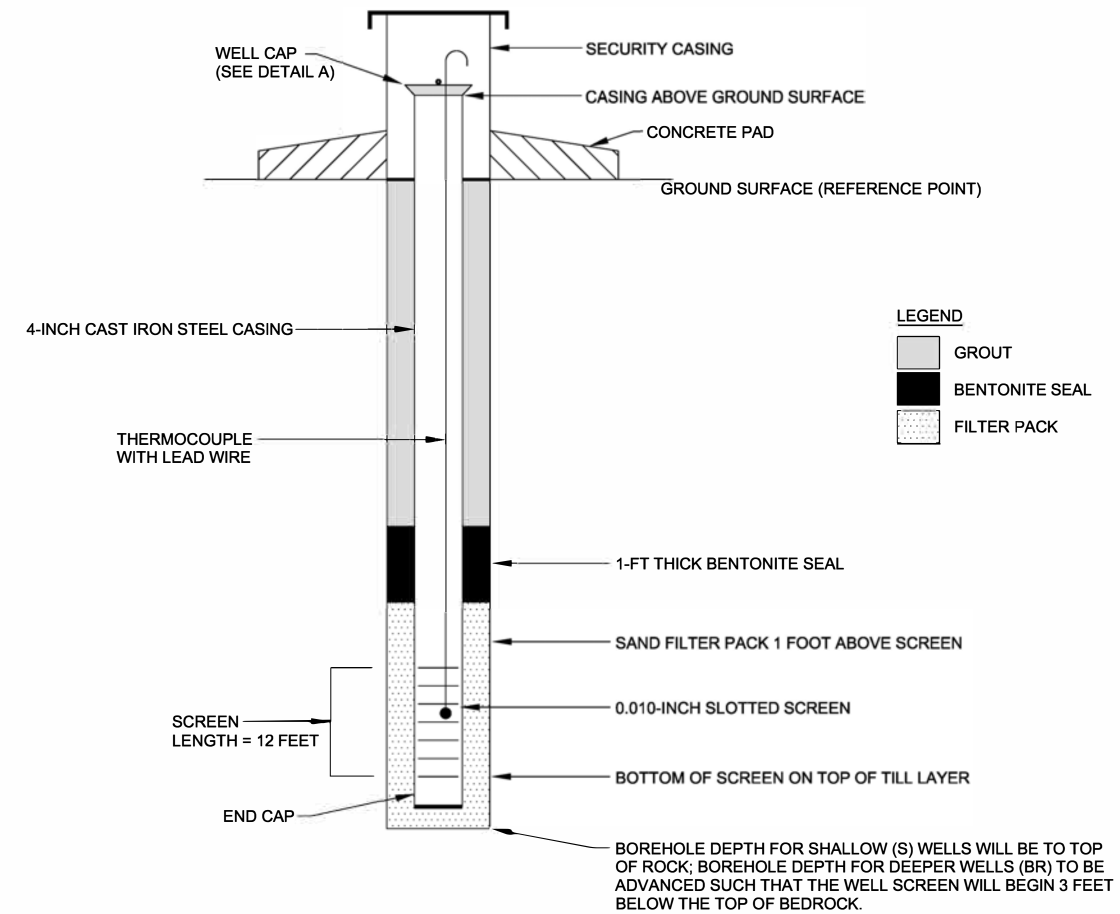
AECOM

DIAZ CHEMICAL 60615479	HOT GROUNDWATER MPE WELL SAMPLING CONFIGURATION
DATE: 01/2020 DRWN: K.P.B.	FIGURE 1



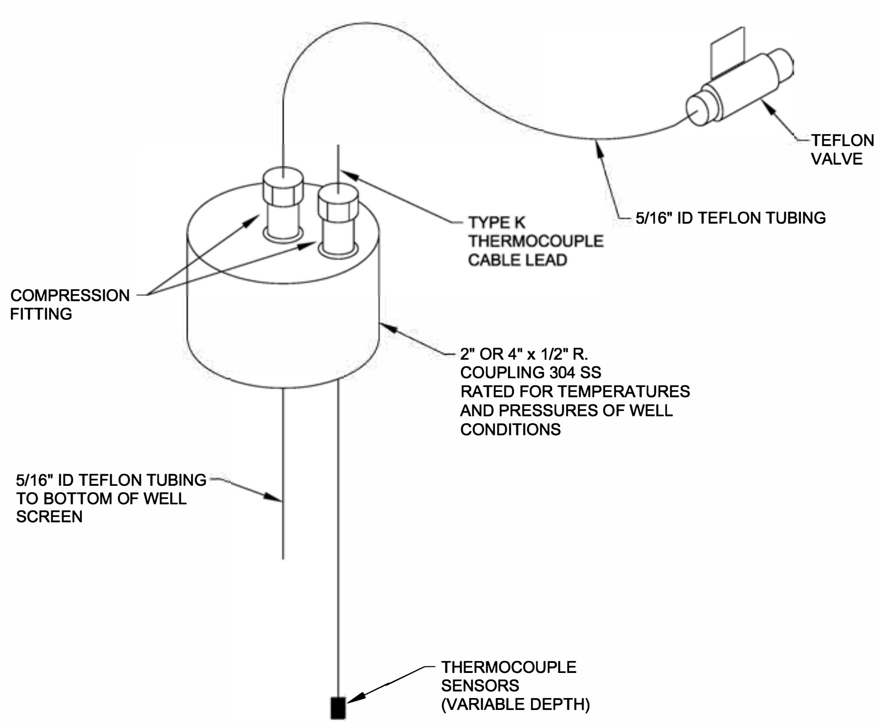
2-INCH WELL CONSTRUCTION

NOT TO SCALE



4-INCH WELL CONSTRUCTION

NOT TO SCALE



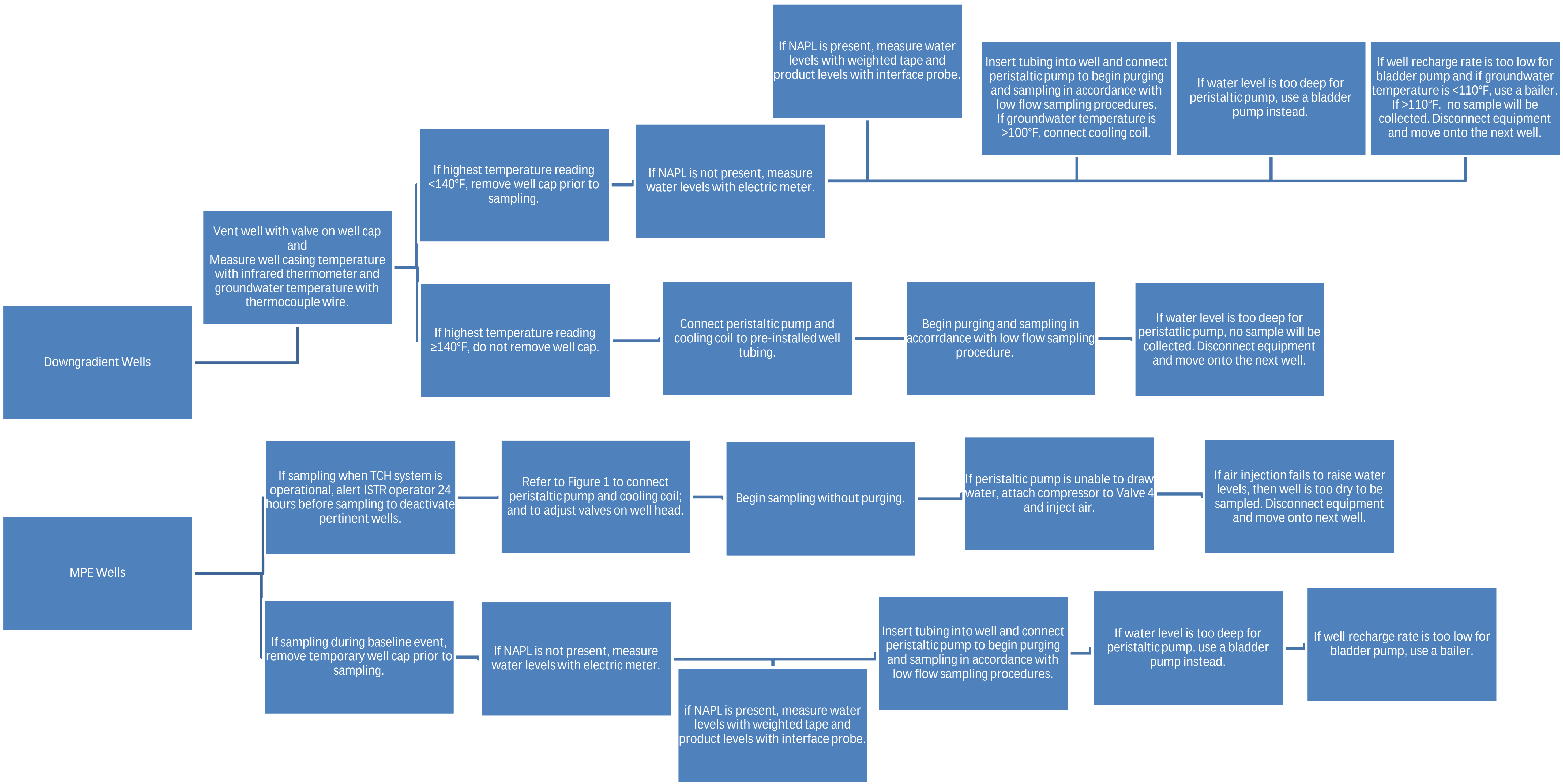
DETAIL A

NOT TO SCALE

Title:	DOWNGRADIENT WELL CONSTRUCTION DETAILS
Location:	DIAZ CHEMICAL SITE HOLLEY, NEW YORK
Client:	US ARMY CORPS OF ENGINEERS KANSAS CITY DISTRICT

URS URS Corporation 40 British American Boulevard Latham, New York 12110	Drafter: KPB	Date: April 2020
	Drg. Size: 11 x 17	Job No.: 60615479
	FIGURE 2	

FIGURE 3 GROUNDWATER SAMPLING DECISION FLOWCHART



C3 What is C3 Technology?

C3 Technology Basics

+ Soil gas is drawn into the system and delivered to the air compressor by a blower.

+ Entrained liquids from the extraction wells are removed at the vapor liquid separator.

+ Process air is compressed to approximately 150 pounds per square inch (psi) by the compressor module.

+ Water vapor is removed from the process stream at air-to-air heat exchangers.

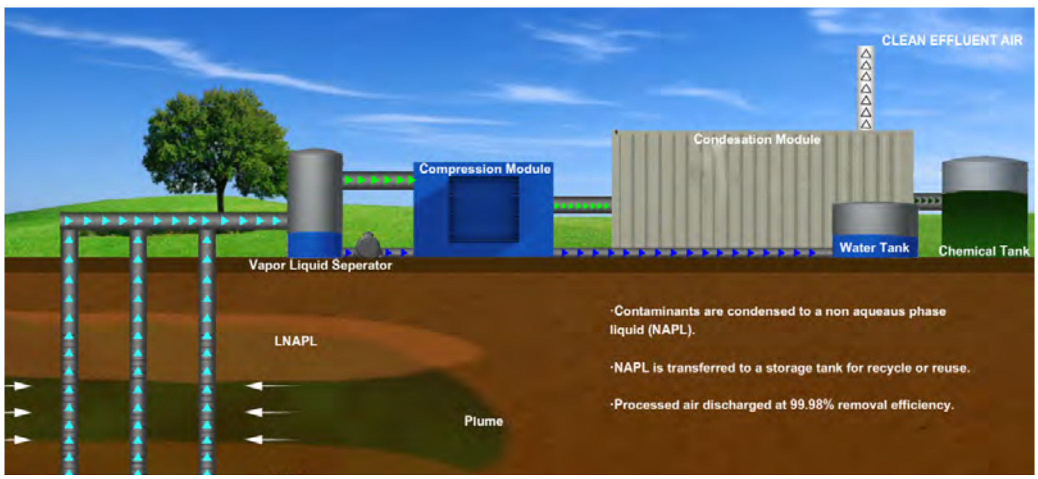
+ The vapor stream is cooled to approximately -40° F in the refrigerated heat exchangers, where the contaminants are condensed out of the vapor stream.

+ The vapor stream is then sent to the regenerative adsorber, which removes any fugitive contaminants, returning them to the inlet stream.

Introducing the Clean Alternative to GAC

C3 Technology, developed by GEO, is a combination of compression, cooling, and condensation processes with a proprietary regenerative adsorption technology that -ly recovers volatile organic compounds (VOCs) from the vapor stream of soil vapor extraction (SVE), dual phase extraction (DPE), or thermal remediation systems. Chemical is recovered as a non-aqueous phase liquid (NAPL) that is then temporarily containerized in appropriate vessels for recycling or proper disposal. Generally, greater than 99.98% of the VOCs are recovered from the vapor stream.

Unlike granular activated carbon (GAC), C3 Technology allows for recycling and reuse of recovered hydrocarbons from fuel impacted sites, nearly eliminating waste delivery to It also results in less CO_2 emissions at sites with VOC concentrations in excess of 1,000 ppmv compared to GAC consumption and regeneration.



C3 Technology KEY ADVANTAGES

+ Zero Onsite Emissions
+ Allows Recovery and Recycling of Contaminants
+ All Volatile and Semi-Volatile Compounds Treated
+ Insensitive to Changes in Vapor Concentration

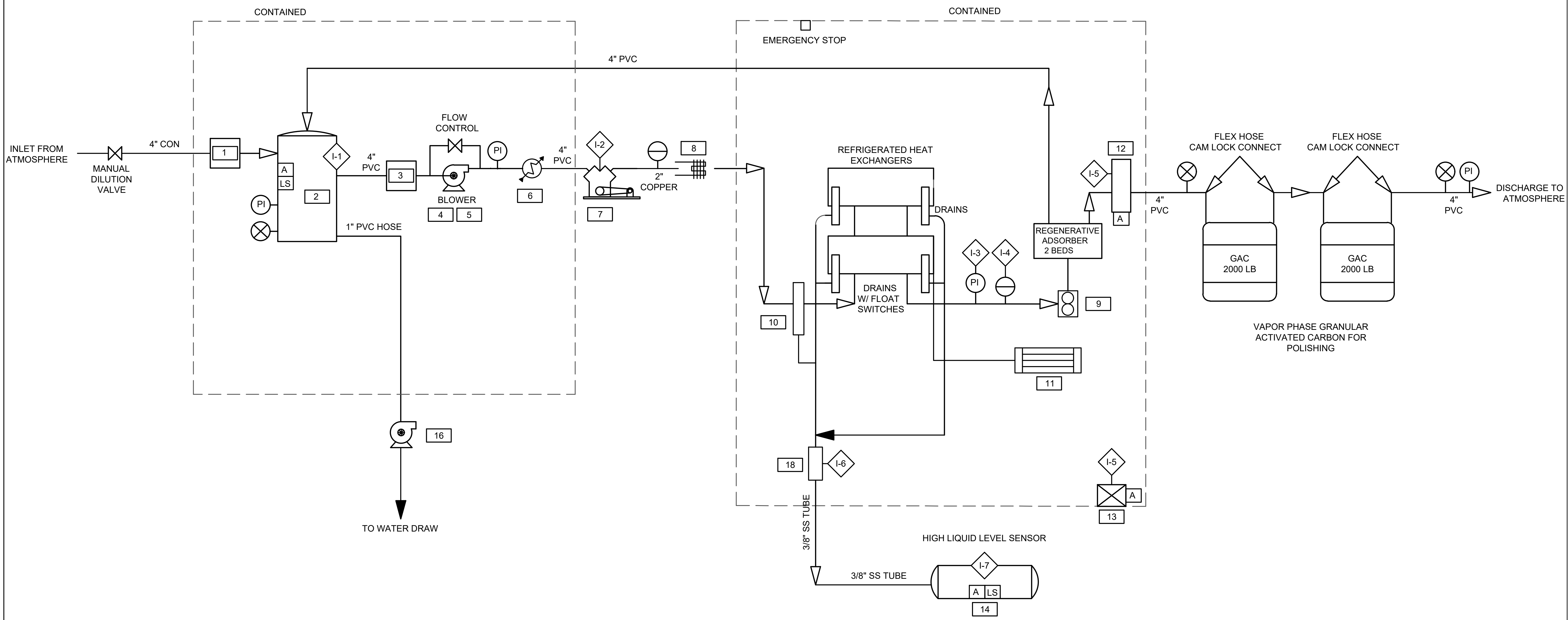
C3 Technology SUCCESS STORIES

+ Over 10 Million Tons of VOCs & SVOCs Recovered
+ Utilized At More Than 40 Projects (SVE and Thermal)
+ Treats All Chlorinated Ethanes and Ethenes

GEO Environmental Remediation Company

www.georemco.com

+1.714.283.1682
1500 W Katella Ave
Orange, CA 92867



LEGEND

CONTROL VALVE	A	SYSTEM ALARM	8	REFRIGERATED DRYER	16	TRANSFER PUMP	I–5 TRIGGERED IF OVA INDICATES PERMITTED LEVELS HAVE BEEN EXCEEDED
SAMPLE PORT	1	INLET AIR FILTER	9	FLOW METER	17	MANUALLY OPERATED DIAPHRAGM PUMP	I–6 TRIGGERED IF LIQUID IN CATCH CAN EXCEEDS PUMP LEVELS
PRESSURE INDICATOR	2	AIR/WATER SEPARATOR	10	STAINLESS STEEL DRAIN	18	CHEMICAL CATCH CAN	I–7 TRIGGERED IF LIQUID IN CHEMICAL TANK EXCEEDS PUMP LEVELS
TEMPERATURE SENSOR	3	BLOWER INLET FILTER	11	CONDENSER		INTERLOCK	
LS LEVEL SENSOR	4	ROTARY POSITIVE DISPLACEMENT BLOWER	12	OVA SENSOR	I–1	TRIGGERED IF LIQUID IN AIR/WATER SEPARATOR EXCEEDS PUMP LEVELS	
SYSTEM PIPING	5	MOTOR	13	AMBIENT AIR OVA MOUNTED ON SIDE WALL	I–2	TRIGGERED BY LOSS OF ELECTRICAL CURRENT	
PACKAGED SKID OUTLINE	6	AIR/AIR HEAT EXCHANGER	14	CHEMICAL TANK	I–3	TRIGGERED IF SYSTEM PRESSURE FALLS BELOW 100 PSI	
ENCLOSURE PAD OUTLINE	7	COMPRESSOR	15	SURGE TANK	I–4	TRIGGERED IF SYSTEM TEMPERATURE REMAINS ABOVE 0 DEGREES FAHRENHEIT FOR OVER 5 MINUTES	

APPROVED	DATE	GEO Environmental Remediation Company	1500 W KATELLA AVE ORANGE, CA 92867
DRAWN TW	10/31/19	TITLE Process & Instrumentation Callouts /. C3 System	
CHKD GG	10/31/19	SIZE B	DWG NO. Diaz Chemical Corp. OU2
APVD GG	10/31/19	SCALE NTS	UNITS NA — SHEET 1 OF 1

C3 Technology White Paper

Introduction

Refrigerated Condensation Vapor Treatment System

Presented here is the C3 Technology high-pressure compression and refrigeration system utilized for vapor treatment applications with high and low concentration volatile organic compounds (VOCs). The C3 Technology system was developed by G.E.O. Inc. (GEO) in 1989. The process and the engineering fundamentals of how it works are described and illustrated for users to incorporate into feasibility evaluations of efficacy or design applications. For further details and/or pricing, please contact www.georemco.com or an authorized distributor / representative in your region.

Applications

Soil Vapor Extraction, Multiphase Extraction, Industrial Vapor Treatment, Vapor Condensation, Chemical Condensation, Chemical Recovery

What's the problem?

Vapor treatment of high levels of VOC concentrations has been and will continue to be a challenge for many Sites with contaminants of concern (COCs) including petroleum hydrocarbons, chlorinated solvents, fluorocarbons, or other chemistries with low adsorption / partition coefficients.

Granular activated carbon is the most commonly employed vapor treatment technology utilized globally, but is cost prohibitive at high VOC concentration and ineffective for chemistries including chloroform, vinyl chloride, methylene chloride, Freon, and many others. Thermal oxidizers are also challenged and generally cannot operate at concentrations in excess of 5,000 parts per million by volume (ppmv) for low BTU value solvents or high BTU value hydrocarbons and only occasionally above 10,000 ppmv for low BTU hydrocarbons. Catalytic oxidizers have a much lower throughput with a maximum BTU content that is generally 20-30% of a thermal oxidizer. Additionally, no alternative exists other than high-pressure cryogenic condensation for concentrations of petroleum hydrocarbons or flammable compounds in excess of 1% LEL.

