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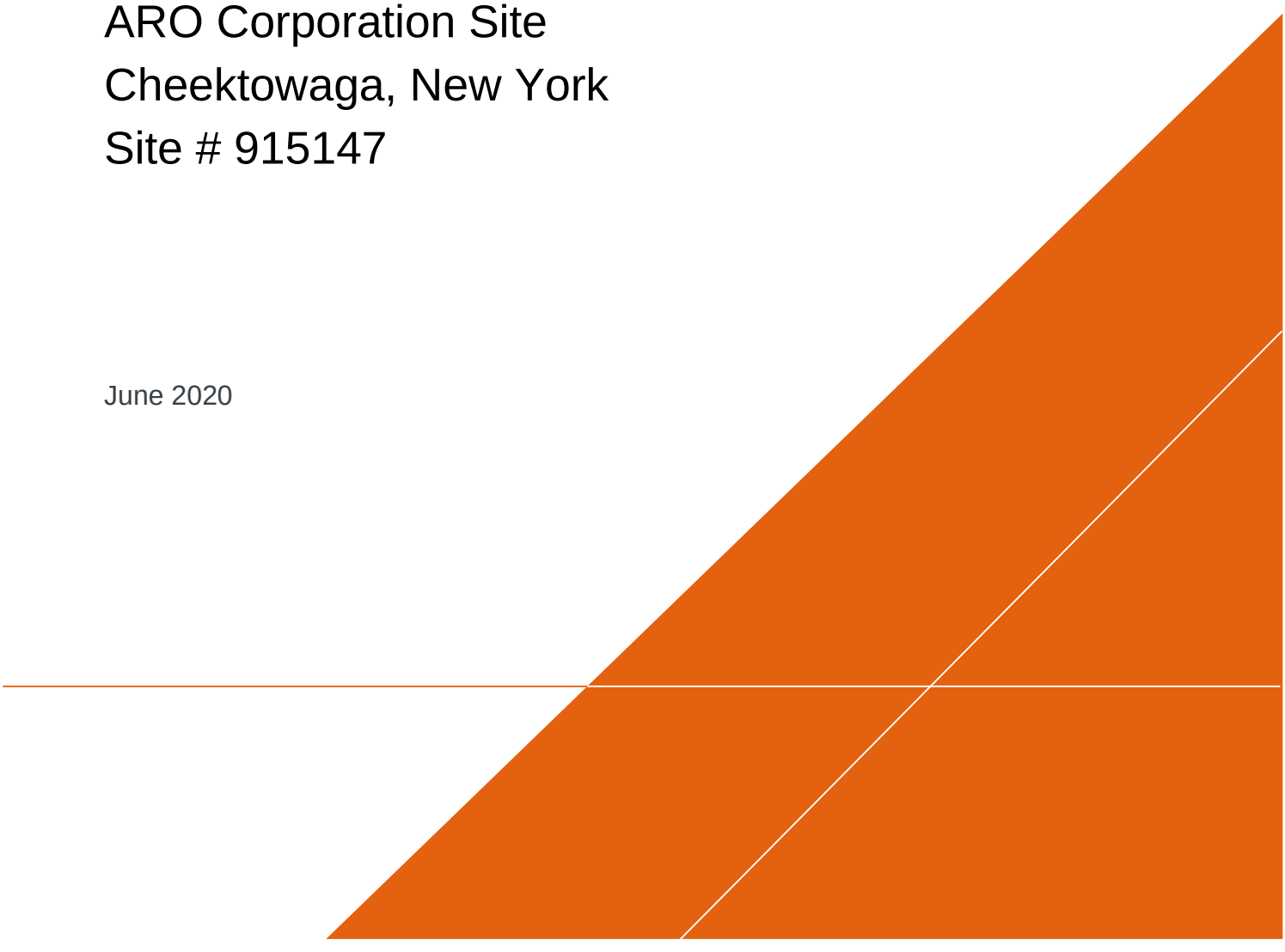
MAY 2019 – MAY 2020
PERIODIC REVIEW REPORT

ARO Corporation Site
Cheektowaga, New York
Site # 915147

June 2020



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Cheektowaga, New York
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ACRONYMS AND ABBREVIATIONS

Arcadis	Arcadis of New York, Inc.
bgs	below ground surface
cfm	cubic feet per minute
cm/sec	centimeters per second
COC	constituent of concern
DCE	dichloroethene
EC/BSA	Erie County/Buffalo Sewer Authority
EDD	EQuIS Electronic Data Deliverable
gpm	gallons per minute
in.Hg	inches of mercury
lb	pounds
LPGAC	liquid-phase granular activated carbon
LRP	liquid ring pump
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
ORP	oxidation-reduction potential
PF	pneumatic fracturing
PRR	Periodic Review Report
PVC	polyvinyl chloride
TCE	trichloroethene
µg/m^3	micrograms per cubic meter
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VER	Vacuum-Enhanced Recovery
VOC	volatile organic compound

1 EXECUTIVE SUMMARY

Arcadis of New York, Inc. (Arcadis), on behalf of Trane Technologies Company LLC (formerly Ingersoll Rand Company) , has prepared this Annual Site Management Periodic Review Report (PRR) for the ARO Corporation Site (New York State Department of Environmental Conservation [NYSDEC] Site Code 915147) (referred to hereafter as the Site) located in Cheektowaga, Erie County, New York (Figure 1). This PRR covers the period from June 2019 through June 2020 (reporting period), as requested in a letter from NYSDEC dated April 10, 2020.

This PRR summarizes the operational and performance monitoring data generated during the 2019-2020 reporting period for the remedial program at the Site. The basis of this report is to satisfy the requirements set forth in the Site Management PRR request and provide the supporting documentation for the Institutional and Engineering Controls Certification (Appendix A).

In accordance with the Remedial Design/Remedial Action Work Plan (Geraghty & Miller 1997), a vacuum-enhanced recovery (VER) system (Figure 2) was installed to recover chlorinated volatile organic compounds (VOCs) present in the dissolved, adsorbed, and vapor phases in the subsurface at the Site. The main constituents of concern (COCs) at the Site are trichloroethene (TCE) and dichloroethene (DCE). The system has been in operation for approximately 22 years.

Overall, the current remedial program has been effective in achieving the remedial goals at the Site by containing and eliminating off-site migration of contaminated soils and groundwater. During the reporting period, the system recovered 1,105,117 gallons of impacted groundwater. Total COC mass removal included approximately 0.32 kilogram (kg) (0.7 pounds [lb]) in the dissolved phase and 20.4 kg (45 lb) in the vapor phase. VOC concentrations in groundwater continue to improve in seven of the ten wells, with three wells exhibiting historically low concentrations in 2019. Three of the ten wells remain relatively stable with some variability occurring due to seasonal fluctuation, as compared to baseline conditions.

All the elements defined in the Operation and Maintenance (O&M) Plan were in compliance during the reporting period. The remedial system was operated continuously during the reporting period, except for noted routine and/or non-routine maintenance activities. No substantial changes were made regarding site management and remedial system operation during the reporting period.

In accordance with the NYSDEC 2018-2019 PRR acceptance letter, dated February 3, 2020, Arcadis will prepare a Well Decommissioning Work Plan to abandon historical wells MW, MWR, MW-5, MW-14, MW-14R, MW-17, MW-18, MW-27, and VEROW-2). This work plan will be submitted under separate cover for the Departments review.

The PRR is organized as follows:

- Section 2 provides a brief overview of the site location, physical description, and previous remedial enhancements.
- Section 3 describes the VER system layout and process.
- Section 4 discusses the system O&M and summarizes operation data.
- Section 5 provides a summary of the system performance evaluation and system analytical results.

- Section 6 summarizes the groundwater monitoring program and groundwater sampling results.
- Section 7 provides conclusions and 2020-2021 goals.
- Section 8 provides a list of references.

2 SITE OVERVIEW

2.1 Site Location and Description

The ARO Corporation site is located on Broadway Street (Route 130) in the Town of Cheektowaga, Erie County, New York (Figure 1). The property consists of the former ARO Corporation parcel and two parcels located adjacent and west of the ARO parcel. The area surrounding the Site is zoned as light industrial/residential. The Site is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 915147. The Site is designated as Class “4,”, which means the Site was properly closed and requires continued management or continuation of O&M activities.

2.2 Background

The former ARO main facility building, which was demolished in December 1997, covered approximately 69,000 square feet of the property. The floor slab of the former main facility building was left in place and not demolished. A separate maintenance and storage building, approximately 4,800 square feet in size, was not demolished and is located south of the west side of the main facility building (Figure 2). The maintenance building currently houses the on-site VER system. Other property areas include a paved area north of the former main facility building, and a larger, paved parking lot area south of the former building. Areas south and west of the parking lot are open fields. The former Zydel properties included former residences and a garage that were demolished in late November 1998.

A storm water drainage ditch extends southward along the eastern property boundary and westward along the southern property boundary. Another drainage ditch begins at a backfilled culvert on the south side of the parking lot. Surface water runoff within this ditch flows south to the west-flowing portion of the storm water drainage ditch located along the perimeter of the property.

The original VER system was installed in 1998 and has been operational for 22-years. The vapor treatment system was taken offline in July 2000 after it was determined not to be required because the vapor phase concentrations had not exceeded Air Guide 1 levels during the operation of the remedial system during the first several years of operation.

Pneumatic fracturing (PF) was conducted at several select areas of the Site in 2004, 2006, and 2009. Pneumatic fracturing is a process by which air is injected at high pressures into the subsurface to create fractures in the geological formation to promote increased hydraulic and pneumatic conductivity, thereby improving the mass recovery potential for site recovery wells. Pneumatic fracturing was conducted at PF-1 through PF-4 in 2004, PF-5 through PF-9 in 2006, and PF-10 through PF-13 in 2009 (Figure 2).

As part of an overall remedial strategy to reduce the remedial lifecycle at the Site, seven former PF wells and one former monitoring well were converted to recovery wells in 2014 (Arcadis 2013]). The remedial goals for the enhancements were to increase the radius of influence of the existing system within the

source areas, thereby providing additional extraction of the higher concentration VOC mass from these impacted areas of the Site.

2.3 Site Geology and Hydrogeology

The subsurface conditions encountered at the Site consist of three primary units: fill material and/or native clay to 5 feet below ground surface (bgs), brown till from approximately 5 to 15 feet bgs, and gray till from approximately 15 to 25 feet bgs. The brown and gray till subsurface conditions encountered at the Site are consistent with a low permeability glacial till geologic formation. Hydraulic conductivities within the till are estimated to be in the range of 10^{-5} centimeters per second (cm/sec) to 10^{-8} cm/sec.

Shallow groundwater has been encountered at depths ranging from 1 to 5 feet bgs throughout the Site. Based on the configuration of the water table at the Site, the horizontal direction of groundwater flow is to the south. The horizontal gradients across the Site vary and are dependent on whether the VER system is operational.

3 VACUUM ENHANCED RECOVERY SYSTEM OVERVIEW

The VER system currently comprises 19 recovery wells. The recovery well locations are shown on Figure 2.

The above grade process and treatment equipment include the following: a liquid ring pump (LRP), a knockout tank (i.e., air/water separator), and liquid phase treatment components. The system equipment and instrumentation are interlocked to a programmable logic controller, which regulates system operation in automatic mode and will activate a system shutdown and alarm callout in the event of a system malfunction. A system layout showing the location of recovery wells and the treatment system is provided on Figure 2.

Vacuum is applied to the recovery wells by the LRP unit via below-grade vacuum process piping. The LRP removes both groundwater and subsurface vapor (i.e., dual-phase) from the recovery wells. The LRP is similar to a conventional vacuum blower, except that it can generate much higher levels of vacuum [28 inches of mercury (in.Hg)].

The recovered groundwater and vapor from each recovery well are directed from a common manifold to the knockout tank. The knockout tank is designed to separate the liquid and vapor process streams from one another. Groundwater is transferred using progressive cavity transfer pumps through four bag filter vessels configured in series, which removes particulates larger than 25 microns in diameter. The final treatment for groundwater consists of two 1,000-lb liquid-phase granular activated carbon (LPGAC) vessels piped in series. The average and cumulative extracted groundwater flows are monitored, and data are logged via a flow transmitter and paddlewheel flow sensor. The extracted vapor-phase flows are monitored and recorded utilizing a hand-held anemometer that measures the velocity, which is then converted to a volumetric flow.

Downstream from the knockout tank, the vapor stream passes through a particulate filter, the LRP, and a secondary knockout tank prior to being released to the atmosphere.

The liquid-phase treatment vessels are equipped with a manifold that can be valved for series, parallel, or isolated operating configurations, allowing flexibility in treatment operation during non-routine maintenance activities. Sample collection valves and individual pressure indicators are located on the inlet and discharge sides of each vessel.

The LPGAC vessels are designed to remove VOCs from the liquid process stream prior to discharge. Treated groundwater is discharged to an on-site sanitary sewer connection under an industrial wastewater discharge permit. The vapor is vented directly to the atmosphere approximately 10 feet above the building roofline.

4 SYSTEM OPERATION AND MAINTENANCE

The VER system operated continuously during the reporting period with only brief shutdown periods due to scheduled O&M activities, non-routine maintenance, and the occurrence of alarm conditions. A combination of recovery wells was operated during 2019 and the first part of 2020, ranging from seven to ten recovery wells operating at one time.

O&M site visits consist of system inspection, recording of operating parameters, influent and effluent system sampling, and investigation of any alarms that may have occurred. The operational data collected during each site visit, as well as maintenance related to each of the major system components (extraction system, liquid and vapor treatment) are discussed in the following subsections.

4.1 System O&M

The following O&M tasks were performed on the VER system (LRP, transfer pump, and related equipment):

- Checked and recorded overall system operation and alarm status;
- Recorded vacuum gauge readings at the knockout tank and LRP to confirm applied vacuum operational set points;
- Checked LRP seal oil level, filter pressure, and temperature to ensure that the LRP was operating within the allowable ranges as recommended by the manufacturer;
- Recorded total volume of groundwater recovered and average groundwater recovery flow rates;
- Recorded extracted air flow rate; and
- Recorded vacuum level readings at individual recovery well gauges (both at interior valve manifold and recovery wellhead locations).