Fortunately, the C3 system can operate very effectively and safe at much higher concentrations than 1% LEL (if permitted by local agency) of VOCs from 0.001% to saturation in the vapor stream. In fact, the higher the vapor concentration, the more cost effective it is for you and your operation.

Why are things ripe for change?

The cost for vapor treatment is increasing constantly due to inflation and cost of maintenance of systems. Specifically, labor costs more everyday and traditional vapor treatment technologies are labor intensive at high VOC concentrations. Furthermore, costs of materials such as metals, shipping, taxes and replacement parts add to the cost of operating and maintaining systems. The low throughput and capacity for destruction of VOCs in applications with high VOC concentrations, results in over-sizing systems, dilution, and other management operations intended to just keep the system operating. Simply speaking, if the system can't handle it, it becomes a bottleneck causing the entire operation or program to take longer and/or require more attention and labor. By removing the bottleneck from the above ground structure, the efficiency and time scale of operation improves by orders of magnitude and results in significantly reduced costs. This means more time and expense for the property owner, business or contractor.

Solution

The C3 technology system requires no dilution and can handle any range of concentrations or mixture of VOCs in a vapor stream and can be operated with varying concentrations and conditions. The real financial savings are realized by: 1) Reduced cost to achieve performance goals with increased throughput and higher VOC removal efficiencies of up to 99.99%, 2) Reduced infrastructure costs by providing a solution that is smaller in size (process air flow rate) compared to GAC or oxidizer system options, and 3) Reduced Site management costs by more timely completion of operations and higher VOCmass recovery rate from the vapor stream. The reduced time in operation or remediation process is significant from a lifecycle perspective at contaminated sites and is very important to highlight. If the wrong system is selected, a reduced mass destruction /recovery rate can result in lost revenue in terms of industrial operations or increased time of remediation by more than a year(s). How much does one extra year of operation cost, considering site management fees, extra quarterly sampling and reporting, and a property that is in long-term transition? Imagine now if it was three years longer to achieve the same results for a very significant and challenging project. The lifecycle cost consideration can be a very important factor in comparing C3 Technology with alternative vapor treatment options.

C3 Technology Description

The C3 Technology developed by G.E.O. is a combination of high pressure (~150psi) and cryogenic-cooling combined with a proprietary regenerative adsorption technology that efficiently condenses and recovers VOCs. Applications include soil vapor extraction (SVE) or dual phase extraction (DPE) systems or industrial process off-gas treatment. The chemical is recovered as a non-aqueous phase liquid (NAPL) that is temporarily containerized in appropriate vessels for recycling or proper disposal.

Process Description

- Contaminated vapor is extracted from the soil by a vacuum blower and delivered to the air compressor
  - Entrained liquids from extraction wells are separated at the water knockout tank.
  - Separated liquids are securely drummed and transported off-site or treated with GAC before discharged to sewer or storm water in accordance with all regulatory requirements.
- Process air is compressed to approximately 150 pounds per square inch (psi) by the compressor.
- The process stream is then cooled to ambient temperature with an air-to-air heat exchanger(s).
- The process stream is further cooled through multiple step wise cooling stages to approximately -40° C in the refrigerated heat exchangers, where the chemical constituents (VOC's) are condensed and separated from the vapor stream.

- The process stream is then passed through a regenerative adsorber, which removes any residual VOCs in vapor phase and directs it back to the inlet stream.
- Vapor effluent VOC concentration is generally measured at between 0.1 and 5 parts per million by volume (ppmv) depending on the mixture of VOCs at the site and in select air quality management districts, a secondary polish is required consisting of granular activated carbon (GAC) prior to discharge to atmosphere.

C3 Technology Operation and Maintenance

The recommended operation and maintenance (O&M) of the C3 Technology system (similar to other industrial type systems) requires regular remote observation with the advanced onboard remote telemetry computer system, monthly reviews of operating conditions and testing of the emergency controls in addition to the quarterly maintenance visits for checking and changing compressor oil. The O&M services are commonly performed by the manufacturer G.E.O. Inc. or one of its local distributors or service providers. However, much of the O&M services can be performed by the leasing company after obtaining certification from the manufacturer during on-site training of the system operation during and after installation and startup.

Additional service activities include redundant granular activated carbon (GAC) bed filtration replacement, which may occur once or twice a year depending on the site conditions and operation of the C3 Technology system as well as the regulatory requirements for the region in which the system is operating. In many locations, the discharge requirements are such that redundant filtration with GAC is not required due to the efficiency of the C3 Technology system alone. However, if redundant GAC "polishing" is required to satisfy permit requirements, the GAC consumption rate is very limited. Below is the recommended GAC vessel sizing and typical footprint space requirement for the treatment systems based on process flow rate of the C3 Technology system. Note that the system may be configured in different ways (square or elongated) to accommodate site space constraints.

Flow Rate	200 SCFM	300 SCFM	500 SCFM	1000 SCFM
Foot Print	25 x 30 ft	30 x 30 ft	35 x 50 ft	40x60 ft
Carbon Polish	Two 400 lb vessels	Two 1000 lbvessels	Two 2000 lbvessels	Two 2000 lbvessels

The following sections include a summary of the training offered in the certification and a summary of the energy demand for operation.

Energy Requirements

The C3 Technology system is operated solely by electricity and require in some cases, dedicated power supply. The energy requirements for the standard C3 Technology units are provided in the following table.

Flow Rate	200 SCFM	300 SCFM	500 SCFM	1000 SCFM
Power Requirements	415 VAC 3-phase 200AMP	415 VAC 3-phase 300AMP	415 VAC 3-phase 400AMP	415 VAC 3-phase 800AMP

Power Usage	150 KVA	230 KVA	380 KVA	740 KVA

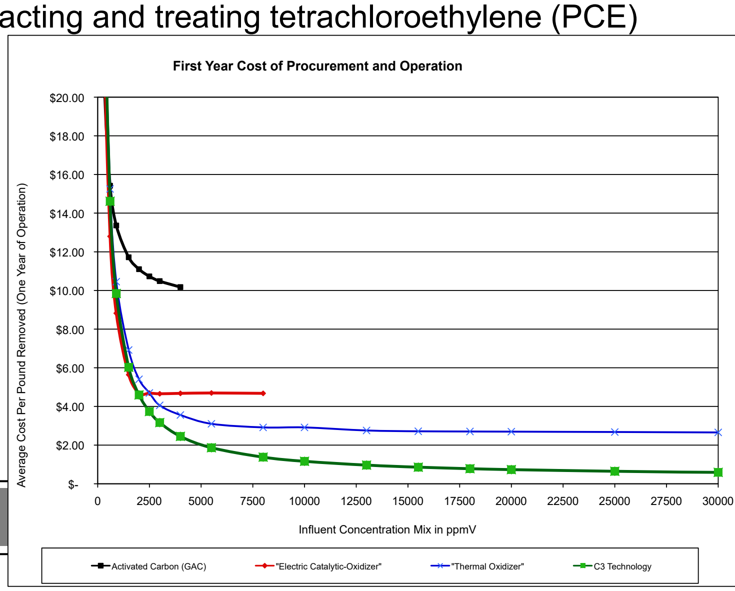
Cost of Operation

C3 Technology is the lowest cost option for vapor treatment available globally when influent vapor concentrations are in excess of 2,000 parts per million by volume (ppmv) of gasoline or other petroleum hydrocarbons. However, when chlorinated solvents are involved such as trichloroethylene or mixtures of hydrocarbons with solvents, then C3 Technology is the lowest cost option at influent vapor concentrations as low as 100 ppmv. C3 Technology is the only viable and dependable option for chloroform.

Some key points of differentiation include the operation and maintenance costs which are not included for purchased systems. The operation “run-time” for GAC vapor treatment systems is generally between 90 and 98% depending on the system size and type of VOCs in the vapor stream. Thermal oxidizers run-time are generally known to average below 90% annually. However, experience with oxidizers reveals that even 90% is grossly overestimated at many sites (C3 has replaced many thermal oxidizer systems revealing annual run-time averages of less than 25%.). Whereas the C3 Technology unit has demonstrated over the past 20 years a monthly average of greater than 95% and G.E.O. Inc will guarantee 90% average monthly uptime or your money back (discounted during monthly invoicing)!

Another key point is that secondary polishing by activated carbon is sometimes required by air quality management agencies for oxidizers and these costs are not included in the estimates. Therefore, we recommend careful consideration of all such miscellaneous additional costs that may be associated with other systems. The costs you see for the C3 system are all inclusive. No surprises!

The following graph provides some relative cost comparisons based on publically available manufacturers specifications on the cost per pound of mass treated on a typical SVE application extracting and treating tetrachloroethylene (PCE) (common contaminant at former drycleaner business locations). There is a clear separation from oxidizer systems at 2,000 ppmV and from activated carbon at approximately 600 ppmV. The actual performance of these systems will vary from site to site based on



many inputs such as cost of electricity, natural gas or propane, actual destruction capacity and so forth. Please contact GEO INC for a free no obligation site-specific evaluation for your site.

The Physics of High Pressure Cryogenic Condensation

Chemicals change physical state in the same way water changes to vapor or ice when subjected to changes in temperature and pressure. We are all familiar with changing water to ice in the freezer at 0°C or 32°F or to gas by boiling water to 100°C or 212°F (at atmospheric pressure 1atm or 14.7 psi) as shown in the diagram on the right. The same is true for benzene, trichloroethylene (TCE), or tetrachloroethylene (PCE) whereby the change from vapor to liquid if cooled to cryogenic temperatures. However what happens when we change the pressure? In the case of the C3 Technology system designed by GEO Inc., the operating pressure generated with compressors is approximately 150 psi or 10.2 atm (1,034 kPa). At this pressure, we do not need to refrigerate the vapor stream as much and condensation can be achieved more effectively at temperatures of between 0 and -40°C depending on the target VOC.

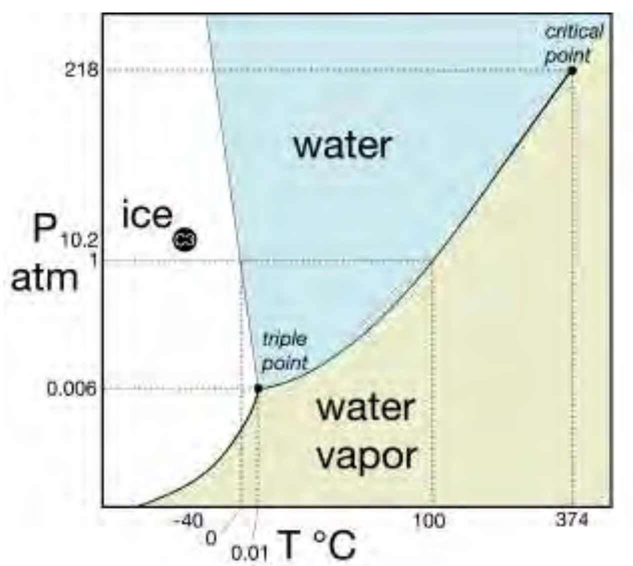


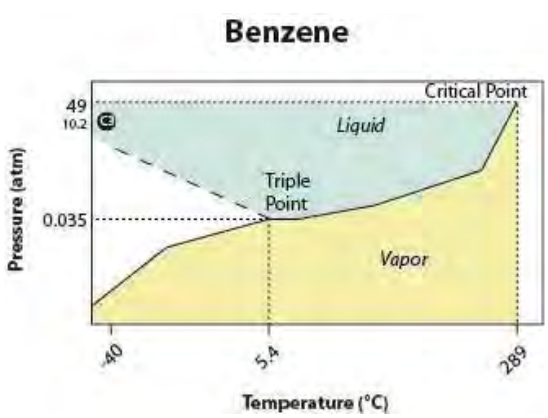
Figure showing changes of state of water molecule at critical point (i.e. point at which phase boundary ceases to exist) and triple point (i.e. defines the temperature and pressure at which the three phases coexist in equilibrium).

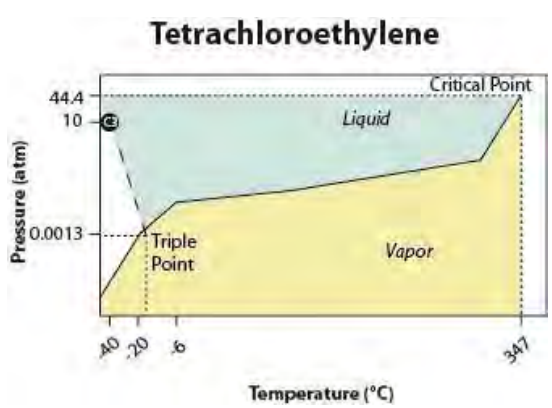
Thermodynamics Of Benzene, TCE, and PCE

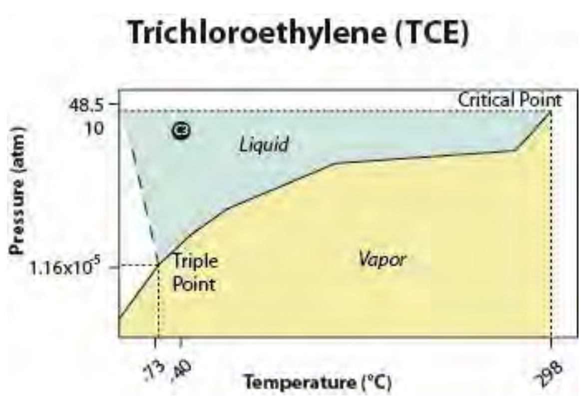
In the same way that water changes phases at certain temperatures and pressures, benzene, TCE and PCE do as well. Benzene for example, undergoes a phase change from a solid to a liquid at 5.5°C and a liquid to a vapor at about 80.1°C (at a pressure of 1 atm). Thus, in order to change benzene vapor into a liquid form at 10atm it must be cooled to below 5.4°C. TCE behaves in a similar way, but at a melting point of -73°C and a boiling point of 87.2°C as does PCE at -19°C and 121.1°C, respectively. Below is a table of the temperatures and pressures of the triple point and critical point of water, benzene, and TCE.

Compound	Triple Point (°C)	Triple Point (atm)	Critical Point (°C)	Critical Point (atm)
Water	0.01	0.006	374	218
Benzene	5.4	0.035	289	48.26
TCE	-73	0.000012	298	49.50
PCE	-20.6	0.0013	347	46.98

As is visible in the phase change graphs of Benzene, TCE, and PCE to the right, in order to condense these contaminants from a vapor to liquid phase, the pressure must be increased and temperature must be decreased. In the C3 system, a compressor creates an atmosphere with a pressure at around 10.2 atm and the temperature is cooled to between -35 and -40°C. As is seen in the graphs below, this pressure and temperature combination is in the liquid phase for each of these contaminants, which means when the vapor enters the C3 system, it will successfully condense into a liquid.



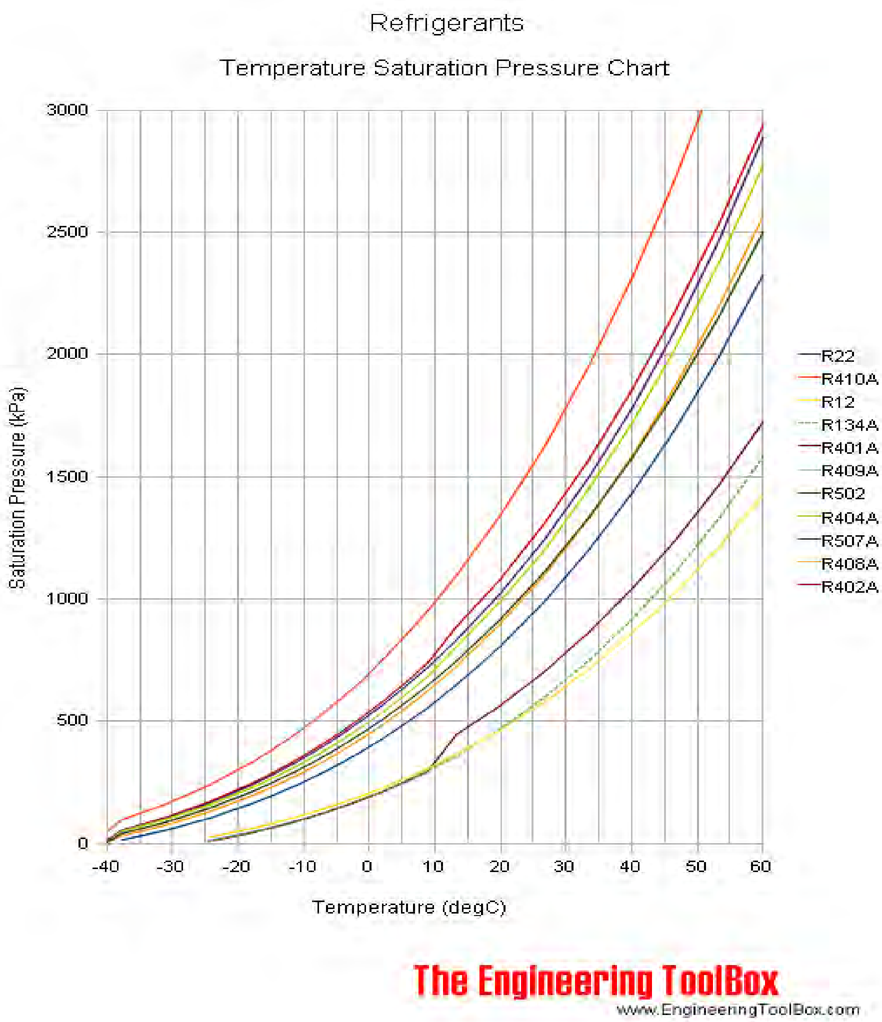




The following sections include a discussion about the use of refrigerants and the thermodynamic conditions required to achieve phase change in a controlled system.

Thermodynamics Of Refrigeration

C3 Technology utilizes R507 refrigerant to generate cryogenic temperatures, which is a standard off-the-shelf refrigerant used industrially (Click here for MSDS). You can use the graphical illustration below to see the temperature vs. saturation pressure curve for each type of refrigerant and R507 being in the middle of the range. Recall that the C3 Technology system generates approximately 10atm or just over 1000kPa of pressure for the vapor stream and cools the vapor stream to about -40°C. This is the unique combination of conditions that has been developed exclusively by GEO that results in the condensation and recovery of VOCs and SVOCs. It is important to note that the refrigerated heat exchangers operate in a close system and do not mix refrigerants with the process vapor stream and is not discharged to the atmosphere. Thus there is no consumption or discharge of R507A refrigerant.



Understanding Importance of Physicochemical Properties of Organic Compounds

The physicochemical properties of organic chemicals influence whether a molecule is in a vapor, liquid or solid state at a given temperature and pressure similar to the water molecule. Furthermore, the efficiency of operation of an off-gas treatment technology is dependent on the engineers understanding of the subject contaminants' physicochemical properties and limitations of the vapor treatment system and its operation parameters. Evaluation of the following chemical properties and of their influence on off-gas treatment technology performance will influence the type and scale of the treatment system as well as the success, time scale and life-cycle cost of the treatment approach.

<u>Henry's Law</u> ($H_L = P_x/C_x$)

- For gas - where P_x is the partial pressure of gas at a given temperature (atm) and C_x is the equilibrium concentration of the gas in solution (mole/m^3); equivalently described as vapor pressure (P_v) divided by the water solubility of the compound.

- Compounds with high H_L will tend to have a greater concentration in air and are more amenable to SVE than other compounds because they easily undergo a phase change from the liquid to vapor phase.

Vapor Pressure ($P_v = CH_L$)

- Where C is the molar concentration of the contaminant in water (mole/ m^3) and H_L is Henry's law constant (atm-m^3/mole).
- Vapor pressure is the pressure of the gas in equilibrium with the aqueous phase liquid at a given temperature and is the measure of the tendency of a substance to pass from a liquid to a vapor state. More simply, the greater the vapor pressure, the more volatile the substance.