4.1.1 Vapor Extraction System O&M

The following O&M tasks were performed regarding the vapor-phase portion of the system:

- Recorded the post-LRP/inlet temperature of the secondary knockout tank
- Recorded the vapor flow rate using a handheld anemometer
- Inspected all pipes and fittings for potential leaks
- Collected effluent vapor samples for laboratory analysis.

The vapor sampling results are also used to estimate the VOC removal from the vapor extraction portion of the system. Vapor-phase mass removal estimates are summarized in Section 5.4.2.

4.1.2 Liquid Treatment System O&M

The following O&M tasks were performed regarding the liquid-phase treatment portion of the system.

- Recorded pressure level readings at the inlet and outlet pressure gauges for each of the two LPGAC vessels.
- Recorded the pre- and post-sediment filter pressure readings.
- Replaced liquid-phase bag filters as needed.
- Inspected all pipes and fittings for potential leaks.
- Inspected liquid- and vapor- phase flow meters to ensure proper operation.
- Collected influent (pre-LPGAC vessel #1), midpoint (post-LPGAC vessel #1), and effluent (post-LPGAC vessel #2) system groundwater samples and submitted for laboratory analysis.
- Cleaned out knockout tank and y-strainer as needed.
- Maintained the LRP and progressive pumps.
- Cleaned and maintained flow meter to ensure continuous flow monitoring, as required by the Erie County/Buffalo Sewer Authority (EC/BSA) industrial wastewater discharge permit.

As outlined above, influent, midpoint, and effluent liquid samples are submitted for laboratory analysis on a quarterly basis. The analytical results are used to determine if the LPGAC media is spent; a condition that can be indicated by the breakthrough of VOCs downstream from the first and/or second LPGAC vessel. Pressure differentials across LPGAC vessels are also used to determine if head losses across vessels are high as a result of the carbon being spent due to adsorption sites being utilized or inorganic fouling (e.g., silt or scale). The system influent groundwater sampling results are used to estimate the VOC removal from the liquid extraction portion of the system. The system effluent groundwater sampling results are used to track the performance of the treatment system to meet the permit requirements set forth by the BSA. The BSA permit requires compliance sampling and reporting on a quarterly basis.

4.2 System Repairs and Non-Routine O&M

During the reporting period, the following system repairs and non-routine O&M activities were performed and remedial enhancements were implemented:

- During the week of June 10, 2019 several non-routine site/system maintenance activities were completed:
  - Redeveloped recovery wells RW-3, 3A, 10, 10A, 11, 11A, and 11B.
  - Redeveloped monitoring well MW-6.
  - Cleaned/redeveloped recovery piping between wells RW-3, 10, and 11 and the treatment system manifold.
  - Replace several faulty treatment system valves/fittings.
  - Site mowing and vegetation control.

- A transfer pump motor fault alarm was received on August 16, 2019. The alarm was determined to be a tripped overload relay. The system was inspected, restarted, and resumed normal operation on August 16, 2019.
- During the week of October 28, 2019 several non-routine system maintenance activities were completed:
  - Replace clogged section of recovery wells RW-3 and RW-10/RW-10A piping near the well heads.
  - Clean system manifold control valves.
  - Replace faulty manifold vacuum gauges.
  - Replace cracked fitting on bag filter housing.
  - Change out carbon in lag vessel and swap lead lag position.

4.3 Objectives of Monitoring

During operation of the VER system, various data were collected and analyzed to evaluate the overall performance and effectiveness of the system. This performance monitoring is intended to achieve the following objectives:

- Evaluate total VOC recovery in the liquid and vapor phases during the operational period.
- Evaluate performance of the groundwater treatment system.
- Determine if any modifications to the system are required to enhance and maximize system performance.
- Ultimately determine when remedial endpoints have been achieved.

Data generated from the system performance monitoring activities are outlined below.

4.4 System Operational Data

The VER system operational data are summarized in Table 1. These data include the applied vacuum, extracted vapor and groundwater flow rates, and extraction wellhead vacuums.

4.4.1 Groundwater Recovery Rates

Total groundwater flow readings were taken from the totalizing flow meter installed on the liquid discharge of the VER system. The average system groundwater flow rates are included in Table 1. A cumulative total of 19,4344,916 gallons of groundwater has been recovered by the VER system as of May 1, 2020. A total of 1,105,117 gallons of water were treated by the VER system during the reporting period (Table 2). This total flow corresponds to an average recovery rate of approximately 2.1 gallons per minute (gpm) over the entire reporting period.

4.4.2 Applied Vacuum/Extracted Vapor Flow Rate

The observed applied vacuum at the system knockout tank generated by the LRP ranged from 11 in.Hg to 21 in.Hg during the reporting period. The extracted vapor flow rate ranged from about 59 to 110 cubic feet per minute (cfm) during the reporting period. The average system vapor flow rates are included in Table 1.

5 SYSTEM PERFORMANCE EVALUATION

The following sections provide an evaluation of the remedial system performance monitoring data during the reporting period, and an overview compared to the baseline (1998) remedial system operation. The estimated annual and total mass removed by the VER system was calculated using the influent VOC sampling results, and system groundwater and vapor extraction flow rates.

5.1 System Liquid Phase

As outlined, groundwater samples were collected on a quarterly basis from the influent of the treatment system, the midpoint between the two LPGAC units, and the effluent (prior to discharging to the sewer under the EC/BSA industrial wastewater discharge permit). All samples were submitted to SGS North America Laboratories located in Dayton, New Jersey, for analysis. The system liquid-phase sampling laboratory analytical results have been submitted to NYSDEC's EIMS Administrator in the required EQuIS Electronic Data Deliverable (EDD) format.

5.1.1 Liquid-Phase Influent Analytical Results

System influent liquid-phase (i.e., groundwater) samples were analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method 8260. The influent sample concentrations were used to estimate the total VOC mass removal from the subsurface and to evaluate the relative changes in the mass removal rate over time. The mass removal estimate is generated using the quarterly influent sample analytical data and the cumulative groundwater flow totals.

Dissolved-phase concentrations of TCE, DCE, and vinyl chloride (VC) in the influent, midpoint, and effluent liquid samples are provided in Table 3. The quarterly influent concentrations of TCE, DCE (total), and VC in samples collected since the system startup (1998) through April 2020 are illustrated graphically on Figure 3.

Quarterly liquid-phase influent concentrations during the reporting period ranged from 41 to 83 micrograms per liter (μg/L) for TCE and 16 to 37 μg/L for DCE. Influent concentrations vary widely based on which recovery wells are online at the time of the sampling and other factors such as extraction rates and groundwater yield/recharge conditions.

Quarterly system liquid-phase samples were collected from the mid-carbon location between the two LPGAC units and analyzed for VOCs using USEPA Method 8260. Liquid-phase midpoint samples were collected to monitor the performance of the lead LPGAC unit and to help determine when a carbon media change is warranted. As noted previously, dissolved-phase concentrations of TCE, DCE, and VC in the influent, midpoint, and effluent samples are provided in Table 3.

5.1.2 Liquid Extraction Rates

As discussed in Section 4.4.1, the total recovered groundwater flows correspond to an average recovery rate of approximately 2.1 gpm over the reporting period. This is relatively consistent with the annual average groundwater recovery rates from 2009 through April 2020, which ranged from 1.5 to 2.8 gpm.

5.1.3 Liquid-Phase Mass Removal

Influent groundwater sampling results were used to estimate VOC recovery rates. As shown in Table 2, influent VOC levels and groundwater recovery rates were used to calculate the estimated overall mass of VOCs recovered in the dissolved phase. A total estimated approximate mass of 0.32 kg (0.7 lb) of VOCs was recovered in the dissolved phase during the reporting period.

As the data in Table 2 and on Figure 3 indicate, the dissolved-phase mass recovery estimates ranged from 0.5 to 1.3 gram per day. The fluctuation in dissolved-phase VOC recovery at the time of sampling is due to variability in the influent mass concentrations in the extracted groundwater depending on which recovery wells are online, extraction rate, and precipitation recharge to the groundwater system.

5.1.4 Effluent Treated Liquid-Phase Analytical Results

Pursuant to the effluent standards set forth by the EC/BSA Pollutant Discharge Elimination System Permit # 10-10-E1017, an effluent sampling event was conducted on a quarterly basis which consists of a 24-hour composite sample (via an automatic sampler) for laboratory analysis of total extractable hydrocarbons and the collection of four grab samples over an 8-hour period for analysis of VOCs. Additionally, a quarterly effluent liquid-phase grab sample is collected and analyzed for VOCs. VOCs and total extractable hydrocarbons were analyzed using USEPA Methods 8260 and 1664, respectively.

During the reporting period, the monitoring parameters were either non-detect or reported at quantities below the permitted effluent limits. These system effluent results indicate that the LPGAC treatment system removed more than 99 percent of the VOCs in the extracted groundwater. The effluent sample results for TCE, DCE, and VC are provided in Table 3.

5.2 System Vapor Phase

Effluent vapor (i.e., soil gas) samples were collected on a quarterly basis from the vapor discharge side of the LRP and submitted for laboratory analysis of VOCs by Method AM 4.02 Chlorinated Hydrocarbons by Pace Analytical Services in Pittsburgh, Pennsylvania. As with the extracted groundwater sampling, the purpose of the vapor sampling is to estimate the total VOC mass removal from the subsurface, and to evaluate the relative changes in vapor-phase mass removal rate over time as a result of the system operation. The mass removal estimate is generated using the vapor sample analytical data and the air flow rate estimates recorded at the time of sampling. The system vapor sample laboratory analytical data have been submitted to NYSDEC's EIMS Administrator in the required EDD format.

5.2.1 Vapor Phase Analytical Results

The quarterly vapor concentrations of TCE, DCE, and VC are presented in Table 4, and time-concentration data collected since the system startup (1998) through April 2020 are depicted graphically on

Figure 4. The two predominant compounds detected in the vapor samples have historically been TCE and DCE. During the reporting period, concentrations of TCE in the vapor samples ranged from 8,055 micrograms per cubic meter (µg/m^3) to 19,332 µg/m^3. Vapor concentrations of DCE ranged from 2,139 µg/m^3 to 4,754 µg/m^3. Vinyl chloride remained below the laboratory detection limits.

5.2.2 Vapor Extraction Rates

As discussed in Section 4.4.2, the extracted vapor flow rate ranged from 59 to 110 cfm during the reporting period. It should be noted that the measured flow rate is solely from the recovery well network online during the sampling event and does not include any makeup (i.e., dilution) air.

5.2.3 Vapor-Phase Mass Removal

Influent vapor sampling results and total vapor extraction flow rates were utilized to estimate the vapor-phase VOC mass removal rate for –the reporting period. These data are presented in Table 5. As the data in Table 5 and on Figure 4 indicate, the vapor-phase mass removal rate ranged from 35 to 73 grams per day. As with dissolved-phase mass recovery, the fluctuation in the vapor-phase recovery rate can be attributed to variability in influent vapor mass concentrations due to recovery well configuration and precipitation recharge influences at the time of sample collection. A total estimated mass of 20.4 kg (45 lb) of VOCs was recovered in the vapor phase during the reporting period.

As expected, the mass transfer of VOCs from soil to vapor is predominantly limited to desorption and diffusion processes, as noted above for the dissolved phase. Therefore, mass removal rates in the vapor phase continue to decline over time as the Site is remediated.

5.3 Total Mass Removal Trend

The VER system has recovered a cumulative total of approximately 61 kg (134 pounds lb) and 595 kg (1,312 lb) of dissolved- and vapor-phase VOCs, respectively, during the period of operation from startup in 1998 through April 2020 (Table 6). The mass removal rate had generally declined for both the liquid- and vapor-phase VOC mass removed during each year of the operation from 1998 through 2003. As indicated in previous reports, the rate of recovery is expected to decrease as the mass removal becomes more dependent on desorption and diffusion processes rather than advective movement and capture of VOCs. However, the dissolved- and vapor-phase mass removal rates increased significantly following implementation of several pneumatic fracturing events at the Site in 2004 through 2009. This mass recovered is a direct indication that the pneumatic fracturing program was effective at increasing the advective movement and capture of VOCs, and substantially enhancing the efficiency of the remediation system. This was accomplished by further increasing the bulk permeability of the dense glacial till formation in each of the recovery well areas, thereby allowing additional VOC mass recovery via physical desorption and diffusion processes.

VOCs in the vapor phase accounted for greater than 90 percent of the total mass recovered to date. However, a percentage of the dissolved-phase mass is transferred to the vapor phase due to the nature of VER system operation via in situ stripping within the capillary fringe, recovery well, and through the extraction piping network. Thus, the vapor-phase influent data reflect, in part, the contribution of dissolved-phase VOCs in groundwater.

As presented in Tables 2 and 5, the dissolved- and vapor-phase mass recovered during the reporting period was estimated at 0.32 and 20.4 kg, respectively. Figure 5 also depicts annual mass recovery through April 2020 for both the dissolved and vapor phases. This corresponds to a combined dissolved- and vapor-phase mass recovery of 20.7 kg (45.7 lb) during the reporting period.

6 GROUNDWATER MONITORING PROGRAM

6.1 Water Level Conditions

Water level measurements were recorded in on-site monitoring wells during June and December 2019. These measurements were collected to monitor groundwater levels in response to operation of the VER system, which provides an indication of the hydraulic influence in the vicinity of the recovery wells under pumping conditions.