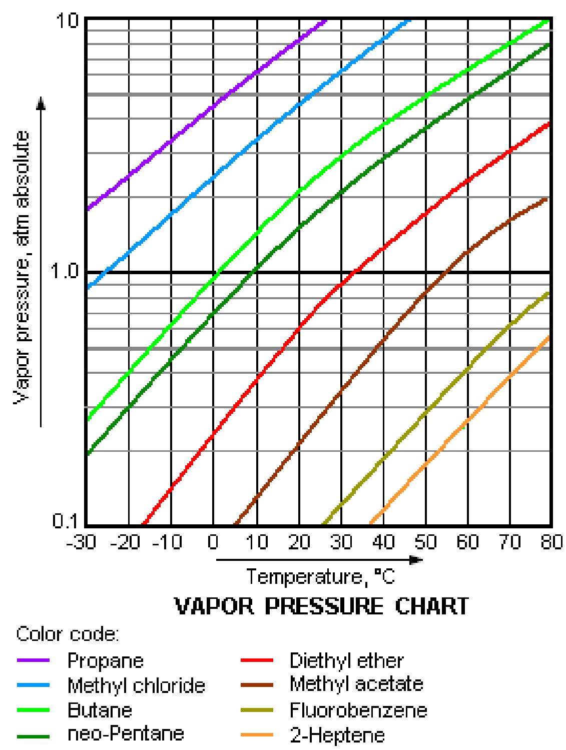


Chart illustrating the vapour pressure curve vs temperature for multiple common organic compounds. Notice that as the temperature decreases so does the vapour pressure.

Partition Coefficient

- Also known as the distribution coefficient or partition constant
- Is the ratio of the concentrations of a substance in two phases of a mixture such as gas/liquid partition?

Water Solubility (NAPL analysis)

- The maximum amount of a substance that can dissolve in water at equilibrium at a given temperature and pressure measured in moles of solute per liter.
- Commonly correlated to octanol-water partition coefficient (Kow).
- Considering water solubility and the measured concentration of the contaminant in groundwater will provide some indication as to the presence of residual NAPL, which is critical in assessing the flux of VOC mass expected during SVE or MPE.

Boiling Point and Melting Point

- Used to determine when a chemical substance changes from solid to liquid (i.e. Melting Point) and from liquid to gaseous state (i.e. Boiling Point).

- A liquid in a high pressure environment has a higher boiling point than when the liquid is at atmospheric pressure. Therefore, by raising the pressure the substance is more likely to remain or return to liquid state.
- If the ambient vadose zone temperature is above the melting point but below the boiling point, it will be stable in liquid form. In order to extract the contaminants through vapor extraction technology, it is preferential to have vadose zone temperature above the boiling point to achieve efficient volatilization. Examples of compounds resistant to standard SVE convention include Chlorobenze with a boiling point of 131 degrees Fahrenheit. *In situ* thermal enhancements are common in these scenarios. **GEO** offers this exact solution for such challenging compounds and at site with significant silt and clay. Visit www.GEORemCo.com for more information.

Organic Carbon Partition Coefficient ($K_{oc} = K_d/F_{oc}$)

$$K_{oc} = \frac{[\text{mass of adsorbed compound/mass of organic carbon}]}{[\text{mass of compound in solution/volume of solution}]}$$

- The ratio of the amount of contaminant adsorbed per unit weight of organic carbon in the soil to the concentration of the chemical in solution at equilibrium.
- Describes the affinity for contaminant liquids to adsorb to soil particles or organic matter, including GAC.

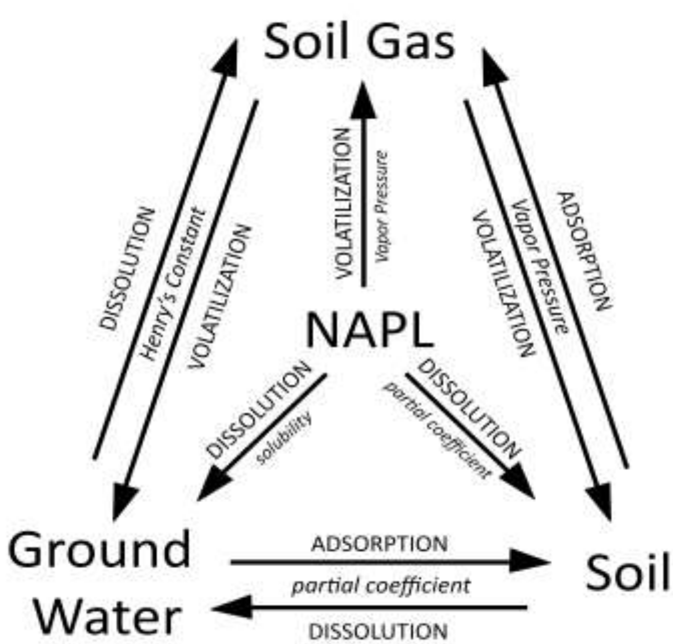


Figure illustrating the four phases of a substance (pure phase or NAPL, adsorbed phase or soil, dissolved phase or in water and vapour phase or soil gas) and the physicochemical properties defined above that influence each phase from one to the other.

The physical properties of substances defined above are utilized in vapor treatment design to understand what substances will be in the vapor phase and at what concentrations. For the designers of the C3 Technology system, the above physical properties provided direction and insight on how to condense these compounds for recovery and potential recycling of the substances.

APPENDIX L Community Air Monitoring Plan {CAMP}

AECOM

Community Air Monitoring Plan

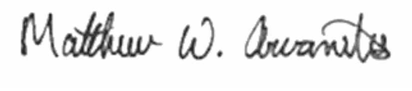
Operable Unit 2 Superfund Site
Village of Holley, Orleans County, New York

Diaz Chemical Corporation

Project Number: 60615479

May 5, 2020

Quality information

Prepared by	Checked by	Approved by
		
Matthew Arvanites Air Measurements, Scientist	Joseph Baum Air Measurements, Scientist	Melissa McLaughlin Air Measurements, Manager

Revision History

Revision	Revision date	Details	Authorized	Name	Position
01	5/5/2020	Added particulate monitoring and details to Response Plan.	5/5/2020	Melissa McLaughlin	Air Measurements Manager

Distribution List

# Hard Copies	PDF Required	Association / Company Name
0	1	URS

Prepared for:

Diaz Chemical Corporation

Prepared by:

URS
250 Apollo Drive
Chelmsford, MA 01824
aecom.com

Copyright © 2020 by AECOM

All rights reserved. No part of this copyrighted work may be reproduced, distributed, or transmitted in any form or by any means without the prior written permission of AECOM.

Table of Contents

Figures

Tables

Abbreviations

AMFT – Air Monitoring Field Technician

AMS – Air Monitoring Station

ASTM – American Society of Testing and Materials

CAMP – Community Air Monitoring Plan

CMS – Chip Measurement System

COC – Constituents of Concern

CD – Compact Disc

DAS – Data Acquisition System

DER – Division of Environmental Regulation

Diaz – Diaz Chemical Corporation

ISTR – In-situ Thermal Remediation

NYSDEC – New York State of Environmental Conservation

NYSDOH – New York State Department of Health

OU2 – Operable Unit 2

PID – Photo Ionization Detector

PM – Project Manager

PWS – Performance Work Statement

QA/QC – Quality Assurance / Quality Control

RAO – Remediation Action Objectives

RAWP – Remedial Action Work Plan

RPD – Relative Percent Difference

RSL – Regional Screening Level

SSHO – Site Safety and Health Officer

SVOC – Semi-volatile Organic Compounds

TAT – Turnaround Time

TVOC – Total Volatile Organic Compounds

UFP-QAPP – Unified Federal Programs Quality Assurance Project Plan

USEPA – United States Environmental Protection Agency

VOC – Volatile Organic Compounds

1. Introduction

On behalf of the Diaz Chemical Corporation (Diaz), URS's Design and Consulting Services Group (URS) has prepared this Community Air Monitoring Plan (CAMP) for the Former Diaz Facility's Operable Unit 2 (OU2) Superfund Site (Site) remediation. This CAMP is being submitted in accordance with the Performance Work Statement developed by the US Army Corps of Engineers to establish the air monitoring and sampling procedures as part of the Remedial Action Work Plan (RAWP). This CAMP fulfills the general requirements for real-time monitoring set forth by the New York State Department of Environmental Conservation (NYSDEC) in the DER-10 Technical Guidance for Site Investigation and Remediation (DER-10; NYSDEC 2010) and chronic/sub chronic exposure risks to the compounds of concern (COC) as set forth by the United States Environmental Protection Agency (USEPA) Regional Screening Levels Users Guide (USEPA, November 2019). The purpose of the CAMP is to provide specific procedures for measuring, documenting, and responding to potential airborne impacts during the excavation and in-situ thermal remediation (ISTR) activities at the Site. The CAMP will: assess Site conditions; evaluate whether the measures used to control potential fugitive emissions are effective; and document ambient air quality/conditions in the immediate vicinity of the Site. If future amendments to the CAMP are required, they will be documented using the amendment form presented in **Appendix A**.

URS is conducting a remediation program at the OU2 Site in accordance with the RAWP. The Site is bounded on the north by Jackson Street, to the east by residential parcels along south Main Street, to the south and west by railroad tracks operated by Genesee Valley Transportation, and beyond that by undeveloped land and a group of buildings. An aerial view of the Site and the expected locations for the air monitoring stations is shown in **Figure 1-1**.

URS is conducting the remediation to address contaminated soil and groundwater within Site source areas. Remediation activities are expected to begin during the first half of 2020 and take approximately 5 years to complete. A combination of excavation and in-situ thermal treatment will be used to achieve remedial action objectives (RAOs) at the Site. The remedial activities at the Site have the potential to generate fugitive emissions, odors, and particulates. URS has incorporated an air monitoring and control component into the program to minimize the potential impact of these emissions on offsite receptors. Air monitoring and sampling will be conducted during soil disturbances, excavation, and thermal remediation. Additionally, air monitoring and sampling will be conducted during the initial set up and mobilization phases, as a baseline air monitoring program.

The constituents of concern (COC) encountered at the Site are defined in the Final Remedial Investigation Report (CDM Smith 2012). These materials may contribute to fugitive emissions during the planned remedial activities. The main COCs include select Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) which have the potential to volatilize into the ambient air and be present in the gaseous state. Soil impacts, both subsurface and at near ground levels, would also have the potential to generate fugitive dust during Site activities.

A detailed view of the Site and the expected locations for each air monitoring station (AMS) is shown in **Figure 1-1**. This configuration was developed based on the predominant wind direction, and the locations of the offsite receptors with respect to the location of potential onsite sources.

Air monitoring and sampling activities will be conducted at the Site fenceline to document potential emissions from soil disturbance areas (test pits, soil excavation, stockpiles, drilling field), and the thermal operations area throughout the remediation activities. Air monitoring and sampling will be conducted to: document ambient air quality/conditions of the Site to assess whether any fugitive emissions resulting from thermal treatment or soil excavation are being generated; evaluate the need for appropriate engineering controls and/or modifications to the thermal treatment system based on air monitoring results; and ensure that the measures used to control fugitive emissions are effective.

This CAMP includes an integrated approach combining real-time continuous monitoring for total volatile organic compounds (TVOCs), particulates less than 10 micrometers in diameter (PM_{10}), and ammonia, and a constituent-specific sampling approach for individual VOCs/SVOCs to document that the Alert/Action Levels and associated responses to exceedances of those levels are appropriate and effective. As part of the CAMP, odors will be assessed on an ongoing basis through observations. Air monitoring will be conducted using an integrated approach that continually reviews the Site activities with respect to the real-time and analytical data to evaluate the need to implement or revise management control protocols.

The integrated air monitoring program consists of the following components:

- **Air Monitoring and Sampling** – conducted using continuous real-time air monitoring techniques and integrated constituent-specific methods that are appropriate for the COC;
- **Quality Assurance / Quality Control (QA/QC)** – specific procedures performed to ensure the validity of the data and associated conclusions related to Site conditions;
- **Alert/Action Level Response Plan** – specific procedures for responding to Alert/Action Level exceedances of VOCs/SVOCs, PM_{10}, odor and/or visible dust; and
- **Reporting** – weekly progress reports/data summaries will be prepared throughout the program, with a final summary report that includes a conclusion as to overall effectiveness of the air monitoring program following the conclusion of the project.

This CAMP has been prepared for inclusion into the RAWP and is organized as follows:

Table 1-1 Community Air Monitoring Plan

Section	Description
Section 1 Introduction	Project air monitoring introduction.
Section 2 Alert/Action Levels and Regional Screening Levels	Defines the project-specific Alert/Action Levels and Regional Screening Levels.
Section 3 Monitoring, Sampling and Analytical Procedures	Defines the procedures and methods for real-time and constituent-specific sampling and analysis.
Section 4 Quality Assurance and Quality Control	Defines the procedures for evaluating results and ensuring that the data is accurate to appropriately characterize ambient air quality.
Section 5 Alert/Action Level Response Plan	Defines the required responses to Alert/Action Level exceedance concentrations.
Section 6 Reporting	Defines the reporting requirements.
Section 7 References	Applicable references.

Figure 1-1 Site Overview

*Site Layout presented herein is conceptual. AMS will be placed along the property boundary. Hand-held monitoring locations will be adjusted as needed based on daily wind conditions, areas of work onsite and nearest sensitive receptors.

2. Site-Specific Alert/Action Levels and Regional Screening Levels

The Site-specific Alert Levels, Action Levels and Regional Screening Levels (RSLs) were developed using the procedures outlined herein.

2.1 Site-Specific Alert and Action Levels

2.1.1 TVOC

Site-specific TVOC Alert and Action Levels were developed for the real-time monitoring for TVOCs using the NYSDOH DER-10 guidance and will be used at the Site to mitigate the potential for long term exposure of the COCs and the associated health risks. An Alert Level is a contaminant concentration that, when exceeded, triggers emission control protocols to avoid reaching or exceeding an Action Level. For example, if odors are detected at the Site, contingent measures such as investigating the source and fixing a leak in the system may be required. An Action Level is a contaminant concentration that when exceeded requires a response such as additional hand-held monitoring and immediate system modifications until the issue is resolved or excessive readings are reduced to an acceptable concentration.

The TVOC Alert Levels were developed using approximately 75% of the Action Level. This tiered approach is intended to require remedial activities to be modified prior to reaching an Action Level exceedance. The Site-specific Alert and Action Levels are detailed in **Table 2-1**.

The Alert and Action Levels will be used as a real-time screening tool to manage remedial activities and minimize the potential for offsite emissions that could pose a human health risk. Comparison of the real-time TVOC monitoring results to the Alert Levels and Action Levels will provide a preliminary evaluation of air quality conditions.

2.1.2 Particulates (PM_{10})

The Site-specific Alert and Action Levels for PM_{10} were based on the DER-10 Guidance. If the Alert Level of 100 µg/m^3 greater than background is exceeded, additional dust suppression techniques will be implemented, and corrective actions taken to reduce the potential for PM_{10} migration offsite. If the Action Level of 150 µg/m^3 greater than background is exceeded, work must stop and the DER must be notified.

2.1.3 Ammonia

The Site-specific ammonia Action Level was calculated based on the non-cancer related sub-chronic RSL for ammonia, which is based on long-term average exposure. To develop a short-term (in this case 15-minute) Action Level, a conservative assumption needs to be made concerning the relative magnitude of peak 15-minute ammonia concentrations and the average ammonia concentration over the 2.1-year project duration. For this evaluation, the peak-to-mean ratio over the course of the project was assumed to be 10:1.

The sub-chronic (acute) RSL for ammonia was developed using the USEPA RSL Users Guide (USEPA November 2019). The results of this calculation are included in **Appendix B**.

Ammonia Action Level (µg/m^3) = ammonia cancer AAC (µg/m^3) * 10:1 peak to mean ratio

Ammonia Action Level (µg/m^3) = 10 µg/m^3 * 10

Ammonia Action Level (µg/m^3) = 100 µg/m^3

Calculated Ammonia Action Level (ppm) = 0.14 ppm

Project Ammonia Action Level (ppm) = 0.25 ppm

Due to the limitations of measuring ammonia in real-time and the conservative nature of the assumptions herein, the Ammonia Action Level will be set to the minimum reporting limit for the measurement device for Ammonia (0.25 ppm).

Table 2-1 Site-Specific Alert and Action Levels

Target Compounds	Alert Level	Action Level
TVOC (15-minute average or instantaneous concentration)	3.7 ppm greater than background[1]	5.0 ppm greater than background[1]
Ammonia (instantaneous concentration)	NA	0.25 ppm
Odor (Instantaneous observation related to Site activities)	Onsite odor observation ≥ 3	Offsite odor complaint
PM_{10} (15-minute average)	100 µg/m^3 greater than background[1]	150 µg/m^3 greater than background[1]
Visible Dust (Instantaneous observation related to Site activities)	Onsite observation	Visible dust moving offsite

Notes:

[1] Background is defined as the lowest concentration recorded onsite during the same period as the elevated concentration.

ppm = parts per million

µg/m^3 = micrograms per meter cubed

2.1.4 Site-Specific Regional Screening Levels for COCs

The site-specific RSLs for the COCs (listed in **Appendix C**) were calculated based on the USEPA RSL Users Guide (USEPA November 2019). Results from the USEPA RSL Calculator are included in **Appendix C** and are based on the following project duration assumptions:

Assume 7 months of exposure during work hours only (February 2020 through August 2020).

$$Duration\ (hours) = \ 7\ months * \frac{4.3\ weeks}{month} * \frac{5\ days}{week} * \frac{10\ hours}{day}$$

$$Duration\ (hours) = 1505\ hours$$

$$Duration\ (days) = Duration(hours) * \frac{1\ day}{24\ hours}$$

$$Duration(days) = 63\ days$$

Assume 2 years of thermal remediation with exposure frequency of 350 days per year 24 hours per day (September 2020 through August 2022). This does not account for two scheduled months without operations.

$$Duration(days) = 2\ years * \frac{350\ days}{year}$$

$$Duration(days) = 700\ days$$

Combined project duration in days:

$$Duration\ (days) = 763\ days$$

$$Duration\ (years) = \frac{763\ days}{365\ days}$$

$$Duration\ (years) = 2.1\ years$$

NOTE – The initial 7-month duration was based on the initial project schedule – we now understand this to be condensed into 4-months. Since the schedule could change further it was determined to be more conservative to use the longer duration in the RSL calculations. The duration of the total project will be re-evaluated periodically to determine its impacts on the RSL calculations, and the RSLs will be re-calculated, as needed. Any changes to the RSL calculations will be documented in a CAMP Amendment using the form presented in **Appendix A**.

Results from the integrated sampling for the COC will be used to calculate the program-average concentrations for comparison to the RSLs over the duration of the remediation program and as part of the final air monitoring and sampling report. Shorter, program-to-date concentrations will be calculated and maintained as part of the air monitoring database and communicated to personnel as necessary. The arithmetic mean will be calculated to represent the various program and shorter averages of the COC. These program-to-date average COC concentrations will be used to periodically evaluate the program's success. The program average concentrations will incorporate both detected and non-detected laboratory concentrations of each COC. The non-detected concentrations will be estimated using the minimum reporting limit.

The program-average concentration of each COC will be compared to the RSLs over the duration of the remediation program as part of the final air monitoring report to establish compliance. Project-to-date average concentrations will be calculated and compared to 80% of the RSLs to evaluate the long-term risk. If any of the running average concentrations exceed 80% of the RSLs, the sampling frequency and Action Levels will be re-evaluated.

3. Air Monitoring, Sampling, and Analytical Procedures

Air monitoring and sampling activities will be conducted throughout the program to evaluate conditions at the property line (fenceline) to ensure that the measures used to control potential fugitive emissions are effective and to document ambient air quality/conditions at the fenceline and in the thermal operations area. The monitoring program will consist of real-time monitoring and 24-hour integrated constituent-specific VOC sampling.

- Continuous real-time monitoring for TVOCs and PM_{10} will be conducted at four (4) AMS, 24 hours per day, 7 days per week. PM_{10} monitoring will be conducted during soil disturbance activities that have the potential to create fugitive dust. These soil disturbance activities may include but are not limited to select pre-construction Site preparation (fencing, concrete removal), drilling for soil sampling and soil excavation, the installation of the well network, transport and relocation of soils to the ISTR treatment area, and final grading activities. The pre-remediation Site preparation activities are anticipated to occur during the initial 4 months of the project, while the final grading activities will be conducted after remediation has been completed;
- Instantaneous hand-held monitoring for TVOCs as well as observational monitoring for odor will be conducted at least twice a day at the fenceline (Monday – Friday, 7AM through 5PM) and within the thermal operations area on an as-needed basis in the event of an Alert/Action Level exceedance;
- Instantaneous hand-held monitoring for PM_{10} as well as observational monitoring for visible dust will be conducted at least twice a day at the fenceline (Monday – Friday, 7AM through 5PM) during soil disturbance activities;
- Ammonia sampling at two (2) AMS (selected based on wind direction and proximity of activities) and within the thermal operations area using a Dräger Chip Measurement System (CMS), or equivalent. Conducted monthly during the Site heat up and every other week during thermal heating;
- 24-hour constituent-specific sampling for the COC will be conducted using SUMMA canisters monthly at the upwind and downwind AMS during Site heat up and every other week during thermal heating; and
- Continuous meteorological monitoring at an onsite location.

An overview of the monitoring approach is provided in **Table 3-1** below.

Table 3-1 Air Monitoring and Sampling Approach

Type	Parameter	Specifications	Documentation	Evaluation
Real-time Continuous Monitoring	TVOC	Real-time 15-minute average TVOC concentrations will be measured at each AMS, 24 hours per day, 7 days per week.	Data will be collected electronically by onsite data loggers and transferred to the central onsite data acquisition system (DAS) for automatic comparison to the Action Levels. Instruments will be calibration-checked daily. The results of these checks will be documented on an appropriate field form and will be maintained as part of the air monitoring database.	**Alert Level:** 15-minute average TVOC > 3.7 ppm; notify onsite Lead Operator. **Action Level:** 15-minute average TVOC > 5.0 ppm; notify onsite Lead Operator and Lead Thermal Engineer.
	PM_{10}	Real-time 15-minute average PM_{10} concentrations will be measured at each AMS, 24 hours per day, 7 days per week during soil disturbance activities.	Data will be collected electronically by onsite data loggers and transferred to the central onsite data acquisition system (DAS) for automatic comparison to the Action Levels. Instruments will be calibration-checked daily. The results of these checks will be documented on an appropriate field form and will be maintained as part of the air monitoring database.	**Alert Level:** 15-minute average PM_{10} > 100 µg/m^3; notify onsite Lead Operator. **Action Level:** 15-minute average PM_{10} > 150 µg/m^3; notify onsite Lead Operator and Lead Thermal Engineer.
	Meteorological Monitoring	Real-time 15-minute wind direction, wind speed, temperature and relative humidity collected at a central onsite location continuously 24/7.	Data will be collected electronically and transferred to the central onsite DAS.	Onsite meteorological data will be used to evaluate the wind conditions.
Hand-Held and Observational Monitoring	TVOC, PM_{10}, Odor and Visible Dust	Hand-held instantaneous measurements of TVOC and PM_{10}, as well as observations of odor and visible dust will be recorded twice a day at the fenceline during work hours (M-F, 7AM-5PM). Additionally, TVOCs will be measured within the thermal operations area an as-needed basis in response to elevated TVOC concentrations at the fence line, on-site odors, or public complaints.	Data will be collected and manually recorded on appropriate field form. Instrumentation, as applicable, will be calibration-checked daily prior use. The results of these calibration checks will be documented on an appropriate field form and will be maintained as part of the air monitoring database.	**Alert/Action Levels:** measurements and observations > Alert/Action Levels; notify onsite Lead Operator and Lead Thermal Engineer.
	Ammonia	Ammonia samples will be collected at two (2) AMS and within the thermal operations area via a Dräger CMS. Performed monthly during the Site heat up and every other week during thermal heating.	Data will be collected and manually recorded on appropriate field form.	**Alert/Action Levels:** measurements and observations > Alert/Action Levels; notify onsite Lead Operator and Lead Thermal Engineer.
Integrated Constituent-Specific Sampling	VOC/SVOC COCs	24-hour integrated VOC/SVOC samples will be collected via Summa Canisters and analyzed in accordance with USEPA TO-15. Monthly samples will be collected at one upwind and one downwind AMS during Site heat up and every other week thereafter.	Samples will be collected and sent for laboratory analysis. The results will be tabulated and used to update the running project-to-date average VOC/SVOC COC concentrations.	**Project Goal:** average project-to-date COC concentrations > 80% of the RSL; notify project team and re-evaluate the sampling frequency and/or Action Levels. The **RSL** will be evaluated at the end of the project to establish compliance with the project risk analysis.

3.1 Real-Time TVOC and PM_{10} Monitoring

The real-time continuous ambient air monitoring system consists of four (4) AMS, one (1) meteorological tower, one (1) data acquisition system (DAS), and one (1) alarm notification system. Each of these components is presented in more detail in the following sections.

Real-time air monitoring for TVOCs and PM_{10} will be conducted at four (4) AMS as detailed in **Table 3-1**. The intent of the real-time monitoring program is to provide an early detection of short-term emissions and potential offsite migration of remediation related TVOC and/or PM_{10} emissions.

Each AMS will be programmed to measure continuous 15-minute average TVOC and PM_{10} concentrations 24/7. The AMS will transmit data on a continuous real-time basis to the DAS via a wireless communication device. In the event of an exceedance of the Alert/Action Level for TVOC or PM_{10}, the air-monitoring field technician (AMFT) will be automatically notified via auditory visual computer alarms and/or a text messaging/email alarm system.

NOTE - PM_{10} monitoring may be conducted during the select pre-construction Site preparation (fencing, concrete removal), and then during drilling for soil sampling and soil excavation, the installation of the well network, and transport and relocation of soils to the ISTR treatment area (anticipated to occur during the initial 4 months of the project). Once these soil disturbance activities are complete (anticipated to take approximately 4 months), the PM_{10} component of the CAMP will be concluded.

3.1.1 Air Monitoring Station Design

Each AMS consists of the following:

- Environmental station enclosure;
- A volatile organic vapor analyzer or MiniRAE PID (or equivalent);
- A particulate monitor equipped with a PM_{10} inlet head (DustTrak or equivalent);
- A data logger; and
- Wireless communications device (radio or modem).

3.1.2 Data Acquisition System and Interactive Display

Real-time continuous data will be collected by the DAS in the central trailer location via radio telemetry. The field technician will have the ability to view and interact with the data to understand the relationship between air quality data collected, meteorological conditions, and Site activities.

3.1.3 Real-Time Alarm Notification System

The DAS at the central trailer will be programmed to compare the 15-minute average TVOC concentrations to the Alert/Action Levels and initiate an alarm (both visually on the computer monitor and by text message/email to the AMFT). In the event of an exceedance concentration, the AMFT will evaluate the concentrations to determine if the exceedance is due to remediation activities. If so, the AMFT will inform the Site Safety Health Officer (SSHO), Project Manager (PM) and Lead System Operator so appropriate actions can be taken. The Alert/Action Level response plan is presented in more detail in **Section 5.0**.

3.2 Real-Time Hand-Held and Observational Monitoring

Hand-held monitoring for TVOCs, PM_{10}, and observational monitoring for odor will be performed approximately twice a day or in response to elevated TVOC/PM_{10} concentrations at the fenceline, onsite odors, or public complaints. Hand-held monitoring for ammonia will be performed monthly during the thermal heat up phase and every other week thereafter once target temperatures are reached. Hand-held ammonia monitoring will continue until treatment of that Stage is complete. The location of the monitoring points may be adjusted throughout the program, as required, to evaluate potential emissions from specific activities and offsite receptors.

The results from these measurements will be recorded on data sheets (stored onsite as a hard copy) and compared to the Alert and Action Levels. Hand-held TVOC, PM_{10}, and ammonia concentrations and odor observations greater than the Alert and Action Levels will be documented and reported to the SSHO, PM and Lead System Operator. Significant odor observations may trigger additional TVOC monitoring and controls at the discretion of the SSHO, PM and Lead Systems Operator.

3.2.1 TVOC, PM_{10} and Ammonia

Routine hand-held monitoring for TVOCs, PM_{10}, and ammonia (as needed) will be conducted at the fenceline twice per day during normal business hours (Monday – Friday, 7AM – 5PM), and in response to Alert/Action Level exceedances as detailed in **Table 3-1**. Hand-held TVOC, PM_{10}, and ammonia measurements will be collected using the following instrumentation:

- TVOC – MiniRAE PID (or equivalent with a 10.6 eV lamp);
- PM_{10} – DustTrak (or equivalent); and
- Ammonia – Dräger CMS.

3.2.2 Observational Monitoring for Odor and Visible Dust

In addition to the hand-held monitoring for TVOCs, PM_{10}, and ammonia, supplemental monitoring for visible dust and odors will be observed, documented, and reported to the Lead Operator. Significant visible dust or odor observations may trigger additional TVOC or PM_{10} monitoring and controls at the discretion of the Lead Operator.

Odor Observations

Supplemental observational monitoring for odors will be conducted at the fenceline during routine hand-held monitoring and in the thermal operations area in the event of an Alert/Action Level exceedance. Odors may constitute a nuisance for the nearby community, visitors to the Site, and onsite workers. Controlling odor emissions from the Site will provide additional means of minimizing complaints from the public and adjacent property owners.

Odor observations will be based on a qualitative and subjective assessment of odor intensity and/or complaints received from the public or adjacent property owners. The odor monitoring scale will be conducted in accordance with descriptions provided in **Table 3-2**.

Table 3-2 Odor Intensity Scale

Scale Description	Odor Intensity Description
0 – Not detectable	Odor not detectable by the sense of smell
1 – Very Light	An odor present in air which activates the sense of smell, but the characteristics may not be distinguishable.
2 – Light	An odor present in air, which activates the sense of smell and is distinguishable and definite. This may not necessarily be objectionable in short durations but may be objectionable in longer durations.

3 – Moderate	An odor present in air which easily activates the sense of smell, is very distinct and clearly distinguishable, and may tend to be objectionable and/or irritating.
4 to 5 – Strong	An odor present in air, which would be objectionable and cause a person to attempt to avoid it completely and may cause physiological effects during prolonged exposure.
5 to 8 – Very Strong	An odor present in the outdoor air, which is so strong, it is overpowering and intolerable for any length of time and causes physiological effects.

Visible Dust Monitoring

A visual evaluation of fugitive dust will also be made on a continuous basis during soil disturbance activities at the Site, which will provide another method to determine whether particulates are becoming airborne due to soil disturbance activities. Observations of visible dust will be recorded in the field data sheets. These observations may generate a communication with the Lead Operator in anticipation of an Action to reduce dust levels. This activity will be documented in the field data sheets. Operational modifications to control dust may also be made in response to public complaints.

3.3 Meteorological Monitoring

A meteorological tower will be erected at an onsite location following installation guidelines established by the USEPA for meteorological monitoring systems, as much as practical. The tower shall be erected without the use of guy wires. The tower will be equipped with sensors to measure 15-minute average wind speed and direction, sigma theta (wind variability), temperature, relative humidity, barometric pressure and precipitation on a continuous basis 24 hours a day, 7 days a week during remedial activities. The meteorological station will be installed prior to the start of remediation activities and will also be operational during the baseline monitoring and sampling period.

Meteorological data will be used in the assessment and determination of upwind and downwind conditions in the review of data collected at the Site, placement of the AMS, and determining best locations for hand-held monitoring.

3.4 Constituent-Specific Sampling and Analysis

Constituent-specific sampling and analysis will be conducted for the principal COCs to document the appropriateness of the Alert/Action Levels and effectiveness of the emission controls. Composite samples will be collected for 24-hour periods at one upwind and one downwind AMS monthly during Site heat up and every other week thereafter once target temperatures are reached. Constituent-specific sampling will continue until treatment of that Stage is complete, as outlined in **Table 3-1**. Upwind and downwind samples will be selected for each sampling period based on forecasted wind directions, location of onsite operations with potential to generate emissions, and sensitive offsite receptors. Additional downwind samples may be required based on onsite operations.

Each integrated sample will be collected at a height that is at or near the top rail of the Site fence. There will be one (1) routine duplicate sample collected at one of the stations for every 20 routine samples. The locations of the constituent-specific sampling may change based on remediation activities, accessibility, and/or weather conditions. Additionally, in the event of loss or suspected loss of pneumatic control of the treatment area, additional samples may be collected. Sample start time shall coordinate with the start of work on that day (i.e., 7AM).

Ambient concentrations of the VOC/SVOC COCs will be characterized using USEPA Method TO-15 (USEPA, 1999) as modified for this project during the laboratory method development task described in the

UFP-QAPP. The composite ambient samples will be collected in 6-liter (L) Summa Canisters using flow controllers calibrated to collect a 6 L sample volume over a 24-hour period. Prior to shipping pre-cleaned evacuated canisters to the Site for use, the laboratory will evacuate the canisters to the prescribed negative pressure approximately -30 inches of mercury (in. Hg), not less than -27 in. Hg. The pressure will be checked upon arrival at the Site, and if the pressure is less than -27 in. Hg, the canister will not be used and will be returned to the laboratory for replacement.

Samples collected in the field will be labeled and kept in a secure location until ready for shipment back to the laboratory. Prior to shipping air samples, a chain of custody form will be completed for each batch of samples. The chain of custody procedures are described in the project Unified Federal Programs Quality Assurance Project Plan (UFP-QAPP). The chain of custody will include information such as project name, project number, sampler's name, sampling date, reporting address, sample contact, laboratory and contact information, sample identifications, sample matrix, analysis required, and special instructions or comments. The completed chain of custody will be signed and timed/dated before the samples are shipped. A copy of the chain of custody will be retained for the project file. The samples will be shipped to the laboratory via overnight or second-day courier services for standard analysis/reporting turnaround time.

Laboratory personnel will sign and date the chain of custody form in acknowledgement of receipt and comment, as necessary, to document the sample conditions upon receiving each batch of samples. The laboratory will also assign a case number or unique sample identification number to each sample and will retain one (1) copy of the completed chain of custody for its records.

Sample analysis will be conducted in accordance with the project-specific UFP-QAPP. Additional detail concerning the measurement performance indicators, field and laboratory QA/QC samples and measurement performance criteria will be presented in the UFP-QAPP. A comparison of the laboratory practical quantitation limits to the RSLs will also be presented. Note that the TO-15 analysis will not resolve the two dibromobenzene isomers. These co-elute and will be reported as a combination (1,3-dibromobenzene/1,4-dibromobenzene). Also, as noted in the Diaz Operable Unit 2 Superfund Site In-Situ Thermal Remedial Action, Phase 2, Performance Work Statement (PWS), 3-bromoacetophenone cannot be analyzed by Method TO-15 and analysis is not required.

3.5 Baseline (Pre-Remediation) Air Monitoring and Sampling Activities

Baseline monitoring and sampling will be conducted to establish baseline ambient air concentrations at the Site prior to the thermal remediation. The baseline program will begin prior to the start of remedial activities, i.e., test pitting, excavations, drilling, thermal treatment) and operate for 1-week (7 days). Baseline conditions will be documented for TVOCs, PM_{10}, ammonia, odors, visible dust, VOCs/SVOCs, and meteorological parameters using the methods described in this CAMP.

Baseline air monitoring will include the following monitoring/sampling and frequencies:

- Real-time TVOC and PM_{10} monitoring will be performed at four (4) AMS for a period of seven (7) days (24 hours per day);
- Hand-held (TVOC, PM_{10}, and ammonia) and observational odor/visible dust monitoring will be performed twice a day at the fenceline, for a period of five (5) days (estimated to be Monday through Friday); and
- Two (2) sets of 24-hour integrated constituent-specific samples will be collected at each of the AMS.

4. Quality Assurance and Quality Control

The CAMP includes several activities related to QA/QC designed to ensure that the field program is being and has been properly conducted and that the analytical results have been reviewed for accuracy and overall quality. The primary goal of the QA/QC aspect of the program is to assure that the field activities, laboratory results, associated responses to exceedances, and the data reporting are appropriate for decision-making purposes and protective of the environment and public health.

4.1 Field Documentation

A field logbook, equipment calibration field forms, and weekly data listings will be maintained by the air monitoring field staff throughout the air monitoring program. Information to be recorded by the air monitoring staff will include:

- Description of Site activities conducted during elevated data values;
- Daily Site maps showing the locations of each AMS and hand-held monitoring locations for the day;
- Any corrective actions conducted due to elevated real-time air monitoring concentrations;
- Constituent-specific VOC sample media receipt dates, conditions, and numbers;
- Copies of the chain of custody forms;
- Sampling equipment installation, operation, and removal dates;
- Sampling equipment calibration check dates and results;
- General field weather conditions on sampling days;
- Any unusual situations which may affect samples or sampling;
- Sample dates; and
- Start and stop times.

General QA/QC procedures related to the collection and analysis of representative field monitoring data and samples are discussed in the following sections.

4.2 Instrument Calibration

Instrument calibrations will be performed according to the manufacturer's recommendations. Hard copies of the manufacturer's instrument manuals will be kept onsite as part of the project notebook.

The following sections detail the specific calibration frequencies for each type of monitoring. Daily instrument calibration results will be maintained onsite for the duration of the project.

4.2.1 Real-Time Air Monitoring

Instrumentation associated with the AMS and hand-held equipment will be calibrated daily (Monday – Friday) in accordance with the manufacturers' instructions using either commercially available standards or internal calibration points. Specific calibration checks may be conducted at the start of each workday. In certain circumstances similar calibration checks will be conducted at the conclusion of the measurement day. For example: A calibration check will be conducted if an instrument is suspected to not be functioning properly. There may also be circumstances in which a calibration check is conducted in conjunction with a period of elevated concentrations to verify or validate the instrument readings. This check could be conducted just after the period of elevated readings or in certain circumstances during the period of elevated concentrations.

Each PID will be calibrated (to zero and an upscale concentration) once daily using a certified standard isobutylene gas for TVOC mode. Particulate monitors for PM_{10} will be zeroed daily in addition to a once-per-week upscale check that will be performed on each unit to verify the instrument's response to elevated particulate concentrations.

The meteorological instrumentation will be calibrated during the setup of the project and at the time of take down to document the condition of the equipment and assure the quality of the meteorological data recorded. Periodic observations and comparisons to other meteorological stations will be made by a technician to evaluate the overall air flow and weather conditions in the area.

4.3 Constituent-Specific Air Monitoring

The 24-hour constituent-specific VOC samples will be collected in a 6-liter individual certified Summa Canister equipped with a flow control regulator during the baseline sampling period and remediation activities. Spare flow control regulators will be supplied by the laboratory for use on the integrated/composite VOC sample. The flow controllers will be calibrated by the laboratory to collect a sample at a flow rate that will allow the canister to fill over a 24-hour period. The flow controllers will be returned to the laboratory recertification every 3 months, or when routine checks indicate a change in flow rate.

4.3.1 Field Quality Control Samples

Field duplicate samples will be collected and used to facilitate the evaluation of the precision and accuracy of the results from the laboratory samples. Duplicate samples will be collected at a rate of one (1) duplicate sample per 20 samples. The results will be evaluated, and it will be determined if the results are reasonable.

Relative Percent Differences (RPDs) between the collocated or duplicate samples should be less than 50% when both results are greater than five times the reporting limit or less than 100% when either result is less than five times the reporting limit.

4.3.2 Data Validation

URS will perform data validation on the results of 10% of the samples analyzed for VOCs using USEPA Method TO-15. The data will be validated by evaluating the specific elements (where applicable to the method) specified in *DER-10 Appendix 2B Guidance for Data Deliverables and the Development of Data Usability Summary Reports*. This validation will follow Stage 2B Validation as described in *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, USEPA 540-R-08-005, January 2009*. Data qualifiers will be applied as described in the *USEPA Region 2 validation guidance document, SOP No. HW-31, Revision 6, Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15, June 2014*.

5. Alert/Action Level Response Plan

This CAMP includes an approach for evaluating Site conditions according to the Alert/Action Levels presented in **Section 2.0**. The DAS and interactive data display will evaluate concentrations and flag the results appropriately according to the Site conditions. In the event of a TVOC/PM_{10} concentration greater than the Alert or Action Level, the DAS will automatically send a text message or email to the AMFT. The AMFT will respond to changes in Site conditions as described below:

1. Verify that the Site conditions are actual and related to remediation activities. This includes confirming proper operation and calibration of the air monitoring station equipment, confirming observations of visible dust related to an exceedance of the PM_{10} Action Level, performing an odor survey to determine if there is any correlation to exceedance of the TVOC Action Level, and performing a PID survey of both the ISTR equipment and a ground level survey in the TTZ to determine if there are correlations to a TVOC Action Level exceedance;
2. Notify the PM, Lead System Operator, Lead Thermal Engineer, and SSHO (if present during construction activities) of periods of elevated concentrations related to remediation activities;
3. Work with the SSHO, PM, Lead Thermal Engineer, and Lead System Operator to agree on the appropriate response action. For TVOCs this may include repairing any equipment leaks detected, determining if plenum/insulating cap or other area requires attention, backing off ISTR vapor recovery flow rates; opening dilution valves; adding additional vapor control technology; or shut down the ISTR system. For PM_{10} this may include fugitive dust suppression techniques for selected project activities such as covering excavated areas or soil piles, minimizing the number of excavation areas, wetting the ground-equipment/excavation faces, use of calcium chloride, and others are also discussed in the RAWP.
4. Remediation Contactor implements control and mitigation measures;
5. Lead System Operator will evaluate the performance of the control and mitigation measures; and
6. Notify SSHO, PM, Lead Thermal Engineer, and Lead System Operator of changes in the air monitoring results.