Water level data are summarized in Table 7, and the corresponding groundwater contour maps for June 11 and December 17, 2019 are presented on Figures 6 and 7, respectively. The contour map representing groundwater elevations for June 11, 2019 were with recovery wells RW-1A/B, RW-3, RW-4, RW-4A, RW-5, RW-7, and RW-9 operating. The contour map representing groundwater elevations for December 17, 2019 were with recovery wells RW-1, RW-4, RW-4A, RW-5, RW-9, RW-10, and RW-10A operating. The hydraulic radius of influence, which varies with each recovery well based on local hydrogeologic conditions, indicates that the system is maintaining hydraulic control of the groundwater in the vicinity of operating recovery wells.

6.2 Semi-Annual Groundwater Monitoring Program

Semi-annual groundwater monitoring activities were conducted in June and December 2019. Groundwater monitoring consisted of collecting groundwater samples from monitoring wells, former pneumatic fracturing locations, and recovery wells, as well as measuring water levels in monitoring wells to evaluate the hydraulic influence of the VER system. The VER system was operating online during the June and December 2019 sampling events. The following 10 wells were sampled to monitor groundwater concentrations during active remediation and evaluate the VER system effectiveness:

Monitoring Wells

- MW-2 (located adjacent to RW-8)
- MW-6 (adjacent to RW-1, RW-1A, and RW-1B)
- MW-11 (adjacent to RW-3 and RW-3A)
- MW-13 (adjacent to RW-3 and RW-3A)
- MW-20 (adjacent to RW-5)
- MW-22 (adjacent to RW-4 and RW-4A)
- MW-23 (adjacent to RW-6)
- MW-24 (adjacent to RW-7)

- MW-29 (adjacent to RW-9 and RW-9A)

Recovery Well

- RW-11 (formerly MW-3).

All groundwater samples were collected and submitted for analysis of VOCs using USEPA Method 8260 at SGS North America Laboratories located in Dayton, New Jersey.

Concentrations of TCE, DCE, and VC for the 2019 groundwater samples are shown in Table 8. Historical concentration trends of TCE and DCE detected in each of the monitoring wells and select recovery wells are shown on Figures 8A, 8B, and 9. The groundwater laboratory analytical results have been submitted to NYSDEC's EIMS Administrator in the required EDD format.

6.3 Groundwater Sampling Results Summary

Both groundwater sampling events conducted during 2019 included collecting groundwater samples from the 10 wells to monitor VOC concentrations and trends and evaluate the performance of the VER system. TCE, DCE, and VC concentrations from the 2019 groundwater monitoring program are shown in Table 8. Historical TCE and DCE concentration trends in groundwater for monitoring and recovery wells are depicted on Figures 8A, 8B, and 9.

The depth to groundwater and the total depth of each well were used to determine the standing volume of groundwater in each monitoring well. Three well purge volumes were calculated for each well prior to sampling. Water quality parameters including temperature, pH, dissolved oxygen, specific conductance, oxidation-reduction potential, and turbidity were measured in the field and recorded on sampling logs the day of sampling (Appendix B). Generally, the water quality parameters remained relatively consistent as compared to historical values/ranges with the exception of turbidity. Turbidity values increased in a number of wells, most notably in MW-6 and MW-29.

The analytical results continue to show improvement in groundwater. VOC concentrations in several of the monitoring wells have declined one to two orders of magnitude since pneumatic fracturing was implemented at the Site. VOC concentrations in several site monitoring wells have fluctuated somewhat in response to changes in pumping cycles or seasonal water table fluctuations but have remained relatively stable.

The following highlights the groundwater analytical data for specific monitoring wells at the Site:

- MW-2: TCE concentrations have remained below the historical high concentrations observed in 2011. However, generally, these concentrations have remained relatively stable the last several years. DCE concentrations generally continue to decline since observing a historical high in 2015.
- MW-6: 2019 TCE concentrations continue to trend downward as compared to baseline values. This trend is mostly attributable to the conversion of PF wells to recovery wells (RW-1A/1B) in that area. DCE concentrations have remained relatively constant as compared to baseline values.
- MW-11: TCE and DCE concentrations continue to trend downward over the last several years, with historical low levels observed in December 2019.

- MW-13: Overall, TCE concentrations both remain relatively stable compared to historical concentrations. However, an increase in concentrations was observed in the December 2019. The increase in TCE concentrations may be attributable to the redevelopment/repair of RW-3/3A that were completed in 2019.
- MW-20: TCE and DCE concentrations continue to remain well below the previous 4-year average concentrations and two to three orders of magnitude below the baseline concentrations.
- MW-22: Both TCE and DCE concentrations were detected at historical low levels, as compared to the baseline, during the 2019 sampling events.
- MW-23: TCE and DCE concentrations both remain relatively stable compared to historical concentrations.
- MW-24: TCE and DCE concentrations both remain relatively stable compared to historical concentrations.
- MW-29: Both TCE and DCE concentrations were detected at historical low levels in 2019, as compared to the baseline and post-pneumatic fracturing events. Based on the 2019 sampling results, the DCE concentrations are three to four orders of magnitude less than the baseline monitoring well concentrations
- RW-11 (former MW-3): TCE and DCE concentrations continue to remain stable and within ranges established following the conversion of this well from a monitoring well to a recovery well. Based on the 2019 sampling results, the TCE concentrations are three orders of magnitude less than the baseline monitoring well concentrations.

7 CONCLUSIONS

The following sections summarize the overall system operation, remedial progress, and operating, maintenance, and monitoring goals for the next reporting period.

7.1 System Summary

The VER system has been effective at removing dissolved, adsorbed, and vapor-phase VOC mass. Since startup of the VER system, groundwater quality at the Site has improved substantially in most areas. The groundwater monitoring analytical results discussed in Section 6.3 are consistent with the decrease in mass removal estimates based on VER system influent groundwater and vapor-phase results presented in Section 5.4. As the available VOC mass decreases, as indicated by groundwater monitoring results, the VOC mass extracted by the VER system will decrease.

The effectiveness of the system is summarized below with the following performance metrics:

- Groundwater monitoring data have continued to indicate substantial improvement in groundwater quality in response to operation of the VER system and remedial enhancements implemented at the Site. This includes the reduction of VOC concentrations by several orders of magnitude at nine of the 15 wells historically monitored on site. These trends in VOC concentration reductions are depicted on Figures 8A, 8B, and 9.

- System dissolved-phase influent VOC concentrations decreased during the reporting period. This decrease in system influent VOC concentrations can be attributed to the areas being influenced by recovery wells and being remediated and mass removal becoming more dependent on diffusion and desorption processes. Therefore, mass removal rates in both the dissolved and vapor phase are declining over time as the Site is remediated.
- Performance monitoring data (i.e., groundwater drawdown and vapor concentrations) have indicated that the VER system has been able to dewater portions of the formation, thus allowing adsorbed VOC mass available below the groundwater table and within the capillary fringe for vapor extraction and in-situ stripping.
- The extent of the groundwater plume has remained stable although VOC concentrations have declined at several monitoring well locations due to operation of the VER system and enhanced VOC mass recovery created by the pneumatic fracturing program and expanded recovery well network. Groundwater concentration trends also indicate a cyclical, fluctuating pattern at some of the monitoring wells.
- Groundwater quality changes are expected to occur over a longer time frame due to the low permeability of the site geology. The advective movement and capture of dissolved-phase VOCs will remain an important mechanism in the mitigation and reduction of VOC impacts, but is expected to decline with continued pumping as VOC mass removal becomes more influenced by slower diffusion processes.
- The liquid-phase treatment system has been effective at removing over 99 percent of the dissolved-phase influent VOC mass recovered by the VER system.
- As of April 2020, the VER system has removed an estimated 595 kg (1,311 lb) of vapor-phase VOC mass and 61 kg (134 pounds lb) of dissolved-phase VOC mass.
- As of April 2020, the VER system has treated an estimated 19,434,916 gallons of groundwater.

7.2 Recommendations and Goals for the 2020-2021 Operation

System operation and performance monitoring will continue to focus on optimizing mass removal rates through cycled operation of recovery wells, evaluating individual recovery well mass removal rates, and continued O&M of the VER system equipment and components.

The goals for system operational activities during the next several months of operation in 2020 will be as follows:

- Redevelop monitoring wells, including MW-6, MW-13, MW-23, and MW-29.
- Redevelop recovery wells RW-1/1A/1B, RW-3/3A, and RW-4/4A.
- Perform individual recovery well pump tests to confirm liquid and vapor phase recovery rates.
- Measure water level at all monitoring wells to monitor hydraulic influence of the system.
- Collect quarterly influent samples to monitor the liquid- and vapor-phase treatment system for mass removal efficiency based on laboratory analysis of samples collected from the system influent.

- Continue operation of the system while performing the required vacuum adjustments at each of the recovery wells to optimize system performance and efficiency and maximize contaminant mass removal rates.
- Continue to collect groundwater samples on a semi-annual basis in accordance with the existing monitoring program. Collect groundwater samples from other selected monitoring wells and recovery wells to track changes in groundwater quality and support remedial decisions.
- Collect quarterly system effluent samples as required by the EC/BSA industrial wastewater discharge permit.
- Continue to monitor the LPGAC treatment system for VOC breakthrough based on laboratory analysis of samples collected from the system influent, midpoint, and effluent locations.
- Abandon historical/non-essential monitoring wells following receipt of NYSDEC approved work plan.

Based on the results of the 2019-2020 remedial program, including the field and laboratory data, the projected overall remedial strategy for the remainder of 2020 will remain unchanged.

8 REFERENCES

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TABLES

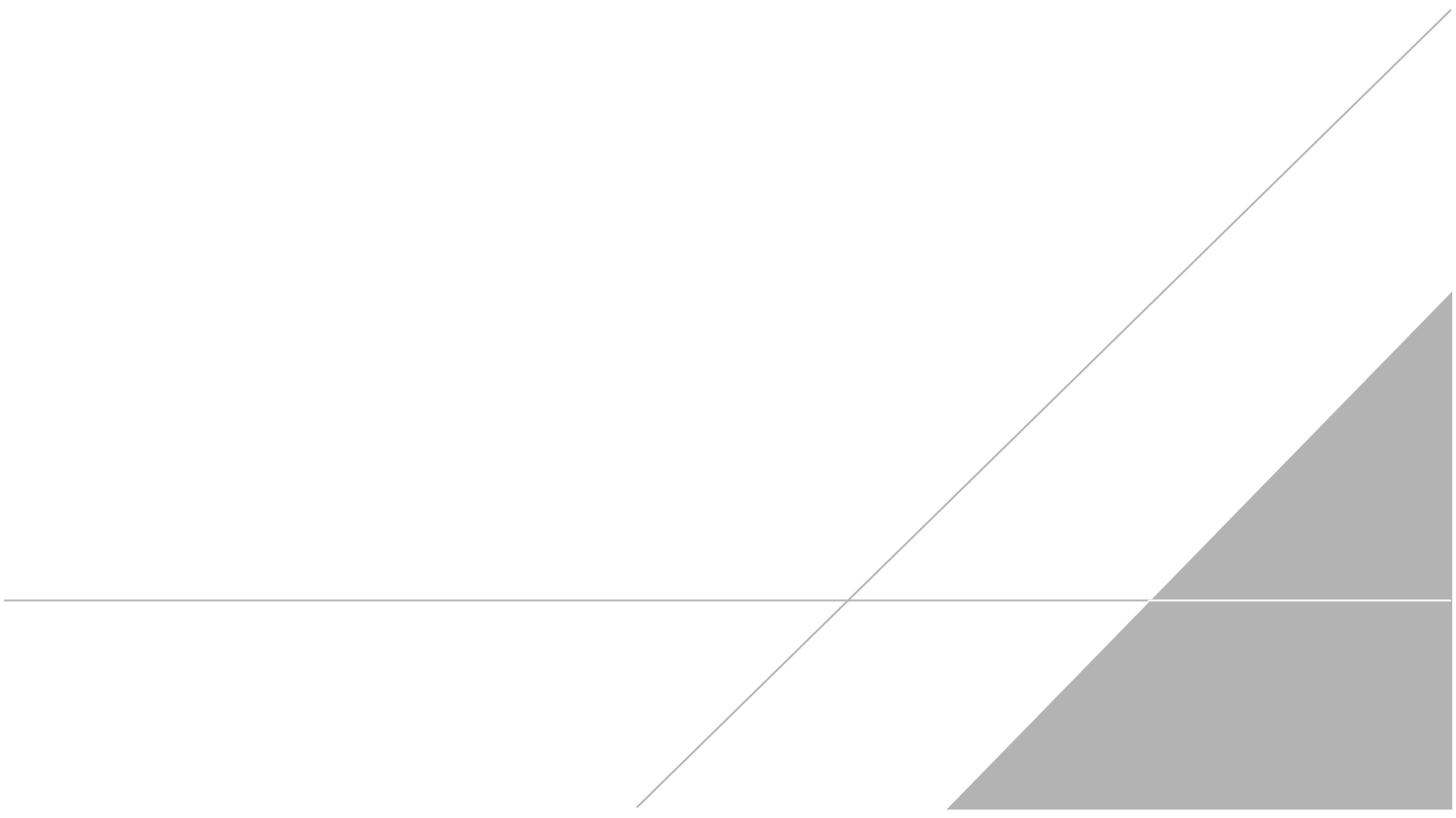

Table 1
VER System Operational Data 2019–2020
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

System Parameter	Date			
	7/13/2019	11/7/2019	1/28/2020	5/1/2020
Knock-out Tank Vacuum (in.Hg)	11	13	21	19
Vapor Extraction Flowrate (cfm)	110	104	82	59
Quarterly System Flow (gallons)	236,380	237,066	279,792	351,879
Recovery Well [1]	**Applied Vacuum (in.Hg)**			
RW-1	--	--	--	15
RW-1A	--	--	--	15
RW-1B	--	--	--	15
RW-2	--	--	--	--
RW-3	14	12	15	18
RW-3A	--	9	13	--
RW-4	--	9	13	--
RW-4A	--	9	--	--
RW-5	17	--	15	10
RW-6	10	--	13	16
RW-7	8	--	13	15
RW-8	--	8	--	--
RW-9	10	--	--	--
RW-9A	3	--	--	--
RW-10	--	8	11	--
RW-10A	--	8	11	--
RW-11	10	--	--	--
RW-11A	8	--	13	3
RW-11B	8	--	13	1

Notes:
1. Recovery well statuses shown are only those present at the time of the monthly system sampling event. Recovery well configurations different than those shown may have occurred between monthly sampling events.