On-site emission controls and mitigation measures that will be used in response to periods of elevated concentrations at the fence line are detailed in the RAWP.

5.1 Documentation

Each period of elevated concentrations greater than the Action Level will be documented by the AMFT in the field log notebook. Information recorded during periods of elevated concentrations will include but not be limited to the following:

- Time of exceedance;
- Location of exceedance;
- Cause for exceedance;
- Relevant meteorological conditions; and
- Documented response actions.

The AMFT will provide an initial verbal notification for each period of elevated concentrations.

5.2 Off-Hours Action Level Response Plan

URS and the Lead Systems Operator will respond to alarm notifications as received via the cell phone communication link during periods of elevated TVOC concentrations during nights and weekends. It is not anticipated that there will be a need for an off-hours PM_{10} Action Level Response plan due to the fact that the limited soil disturbance activities will be conducted during the workday (Monday through Friday, 7AM – 5PM). URS's responses to off-hours TVOC Action Level exceedances are identified in **Table 5-1**. Onsite emission controls and mitigation measures that will be used in response to periods of elevated concentrations at the fenceline are presented in the RAWP.

Table 5-1 Off-Hours Action Level Response Plan

Action Level	Air Monitoring Contractor Actions
TVOC > Action Levels	Call the 24-hour point of contact (PM, Lead Thermal Engineer, and Lead System Operator) and describe the Site conditions. Assess if Action Level exceedance is caused by onsite or offsite conditions based on meteorological conditions. Meet Lead System Operator at the Property as requested.

*The AMFT must be directed and accompanied by the Lead System Operator during off-hour periods. Health and safety considerations should be considered prior to entering the property during periods off-hours.

6. Reporting

The air monitoring and sampling results from the program will be documented and reported in several ways: verbal exceedance notifications; weekly project summaries; and Final Phase Reports at the conclusion of each phase.

6.1 Exceedance Notifications

Notifications of real-time exceedances of the Alert or Action Level will be provided to the SSHO, PM and Lead System Operator verbally as they occur and will be documented by the AMFT in the field notebook.

6.2 Weekly Project Summaries

Weekly project summaries of the real-time air monitoring data (daily maximum concentrations, and weekly maximum and average concentration for each AMS) will be prepared for the PM. The summaries will be supplemented with notations of any exceedances of the Action Levels and associated control responses and/or operational modifications. In addition, meteorological plots including a wind rose documenting trends in wind direction, and time-series plots of wind speed, temperature, and relative humidity will be included in the weekly data summaries.

The results from the constituent-specific sample analysis will be summarized on a weekly basis, as they are accumulated. The summary will include program-to-date average concentrations of the principal COC. The laboratory results will typically be summarized on a regular basis and the report will be generated based on the receipt-schedule of the laboratory results.

6.3 Final Air Monitoring Report

At the conclusion of the project, URS will prepare a summary of the real-time and integrated constituent-specific air monitoring results. The summary will include synopsis of meteorological data as well as real-time and constituent-specific VOC data from each air monitoring location. The results of the constituent-specific sampling (averaged at each location over the combined phases of the project) will be compared to the AACs.

URS will incorporate these summaries into the final interim reports for each Stage of remediation documenting the air monitoring results. Additionally, copies of the analytical data and QC documentation will be provided on a compact disc (CD) following the completion of the program.

7. References

AECOM, *DRAFT Unified Federal Programs Quality Assurance Project Plan Diaz Chemical Corporation Operable Unit 2 Superfund Site In-Situ Thermal Remedial Action, Phase 2,* January 2020.

National Climatic Data Center (NCDC). *Climatic Wind Data for the United States*. November 1998.

NYSDEC. *DER-10 Technical Guidance for Site Investigation and Remediation.* May 2010.

US Army Corps of Engineers. *Diaz Chemical Corporation Operable Unit 2 Superfund Site In-Situ Thermal Remedial Action, Phase 2, Performance Work Statement.* February 2019.

USEPA Method TO-15. *Determination of Volatile Organic Compounds in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography/Mass Spectrometry.* January 1999.

USEPA. *Regional Screening Levels – Users Guide.* November 2019. https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide

USEPA. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, USEPA 540-R-08-005.* January 2009.

USEPA. *USEPA Region 2 validation guidance document, SOP No. HW-31, Revision 6, Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15.* June 2014.

Appendix A Community Air Monitoring Plan Amendment Form

Amendment No.: ______________________

Client:	**Project Number:**
Location:	**Date:**
Air Monitoring Project Manager:	
Amendment Description:	
Reason for Amendment:	

Appendix B Ammonia Sub-Chronic Regional Screening Level Calculation

Site-specific
Resident Equation Inputs for Air

*** Inputted values different from Resident defaults are highlighted.**

Variable	Resident Air Default Value	Form-input Value
ED_{res} (exposure duration) years	26	2.1
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	0.1
ED_{6-16} (mutagenic exposure duration third phase) years	10	0
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	0
EF_{res} (exposure frequency) days/year	350	365
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	365
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	365
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	365
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	365
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Output generated 05DEC2019:14:28:18

Site-specific
Resident Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR (ug/m ^{3})$^{-1}$	IUR Ref	RfC (mg/m ^{3})	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m ^{3})	Noncarcinogenic SL THI=0.1 (ug or fibers/m ^{3})	Screening Level (ug or fibers/m ^{3})
Ammonia	7664-41-7	No	Yes	Inorganics	-		1.00E-01	P /Subchronic	-	1.00E+01	1.00E+01 nc

Output generated 05DEC2019:14:28:18

Inhalation Unit Risk Toxicity Metadata

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ³)⁻¹	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species	Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference	Inhalation Unit Risk Notes
Ammonia	7664-41-7	Inorganics											

Oral Slope Factor Toxicity Metadata

Chemical	CASNUM	Chemical Type	Oral Slope Factor (mg/kg-day) $^{-1}$	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species	Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference	Oral Slope Factor Notes
Ammonia	7664-41-7	Inorganics											

Oral Sub-Chronic Toxicity Metadata

Chemical	CASNUM	Chemical Type	Subchronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Subchronic Reference Dose Basis	Oral Subchronic Reference Dose Confidence Level	Oral Subchronic Reference Dose Critical Effect	Oral Subchronic Reference Dose Target Organ	Oral Subchronic Reference Dose Modifying Factor	Oral Subchronic Reference Dose Uncertainty Factor
Ammonia	7664-41-7	Inorganics	-							

Oral Subchronic Reference Dose Species	Oral Subchronic Reference Dose Route	Oral Subchronic Reference Dose Study Duration	Oral Subchronic Reference Dose Study Reference	Oral Subchronic Reference Dose Notes

Output generated 05DEC2019:14:28:18

Inhalation Sub-Chronic Toxicity Metadata

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m³)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect	Inhalation Subchronic Reference Concentration Target Organ
Ammonia	7664-41-7	Inorganics	0.1	PPRTV	NOAEL: 2.3 mg/m3	Medium	Effects	Pulmonary

Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
NA	30	Human	Inhalation	12.2 years	Holness et al. 1989	NOAEL was adjusted from 6.4 mg/m3

Appendix C VOC Sub-Chronic and Chronic Regional Screening Levels

NOTE – URS is currently reviewing the Site-specific RSLs and the analytical reporting limits to determine feasibility. This will be finalized prior to implementation of the program.

Site-specific
Resident Equation Inputs for Air

*** Inputted values different from Resident defaults are highlighted.**

Variable	Resident Air Default Value	Form-input Value
ED_{res} (exposure duration) years	26	2.1
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	0.1
ED_{6-16} (mutagenic exposure duration third phase) years	10	0
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	0
EF_{res} (exposure frequency) days/year	350	365
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	365
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	365
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	365
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	365
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Output generated 06FEB2020:08:52:58

Site-specific
Resident Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m^3)	Screening Level (ug or fibers/m^3)
Amino-4-chlorobenzotrifluoride, 3-	121-50-6	No	Yes	Organics	-		-		-	-	
Benzene	71-43-2	No	Yes	Organics	7.80E-06	I	8.00E-02	P /Subchronic	4.27E+00	8.00E+01	4.27E+00 ca*
Bromo-2-chloroethane, 1-	107-04-0	No	Yes	Organics	6.00E-04	X	-		5.56E-02	-	5.56E-02 ca
Bromo-3-fluorobenzene, 1-	1073-06-9	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Bromo-4-Ethylbenzene, 1-	1585-07-5	No	Yes	Organics	-		-		-	-	
Bromo-4-fluorobenzene, 1-	460-00-4	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Bromoacetophenone, 3-	2142-63-4	No	No	Organics	-		-		-	-	
Bromopyridine, 2-	109-04-6	No	No	Organics	-		-		-	-	
Chlorobenzene	108-90-7	No	Yes	Organics	-		5.00E-01	P /Subchronic	-	5.00E+02	5.00E+02 nc
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	No	Yes	Organics	-		-		-	-	
Chlorobenzotrifluoride, 4-	98-56-6	No	Yes	Organics	-		3.00E+00	P /Subchronic	-	3.00E+03	3.00E+03 nc
Cumene	98-82-8	No	Yes	Organics	-		9.00E-02	H /Subchronic	-	9.00E+01	9.00E+01 nc
Cyclohexane	110-82-7	No	Yes	Organics	-		1.80E+01	P /Subchronic	-	1.80E+04	1.80E+04 nc
Dibromo-3-chloropropane, 1,2-	96-12-8	Yes	Yes	Organics	6.00E-03	P	2.00E-03	P /Subchronic	5.75E-04	2.00E+00	5.75E-04 ca
Dibromobenzene, 1,3-	108-36-1	No	Yes	Organics	-		-		-	-	
Dibromobenzene, 1,4-	106-37-6	No	Yes	Organics	-		-		-	-	
Dibromoethane, 1,2-	106-93-4	No	Yes	Organics	6.00E-04	I	2.00E-03	H /Subchronic	5.56E-02	2.00E+00	5.56E-02 ca*
Dichlorobenzotrifluoride, 3,4-	328-84-7	No	Yes	Organics	-		-		-	-	
Dichloroethane, 1,1-	75-34-3	No	Yes	Organics	1.60E-06	C	-		2.08E+01	-	2.08E+01 ca
Dichloroethane, 1,2-	107-06-2	No	Yes	Organics	2.60E-05	I	7.00E-02	P /Subchronic	1.28E+00	7.00E+01	1.28E+00 ca*

Site-specific
Resident Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or fibers/m ^{3})	Screening Level (ug or fibers/m ^{3})
Dichloroethylene, 1,1-	75-35-4	No	Yes	Organics	-		7.93E-02	A /Subchronic	-	7.93E+01	7.93E+01 nc
Dichloroethylene, 1,2-trans-	156-60-5	No	Yes	Organics	-		7.93E-01	A /Subchronic	-	7.93E+02	7.93E+02 nc
Dichloropropene, cis-1,3-	10061-01-5	No	Yes	Organics	-		-		-	-	
Dichloropropene, trans-1,3-	10061-02-6	No	Yes	Organics	-		-		-	-	
Ethylbenzene	100-41-4	No	Yes	Organics	2.50E-06	C	9.00E+00	P /Subchronic	1.33E+01	9.00E+03	1.33E+01 ca
Fluorobenzene	462-06-6	No	Yes	Organics	-		3.00E-02	X /Subchronic	-	3.00E+01	3.00E+01 nc
Methyl Ethyl Ketone (2-Butanone)	78-93-3	No	Yes	Organics	-		1.00E+00	H /Subchronic	-	1.00E+03	1.00E+03 nc
Methylcyclohexane	108-87-2	No	Yes	Organics	-		-		-	-	
Methylene Chloride	75-09-2	Yes	Yes	Organics	1.00E-08	I	1.04E+00	A /Subchronic	3.45E+02	1.04E+03	3.45E+02 ca**
Styrene	100-42-5	No	Yes	Organics	-		3.00E+00	H /Subchronic	-	3.00E+03	3.00E+03 nc
Tetrachloroethylene	127-18-4	No	Yes	Organics	2.60E-07	I	4.07E-02	A /Subchronic	1.28E+02	4.07E+01	4.07E+01 nc
Toluene	108-88-3	No	Yes	Organics	-		5.00E+00	P /Subchronic	-	5.00E+03	5.00E+03 nc
Trichloroethane, 1,1,1-	71-55-6	No	Yes	Organics	-		5.00E+00	I /Subchronic	-	5.00E+03	5.00E+03 nc
Trichloroethylene	79-01-6	Yes	Yes	Organics	4.10E-06	I	2.15E-03	A /Subchronic	2.61E+00	2.15E+00	2.15E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	Organics	4.40E-06	I	7.67E-02	A /Subchronic	2.21E-01	7.67E+01	2.21E-01 ca
Xylene, m-	108-38-3	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylene, o-	95-47-6	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylene, p-	106-42-3	No	Yes	Organics	-		1.00E-01	S /Chronic	-	1.00E+02	1.00E+02 nc
Xylenes	1330-20-7	No	Yes	Organics	-		4.00E-01	P /Subchronic	-	4.00E+02	4.00E+02 nc

Inhalation Unit Risk Toxicity Metadata

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Benzene	71-43-2	Organics	7.80E-06	IRIS	Known/likely human carcinogen	Leukemia	Blood	Human
Bromo-2-chloroethane, 1-	107-04-0	Organics	6.00E-04	PPRTV SCREEN	UN	Nasal cavity (includes adenoma, adenocarcinoma, papillary adenoma, squamous cell carcinoma, and or/papilloma), hemangiosarcomas, mesotheliomasy	Reproductive, Other, Respiratory	Rat
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics						
Bromo-4-fluorobenzene, 1-	460-00-4	Organics						
Chlorobenzene	108-90-7	Organics						
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics						
Chlorobenzotrifluoride, 4-	98-56-6	Organics						
Cumene	98-82-8	Organics						
Cyclohexane	110-82-7	Organics						

Inhalation Unit Risk Toxicity Metadata

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
Low-dose linearity utilizing maximum likelihood estimates	NA	NA	Rinsky et al. 1981, 1987, Paustenbach et al. 1993, Crump and Allen 1984, Crump 1992, 1994, U.S. EPA 1998
NA	Inhalation	6 hours/day, 5 days/week, 103 weeks	NTP 1982

Inhalation Unit Risk Notes
NA
NA

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	6.00E-03	PPRTV	LI	Tumors	Nasal	Rat
Dibromobenzene, 1,3-	108-36-1	Organics						
Dibromobenzene, 1,4-	106-37-6	Organics						
Dibromoethane, 1,2-	106-93-4	Organics	6.00E-04	IRIS	Likely to be carcinogenic to humans	adenoma, adenocarcinoma, papillary adenoma, squamous cell carcinoma, and or/papilloma; hemangiosarcomas, mesotheliomas	Nasal cavity	Rat
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics						
Dichloroethane, 1,1-	75-34-3	Organics	1.60E-06	Cal EPA	C	NA	NA	NA
Dichloroethane, 1,2-	107-06-2	Organics	2.60E-05	IRIS	B2	Hemangioscarcomas	Blood	Rat
Dichloroethylene, 1,1-	75-35-4	Organics						

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
NA	Inhalation	105-107, 103, or 84 weeks	NTP 1982
Multistage-Weibull model; linear extrapolation from lower 95% confidence limit on dose associated with extra risk (adjusted for background) at point of departure at lower end of data range.	NA	NA	NTP 1982
NA	NA	NA	NA
Linearized multistage procedure, extra risk	NA	NA	NCI 1978

Inhalation Unit Risk Notes
Based on the BMC10. For chemicals that have been determined to be carcinogenic by a mutagenic mode of action, sample calculations for estimation of risk are supplied in the Supplementary Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, March, 2005, especially Example 2 which presents a sample calculation for a total lifetime exposure (0-70 years). Both the exposure and the increased potency in early life exposures must be utilized by the risk assessor in the field to determine risk. For inhalation; (IUR), Risk = IUR x ADAF x Exposure Concentration x Duration Factor , which is independent of intake rates and body weights, the ADAFs are applied according to the exposure concentration (e.g. mg chemical/cubic meter) and duration factor in each age category, viz. 0<2 years, 2<16 years using a 10 fold and 3 fold factor, respectively, times the IUR , and greater than 16 years with no additional factor, taking into account the time of exposure relative to a 70 year lifetime. For example an exposure in the 0-2 year category, would be calculated as (exposure concentration x 10 x 2/70 years x IUR); for the 2-16 years (exposure concentration x 3 x 13/70 years x IUR), and finally for greater than 16 years (exposure concentration x 1 x 55/70 x IUR). Exposure concentrations must be determined for each life stage. The lifetime risk is the sum of the individual risks at each life stage. If the exposure concentrations are the same at each life stage, the lifetime risk would be; Exposure Concentration x 1.6 x IUR, i.e. a 60% greater susceptibility from a whole life exposure (from birth.)
NA
NA
NA

Chemical	CASNUM	Chemical Type	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species
Dichloroethylene, 1,2-trans-	156-60-5	Organics						
Ethylbenzene	100-41-4	Organics	2.50E-06	Cal EPA	D	NA	NA	NA
Fluorobenzene	462-06-6	Organics						
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics						
Methylcyclohexane	108-87-2	Organics						
Methylene Chloride	75-09-2	Organics	1.00E-08	IRIS	likely to be carcinogenic in humans	Hepatocellular carcinomas or adenomas, bronchoalveolar carcinomas or adenomas	Liver	male B6C3F1 mice
Styrene	100-42-5	Organics						
Tetrachloroethylene	127-18-4	Organics	2.60E-07	IRIS	likely to be carcinogenic in humans by all routes of exposure	Hepatocellular adenomas or carcinomas	liver	mouse
Toluene	108-88-3	Organics						
Trichloroethane, 1,1,1-	71-55-6	Organics						
Trichloroethylene	79-01-6	Organics	4.10E-06	IRIS	carcinogenic to humans	Renal cell carcinoma, non-Hodgkin's lymphoma, and liver tumors	Kidney, Liver	human
Vinyl Chloride	75-01-4	Organics	4.40E-06	IRIS	Known/likely human carcinogen	Liver angiosarcomas, angiomas, hepatomas, and neoplastic nodules	Liver	Rat
Xylene, m-	108-38-3	Organics						
Xylene, o-	95-47-6	Organics						
Xylene, p-	106-42-3	Organics						
Xylenes	1330-20-7	Organics						

Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference
NA	NA	NA	NA
Multistage model with linear extrapolation from the point of departure (BMDL10)	NA	NA	Mennear et al. 1988 and NTP 1986
Multistage model with linear extrapolation from the point of departure (BMCL10), followed by extrapolation to humans using the PBPK model of Chiu and Ginsberg (2011)	NA	NA	JISA 1993
LEC01	NA	NA	Charbotel et al. 2006, EPA 2011, Raaschou-Nielsen et al. 2003
LED 10/ linear method	NA	NA	Maltoni et al. 1981, Maltoni et al. 1984

Inhalation Unit Risk Notes
NA
NA
NA
NA
NA

Chemical	CASNUM	Chemical Type	Oral Slope Factor (mg/kg-day) $^{-1}$	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species
Benzene	71-43-2	Organics	5.50E-02	IRIS	Known/likely human carcinogen	Leukemia	Blood	Human
Bromo-2-chloroethane, 1-	107-04-0	Organics	2.00E+00	PPRTV SCREEN	UN	Forestomach tumors, hemangiosarcomas, thyroid follicular cell adenomas or carcinomas	Gastrointestinal, Endocrine	Rat
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics						
Bromo-4-fluorobenzene, 1-	460-00-4	Organics						
Chlorobenzene	108-90-7	Organics						
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics						
Chlorobenzotrifluoride, 4-	98-56-6	Organics						
Cumene	98-82-8	Organics						
Cyclohexane	110-82-7	Organics						
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	8.00E-01	PPRTV	LI	Renal tubular cell adenoma or carcinoma	Kidney	Rat
Dibromobenzene, 1,3-	108-36-1	Organics						
Dibromobenzene, 1,4-	106-37-6	Organics						
Dibromoethane, 1,2-	106-93-4	Organics	2.00E+00	IRIS	Likely to be carcinogenic to humans	Forestomach tumors, hemangiosarcomas, thyroid follicular cell adenomas or carcinomas	Forestomach and thyroid	Rat
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics						
Dichloroethane, 1,1-	75-34-3	Organics	5.70E-03	Cal EPA	C	NA	NA	NA
Dichloroethane, 1,2-	107-06-2	Organics	9.10E-02	IRIS	B2	Hemangiosarcomas	Blood	Rat
Dichloroethylene, 1,1-	75-35-4	Organics						

Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference
Linear extrapolation of human occupational data	NA	NA	Rinsky et al. 1981, Rinsky et al. 1987, Paustenbach et al. 1993, Crump 1994, U. S. EPA 1998, U.S. EPA 1999
NA	Oral: gavage	104 weeks	NCI 1978
NA	Oral: diet	104 weeks	Hazelton Laboratories 1977
Multistage model with Poly-3 adjusted incidence data; linear extrapolation from lower 95% confidence limit on dose associated with extra risk (adjusted for background) at point of departure at lower end of data range.	NA	NA	NCI 1978
NA	NA	NA	NA
Linearized multistage procedure with time-to-death analysis, extra risk	NA	NA	NCI 1978

Oral Slope Factor Notes
NA
NA
For chemicals that have been determined to be carcinogenic by a mutagenic mode of action, sample calculations for estimation of risk are supplied in the Supplementary Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, March, 2005, especially Example 2, which presents a sample calculation for a total lifetime exposure (0-70 years). Both the exposure and the increased potency in early life exposures must be utilized by the risk assessor in the field to determine risk. For oral exposure (OSF), the dose (Dose= Intake Rate x Concentration in media / Body Weight; e.g. mg/kg-day; Risk = Dose x ADAF x Duration factor x OSF) must be calculated for each age bracket (0-<2, 2-<16, and 16-70 years). The dose for each life stage is utilized to determine risk as indicated above using the appropriate ADAF (10, 3, 1), and duration factor (2/70, 13/70 and 55/70). The Exposure Factors Handbook indicates that the average weight for human male and female in the age bracket of 0-<2 is 7.6 Kg, for 2-<16 is 36.4 Kg and for 16-70 is 70Kg. Intake rates for each life stage and concentrations in the media must be determined by the risk assessor in the field.
NA
NA
NA

Chemical	CASNUM	Chemical Type	Oral Slope Factor (mg/kg-day) $^{-1}$	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species
Dichloroethylene, 1,2-trans-	156-60-5	Organics						
Ethylbenzene	100-41-4	Organics	1.10E-02	Cal EPA	D	NA	NA	NA
Fluorobenzene	462-06-6	Organics						
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics						
Methylcyclohexane	108-87-2	Organics						
Methylene Chloride	75-09-2	Organics	2.00E-03	IRIS	likely to be carcinogenic in humans	Hepatocellular carcinomas or adenomas	Liver	male B6C3F1 mice
Styrene	100-42-5	Organics						
Tetrachloroethylene	127-18-4	Organics	2.10E-03	IRIS	likely to be carcinogenic in humans by all routes of exposure	Hepatocellular adenomas or carcinomas	Liver	mouse
Toluene	108-88-3	Organics						
Trichloroethane, 1,1,1-	71-55-6	Organics						
Trichloroethylene	79-01-6	Organics	4.60E-02	IRIS	carcinogenic to humans	Derived from IUR	Derived from IUR	Derived from IUR
Vinyl Chloride	75-01-4	Organics	7.20E-01	IRIS	Known/likely human carcinogen	Total of liver angiosarcoma, hepatocellular carcinoma, and neoplastic nodules	Liver	Rat
Xylene, m-	108-38-3	Organics						
Xylene, o-	95-47-6	Organics						
Xylene, p-	106-42-3	Organics						
Xylenes	1330-20-7	Organics						

Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference
NA	NA	NA	NA
Multistage model with linear extrapolation from the point of departure (BMDL10)	NA	NA	Serota et al. 1986
Multistage model with linear extrapolation from the point of departure (BMDL10), followed by route-to-route extrapolation to the oral route and interspecies extrapolation using the PBPK model of Chiu and Ginsberg (2011)	NA	NA	JISA 1993
Derived from IUR	NA	NA	Derived from IUR
LMS method	NA	NA	Feron et al. 1981

Oral Slope Factor Notes
NA
NA
NA
NA
NA

Chemical	CASNUM	Chemical Type	Subchronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Subchronic Reference Dose Basis	Oral Subchronic Reference Dose Confidence Level
Benzene	71-43-2	Organics	0.01	PPRTV	BMDL: 1.2 mg/kg-day	Medium
Bromo-2-chloroethane, 1-	107-04-0	Organics	-			
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics	0.003	PPRTV SCREEN	NOAEL-HED: 1 mg/kg-day	NA
Bromo-4-fluorobenzene, 1-	460-00-4	Organics	0.003	PPRTV SCREEN	NOAEL-HED: 1 mg/kg-day	NA
Chlorobenzene	108-90-7	Organics	0.07	PPRTV	NOAEL: 19.6 mg/kg/day	Medium
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics	0.0001	PPRTV SCREEN	LOAEL: 1 mg/kg-day	NA
Chlorobenzotrifluoride, 4-	98-56-6	Organics	0.03	PPRTV	BMDL: 8.8 mg/kg-day	Medium
Cumene	98-82-8	Organics	0.4	HEAST	NOAEL: 154 mg/kg/day	NA
Cyclohexane	110-82-7	Organics	-			
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	0.002	PPRTV	NOAEL: .7 mg/kg-day	Medium
Dibromobenzene, 1,3-	108-36-1	Organics	0.004	PPRTV SCREEN	NOAEL: 1.2 mg/kg-day	NA
Dibromobenzene, 1,4-	106-37-6	Organics	0.1	HEAST	NOAEL: 10 mg/kg/day	NA
Dibromoethane, 1,2-	106-93-4	Organics	-			
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics	0.05	PPRTV SCREEN	NOAEL: 14.4 mg/kg-day	NA
Dichloroethane, 1,1-	75-34-3	Organics	2	PPRTV	NOAEL: 714.3 mg/kg-day	Low
Dichloroethane, 1,2-	107-06-2	Organics	0.02	PPRTV	LOAEL: 58 mg/kg-day	Medium
Dichloroethylene, 1,1-	75-35-4	Organics	0.009	HEAST	LOAEL: 9 mg/kg/day	NA
Dichloroethylene, 1,2-trans-	156-60-5	Organics	0.2	ATSDR	NOAEL: 17 mg/kg-day	NA

Oral Subchronic Reference Dose Critical Effect	Oral Subchronic Reference Dose Target Organ	Oral Subchronic Reference Dose Modifying Factor	Oral Subchronic Reference Dose Uncertainty Factor	Oral Subchronic Reference Dose Species
Decreased lymphocyte count	Blood	NA	100	Human
Increased relative liver weight (liver:body weight ratio) and hepatic microsomal enzyme induction for surrogate POD	Liver	NA	300	Rat
Increased relative liver weight (liver:body weight ratio) and hepatic microsomal enzyme induction for surrogate POD	Liver	NA	300	Rat
Slight bile duct proliferation, slight swelling and vacuolation and leukocytic infiltration; Swelling of tubular epithelium and variations in cellularity	Liver; Kidney	NA	300	Dog
Decreased relative brain weight; Increased triglycerides	CNS; Whole body	NA	10000	Rat
Increased cholesterol and triglycerides	Liver	NA	300	Rat
Increased weight	Kidney	NA	300	Rat
Testicular effects	Testicle	NA	300	Rabbit
Increased relative liver weight and hepatic microsomal enzyme induction	Liver	NA	300	Rat
Increased relative weight; Altered enzyme activities	Liver; Liver	NA	100	Rat
Lesions	Kidney	NA	300	Rat
Renal injury	Kidney	NA	300	Rat
Greater than 10 percent increase in relative kidney weight	Kidney	NA	3000	Rat
Lesions	Liver	NA	1000	Rat
Increased serum alkaline phosphatase and increase in relative liver weight	Hepatic	NA	100	Mouse

Oral Subchronic Reference Dose Route	Oral Subchronic Reference Dose Study Duration	Oral Subchronic Reference Dose Study Reference	Oral Subchronic Reference Dose Notes
Occupational Inhalation study	NA	Rothman et al. 1996	Based on the same principal study as the chronic RfD in IRIS.
Oral	90 days	Carlson and Tardiff 1977	NA
Oral	90 days	Carlson and Tardiff 1977	NA
Oral	13 weeks	Hazleton Laboratories 1967	There is also a LOAEL value with this study.
Oral: gavage	28 days	Bucchi et al. 1983	NA
Oral: gavage	28 days	Macri et al. 1987	Benchmark dose modeling was used to calculate a BMDL1 based on the LOAEL of 100 mg/kg-day
Oral: gavage	194 days	NA	NA
Oral	10 weeks	Foote et al. 1986	There is also a LOAEL value with this study.
Oral	90 days	Carlson and Tardiff 1977	NA
Oral: gavage	45 or 90 days	NA	NA
Oral: gavage	14 days	Raltech Scientific Services, Inc. 1980	NA
Oral	13 weeks	Muralidhara et al. 2001	NOAEL was adjusted from 1000 mg/kg-day for continuous exposure
Oral: drinking water	13 weeks	NTP 1991	NA
Oral: drinking water	2 years	NA	The chronic oral RfD was adopted as the subchronic oral [RfD].
Hepatic	90 days	Barnes et al. 1985	NA

Oral Sub-Chronic Toxicity Metadata

Chemical	CASNUM	Chemical Type	Subchronic Oral Reference Dose (mg/kg-day)	Toxicity Source	Oral Subchronic Reference Dose Basis	Oral Subchronic Reference Dose Confidence Level
Ethylbenzene	100-41-4	Organics	0.05	PPRTV	BMDL: 48 mg/kg-day	Medium
Fluorobenzene	462-06-6	Organics	-			
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics	2	HEAST	NOAEL: 1711 mg/kg/day	NA
Methylcyclohexane	108-87-2	Organics	-			
Methylene Chloride	75-09-2	Organics	0.06	HEAST	NOAEL: 5.85 mg/kg/day	NA
Styrene	100-42-5	Organics	-			
Tetrachloroethylene	127-18-4	Organics	0.008	ATSDR	LOAEL: 2.3 mg/kg-day	NA
Toluene	108-88-3	Organics	0.8	PPRTV	BMDL: 238 mg/kg-day	Medium
Trichloroethane, 1,1,1-	71-55-6	Organics	7	IRIS	NA	NA
Trichloroethylene	79-01-6	Organics	0.0005	ATSDR	HEC99: 0.048/0.35/0.37 mg/kg/day	NA
Vinyl Chloride	75-01-4	Organics	-			
Xylene, m-	108-38-3	Organics	-			
Xylene, o-	95-47-6	Organics	-			
Xylene, p-	106-42-3	Organics	-			
Xylenes	1330-20-7	Organics	0.4	PPRTV	BMDL: 440 mg/kg-day	Low-to-medium

Oral Subchronic Reference Dose Critical Effect	Oral Subchronic Reference Dose Target Organ	Oral Subchronic Reference Dose Modifying Factor	Oral Subchronic Reference Dose Uncertainty Factor	Oral Subchronic Reference Dose Species
Centrilobular hepatocyte hypertrophy	Liver	NA	1000	Rat
Decreased birth weight	Fetus	NA	1000	Rat
Toxicity	Liver	NA	100	Rat
Derived from PBPK model-based route-to-route extrapolation	Neurol.	NA	100	Human
Increased kidney weight	Kidney	NA	300	Rat
NA	NA	NA	NA	NA
Increased incidence of congenital heart abnormalities/30% decreased thymus weight, increased serum levels of IgG and selected autoantibodies/Decreased PFC response in male and female pups, increased hypersensitivity response in male pups	Develop./Immuno./Immuno.	NA	NA	Rat/Mouse/Mouse
10% decrease in body weight	Whole body	NA	1000	Rat

Oral Subchronic Reference Dose Route	Oral Subchronic Reference Dose Study Duration	Oral Subchronic Reference Dose Study Reference	Oral Subchronic Reference Dose Notes
Oral: gavage	13 weeks	Mellert et al. 2007	Benchmark dose modeling was used on data for liver changes.
Oral: drinking water	Multi-generation	NA	The chronic oral RfD was modified to estimate the subchronic oral [RfD].
Oral: drinking water	24 months	NA	The chronic oral RfD was adopted as the subchronic oral [RfD].
Neurol.	106 months	Cavalleri et al. 1994	ATSDR has adopted the chronic-duration oral MRL as the acute-duration and intermediate-duration oral MRLs.
Oral: gavage	13 weeks	NTP 1990	Based on the same critical study as the chronic RfD in IRIS.
NA	NA	NA	NA
Develop./Immuno./Immuno.	GD 0-21/30 weeks/GD 0-21 and 3 or 8 weeks PPD	Johnson et al. 2003/Keil et al. 2009/Peden-Adams et al. 2006	3 different studies were used to derive the intermediate and chronic oral MRLs.
Oral: gavage	90 days	Wolfe 1988a	NA

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m³)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Benzene	71-43-2	Organics	0.08	PPRTV	BMDL: 8.2 mg/m3	Medium	Decreased lymphocyte count
Bromo-2-chloroethane, 1-	107-04-0	Organics	-				
Bromo-3-fluorobenzene, 1-	1073-06-9	Organics	0.03	PPRTV SCREEN	BMCL10-HEC: 8.9 mg/m3	NA	Centrolobular hepatocyte enlargement for surrogate POD
Bromo-4-fluorobenzene, 1-	460-00-4	Organics	0.03	PPRTV SCREEN	BMCL10-HEC: 8.9 mg/m3	NA	Centrolobular hepatocyte enlargement for surrogate POD
Chlorobenzene	108-90-7	Organics	0.5	PPRTV	NOAEL: 50 ppm	Low	Increased weight and hepatocellualr hypertrophy; Increased weights, tubule dilation, inflammation of the interstitial cells, and regeneration of the epithelium in males
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	Organics	-				
Chlorobenzotrifluoride, 4-	98-56-6	Organics	3	PPRTV	NOAEL: 332 mg/m3	Low	Hepatocellular hypertrophy, increased liver weight, minor changes in serum chemistry (small increase in serum ATL)
Cumene	98-82-8	Organics	0.09	HEAST	NOAEL: 105.1 ppm	NA	Involvement; Irritation
Cyclohexane	110-82-7	Organics	18	PPRTV	BMCL-ISDHEC: 1822 mg/m3	Moderate	Reduced body weight of F2 pups
Dibromo-3-chloropropane, 1,2-	96-12-8	Organics	0.002	PPRTV	NOAEL: .17 mg/m3	Medium	Testicular effects

Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Blood	NA	100	Human	Inhalation study	NA	Rothman et al. 1996	Based on the same principal study as the chronic RfC in IRIS.
Liver	NA	300	Rat	Inhalation	6 hr/d, 7 d/wk, 28 days	Safepharm Labs Ltd. 1993 (cited in US EPA 2011b)	NA
Liver	NA	300	Rat	Inhalation	6 hr/d, 7 d/wk, 28 days	Safepharm Labs Ltd. 1993 (cited in US EPA 2011b)	NA
Liver; Kidney	NA	100	Rat	Inhalation	2 generations	Nair et al. 1987	The LED was estimated using EPA benchmark dose methodology and then converted to a human equivalent concentration. A LOAEL is also associated with this value.
Liver	NA	100	Rat	Inhalation	13 weeks	Newton et al. 1998	NOAEL was adjusted from 252 ppm to calculate the HEC
Central nervous system; Nose	NA	1000	Rat	Inhalation: intermittent	4 weeks	NA	NA
Developmental	NA	100	Rat	Inhalation	10 weeks prior to mating through lactation	Kreckmann et al. 2000, Haskell Laboratories 1997a	NA
Testicle	NA	100	Rabbit	Inhalation	14 weeks	Rao et al. 1982	The NOAEL was adjusted from 0.94 mg/m3 to account for intermittent exposure.

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m³)	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Dibromobenzene, 1,3-	108-36-1	Organics	-				
Dibromobenzene, 1,4-	106-37-6	Organics	-				
Dibromoethane, 1,2-	106-93-4	Organics	0.002	HEAST	LOAEL: 88 ppb	NA	Effects
Dichlorobenzotrifluoride, 3,4-	328-84-7	Organics	-				
Dichloroethane, 1,1-	75-34-3	Organics	-				
Dichloroethane, 1,2-	107-06-2	Organics	0.07	PPRTV	LOAEL-HEC: 22 mg/m3	Low	Neurobehavioral impairment
Dichloroethylene, 1,1-	75-35-4	Organics	0.0792965	ATSDR	NOAEL: 5 ppm	NA	Increased SGPT and AP enzyme activity; decreased lipid content
Dichloroethylene, 1,2-trans-	156-60-5	Organics	0.7929652	ATSDR	LOAEL: 200 ppm	NA	Slight fatty accumulation in liver lobules
Ethylbenzene	100-41-4	Organics	9	PPRTV	LOAEL: 868 mg/m3	Medium	Histopathological evidence of ototoxicity without functional changes in audiometric threshold.
Fluorobenzene	462-06-6	Organics	0.03	PPRTV SCREEN	BMCL-10HEC: 8.9 mg/m3	NA	Centrilobular hepatocyte enlargement in males
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Organics	1	HEAST	NOAEL: 1010 ppm	NA	Decreased birth weight
Methylcyclohexane	108-87-2	Organics	-				
Methylene Chloride	75-09-2	Organics	1.0420859	ATSDR	LOAEL: 25 ppm	NA	Cytoplasmic vacuolization, fatty infiltration
Styrene	100-42-5	Organics	3	HEAST	NOAEL: 22 ppm	NA	Effects
Tetrachloroethylene	127-18-4	Organics	0.04069	ATSDR	LOAEL: 7.3 ppm	NA	Color vision loss

Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Sperm	NA	100	Human	Inhalation: intermittent	NA	NA	The chronic inhalation [RfC] was modified to estimate the subchronic inhalation [RfC].
Neurological	NA	300	Human	Inhalation	Occupational	Kozik 1957	NA
Hepatic	NA	100	Guinea pig	Hepatic	90 days	Prendergast et al. 1967	NA
Hepatic	NA	1000	Rat	Hepatic	8 or 16 weeks	Freundt et al. 1977	NA
Ear	NA	100	Rat	Inhalation: whole body	6 hr/d, 6 d/wk, 13 weeks	Gagnaire et al. 2007	The LOAEL of 868 mg/m3 was converted to a LOAEL-HEC of 868 mg/m3.
Liver	NA	300	Rat	Inhalation	28 days	Safepharm Labs Ltd 1993	NA
Fetus	NA	3000	Mouse	Inhalation: intermittent	10 days	NA	The chronic inhalation RfC was adopted as the subchronic inhalation [RfC].
Hepatic	NA	90	Rat	Hepatic	100 days	Haun et al. 1972	NA
Central nervous system	NA	10	Human	Inhalation: occupational	NA	NA	NA
Neurol.	NA	100	Human	Neurol.	106 months	Cavalleri et al. 1994	ATSDR has adopted the chronic-duration inhalation MRL as the acute-duration and intermediate-duration inhalation MRLs.