Definitions:
cfm - cubic feet per minute
in.Hg - inches of mercury
"--" - Indicates recovery well offline

Table 2
Dissolved Phase VOC Recovery 2019-2020
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Date	Dissolved Phase Influent VOC Concentrations (µg/L)			Total Cumulative Flow (gal)[1]	Monthly Reporting Period Flow (L)	Estimated Mass Recovered Per[2] Reporting Period (kg)				Cumulative VOC Recovery (kg)	Cumulative Days Operating	Estimated VOC Recovery Rate Per Reporting Period (kg/day)	Estimated VOC[3] Mass Adsorbed Per Reporting Period (%)
	TCE	DCE (tot)	VC			TCE	DCE (tot)	VC	Total				
4/25/2019	38	37	0	18,329,799	773,138	0.029	0.026	0.000	0.055	6.11	0	0.0006	100.0
7/13/2019	41	16	0	18,566,179	894,793	0.035	0.024	0.000	0.059	6.17	79	0.0007	100.0
11/7/2019	43	23	0	18,803,245	897,390	0.038	0.017	0.000	0.055	6.22	196	0.0005	100.0
1/28/2020	63	29	0	19,083,037	1,059,125	0.056	0.027	0.000	0.083	6.30	278	0.0010	100.0
5/1/2020	83	37	0	19,434,916	1,332,003	0.084	0.038	0.000	0.122	6.43	372	0.0013	100.0
Groundwater Recovered 4/25/2019 - 5/1/2020 (gal)				**1,105,117**	**Total VOCs Recovered April 2019 - April 2020 (kg):**					**0.32**			**100.0**
Average Groundwater Recovery Rate (gpm)				**2.1**									

Notes:

1. Total cumulative flows indicated are estimated values based on flowmeter FQI-210.
2. Estimated mass recovered/discharged per reporting period calculated using influent/effluent water VOC concentrations and groundwater flow for that reporting period, respectively. VOC concentrations used for calculation are averages of those obtained from previous monthly sampling event and those obtained from current monthly sampling event.
3. Adsorption rates calculated using estimated VOC mass recovered and estimated VOC mass discharged per reporting period.

Definitions:

DCE (tot) - Dichloroethene (sum of 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE)
gal - gallons
gpm - gallons per minute
kg - kilograms
kg/day - kilograms per day
L - Liters
NS - Not Sampled
TCE - Trichloroethene
tot - total
µg/L - micrograms per liter
VC - Vinyl chloride
VOC - Volatile Organic Compounds

ARCADIS Design & Consultancy for natural and built assets

Table 3
Dissolved Phase System Influent TCE, DCE, and VC Concentrations
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Sample Date	Sample Point	TCE (µg/L)	DCE (total) (µg/L)	VC (µg/L)
7/13/2019	Influent	40.9	15.7	ND
	Mid-Point	ND	21.2	ND
	Effluent	ND	ND	ND
11/7/2019	Influent	43.2	22.8	ND
	Mid-Point	13	6.8	ND
	Effluent	ND	ND	ND
1/28/2020	Influent	63.0	28.5	ND
	Mid-Point	8.3	4.1	ND
	Effluent	ND	ND	ND
5/1/2020	Influent	83.3	36.7	ND
	Mid-Point	78.6	34.0	ND
	Effluent	ND	ND	ND

Notes:
1. All concentrations in µg/L.
2. Samples analyzed using USEPA method 624.

Definitions:
DCE (total) - Dichloroethene (sum of 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE)
ND - Non-Detect, below the laboratory detection limits
TCE - Trichloroethene
VC - Vinyl Chloride
µg/L - micrograms per liter

Table 4
Vapor Phase System Effluent TCE, DCE, and VC Concentrations
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Sample Date	TCE		DCE (total)		VC	
	ppmv	µg/m^3	ppmv	µg/m^3	ppmv	µg/m^3
7/13/2019	3.60	19,332	1.20	4,754	ND	ND
11/7/2019	1.50	8,055	0.54	2,139	ND	ND
1/28/2020	1.50	8,055	0.66	2,615	ND	ND
5/1/2020	3.10	16,647	1.00	3,962	ND	ND

Notes:

1. Samples analyzed by Pace Analytical using their in-house analytical method AM 4.02.

Definitions:

DCE (total) - Dichloroethene (sum of 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE)
µg/m^3 - micrograms per cubic meter
ND - Non-Detect, below the laboratory detection limits
ppmv - parts per million by volume
TCE - Trichloroethene
VC - Vinyl Chloride

Table 5
Vapor Phase VOC Recovery 2019-2020
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Date	Influent Vapor VOC[1] Concentrations (ppmv)			Influent Vapor VOC[2] Concentrations (µg/m^3)			Influent Vapor VOC[3] Concentrations (µg/L)			Vapor Extraction Flowrate (cfm)	Reporting[4] Period Volume of Air (L)	Mass Recovered Per[2] Reporting Period (kg)			Cumulative Mass Recovered (kg)			Estimated Cumulative VOC Recovery (kg)	2019-2020 Cumulative Operating Days	Estimated VOC Recovery Rate Per Reporting Period (kg/day)
	TCE	DCE (tot)	VC	TCE	DCE (tot)	VC	TCE	DCE (tot)	VC			TCE	DCE (tot)	VC	TCE	DCE (tot)	VC			
4/25/2019	0.84	0.60	0.0	4,511	2,377	0.0	4.51	2.38	0.0	44	112,787,459	0.46	0.23	0.0	60.6	13.3	0.0	73.9	0	0.011
7/13/2019	3.6	1.20	0.0	19,332	4,754	0.0	19.33	4.75	0.0	110	355,673,825	4.24	1.27	0.0	64.8	14.6	0.0	79.4	79	0.070
11/7/2019	1.5	0.54	0.0	8,055	2,139	0.0	8.06	2.14	0.0	104	496,220,774	6.79	1.71	0.0	71.6	16.3	0.0	87.9	196	0.073
1/28/2020	1.5	0.66	0.0	8,055	2,615	0.0	8.06	2.61	0.0	82	274,210,099	2.21	0.65	0.0	73.8	17.0	0.0	90.8	278	0.035
5/1/2020	3.1	1.00	0.0	16,647	3,962	0.0	16.65	3.96	0.0	59	226,170,317	2.79	0.74	0.0	76.6	17.7	0.0	94.3	372	0.038
												Total VOCs Recovered Apr. 2019 - Apr. 2020 (kg):						20.4		

Notes:

1. Samples analyzed by Pace Analytical using their in-house analytical method AM 4.02 Vapors.
2. Vapor results were converted to µg/m^3 and µg/L using unit conversion factors, assuming a temperature of 25 C (+ 273.15 K), and gas constant, 0.08206 l*atm/(mol*K).
3. Estimated mass recovered per reporting period calculated based on monthly influent vapor concentrations and estimated volume of air treated for that reporting period. Influent vapor concentration used for calculation is average of influent vapor concentrations obtained from current and previous monthly vapor sampling event.
4. Volumes of air treated are estimated values based on handheld anemometer readings.

Definitions:

cfm - cubic feet per minute
DCE (total) - Dichloroethene (sum of 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE)
kg - kilograms
kg/day - kilograms per day
L - Liters
ppmv - parts per million by volume
TCE - Trichloroethene
tot - total
µg/L - micrograms per liter
µg/m^3 - micrograms per cubic meter
VC - Vinyl chloride
VOC - Volatile Organic Compounds

Table 6
Cumulative VOC Recovery
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Year(s)	Dissolved Phase		Vapor Phase	
	Estimated Annual Dissolved Phase VOC Recovery (kg)	Cumulative VOC Recovery (kg)	Estimated Annual Vapor Phase VOC Recovery (kg)	Cumulative VOC Recovery (kg)
1998-2000	12.2	12.2	22.4	22.4
2001	0.38	12.6	10.8	33.2
2002	0.77	13.4	5.4	38.6
2003	0.74	14.1	3.8	42.4
2004	0.64	14.8	5.6	48.0
2005	1.63	16.4	16.8	64.8
2006	2.19	18.6	31.9	96.7
2007	5.25	23.8	50.6	147.3
2008	8.35	32.2	60.7	208.0
2009	8.12	40.3	130.3	338.3
2010	1.19	41.5	33.7	372.0
2011	4.79	46.3	47.4	419.4
2012	2.89	49.2	31.7	451.1
2013	0.89	50.1	21.8	472.9
2014	4.66	54.7	27.4	500.3
2015	2.02	56.8	17.2	517.5
2016	0.76	57.5	19.9	537.5
2017	1.04	58.6	21.9	559.4
2018	1.91	60.5	11.2	570.5
2019	0.49	60.9	17.7	588.2
2020 (Through April)	0.21	61.2	6.4	594.6
Cumulative VOCs Recovered through April 2020:		**61.2**		**594.6**

Notes:
1. Due to error in the summary table, the cumulative liquid and vapor phase mass removal values reported for the 2017-2018 reporting period were incorrect. The values shown in the table above have been corrected.

Definitions:
kg - kilograms
VOC - Volatile Organic Compounds

Table 7
Groundwater Elevation Data, June and December 2019
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Well	Measuring Point Elevation (ft amsl)	Date 6/11/2019		Date 12/17/2019	
		DTW (ft)	GW Elevation (ft amsl)	DTW (ft)	GW Elevation (ft amsl)
MW-1	104.12	3.03	101.09	3.32	100.80
MW-2	101.33	5.25	96.08	3.79	97.54
MW-4[(1)]	103.52	4.29	99.23	4.25	99.27
MW-4R	100.98	29.71	71.27	29.91	71.07
MW-5[(1)]	103.31	11.20	92.11	10.26	93.05
MW-6	98.50	3.83	94.67	2.43	96.07
MW-7[(1)]	102.16	11.10	91.06	9.18	92.98
MW-8	99.49	3.09	96.40	3.07	96.42
MW-9	100.29	13.32	86.97	3.51	96.78
MW-10R	98.94	0.10	98.84	0.33	98.61
MW-11[(1)]	99.82	9.81	90.01	10.04	89.78
MW-13	99.86	11.20	88.66	11.61	88.25
MW-14	103.14	5.93	97.21	6.07	97.07
MW-14R	101.80	13.13	88.67	13.16	88.64
MW-15	103.16	4.50	98.66	2.95	100.21
MW-16	99.70	8.63	91.07	4.21	95.49
MW-17	99.92	0.00	99.92	0.50	99.42
MW-19	100.52	8.99	91.53	4.42	96.10
MW-20	101.70	7.45	94.25	6.35	95.35
MW-21	100.34	5.20	95.14	4.73	95.61
MW-22	101.39	7.98	93.41	5.42	95.97
MW-23	100.25	7.05	93.20	5.29	94.96
MW-24	98.22	11.92	86.30	2.51	95.71
MW-25	97.80	3.70	94.10	2.00	95.80
MW-26	98.76	0.00	98.76	0.00	98.76
MW-27	98.80	4.32	94.48	2.44	96.36
MW-28	101.04	3.33	97.71	3.10	97.94
MW-29	101.01	6.13	94.88	2.48	98.53
OW-101	99.84	3.45	96.39	3.57	96.27
OW-102	98.60	1.74	96.86	1.91	96.69
VEROW-1	98.44	10.92	87.52	2.45	95.99
VEROW-2	98.58	0.26	98.32	0.00	98.58

Notes:
1. Monitoring wells MW-4, MW-5, MW-7, and MW-11 underwent repairs in September 2008 which altered their measuring points. This table uses the previous measuring point elevations, as the repairs did not result in significant elevation changes.

Definitions:
DTW - Depth To Water
ft amsl - feet above mean sea level
GW - Groundwater

Table 8
2019 TCE, DCE, and VC Concentrations in Groundwater
ARO Corporation Site
Cheektowaga, New York
NYSDEC Site # 915147

Well ID	Sample Date	TCE (µg/L)	DCE (total) (µg/L)	VC (µg/L)
MW-2	6/13/2019	28,000	5,853.7	ND
	12/18/2019	10,500	2,326.2	ND
MW-6	6/12/2019	1,290	1,383.9	26.3
	6/12/2019 (Duplicate)	1,160	1,212.5	23.0
	12/18/2019	441	1,340.6	36.9
MW-11	6/12/2019	4,700	1,059.6	11.6
	12/18/2019	253	26.1	ND
MW-13	6/12/2019	61,600	10,965.2	ND
	12/18/2019	92,900	9,982.2	42.5J
	12/18/2019 (Duplicate)	76,200	8,920.6	59.8
MW-20	6/13/2019	13.8	25.5	ND
	12/18/2019	64.9	219.53	4.0
MW-22	6/13/2019	192	62.62	ND
	12/18/2019	56.8	15.2	ND
MW-23	6/13/2019	700	532.9	2.9
	12/18/2019	1,710	642	ND
MW-24	6/12/2019	929	486.7	12.5
	12/18/2019	861	249.1	4.6
MW-29	6/13/2019	581	136.2	ND
	12/18/2019	48.6	9.4	ND
RW-11 (MW-3)	6/13/2019	2,280	942.4	208
	12/18/2019	2,940	499.9	63.8

Notes:
1. All concentrations in micrograms per liter (µg/L).