Inhalation Sub-Chronic Toxicity Metadata

Chemical	CASNUM	Chemical Type	Subchronic Inhalation Reference Concentration (mg/m ^{3})	Toxicity Source	Inhalation Subchronic Reference Concentration Basis	Inhalation Subchronic Reference Concentration Confidence Level	Inhalation Subchronic Reference Concentration Critical Effect
Toluene	108-88-3	Organics	5	PPRTV	NOAEL (average): 46 mg/m3	High	Effects
Trichloroethane, 1,1,1-	71-55-6	Organics	5	IRIS	NA	NA	NA
Trichloroethylene	79-01-6	Organics	0.00215	ATSDR	BMDL/LOAEL (HEC99): 0.0037/0.033 ppm	NA	Cardiac malformations in rat fetuses/decreased thymus weight in adult mice
Vinyl Chloride	75-01-4	Organics	0.0766871	ATSDR	LOAEL: 10 ppm	NA	Centrilobular hypertrophy
Xylene, m-	108-38-3	Organics	-				
Xylene, o-	95-47-6	Organics	-				
Xylene, p-	106-42-3	Organics	-				
Xylenes	1330-20-7	Organics	0.4	PPRTV	NOAEL: 39 mg/m3	Medium	Impaired motor coordination

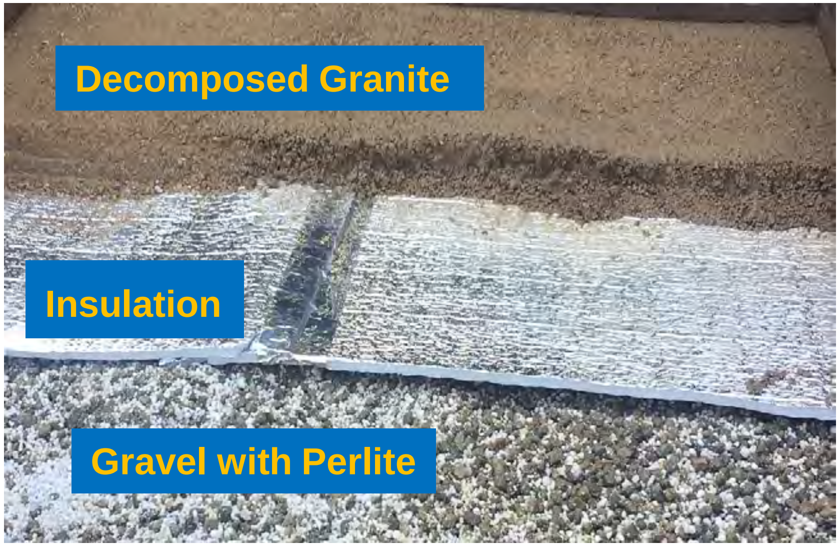
Inhalation Sub-Chronic Toxicity Metadata

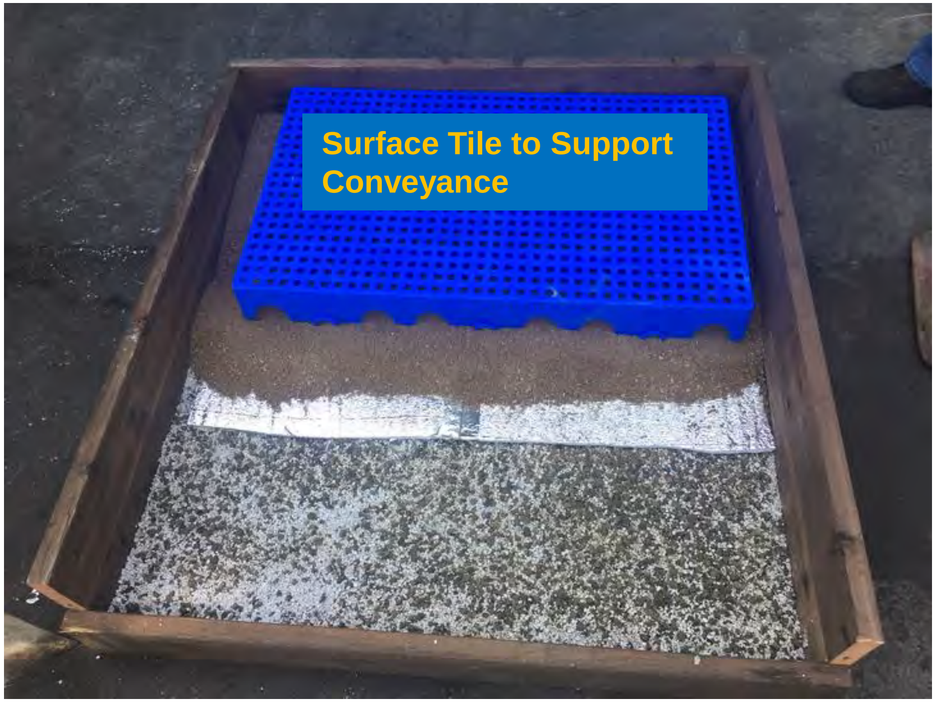
Inhalation Subchronic Reference Concentration Target Organ	Inhalation Subchronic Reference Concentration Modifying Factor	Inhalation Subchronic Reference Concentration Uncertainty Factor	Inhalation Subchronic Reference Concentration Species	Inhalation Subchronic Reference Concentration Route	Inhalation Subchronic Reference Concentration Study Duration	Inhalation Subchronic Reference Concentration Study Reference	Inhalation Subchronic Reference Concentration Notes
Neurological	NA	10	Human	Inhalation	Multiple studies	Multiple human studies	The chronic RfC in IRIS was adopted as the subchronic RfC.
NA	NA	NA	NA	NA	NA	NA	NA
Develop./Immuno.	NA	NA	Rat/Mouse	Develop./Immuno.	GD 1-22/30 weeks	Johnson et al. 2003/Keil et al. 2009	RfC was derived using 2 different oral studies and route-to-route extrapolation.
Hepatic	NA	30	Rat	Hepatic	19 weeks	Thornton et al. 2002	NA
Whole body	NA	100	Rat	Inhalation	6 hr/d, 5 d/wk, 3 months	Korsak et al. 1994	Based on the same date for the chronic RfC on IRIS, where the NOAEL of 50 ppm was converted to a NOAEL-HEC of 39 mg/m3.

APPENDIX M

Insulated Cap Components

DIAZ - Vapor Cover





GEO Environmental Remediation Company

Expanded Perlite

CONSTRUCTION GRADE

GENERAL DESCRIPTION

PRODUCT: Construction Grade expanded perlite

DESCRIPTION: Multi-purpose lightweight concrete and plaster aggregate, or loose fill insulation.

DRY SIEVE ANALYSIS

US MESH	MICRONS	% PASSING BY WT.
No. 4	4750	100
No. 8	2380	85 — 100
No. 16	1190	40 — 85
No. 30	600	20 — 60
No. 50	300	5—25
No. 100	150	0—10

SUPPLEMENTARY INFORMATION

- Meets ASTM C549: Perlite Loose Fill Insulation
- Meets ASTM C332: Lightweight Aggregates for Insulating Concrete
- Thermal Resistivity (R-val): approx. 2.6 per inch

CHEMICAL NAME:	Sodium Potassium Aluminum Silicate
APPEARANCE:	White granules, odorless
LOOSE BULK DENSITY:	7.5 — 12.0 lb/ft^3
pH (OF WATER SLURRY):	Neutral
REFRACTIVE INDEX:	1.5
HARDNESS (MOHS):	5.5
FUSION POINT:	2300 – 2450 °F
FLASH POINT:	Non-flammable
SPECIFIC GRAVITY:	2.2 – 2.4
THERMAL CONDUCTIVITY:	0.27 - 0.41 Btu.in/h.ft2. °F @ 75 °F
SOLUBILITY:	Negligible in water and weak acids.*

* Soluble in hot concentrated alkali and HF; moderately (less than 10%) in 1N NaOH. Slightly (less than 3%) in mineral acid.

PACKAGING OPTIONS

- 4 cu. ft. (113 L) paper bags
- 60 cu. ft. super sacks (2.2 yd/1.7 m^3)
- 56 cu. ft. super sacks (2.1 yd/1.6 m^3)

SUPREME PERLITE Construction Grade expanded perlite consists of 1/8" size granules and smaller. It is useful for mixture with cement aggregate to make lightweight insulating concrete and cementitious plaster. It can also be poured loose into masonry cavity walls or use in bags as subfloor insulation.

Perlite is a heat-expanded siliceous volcanic rock with the following characteristics:

- Incombustible
- 100% natural
- Inert, stable
- pH neutral
- Ultra-lightweight
- Non-toxic
- Asbestos-free
- Vermin & rot proof

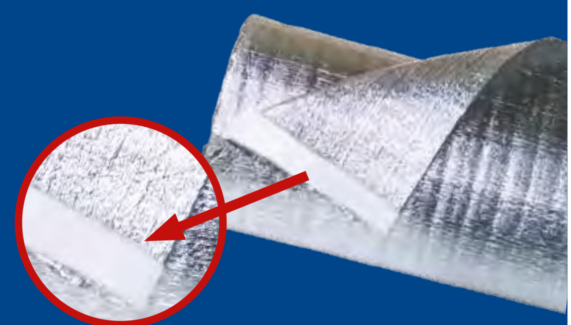
SUPREME PERLITE COMPANY | 4600 N SUTTLE ROAD, PORTLAND, OR 97217
PH 503.286.4333 · FAX 503.286.1068 · INFO@PERLITE.COM · WWW.PERLITE.COM

10M PLUS

TECHNICAL DATA SHEET
REFLECTIVE THERMAL INSULATION
PRODEX

REFLECTIVE REINFORCED FOIL + CLOSED CELL POLYETHYLENE FOAM + REFLECTIVE REINFORCED FOIL

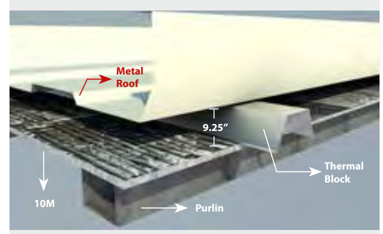
Reflective thermal insulation that adds R value, prevents heat, moisture and air transfer.



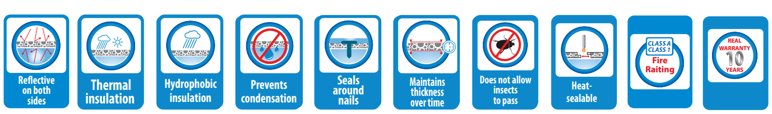
➜ With a 2" grade of 0.19" thick space in the edge of the insulation roll to facilitate and improve the overlap between each piece

PRODXEX TOTAL 10M (REINFORCED REFLECTIVE FACER + POLYETHYLENE FOAM + REINFORCED REFLECTIVE FACER)		
DIMENSIONS AND TOLERANCES OF THE STANDARD PRODUCT		
THICKNESS: 0.4 ± 0.027 (in)	LENGTH: 85.3 +- 1 (ft)	WIDTH: 4 ± 0.032 (ft)
TECHNICAL CHARACTERISTICS OF THE PRODUCT		
CHARACTERISTICS	VALUE	STANDARD
FOAM CELL STRUCTURE	CLOSED	-
EFECTIVE WIDTH	4 ft	-
AVERAGE WEIGHT	0.0632 lb/ft^2	-
THERMAL CONDUCTIVITY	0.0186 Btu/ft.h.ºf	ASTM C 518
WATER VAPOR PERMEANCE	0.011 perms (impermeable)	ASTM E 96-05
FLAME INDEX	0	ASTM E-84-10
CRITICAL RADIANT FLUX	0.50 W/cm^2	ASTM E 970-10
SMOKE DEVELOPMENT	5	ASTM E-84-10
EMITANCE	0.04	ASTM C-1371-04
FUNGI RESISTANCE	NO GROWTH	ASTM C 1338
ADHESIVE PERFORMANCE	NO BLEEDING / NO DELAMINATION	ASTM C-1224
TEMPERATURE AND HUMIDITY RESISTANCE	NO CORROSION/NO DELAMINATION/NO LOSS OF METALIZATION	ASTM C-1258-08
PLIABILITY	NO CRACKING/ NO DELAMINATION	ASTM C-1224
TEMPERATURE RANGE	-4 ºf / 180 ºf	ASTM C-1224
TENSILE STRENGTH AT BREAK (MD)	23.8 LbF/inch	ASTM D-638
R VALUE (Heat Flow Down)	***22** (ft2.hr.°F/Btu)	ASTM C-236

* Installation method Purling OC 60 in



➜ Tested in bays ranging between 8 to 13 ft. No issue spanning large bays.
➜ Do not install at soffits when the insulation can be permanently exposed to UV radiation .



CENTRAL AMERICAN PRODUCT MADE IN COSTA RICA

PRODEX, A MANAGEMENT SYSTEM CERTIFIED COMPANY

Certification number for:
Costa Rica: RE-005/03/2004, SGA-003/01/2009 y CRISJO00064-1-10
Panama: RE-005/03/2004

PRODEX
LEADERS IN THERMAL INSULATION FOR CONSTRUCTION

INSULATION 4LESS.COM
Saving You Money With A Green Solution

3M™ Metal Foil Tapes

Expanding choices for applications success

Performance and price as you need it

3M

3M™ Metal Foil Tapes reflecting, wrapping, masking, sealing, and more from air ducts to washing machines

With 3M metal foil tapes, select from combinations of conformable backings and adhesives to meet application demands in many markets:

- Aerospace
- Appliance
- Construction
- Electronics
- Machinery
- Manufacturing
- Metal Finishing
- MRO
- Plastics
- Specialty Vehicle
- Transportation
- and more

Applications range from heat shielding to paint strip masking, light reflection to wire harness wrapping, thermal conductivity to duct sealing.

Appliance **Construction** **Aerospace**

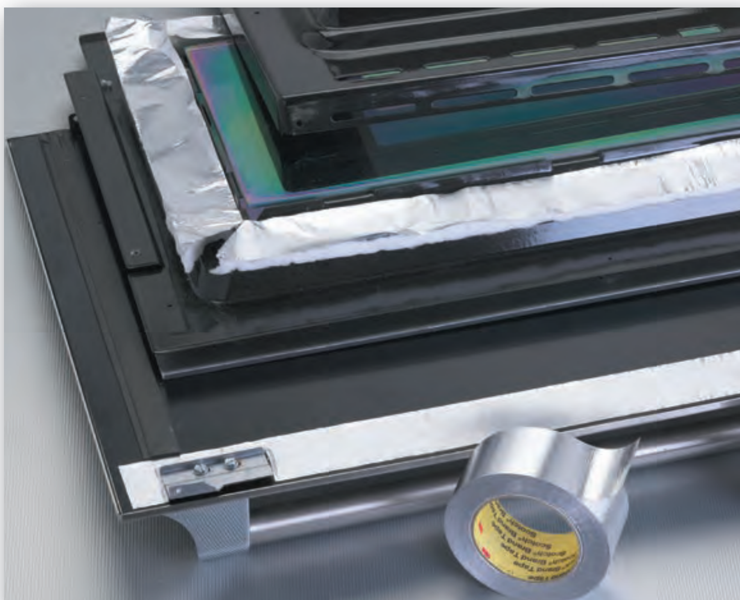
Specialty Vehicle **Metal Finishing** **And more**

Standard Aluminum Foil Tapes

Select acrylic, rubber, or silicone adhesives and conformable backings ranging from 1.2 to 12 mils.

- Resist flame, moisture, weather, dirt, UV degradation, and most chemicals
- Thermally conductive for heating and cooling efficiency
- Reflect heat and light

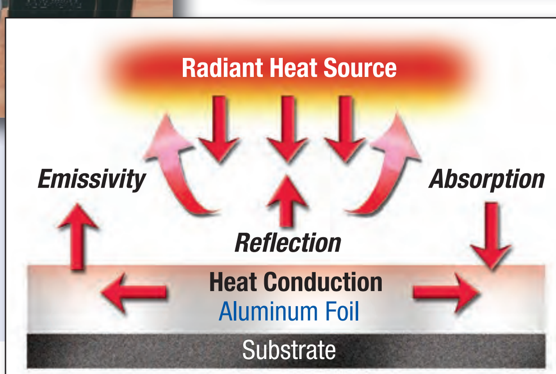
1



3M™ Aluminum Foil Tape bonds on contact as heat shielding inside an oven door. Helps keep the exterior cool to the touch behind the handle and around the window perimeter.

2

With high heat reflectivity and thermal conductivity, 3M™ Aluminum Foil Tapes protect heat-sensitive components near lights in a garage door opener housing.



Standard Aluminum Foil Tapes

Product Number	Backing Thickness (mils)	Total Thickness (mils)	Liner/SW (self-wound)	Adhesive	Adhesion to Steel oz./in. (N/100 mm)	Tensile Strength lbs./in. (N/100 mm)	Temperature Range °F (C°)	Features
ASTM Test Method:		D-3652	D-3652		D-3330	D-3759		
Premium Performance Aluminum Foil Tapes								
425	2.8	4.6	SW	Acrylic	47 (51)	30 (525)	-65 to 300°F (-54 to 149°C)	Most versatile aluminum tape. L-T-80B, SAE AMS T-23397, UL 723 Classified, UL 746C Recognized, F.A.R. 25.853.
427	2.8	4.6	Liner		50 (55)	30 (525)		Linered version of 425.
431	1.9	3.1	SW		41 (45)	19 (338)		Conformable aluminum tape. UL 723 Classified.
433	2.0	3.6	SW	Silicone	40 (44)	20 (350)	-65 to 600°F (-54 to 316°C)	Silicone adhesive for high temperature resistance; MIL-T-47014, F.A.R. 25.853, UL 746C Recognized; smooth easy unwind; clean, straight edges with minimal wrinkling.
433L	2.0	3.5	Liner		38 (42)	20 (350)		Linered version of 433.
438	5.0	7.2	SW	Acrylic	43 (47)	59 (1033)	-65 to 300°F (-54 to 149°C)	Thickest non-reinforced aluminum tape for heat resistance; smooth easy unwind; clean, straight edges with minimal wrinkling. UL 723 Classified.
439	1.9	3.1	Liner		41 (45)	18 (315)		Linered version of 431.
3338	5.0	7.0	Liner		45 (49)	50 (876)	-30 to 300°F (-34 to 149°C)	66 lb. moisture stable liner.
33801	2.0	4.0	Liner		40 (44)	20 (350)	-30 to 425°F (-34 to 218°C)	High temperature acrylic adhesive at 425°F. UL 723 Classified.
33806	3.0	5.0	Liner	Acrylic	40 (44)	30 (525)		High temperature acrylic adhesive at 425°F
General Purpose Aluminum Foil Tapes								
3311	2.0	3.6	Liner	Rubber	90 (98)	17 (298)	-10 to 180°F (-23 to 82°C)	UL 723 listed.
3369	1.2	2.4	Liner	Acrylic	35 (38)	10 (180)	-30 to 260°F (-34 to 127°C)	Thinnest aluminum foil tape. UL 723 Classified.
3381	1.4	2.7	Liner		40 (44)		-30 to 250°F (-34 to 121°C)	40 lb. natural kraft paper liner. UL 723 Classified.
1449	1.4	2.6	SW		37 (40)	19 (333)	-25 to 250°F (-32 to 121°C)	1.4 mil backing; thin aluminum foil tape for conformability.
33803	1.8	3.6	Liner	Rubber	90 (99)	15 (263)	0 to 175°F (-18 to 79°C)	High tack rubber adhesive. 40 lb. liner. UL 723 Classified.
97065	1.8	3.25	Liner	Acrylic	40 (44)		-30 to 250°F (-34 to 121°C)	60 lb. moisture stable liner. Good for die-cut applications.
1450	1.9	3.1	SW	Rubber	114 (125)	19 (333)	-40 to 200°F (-40 to 93°C)	High tack adhesive for good, instant adhesion to many surfaces.
3380	2.0	3.25	Liner	Acrylic	40 (44)	10 (175)	-30 to 260°F (-34 to 127°C)	40 lb. natural kraft paper liner. Good for narrow slit rolls. UL 723 Classified.
4380	2.0	3.25	SW		40 (44)	10 (175)	-30 to 300°F (-34 to 149°C)	General purpose aluminum foil tape.
34383	2.8	4.5	SW		40 (44)	30 (525)	-30 to 260°F (-34 to 127°C)	General purpose aluminum foil tape.
3363	3.0	5	Liner					40 lb. natural kraft paper liner. Good for narrow slit rolls. UL 723 Classified.
3367	3.0	4.4	Liner					66 lb. moisture stable liner. Good for die-cut applications.

This data has not been verified. Additional testing is required.

NOTE: This technical information and data should be considered representative or typical only and should not be used for specification purposes.

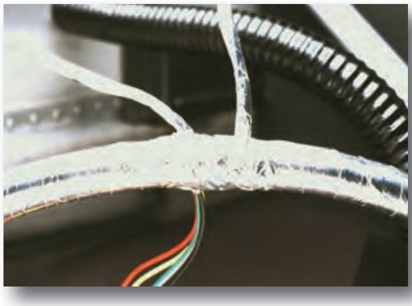
Conformable 3M™ Aluminum Foil Tape securely holds copper cooling tubes to refrigerator panels. Thermal conductivity helps maximize cooling efficiency.

3

Specialty Foil Tapes

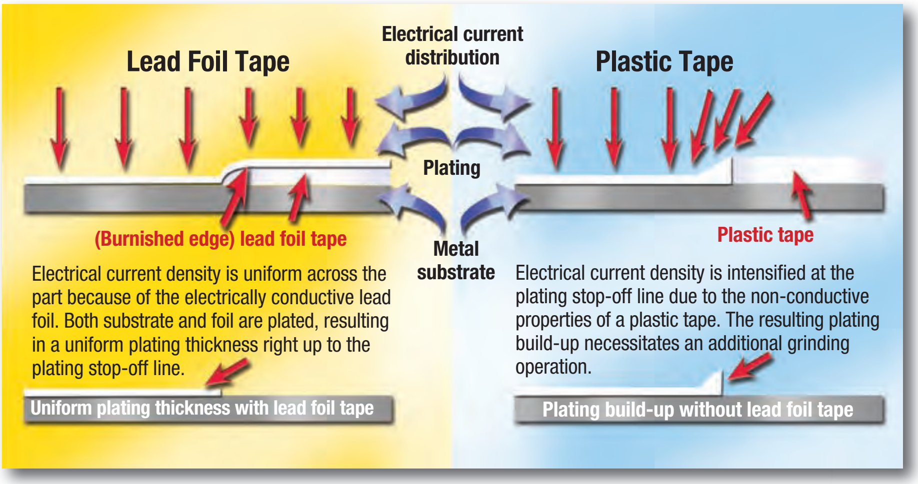
Select a 3M specialty metal tape for applications such as:

- Lead foil tape for acid-resistant masking during electroplating and anodizing; radiopacity for x-ray markers
- Copper foil tape with or without conductive adhesive for EMI/RFI shielding
- Stainless steel tape for sealing and protecting of stainless steel surfaces
- Glass cloth-reinforced aluminum foil tape for bundling wire harnesses



4

Tear-resistant 3M™ Reinforced Aluminum Foil Tape 363 bundles wire harnesses and helps protect wires, cables, and other flexible parts from heat.