Definitions:
DCE (total) - Dichloroethene (sum of 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE)
J - Estimated value.
ND - Non-Detect, below laboratory detection limits
TCE - Trichloroethene
VC - Vinyl Chloride

FIGURES

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TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

SOURCE: RAY L. SONNENBERGER LAND SURVEYOR, 1997

LEGEND

MW-17	MONITORING WELL	RW-2	RECOVERY WELL
OW-101	OBSERVATION WELL	VEROW-2	MONITORING WELL
PF-3	PNEUMATIC FRACTURING WELL		RECOVERY SYSTEM TRENCH/PIPING

- PROPERTY BOUNDARY
- W — WATER LINE
- NG — NATURAL GAS LINE
- TREATMENT SYSTEM DISCHARGE LINE
- BSA SANITARY SEWER LINE

N

0 80 FT

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

SITE PLAN/REMEDIAL SYSTEM LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

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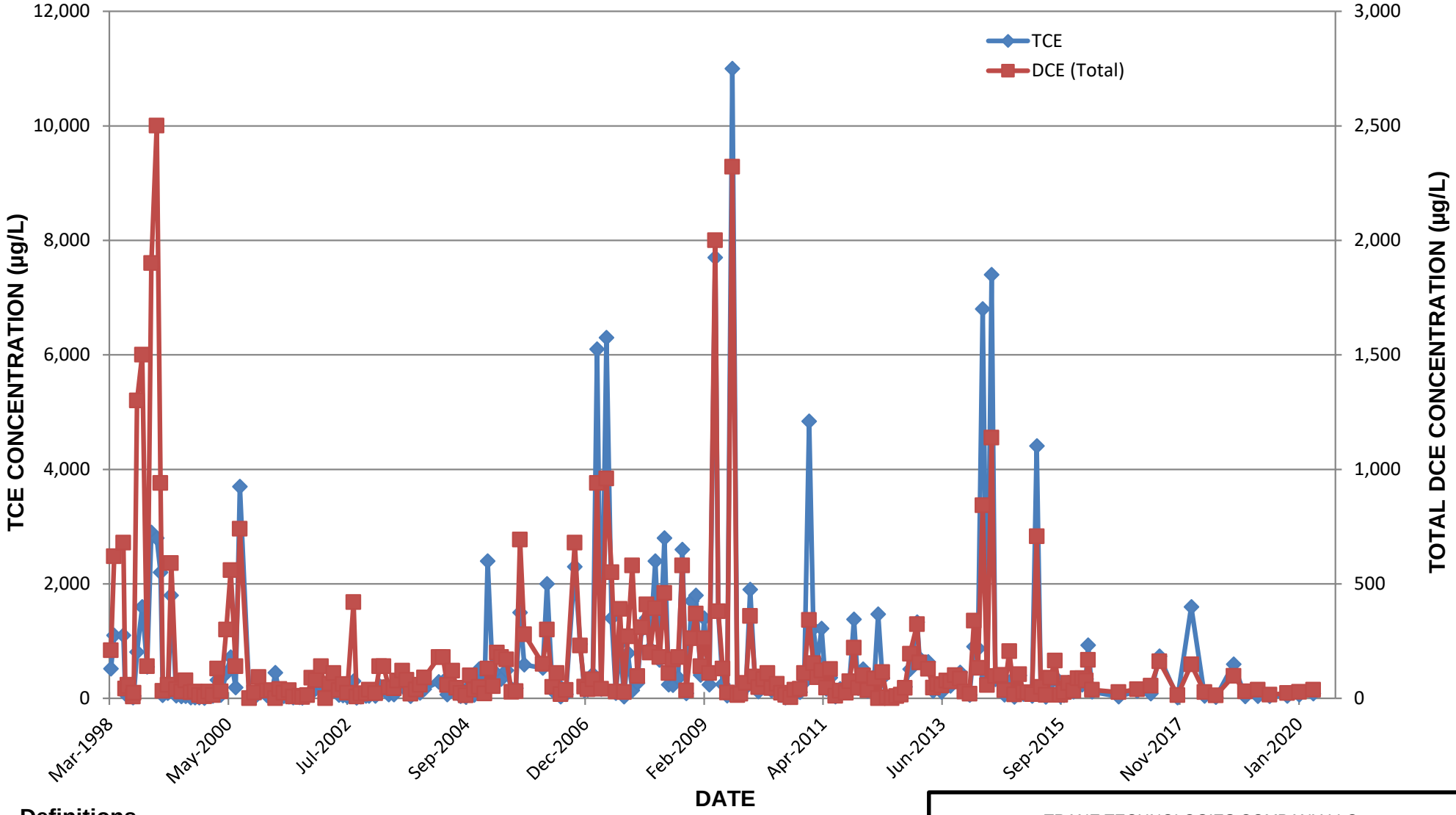


Definitions

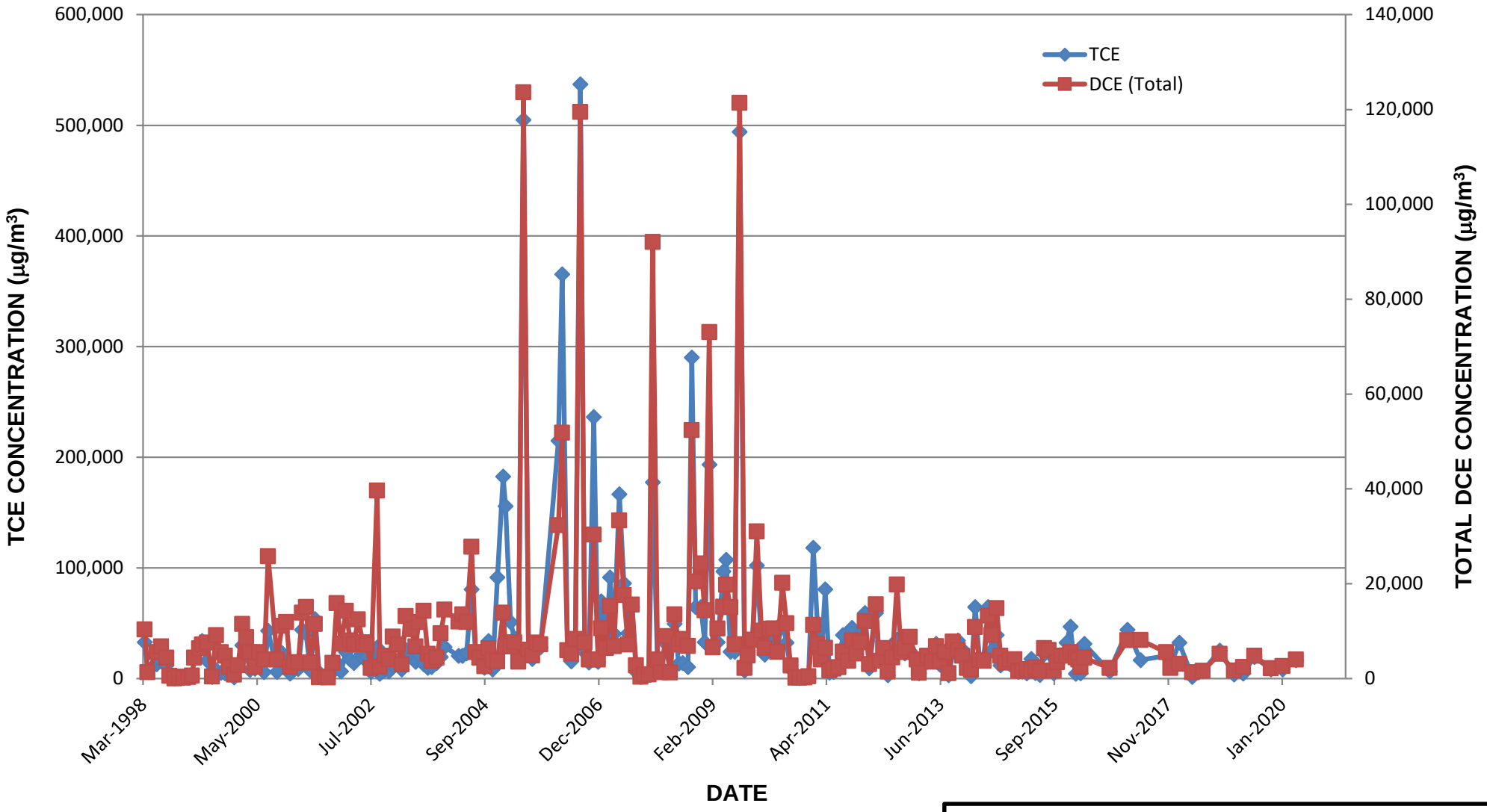
DCE - Dichloroethene
TCE – Trichloroethene
µg/L – microgram per liter

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

System Influent Dissolved-Phase Concentrations (1998 – 2020)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3



Definitions

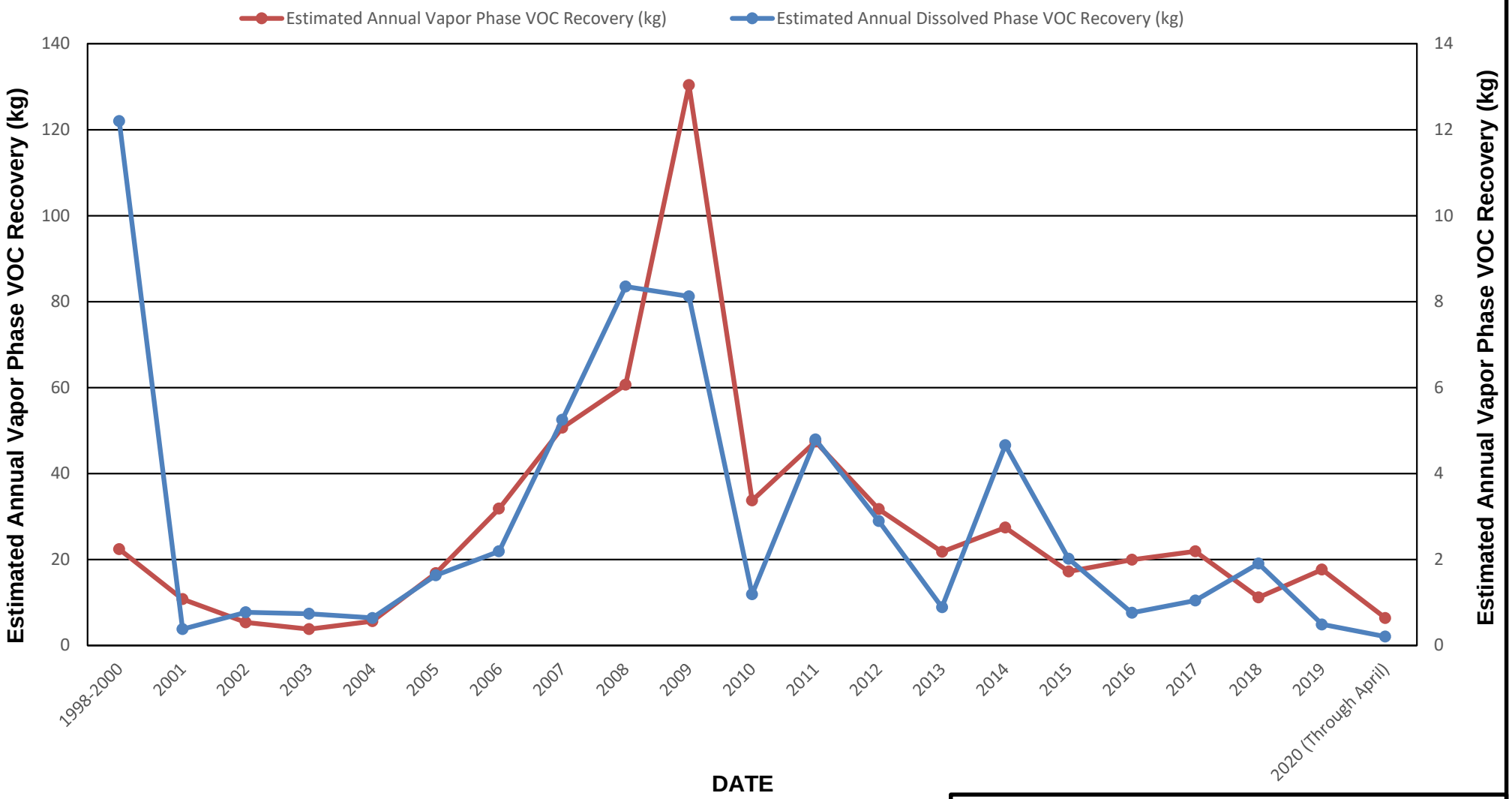
DCE - Dichloroethene
TCE – Trichloroethene
µg/m³ – microgram per cubic meter

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

System Influent Vapor-Phase Concentrations (1998 – 2020)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4



Definitions

kg – kilogram
VOC – Volatile Organic Compound

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

Annual Cumulative VOC Recovery (kg)
(1998 – 2020)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5

BROADWAY

BROADWAY

DRAINAGE DITCH

DRAINAGE DITCH

NIAGARA LOCKPORT AND ONTARIO POWER COMPANY

MW-4 MW-4R MW-5 MW-18 MW-17 MW-1 MW-27 VEROW-2 MW-19 MW-14R MW-14 MW-13 RW-3 MW-11 MW-26 RW-2 MW-6 RW-1A VEROW-1 RW-1 RW-1B OW-103 PF-11 OW-101 PF-5 RW-3 MW-22 RW-4 RW-4A MW-21 OW-102 MW-25 MW-20 PF-9 RW-5 RW-7 MW-24 RW-6 MW-23 MW-10R RW-8 MW-2 PF-7 PF-3 RW-10A RW-10 RW-9 MW-15 RW-11 MW-3R MW-29 RW-9A MW-28 MW-16 MW-7 RW-11B MW-9 MW-8

100 98 96 94 92 90 88 86

FORMER MAIN FACILITY BUILDING
(FLOOR SLAB EXISTING)

METAL PREPARATION ROOM

TREATMENT SYSTEM

MAINTENANCE AND STORAGE BLDG.

NATURAL GAS LINE

6" SEWER LINE

8" SEWER LINE

LEGEND:

- STORMWATER RUNOFF DRAINAGE DITCH
- PROPERTY LINE
- MONITORING WELL
- OBSERVATION WELL
- RECOVERY WELL
- VER OBSERVATION WELL
- FORMER PNEUMATIC FRACTURING WELL
- RECOVERY SYSTEM TRENCH/PIPING
- SUBSURFACE STORM WATER/SANITARY SEWERS
- MANHOLE
- SANITARY SEWER MANHOLE
- DRAINAGE GRATE
- W — WATER
- BU — BURIED UTILITIES
- NG — NATURAL GAS
- 92 — GROUNDWATER ELEVATION CONTOUR (2 FOOT INTERVAL)

NOTES:

1. SOURCE: RAY L. SONNENBERGER LAND SURVEYOR, 1997.
2. FORMER PNEUMATIC FRACTURING WELLS PF-1, PF-2, PF-4, PF-6, PF-8, PF-9, PF-10, PF-11 AND PF-13 CONVERTED TO RECOVERY WELLS, OCTOBER 2013. THESE WELLS HAVE BEEN RE-IDENTIFIED AS RW-1A (FORMER PF-1), RW-1B (FORMER PF-2), RW-10A (FORMER PF-4), RW-3A (FORMER PF-6), RW-9A (FORMER PF-8), RW-4A (FORMER PF-10), RW-11B (FORMER PF-12) AND RW-11A (FORMER PF-13).

0 40' 80'
GRAPHIC SCALE

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

GROUNDWATER CONTOUR MAP JUNE 11, 2019

ARCADIS Design & Consultancy for natural and built assets

FIGURE 6

G:\ACAD\PROJ\R - ARO\00300-FIG-6.dwg LAYOUT: 6 SAVED: 4/24/2020 10:30 AM ACADVER: 23.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/24/2020 10:31 AM BY: MULLINS, JASMINE

XREFS:
00220X00
00220X01

IMAGES:

BROADWAY

MW-4 MW-4R DRAINAGE DITCH MW-5 MW-18 MW-17 MW-1 MW-27 VEROW-2 MW-19 MW-14R MW-14 MW-13 MW-3A MW-11 MW-26 RW-2 MW-6 RW-1A VEROW-1 RW-1 RW-1B OW-103 PF-11 OW-101 PF-5 RW-3 RW-4 MW-22 DRAINAGE DITCH MW-21 OW-102 MW-25 RW-4A MW-20 PF-9 RW-5 RW-7 MW-24 RW-6 MW-23 MW-10R RW-8 MW-2 TREATMENT SYSTEM MW-16 MW-7 PF-7 PF-3 MW-15 RW-10A RW-10 RW-9 MW-3R RW-11 RW-11B MW-29 RW-9A MW-28 MW-9 MW-8

FORMER MAIN FACILITY BUILDING (FLOOR SLAB EXISTING)

METAL PREPARATION ROOM

MAINTENANCE AND STORAGE BLDG.

NIAGARA LOCKPORT AND ONTARIO POWER COMPANY

NATURAL GAS LINE

6" SEWER LINE

8" SEWER LINE

100 98 96 94 86

LEGEND:

- STORMWATER RUNOFF DRAINAGE DITCH
- PROPERTY LINE
- MONITORING WELL
- OBSERVATION WELL
- RECOVERY WELL
- VER OBSERVATION WELL
- FORMER PNEUMATIC FRACTURING WELL
- RECOVERY SYSTEM TRENCH/PIPING
- SUBSURFACE STORM WATER/SANITARY SEWERS
- MANHOLE
- SANITARY SEWER MANHOLE
- DRAINAGE GRATE
- W — WATER
- BU — BURIED UTILITIES
- NG — NATURAL GAS
- 94 — GROUNDWATER ELEVATION CONTOUR (2 FOOT INTERVAL)

NOTES:

1. SOURCE: RAY L. SONNENBERGER LAND SURVEYOR, 1997.
2. FORMER PNEUMATIC FRACTURING WELLS PF-1, PF-2, PF-4, PF-6, PF-8, PF-9, PF-10, PF-11 AND PF-13 CONVERTED TO RECOVERY WELLS, OCTOBER 2013. THESE WELLS HAVE BEEN RE-IDENTIFIED AS RW-1A (FORMER PF-1), RW-1B (FORMER PF-2), RW-10A (FORMER PF-4), RW-3A (FORMER PF-6), RW-9A (FORMER PF-8), RW-4A (FORMER PF-10), RW-11B (FORMER PF-12) AND RW-11A (FORMER PF-13).

0 40' 80'
GRAPHIC SCALE

TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

GROUNDWATER CONTOUR MAP DECEMBER 17, 2019

ARCADIS Design & Consultancy for natural and built assets

FIGURE 7

G:\ACAD\PROJ\R - ARO\00300-FIG-7.dwg LAYOUT: 7 SAVED: 4/24/2020 10:25 AM ACADVER: 23.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/24/2020 10:32 AM BY: MULLINS, JASMINE

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00220X01

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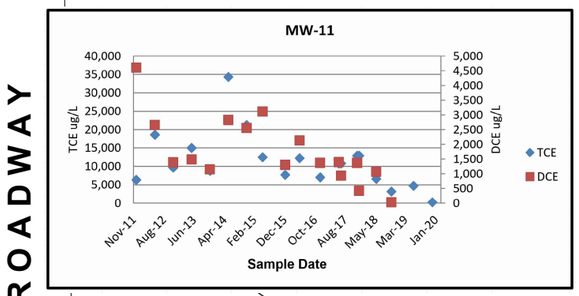
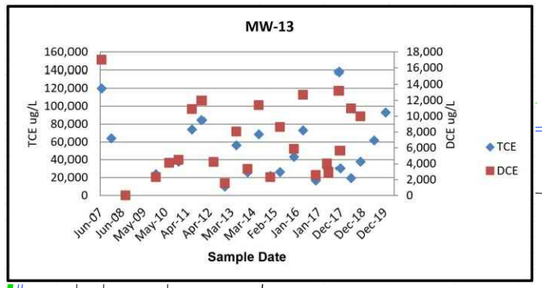




BROADWAY

DRAINAGE DITCH

NIAGARA LOCKPORT AND ONTARIO POWER COMPANY

MW-5

MW-18

MW-17

MW-14R

MW-14

MW-27

VEROW-2

MW-19

MW-1

MW-13

MW-11

RW-3A

MW-26

RW-2

MW-6

RW-1A

VEROW-1

RW-1

OW-103

PF-11

OW-101

PF-5

RW-3

DRAINAGE DITCH

MW-22

RW-4

RW-4A

MW-21

MW-20

PF-9

RW-5

OW-102

MW-25

FORMER MAIN FACILITY BUILDING
(FLOOR SLAB EXISTING)

RW-7

MW-24

RW-6

MW-23

MW-10R

RW-8

MW-2

TREATMENT SYSTEM

MAINTENANCE AND STORAGE BLDG.

METAL PREPARATION ROOM

PF-7

PF-3

MW-16

MW-7

MW-15

RW-10A

RW-10

RW-9

RW-11

MW-3R

MW-29

RW-11A

RW-9A

MW-28

RW-11B

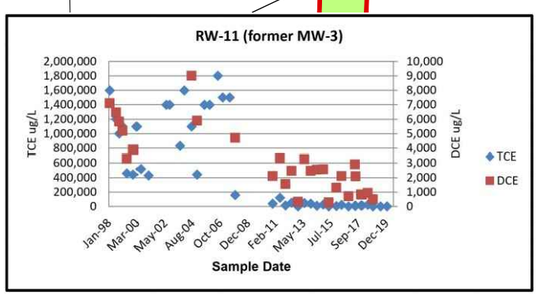
NATURAL GAS LINE

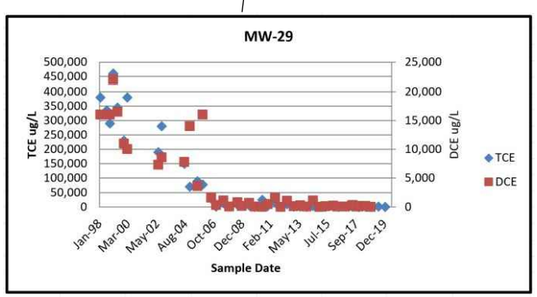
6" SEWER LINE

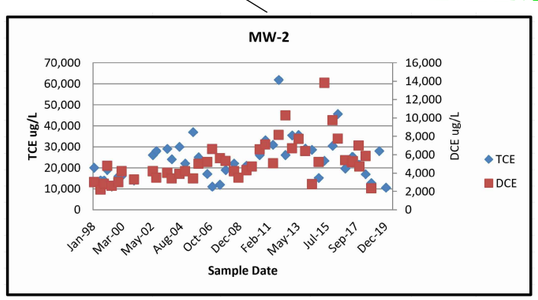
8" SEWER LINE

MW-9

MW-8







LEGEND:

- STORMWATER RUNOFF DRAINAGE DITCH
- PROPERTY LINE
- MONITORING WELL
- OBSERVATION WELL
- RECOVERY WELL
- VER OBSERVATION WELL
- FORMER PNEUMATIC FRACTURING WELL
- RECOVERY SYSTEM TRENCH/PIPING
- SUBSURFACE STORM WATER/SANITARY SEWERS
- MANHOLE
- SANITARY SEWER MANHOLE
- DRAINAGE GRATE
- W — WATER
- BU — BURIED UTILITIES
- NG — NATURAL GAS

NOTES:

1. SOURCE: RAY L. SONNENBERGER LAND SURVEYOR, 1997.
2. FORMER PNEUMATIC FRACTURING WELLS PF-1, PF-2, PF-4, PF-6, PF-8, PF-9, PF-10, PF-11 AND PF-13 CONVERTED TO RECOVERY WELLS, OCTOBER 2013. THESE WELLS HAVE BEEN RE-IDENTIFIED AS RW-1A (FORMER PF-1), RW-1B (FORMER PF-2), RW-10A (FORMER PF-4), RW-3A (FORMER PF-6), RW-9A (FORMER PF-8), RW-4A (FORMER PF-10), RW-11B (FORMER PF-12) AND RW-11A (FORMER PF-13).
3. ANALYTICAL RESULTS OF GROUNDWATER SAMPLES COLLECTED FEBRUARY AND MARCH 1998 REPRESENTS BASELINE GROUNDWATER QUALITY CONDITIONS PRIOR TO START UP OF VER REMEDIAL SYSTEM ON MARCH 11, 1998.

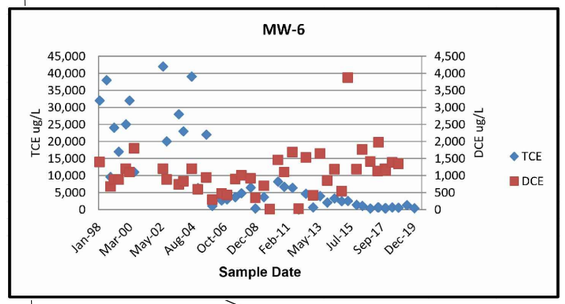
0 40' 80'
GRAPHIC SCALE

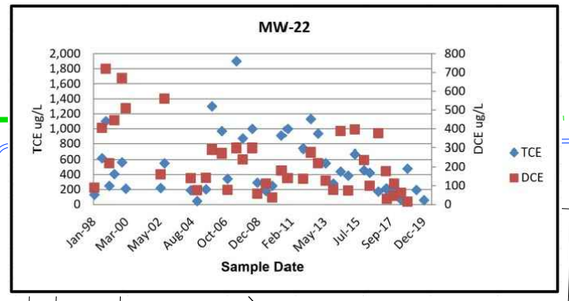
TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

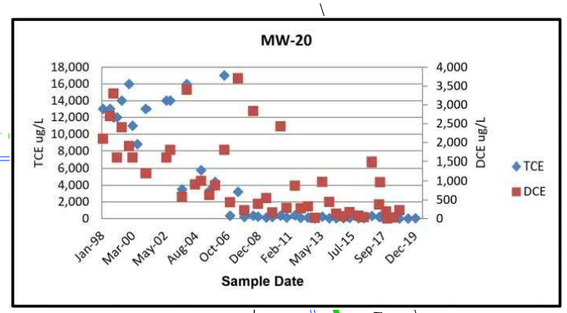
VOC CONCENTRATIONS IN GROUNDWATER (1 of 2)

ARCADIS Design & Consultancy for natural and built assets

FIGURE 8A







BROADWAY

DITCH

AND ONTARIO POWER COMPANY

MW-18

MW-17

MW-1

MW-27

VEROW-2

MW-19

MW-14R

MW-14

RW-1

MW-6

RW-1A

VEROW-1

MW-26

RW-2

MW-13

MW-11

RW-3A

OW-101

RW-3

PF-5

PF-11

OW-103

DRAINAGE DITCH

MW-22

RW-4

RW-4A

MW-21

MW-20

PF-9

RW-5

OW-102

MW-25

RW-7

MW-24

RW-6

FORMER MAIN FACILITY BUILDING
(FLOOR SLAB EXISTING)

MW-10R

RW-8

MW-2

TREATMENT SYSTEM

MAINTENANCE AND STORAGE BLDG.