Product Number	Backing Thickness (mils)	Total Thickness (mils)	Liner/SW (self-wound)	Adhesive	Adhesion to Steel oz./in. (N/100 mm)	Tensile Strength lbs./in. (N/100 mm)	Temperature Range °F (°C)	Features
ASTM Test Method:		D-3652	D-3652		D-3330	D-3759		
Lead Foil Tapes								
420	4.7	6.8	Liner	Rubber	45 (49)	20 (350)	-60 to 225°F (-51 to 107°C)	Linered plating tape.
421	4.0	6.3	SW		31 (34)	15 (263)		Self-wound plating tape.
4201	5.0	6.5	Liner	Acrylic	40 (44)	20 (350)	-30 to 225°F (-34 to 121°C)	Permanent acrylic adhesive.
34201	5.0	6.25		Rubber	50 (55)	20 (350)	0 to 180°F (-18 to 82°C)	Removable rubber adhesive.
Copper Foil Tapes								
3313	1.4	3.0	Liner	Conductive Acrylic	30 (33)	33 (578)	0 to 250°F (-18 to 121°C)	EMI/RFI shielding. UL 510 Recognized.
3324	1.25	2.9		Acrylic	40 (44)	20 (350)	-30 to 225°F (-34 to 121°C)	EMI/RFI shielding.
3325	1.5	3.0			40 (44)	28 (491)	0 to 225°F (-18 to 107°C)	EMI/RFI shielding. UL 510 Recognized.
33315	1.5	3.3			35 (39)	28 (491)	-30 to 300°F (-34 to 149°C)	"Tinned," corrosion resistant.
33316	1.5	3.0		Conductive Acrylic	30 (33)	33 (578)	0 to 250°F (-18 to 121°C)	"Tinned," corrosion resistant. UL 510 Recognized.
Stainless Steel Foil Tape								
3361	2.0	3.8	Liner	Acrylic	40 (44)	100 (1751)	-30 to 250°F (-34 to 121°C)	Corrosion resistant.
Specialty Foil Tapes								
363	3.4	7.3	SW	Silicone	52 (57)	135 (2364)	-65 to 600°F (-54 to 316°C)	Aluminum foil/glass cloth. Highest temperature metal foil tape.
363L	3.4	7.3	Liner		52 (57)			Linered version of 363.
1430	5.0	5.5	SW	Acrylic	22 (24)	19 (333)	-65 to 300°F (-54 to 106°C)	Aluminum foil/non-woven laminate Flexible wrapping tape.
3302	2.0	3.6	Liner	Conductive Acrylic	30 (33)	20 (350)	0 to 225°F (-18 to 107°C)	Aluminum foil tape. EMI/RFI shielding. UL 510 Recognized.

This data has not been verified. Additional testing is required.

NOTE: This technical information and data should be considered representative or typical only and should not be used for specification purposes.

HVAC and Construction Tapes

Select from a variety of 3M™ Metal Foil Tapes for any residential or commercial site application including rigid and flexible HVAC duct work.

5

To seal fiberglass duct board and flexible duct systems, 3M™ Foil Tape 3340 meets the performance requirements for UL 181A-P and UL 181B-FX.

6

With aggressive adhesive and dead soft aluminum, 3M™ Foil Tape 3380 seals and secures seams and joints for long-term durability. UL 723 Listed for duct sealing and general repairs.

7

3M™ FSK Facing Tape 3320 is engineered specifically as a vapor retardant tape to seal mineral wool foil-faced insulation, bare sheet metal ducts, and blanket style fiberglass duct insulation.

Product Number	Backing Thickness (mils)	Total Thickness (mils)	Liner/SW (self-wound)	Adhesive	Adhesion to Steel oz./in. (N/100 mm)	Tensile Strength lbs./in. (N/100 mm)	Temperature Range °F (°C)	Features
ASTM Test Method:		D-3652	D-3652		D-3330	D-3759		
HVAC Construction								
3320	6.0	6.7	Liner	Acrylic	81 (89)	40 (712)	-20 to 175°F (-29 to 79°C)	Aluminum foil/scrim/laminate. UL 723 Classified.
3340	2.0	4.0			30 (33)	20 (350)	-30 to 250°F (-34 to 121°C)	Aluminum foil tape. for use with rigid and flexible ducts. UL 181 A-P and 181 B-FX Listed.
3350	1.6	3.1	SW		33 (36)	36 (631)	-30 to 230°F (-34 to 110°C)	Polypropylene tape for use with flexible ducts. UL 181 B-FX Listed.
3380	2.0	3.25	Liner		40 (43)	10 (175)	-30 to 260°F (-34 to 127°C)	General purpose aluminum foil tape. Go to product for this market. UL 723 Classified.
3381	1.4	3.0			40 (44)	10 (180)	-40 to 250°F (-40 to 121°C)	Value grade aluminum foil tape. UL 723 Classified.
3382	2.5	4.2			50 (55)	30 (525)	-40 to 300°F (-40 to 149°C)	Foil/PET laminate, tear resistance. Roof and gutter repair tape.

NOTE: This technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ Sound Damping Foils when quiet is the sound of quality

Reduce noise and vibration in many applications

With pressure sensitive viscoelastic acrylic polymer on dead soft aluminum foil, 3M™ Sound Damping Foils quiet noise and reduce vibration in many areas for Aerospace, Automotive, Appliances, Construction, and MRO (Maintenance and Repair).

- Reduce structure-borne noise in metal and composite panels and support structures
- Optimized acrylic converts vibrational energy to negligible heat that readily dissipates
- Reduce vibrational fatigue to decrease wear and tear on parts and lower the risk of part loosening and displacement
- Effective damping with as little as 10% surface coverage
- Pressure sensitive for easy self-fixturing application
- Long aging performance
- Good performance over a wide temperature range
- Linered construction provides ability to die-cut product


9

3M™ Damping Foil 2552 on the inside of a washing machine reduces structure-borne noise and reduces vibrational fatigue to decrease the risk of part loosening and displacement.


8

Applied with a 3M™ PA-1 Wiper to the inside of a car door, 3M™ Damping Foil 2552 effectively damps noise and vibration with as little as 10% surface coverage. Optimized acrylic on a dead soft aluminum constraining layer converts vibrational energy to negligible heat that readily dissipates.


10

3M™ Damping Foil 435 between the ribs and stringers of an aircraft fuselage helps reduce vibrational fatigue and noise inside the passenger cabin.

Product/ Color	Tape Structure (Backing/Adhesive)	Backing Thickness mils (mm)	Total Thickness mils (mm)	Adhesion to Steel oz./in. (N/100 mm)	Tensile Strength lbs./in. (N/100 mm)	Temperature Range °F (°C)	Features
ASTM Test	Method:	D-3652	D-3652	D-3330	D-3759		
Damping Foils							
434/Silver	Aluminum/VEP[1]	5.5 (0.14)	7.5 (0.19)	65 (71)	53 (928)	-76 to 68°F (-60 to 20°C)[2]	Low temperature vibration damping.[3]
435/Silver		8.0 (0.20)	13.5 (0.34)		84 (1470)		
436/Silver		12.0 (0.31)	17.5 (0.45)		126 (2205)		
2542/Silver		5.0 (0.13)	10 (0.25)	65 (71)	40 (700)	-25 to 175°F (-32 to 80°C)[2]	Thinner, general purpose vibration damping.
2552/Silver		10.0 (0.25)	15 (0.38)	65 (71)	80 (1400)	-25 to 175°F (-32 to 80°C)[2]	General purpose vibration damping.[3]
4014/Silver	Aluminum-Urethane/Acrylic	3.0 (0.076)	250 (6.35)	N/A	N/A	-94 to 86°F (-70 to 30°C)[2]	Foil/foam sheet laminate.[3]

This data has not been verified. Additional testing is required.

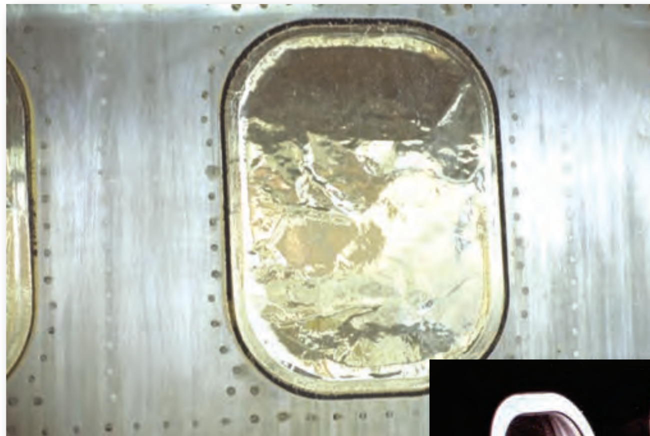
[1] Viscoelastic polymer [2] Optimum damping temperature [3] The specimen passed the requirements of FAR 25.853 (a)(1)(ii) per AMDT.25-83 tested in composite on aluminum backer.

NOTE: This technical information and data should be considered representative or typical only and should not be used for specification purposes.

Converting 3M Foil Tape Technologies to the form and fit you need for applications success

3M Converters match 3M™ Foil Tapes to customer requirements with the exact form, fit, and functionality. Converter expertise includes part design, quick prototyping, slitting, and die-cutting. Applications range from small, intricate copper foil EMI/RFI shields for sensitive electronics to precisely fitted masks for commercial aircraft windows during paint stripping.

Many 3M™ Metal Foil Tapes are linered for easy handling and productive processing. For example, General Purpose Aluminum Foil Tape 3367 features a 66# moisture stable liner for die-cutting. The 40# kraft liner on General Purpose Aluminum Foil Tape 3380 holds shape and position when slit into narrow rolls.


11

With conformability and chemical resistance, die-cut masks of 3M™ Aluminum Foil Tape protect aircraft windows during harsh chemical paint stripping.


12


13


14


15

Product Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. **Warranty, Limited Remedy, and Disclaimer:** Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price. **Limitation of Liability:** Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

3M

Industrial Adhesives and Tapes Division

3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
800-362-3550 . 877-369-2923 (Fax)
www.3M.com/industrialtapes

3M is a trademark of 3M Company.
70-0709-5390-9

Printed in U.S.A
© 3M 2012

Crushed Products

3/4 Inch Road Base

3/4 Inch Road Base

Road Base Material also known as road rock, road gravel, aggregate base, AB, asphalt base and 3/4" minus. By any name it is still a product with a specific size and gradation. Road base will last much longer if contour is graded to a crown. It allows the storm water to be shed and keep the road bed from becoming a bed of mud.

Base material primarily used in driveways and pathways, and an excellent wet weather product. Can also be used for pipe bedding. Comes is a variety of sizes.

Other Products

- Aggregate Products
  - Crushed Products
    - 3/4" Road Base
    - Type 1 Bedding
    - 3/4" Clear Crush
    - 1/2" Minus Crusher Dust
    - 75mm Minus (Quarry)
  - Stone Products
  - Sand Products
  - Specialty Products
  - Fill Aggregates

单面窝峰防泄漏托盘 全新料低压卡板 塑料卡板

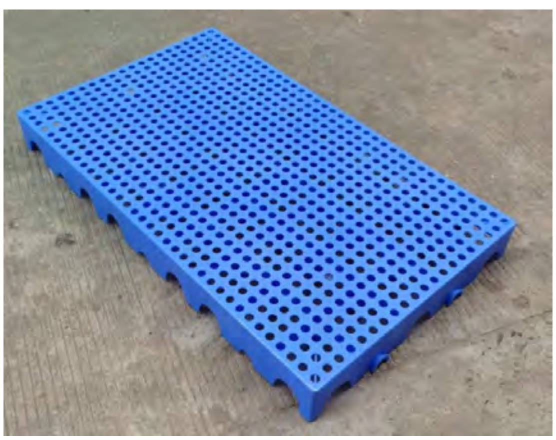
SINGLE-SIDED NEST PEAK ANTI-LEAKAGE TRAY NEW MATERIAL MOLDED INTERLOCKING PLASTIC TILE

是现代运输、包装、仓库的重要工具，是国际上规定用于食品、水产品、医药、烟草、化学品、化工原料、立体仓库等各行业之储存必备器材是车间长期周转和一次性出口使用。

The plastic tiles are designed to interlock together to provide a continuous surface walking or supporting equipment.

产品性能 Specification:

产地 made in :	东莞 Dongguan, China	型号 model :	3
类型 type:	九脚型 nine stud type	材质 materials :	pp pe
型式 locking :	四面进叉 four sides	加工定制 special ordered:	是 yes
结构 structure:	网格九脚型 nine stands net grid	动载 dynamic load :	600kg
静载 dead load :	2000kg	尺寸 dimension :	1000*600*100mm
适用范围 application :	车间周转 manufacture flooring	重量 Weight :	4.1kg



AECOM

Prepared by:
AECOM
Chelmsford, MA 02180
March 6, 2020

Standard Operating Procedure for Hot Soil Sampling

SOP: Hot Soil Sampling

Noushin Fallahpour

Prepared By: Noushin Fallahpour, P.E.
Environmental Engineer

Art Taddeo

Reviewed By: Arthur Taddeo
Project Manager

Contents

List of Figures

1.0 Purpose

AECOM has prepared the following SOP that describes general and specific procedures, methods and considerations to be used and observed for safe collection of hot soil samples during, or after, the application of Thermal Conduction Heating (TCH) for field screening or laboratory analysis.

2.0 Scope/Application

The procedures contained in this document serve as a guideline for the collection of hot soil samples during, or after, the application of TCH by field personnel in conjunction with site specific sample analysis plans, permit requirements, and applicable health and safety regulations.

3.0 Equipment and Supplies

1) Project-specific sampling procedures (RAWP, UFP-QAPP, and Site Safety & Health Plan-SSHP), geological logs, soil sampling field form, field notebook/pen, and waterproof marker pens.

2) Drill rig and related equipment to include liners/sleeves for sampling tubes rated to withstand temperatures of near 100°C, such as brass, rigid polycarbonate (Lexan), stainless steel, Teflon, etc. Flexible polymer sheets (parafilm) are then used to seal each end of the liners and caps are fitted over the end seals prior to cooling soil cores.

3) Ice bath (large container and ice; no water) for cooling process.

4) Digital insertion thermometer and/or infrared thermometer.

5) Sample containers, labels, and chain-of-custody forms (as required by the laboratory for the analysis). Cooler is also needed to preserve samples before shipment.

6) Safety Glasses with side shields. Additional option: full face-shield (wear over safety glasses) and leather apron. Other site-specific PPE requirements. Refer to site specific Health and Safety Plan (HASP)

7) Latex gloves. Additional option: cotton or leather outer gloves (wear over inner latex gloves). Plastic trash bags, Ziplock® bags, and paper towels are other field supplies required on site.

8) Packaging material and shipping labels.

4.0 Hot Soil Sampling

Prior to ISTR, soils will be at ambient temperatures, while later in the ISTR process the temperatures will be hot. Soil sampling procedures include all the steps in this SOP including evaluation of the conditions upon arrival and decontamination of all equipment

4.1 Safety Considerations

There are certain hazards associated with TCH during the remediation of soil and groundwater. These hazardous include possible contact with gas, steam, hot water, hot soil, other hot surfaces, or hazardous chemicals. Exposure to these hazards can be mitigated through engineering controls and strict adherence to documented procedures and safety protocols. At a minimum, the thermal system should be de-energized (lock out/tag out) or deactivated in the immediate area of the soil sampling activities, if not the entire well field prior to positioning the drill rig. Consult the APP/SSHP for specific safety protocols during sampling. If in question, the field team should check the drilling auger or sampling rod temperatures using an infrared thermometer to confirm safe temperatures, and/or use the proper personal protective equipment if necessary.

4.2 Drilling Approach

Establish a thorough understanding of the purposes of the sampling event prior to field activities and review the requisite field and laboratory information prior to soil sampling. Soil conditions at the site will be documented for two purposes. Baseline soil samples will be collected to observed soil lithology, soil staining, odors, depth to bedrock, and contaminant concentrations prior to treatment at the various depths sampled. Secondly, interim (if obtained) and final soil samples will be collected to document the extent of treatment as compared to the In situ Thermal Treatment (ISTR) Remediation Soil Goals.

Soil samples for ISTR baseline data will be obtained during the construction drilling, co-located with the temperature and pressure monitoring point borings. Interim and final ISTR soil samples will be obtained from similarly located borings as well as other locations with the ISTR treatment zone to take advantage of operational information and allow focusing on both areas that appear to be treated, as well as areas that show recalcitrance to treatment.

During the baseline and early phases of the ISTR, soils may not be hot, while later in the process the temperatures will be extremely elevated. Soil sampling procedures include the following steps: confirmation of the location of the sample boreholes and depths prior to drilling, review of the accessibility of the proposed boring area with respect to ISTR system infrastructure, proximity to site perimeter fencing and off-site receptors, initial decontamination of all equipment to be used, as well as between boreholes unless dedicated equipment is used, safe advancement of drilling augers/rods/barrels into the subsurface, and obtaining soil samples as the final step. Depending upon specific field conditions, additional steps may be necessary or other steps deleted.

Soil sampling is best achieved using either a direct push drill rig or a rotosonic drill rig, depending on the nature of the site geology and depths to be sampled. Drilling procedures should allow advancement of split spoon or core barrel (macrocore) sampling tubes to allow undisturbed soil samples to be retrieved for logging and sampling. Drilling procedures will include both auger rigs and sonic drilling techniques. If sampling tubes are to use liners/sleeves, the liners must be rated to withstand temperatures of near 100°C. Flexible polymer sheets (parafilm) are then used to seal each end of the liners and caps are fitted over the end seals prior to cooling soil cores.

4.3 Sampling Procedure

The steps outlined below must be followed for hot soil sampling.

1. Call the thermal remediation operator the day prior to sampling to schedule a shutdown for an appropriate duration prior to groundwater sampling.

2. An authorized person (trained and certified in lock-out and tag-out procedures, or equivalent) shall de-energized the applicable TCH wells or areas of the site using the site-specific instructions.

3. If possible, samples should be collected in order from locations having the lowest anticipated concentrations of contaminants of concern to location having the highest concentrations. Regardless, equipment that is not dedicated to each borehole shall be decontaminated between samples.

4. Soils will be obtained by driller using sampling tubes and liners for the specific sampling depths described in the Remedial Action Work Plan (RAWP). As the soil liners become available, handle carefully due to heat/steam. Protection for handling of hot push rods and soil core barrels/liners is important.

5. The ends of the liners should be capped and the liners placed onto ice to allow cooling. Avoid allowing any melted ice water to enter the liners. When liner feels cool to the touch, use infrared thermometer to check temperature. Alternatively, remove cap and place digital thermometer into soil liner to determine temperature.

6. When the temperature is between 70°F and 80°F (21°C to 27°C), the soils should be removed as intact as possible, either by cutting the liner longitudinally to expose the soils, or push extracting the soils from the liner tube.

7. The soil liner interval should be screened with a PID. The distinct depth interval aliquots to be sampled shall be obtained for head-space screening by PID, and a split sample placed into sampling containers (with preservative, if appropriate) for the analyses necessary. Care should be taken to select the from near the center of the core barrel where evaporative losses are minimized.

8. All samples are labeled, preserved and shipped per the UFP-QAPP. Document all necessary field and sampling information as per UFP-QAPP in groundwater Chain of Custody form, sampling field form, field notebook, etc.

9. When sampling is complete, contact ISTR system operator to allow re-energizing of well field or portion thereof to resume treatment

Ice bath

Testing the temperature of the sampling core

Opening sampling core after cooling

Core; ready to collect soil samples

Figure 1- Hot Soil Sampling Procedure

5.0 References

Environmental Protection Agency, United States (EPA), 1982. *Handbook for Sampling and Sample Preservation of Water and Wastewater.* EPA-600/4-82-029. Cincinnati: EPA Office of Research and Development, Environmental Monitoring and Support Laboratory.