MW-23

MW-16

MW-7

METAL PREPARATION ROOM

PF-7

PF-3

MW-15

RW-10A

RW-10

RW-9

RW-11

RW-11A

MW-3R

MW-29

RW-9A

RW-11B

MW-28

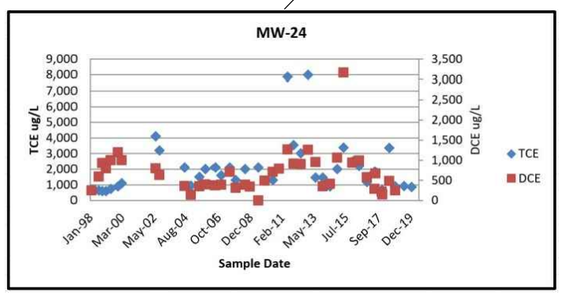
NATURAL GAS LINE

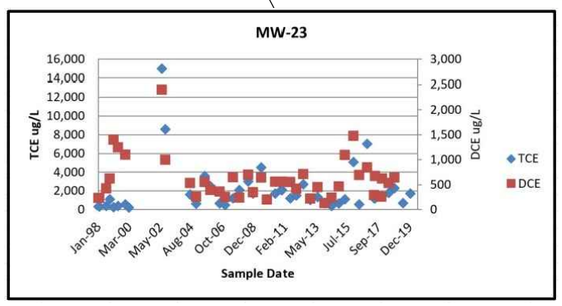
6" SEWER LINE

8" SEWER LINE

MW-9

MW-8





LEGEND:

- STORMWATER RUNOFF DRAINAGE DITCH
- PROPERTY LINE
- MONITORING WELL
- OBSERVATION WELL
- RECOVERY WELL
- VER OBSERVATION WELL
- FORMER PNEUMATIC FRACTURING WELL
- RECOVERY SYSTEM TRENCH/PIPING
- SUBSURFACE STORM WATER/SANITARY SEWERS
- MANHOLE
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- DRAINAGE GRATE
- W — WATER
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NOTES:

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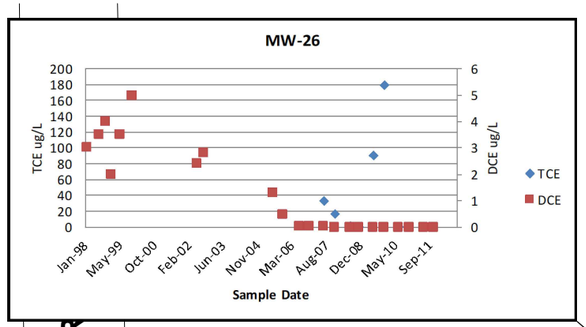
0 40' 80'
GRAPHIC SCALE

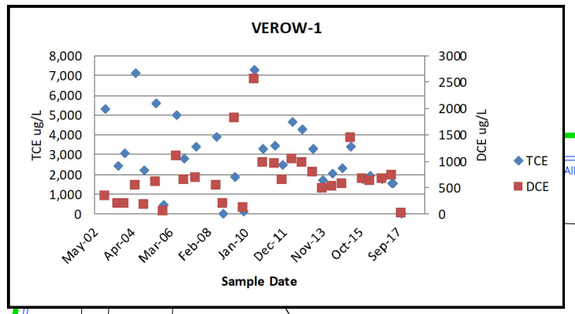
TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

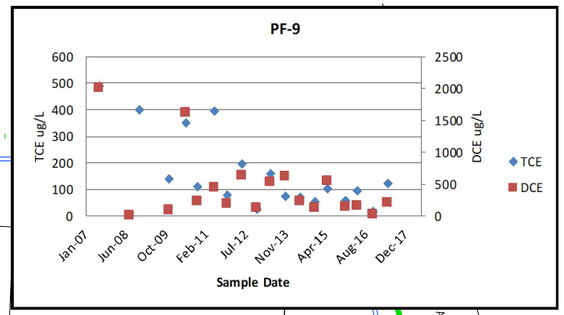
VOC CONCENTRATIONS IN GROUNDWATER (2 of 2)

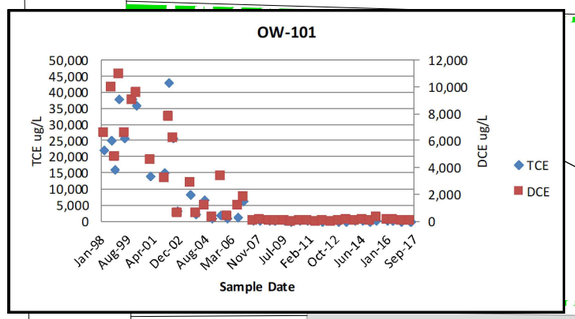
ARCADIS Design & Consultancy for natural and built assets

FIGURE 8B









LEGEND:

- STORMWATER RUNOFF DRAINAGE DITCH
- PROPERTY LINE
- MONITORING WELL
- OBSERVATION WELL
- RECOVERY WELL
- VER OBSERVATION WELL
- FORMER PNEUMATIC FRACTURING WELL
- RECOVERY SYSTEM TRENCH/PIPING
- SUBSURFACE STORM WATER/SANITARY SEWERS
- MANHOLE
- SANITARY SEWER MANHOLE
- DRAINAGE GRATE
- W — WATER
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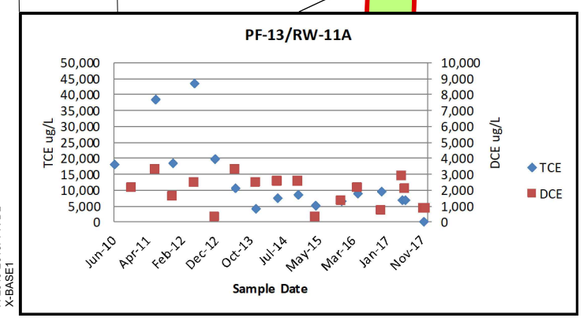
0 40' 80'
GRAPHIC SCALE



TRANE TECHNOLOGIES COMPANY LLC
ARO CORPORATION SITE
CHEEKTOWAGA, NEW YORK

HISTORICAL VOC CONCENTRATIONS IN GROUNDWATER IN SELECT WELLS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 9

APPENDIX A

Institutional Controls and Engineering Controls Certifications

Enclosure 2
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. **915147**

Site Name ARO Corporation

Site Address: 3695 Broadway Zip Code: 14227
City/Town: Cheektowaga
County: Erie
Site Acreage: ~~1.000~~ The three parcels listed below total 8.8 Acres

Reporting Period: May 14, 2019 to May 14, 2020

	YES	NO
1. Is the information above correct?	☐	X
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	X
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	X
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	X
If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.		
5. Is the site currently undergoing development?	☐	X

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below? Industrial	X	☐
7. Are all ICs/ECs in place and functioning as designed?	X	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

Signature of Owner, Remedial Party or Designated Representative Date

SITE NO. 915147 **Box 3**

Description of Institutional Controls

Parcel	Owner	Institutional Control
103.17-1-17	~~Ingersoll-Rand Company~~ Trane Technologies Company LLC (formerly Ingersoll Rand Company)	A long term Operation, Monitoring and Maintenance Plan is in place in accordance with the March 1995 Record of Decision (ROD). The OM and M Plan includes periodic sampling of the groundwater and monitoring of the Vacuum Enhanced Recovery System (Extraction System, Vapor Treatment System, and Liquid Treatment System).
103.17-1-18	~~Ingersoll-Rand Company~~ Trane Technologies Company LLC (formerly Ingersoll Rand Company)	A long term Operation, Monitoring and Maintenance Plan is in place in accordance with the March 1995 Record of Decision (ROD). The OM and M Plan includes periodic sampling of the groundwater and monitoring of the Vacuum Enhanced Recovery System (Extraction System, Vapor Treatment System, and Liquid Treatment System).
103.17-1-19	~~Ingersoll-Rand Company~~ Trane Technologies Company LLC (formerly Ingersoll Rand Company)	A long term Operation, Monitoring and Maintenance Plan is in place in accordance with the March 1995 Record of Decision (ROD). The OM and M Plan includes periodic sampling of the groundwater and monitoring of the Vacuum Enhanced Recovery System (Extraction System, Vapor Treatment System, and Liquid Treatment System).

Box 4

Description of Engineering Controls

Parcel	Engineering Control
103.17-1-17	Groundwater Treatment System Vapor Mitigation
103.17-1-18	Groundwater Treatment System Vapor Mitigation
103.17-1-19	Groundwater Treatment System Vapor Mitigation

Box 5

Periodic Review Report (PRR) Certification Statements

1. I certify by checking "YES" below that:

   a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

   b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

YES	NO
X	☐

2. If this site has an IC/EC Plan (or equivalent as required in the Decision Document), for each Institutional or Engineering control listed in Boxes 3 and/or 4, I certify by checking "YES" below that all of the following statements are true:

   (a) the Institutional Control and/or Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

   (b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

   (c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

   (d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

   (e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
X	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

_____ _____

Signature of Owner, Remedial Party or Designated Representative | Date

IC CERTIFICATIONS
SITE NO. 915147

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Todd Carignan (print name) at 855 Route 146, Suite 210, Clifton Park, NY 12065 (print business address),

am certifying as Remedial Party (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification

5/29/2020
Date

IC/EC CERTIFICATIONS

Box 7

Professional Engineer Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Moh Mohiuddin (print name) at 50 Millstone Rd, East Windsor, NJ 08520 (print business address),

am certifying as a Professional Engineer for the Remedial Party (Owner or Remedial Party)

Signature of Professional Engineer, for the Owner or Remedial Party, Rendering Certification

Stamp (Required for PE)

05/27/2020
Date

APPENDIX B

Groundwater Sampling and Purge Logs

ARCADIS | Design & Consultancy for natural and built assets

Water Level Record

Project Ingersoll-ARO

Date 6/11/2019

Technician JB/MK

Well (s)	Depth to Water (ft)	Total Depth	Time	MP (PVC)	Remarks Vacuum on/off
MW-1	3.03	28.48		Top of M.P. fitting	—
MW-2	4.80	21.28			HB
MW-3	—	—			—
MW-3R	24.20	44.14			HB
MW-4	4.29	18.90			SB
MW-4R	~~30.71~~ 29.71	32.91			HB
MW-5	11.20	26.87			SB
MW-6	~~DRY~~ DRY				
MW-7	11.10	22.51			HB
MW-8	3.29	17.54			HB
MW-9	13.32	24.83			
MW-10R	0.10	16.38			SB Sediment
MW-11	6.08	12.18			SB
MW-13	6.22	23.41			SB
MW-14	5.93	23.20			HB
MW-14R	13.13	43.60			HB
MW-15	4.50				
MW-16	8.63	23.28			HB
MW-17	0.00	23.63			Above Top of Well HB
~~MW-18~~	Obstruction				
MW-19	8.99	~~26.5~~ 24.5			SB
MW-20	7.63	24.61			SB
MW-21	~~6~~ 5.20	15.50			SB
MW-22	9.62	20.89			SB
MW-23	10.02	19.48			HB
MW-24	11.75	17.53			HB
MW-25	3.70	12.10			HB
MW-26	Surface				
MW-27	4.32	16.~~8~~15			~~SB~~ HB
MW-28	3.33	16.64			HB
MW-29	12.48	18.32			SB
OW-101	3.45	6.20			
OW-102	1.74	4.64			
OW-103	~~DRY~~	~~4.84~~			Could not access
VEROW-1	10.92	12.46			SB
VEROW-2	0.26	13.70			SB

ARCADIS

Water Level Record

Project Ingersoll-ARO

Date 6/11/2019
Technician JB/MK

Well (s)	Depth to Water (ft)	Total Depth (ft)	Time	MP (PVC)	Remarks Vacuum on/off
RW-1A/PF-1	~~13.59~~	19.43			
RW-1B/PF-2	13.53	~~18.53~~ 18.61			
PF-3	9.91	19.00			SB
RW-10A/PF-4	12.00	19.28			HB
PF-5	6.62	19.14			
RW-3A/PF-6	5.50	18.88			HB
PF-7	—	—			Stuck Closed
RW-9A/PF-8	17.70	19.24			SB
PF-9	5.33	18.83			SB
RW-4A/PF-10	8.80	19.68			HB
PF-11	10.41	17.61			
RW-11B/PF-12	13.65	19.32			HB
RW-11A/PF-13	11.84	19.32			HB
RW-11	17.43	24.34			HB
RW-1	~~11.58~~ 11.58	~~11.58~~ 19.12			
RW-2	2.01	17.90			HB
RW-3	4.88	19.10			
RW-4	9.20	17.95			HB
RW-5	~~6.62~~ 6.34	16.31			On HB
RW-6	19.44	20.75			On
RW-7	13.19	18.50			HB
RW-8	2.70	19.63			SB
RW-9	18.69	19.48			HB
RW-10	11.53	22.19			HB

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-13-19

Site/Well No.: MW-2 Replicate No.: —

Weather: 60° rain Sampling Time: Begin 1325 End 1455

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	21.17
Depth to Water (ft bmp)	5.25
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	15.92
Casing Diameter	2"
Gallons in Well	2.5
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin ____ End ____

Field Parameters

Color: Clear

Odor: none

Appearance: —

	1	1V	2V	3V
pH (s.u.)	9.07	7.58	7.39	7.35
Conductivity (mS/cm)	0.85	0.80	0.79	0.73
Conductivity (µmhos/cm)	~~13.1~~			
Temperature (°C)	13.1	13.3	12.1	12.1
DO (mg/L)	2.44	2.57	2.65	2.72
Turbidity (NTU)	~~1330/94~~	19.8	12.7	9.67
Time	1330	1355	1425	1455
DTW (ft bmp)	5.25	9.48	13.90	15.20
ORP	73.8	61.3	56.9	64.1

Remarks:

Water Quality Meter: YSI Pro DDS

System On/Off: ~~SP~~ on

Initial Purge: —

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Page 1 of

Project Ingersol Rand - ARO Project No. 30220.0025 Date 6-12-19

Site Location 3695 Broadway, Cheektowaga, NY

Site/Well No. MW-6 Replicate No. DUP-01-20190612

Weather Clear Sunny 75° Sampling Time: Begin 15:20 End 15:30 Sample Time

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	14.14
Depth to Water (ft bmp)	3.83
Depth to Packer (ft bmp)	–
Water Column in Well (ft)	10.31
Casing Diameter	2"
Gallons in Well	1.65
Gallons Pumped/Bailed Prior to Sampling	5 bail
Sample Pump Intake Setting (ft bmp)	–
Packer Pressure (psi)	–
Pumping Rate (ml/min)	–
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 15:00 End 15:20

Field Parameters

Color: Lt Brown

Odor: None

Appearance: Turbid

	I	1V	2V	3V
pH (s.u.)	7.45	7.52	7.49	7.20
Conductivity (mS/cm)	0.71	0.78	1.02	1.07
Conductivity (µmhos/cm)				
Temperature (°C)	57.4	57.1	56.6	57.9
DO (mg/L)	6.30	6.80	5.22	3.75
Turbidity (NTU)	192	>1000	>1000	>1000
Time	15:00	15:10	15:15	15:20
DTW (ft bmp)	3.83	3.65	3.83	4.00
ORP	132.6	112.0	91.2	86.3

Remarks:
Water Quality Meter: YSI Pro Plus
System On/Off: On
Initial Purge: Turbid

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: 40000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-12-19

Site/Well No.: MW-11 Replicate No.: —

Weather: 75-80° Sunny Sampling Time: Begin 1424 End 1500

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	@ 12.19
Depth to Water (ft bmp)	9.81
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	3.10
Casing Diameter	2"
Gallons in Well	.496
Gallons Pumped/Bailed Prior to Sampling	-
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1430 End 1500

Field Parameters

Color: Clear

Odor: None

Appearance: -

	1	.5 1V	1.0 2V	1.5 3V
pH (s.u.)	7.67	7.81	7.85	7.86
Conductivity (mS/cm)	0.453	0.382	0.396	.509
(µmhos/cm)				
Temperature (°C)	15.8	13.6	12.66	7.86
DO (mg/L)	8.55	8.03	7.49	6.31
Turbidity (NTU)	507	68.22	489.66	468.92
Time	1435	1440	1445	1450
DTW (ft bmp)	10.04	10.29	0.51	11.66
ORP	173.8	189.7	201.4	213.2

Remarks:

Water Quality Meter: ~~PID~~ YSI DO's

System On/Off:

Initial Purge: Clear

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

Δ Sampled @ 1451

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Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.0215 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-12-19

Site/Well No.: MW-13 Replicate No.: —

Weather: 75-80° Sunny Sampling Time: Begin 1505 End 1533

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	23.45
Depth to Water (ft bmp)	11.20
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	12.25
Casing Diameter	2"
Gallons in Well	1.96
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1420 / 1506 End 1520

Field Parameters

Color: Clear

Odor: None

Appearance: —

	1	2 1V	4 2V	6 3V
pH (s.u.)	7.87	7.73	7.97	7.85
Conductivity (mS/cm)	0.425	0.641	0.651	0.696
Conductivity (µmhos/cm)				
Temperature (°C)	14.4	12.6	12.5	12.1
DO (mg/L)	5.71	5.02	4.24	3.66
Turbidity (NTU)	43.57	62.22	424.49	223.84
Time	1508	1513	1521	1528
DTW (ft bmp)	11.20	13.63	15.60	17.31
ORP	185.1	218.7	216.8	202.1

Remarks:
- Water Quality Meter: 65450 PID PDS
- System On/Off: On
- Initial Purge: —

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

* Sampled @ 1530

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-13-19

Site/Well No.: MW-20 Replicate No.: -

Weather: 60°, rain Sampling Time: Begin 1105 End 1135

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	24.60
Depth to Water (ft bmp)	~~20~~ 7.45
Depth to Packer (ft bmp)	-
Water Column in Well (ft)	17.15
Casing Diameter	2"
Gallons in Well	2.74
Gallons Pumped/Bailed Prior to Sampling	-
Sample Pump Intake Setting (ft bmp)	-
Packer Pressure (psi)	-
Pumping Rate (ml/min)	-
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1108 End 1125

Field Parameters

Color: Clear

Odor: None

Appearance: -

	I	1V	2V	3V
pH (s.u.)	7.47	7.32	7.40	7.43
Conductivity (mS/cm)	0.704	0.738	0.746	0.748
(µmhos/cm)				
Temperature (°C)	12.0	10.2	10.4	10.3
DO (mg/L)	4.50	4.09	4.73	4.64
Turbidity (NTU)	42.06	23.35	50.8	61.4
Time	1108	~~1115~~	1120	~~1125~~ 1125
DTW (ft bmp)	7.45	10.75	12.92	13.91
ORP	171.4	171.9	173.9	172.8

Remarks:

Water Quality Meter: YSI Pro DDS

System On/Off: On

Initial Purge: -

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

Sample 1130

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Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-13-19

Site/Well No.: MW-22 Replicate No.: —

Weather: 60°. rain Sampling Time: Begin 1140 End 1210

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	20.86
Depth to Water (ft bmp)	7.98
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	12.88
Casing Diameter	2"
Gallons in Well	2.06
Gallons Pumped/Bailed Prior to Sampling	-
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Paristeltic Pump
Sampling Method	Paristeltic Pump
Purge Time	Begin 1140 End 1210

Field Parameters

Color: Clear

Odor: none

Appearance: -

	I	1V	2V	3V
pH (s.u.)	7.34	7.31	7.26	7.39
Conductivity (mS/cm)	0.889	0.834	0.845	0.848
(µmhos/cm)				
Temperature (°C)	11.7	10.7	10.5	10.6
DO (mg/L)	5.84	6.67	6.83	6.30
Turbidity (NTU)	298.2	754.41	1444.91	2324.66
Time	1145	1151	1158	1205
DTW (ft bmp)	7.98	9.71	10.31	11.68
ORP	179.3	183.7	191.7	189.7

Remarks:
Water Quality Meter: YSI Pro DDS
System On/Off: On
Initial Purge: -

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-13-19

Site/Well No.: MW-23 Replicate No.: -

Weather: 60°, rain Sampling Time: Begin 1030 End 1100

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	19.04
Depth to Water (ft bmp)	7.05
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	11.99
Casing Diameter	2
Gallons in Well	1.91
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin ____ End ____

Field Parameters

Color: Clear

Odor: None

Appearance: -

	1	2 1V	4 2V	6 3V
pH (s.u.)	8.03	7.63	7.48	7.33
Conductivity (mS/cm)	0.785	0.760	0.768	.863
(µmhos/cm)				
Temperature (°C)	12.80	11.0	10.3	11.8
DO (mg/L)	6.80	6.86	6.56	4.83
Turbidity (NTU)	1.07	154.4	1304.79	456.1
Time	1036	1039	1042	1050
DTW (ft bmp)	7.05	9.14	9.99	10.43
ORP	164.4	153.1	157.5	160.3

Remarks:

Water Quality Meter: YSI Pro DSS

System On/Off: On

Initial Purge: -

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

4 - Sampled @ 1050

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Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-12-19

Site/Well No.: MW-24 Replicate No.: —

Weather: 75-80° Sunny Sampling Time: Begin 1342 1442 End 1512

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	17.57
Depth to Water (ft bmp)	11.92
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	5.65
Casing Diameter	2"
Gallons in Well	.90
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1447 End 1512

Field Parameters

Color: Clear

Odor: None

Appearance: —

	1	1V	2V	3V
pH (s.u.)	7.44	7.45	7.36	7.33
Conductivity (mS/cm)	0.867	0.934	0.911	0.913
(µmhos/cm)				
Temperature (°C)	14.1	12.7	13.0	15.7
DO (mg/L)	6.61	5.00	5.67	5.82
Turbidity (NTU)	315.69	176.70	45.50	10.17
Time	1447	1453	1459	1512
DTW (ft bmp)	11.92	13.75	13.96	15.38
ORP	181.9	198.5	265.0	226.7

Remarks:

Water Quality Meter: ~~Pro DT~~ YSI Pro DSS

System On/Off: On

Initial Purge: —

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

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Water Sampling Log

Project: Ingersol Rand - ARO Project No.: A4000220.0025 Page: 1 of 1

Site Location: 3695 Broadway, Cheektowaga, NY Date: 6-12-19

Site/Well No.: MW-29 Replicate No.: -

Weather: 70-80° Sunny Sampling Time: Begin 1346 End 1415

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	18.3
Depth to Water (ft bmp)	6.13
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	12.17
Casing Diameter	2"
Gallons in Well	1.9
Gallons Pumped/Bailed Prior to Sampling	-
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1345 End 1400

Field Parameters

Color: Clear

Odor: None

Appearance: -

	I	1V	2V	3V
pH (s.u.)	7.79	7.67	7.48	7.41
Conductivity (mS/cm)	0.507	0.747	0.730	0.733
Conductivity (µmhos/cm)				
Temperature (°C)	14.0	12.0	11.2	11.4
DO (mg/L)	8.06	7.33	7.22	7.34
Turbidity (NTU)	634.1	670.4	841.6	216.0
Time	1345	1350	1356	1403
DTW (ft bmp)	6.13	6.71	6.80	6.92
ORP	224.6	215.1	214.1	216.5

Remarks:

Water Quality Meter: YSI Pro DDS

System On/Off: On

Initial Purge:

Constituents Sampled: See COC Sampling Personnel: JB/MK

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

Sample @ 1405

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Water Level Record

Project Ingersoll-ARO

Date 12/17/19
Technician ST JB

Well (s)	Depth to Water (ft)	Total Depth (ft) from 6/11/19	Time	MP (PVC)	Remarks Vacuum on/off
MW-1	3.32	28.48		✓	
MW-2 ✓	3.79	21.28	1150	✓	
MW-3	—	—	—	—	
MW-3R	—	21.24		✓	
MW-4	4.25	18.90	1230	✓	
MW-4R	29.91	32.91	1231	✓	
MW-5	10.26	26.87	1245	✓	
MW-6 ✓	2.43	14.14	1325		PFOA
MW-7	9.18	22.51		✓	
MW-8	3.07	17.54	1208	✓	
MW-9	3.51	24.83	1200	✓	
MW-10R	— 0.33	~~16.38~~	—	—	~~Could not access~~
MW-11 ✓	10.04	12.18	1300	✓	
MW-13 ✓	11.61	23.41	1302	✓	
MW-14	6.07	23.20	1240	✓	
MW-14R	13.16	43.60		✓	
MW-15	2.95			✓	PFOA
MW-16	4.21	23.28		✓	
MW-17	0.50	23.63	1315	✓	water in well box removed
MW-18	Obstruction	—	—	✓	
MW-19	4.42	24.50		✓	~~Hit?~~ Through Metal Hole
MW-20 ✓	6.35	24.61		✓	
MW-21	4.73	15.50		✓	
MW-22 ✓	5.42	20.89		✓	
MW-23 ✓	5.29	19.48		✓	
MW-24 ✓	2.51	17.53		✓	
MW-25	2.00	12.10		✓	
MW-26 0.00	above TOC in well box	J-plug off			→
MW-27	2.44	16.15	1250	✓	
MW-28	3.10	18.84	1155	✓	
MW-29 ✓	2.48	18.32	1204	✓	
OW-101	3.57	6.20	1304	✓	
OW-102	1.91	4.64	1322	✓	
OW-103	—	—	—	—	Could not access
VEROW-1	2.45	12.46			
VEROW-2	water above TOC in	~~13.70~~			→

0.00 well box, J-plug off

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Water Level Record

Project: Ingersoll-ARO

Well (s)	Depth to Water (ft)	Total Depth (ft) from 6/11/19	Time	MP (PVC)	Remarks Vacuum on/off
RW-1A/PF-1	2.16	19.43			
RW-1B/PF-2	2.13	18.61			
PF-3	6.26	19.00			
RW-10A/PF-4	6.50	19.28			
PF-5	8.83	19.14			on
RW-3A/PF-6	7.99	18.88			
PF-7	—	—	—		on Couldn't access Lid Stuck
RW-9A/PF-8	8.09	19.24			
PF-9	3.96	18.83			
RW-4A/PF-10	3.96	19.68			on
PF-11	2.53	17.61			
RW-1	2.00	19.32			
RW-2	1.98	19.32			on
RW-3	6.43	24.34			on
RW-4	14.40	19.12			on
RW-5	3.23	17.90			on
RW-6	2.45	19.10			
RW-7	2.60	17.95			
RW-8	2.21	16.31			
RW-9	4.27	20.75			
RW-10	~~6.50~~ 5.72	18.50			on
RW-11 ✓	5.06	19.63			Change Name on Well Lid
RW-11A/PF-13	4.60	19.48			
RW-11B/PF-12	4.24	22.19			

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO | Project No.: AY000220.0027.5 | Page: 1 of

Site Location: Broadway, Cheektowaga, NY | Date: 12/18/19

Site/Well No.: MW-2 | Replicate No.: —

Weather: — | Sampling Time: Begin — End ~~13:20~~ 13:45

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	21.28
Depth to Water (ft bmp)	3.79
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	17.49
Casing Diameter	2"
Gallons in Well	2.79
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer/peristaltic pump
Sampling Method	Bailer/peristaltic pump
Purge Time	Begin — End —

Field Parameters

Color: Clear

Odor: None

Appearance: —

	I	1V	2V	3V
pH (s.u.)	7.16	7.49	7.16	7.32
Conductivity (mS/cm)	0.793	0.759	.761	0.754
Conductivity (µmhos/cm)				
Temperature (°C)	7.2	7.3	8.0	8.2
DO (mg/L)	3.26	4.49	3.51	4.12
Turbidity (NTU)	9.17	0.66	1.94	1.74
Time	12:30	12:55	13:15	13:30
DTW (ft bmp)				
ORP	146.6	153.2	141.4	146.3

Remarks:

Water Quality Meter: YSI DSS Pro

System On/Off:

Initial Purge:

Constituents Sampled: See COC | Sampling Personnel: JB

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.0027.5 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: MW-6 Replicate No.: —

Weather: Clear, 24' Sampling Time: Begin 1020 End 1045 1045

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	14.14
Depth to Water (ft bmp)	2.43
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	11.71
Casing Diameter	2"
Gallons in Well	1.87
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time Begin	End

Field Parameters

Color	Cloudy
Odor	N/a
Appearance	Slightly turbid

	1	1V	2V	3V
pH (s.u.)	7.55	7.22	7.23	7.11
Conductivity (mS/cm)	447.5	787	932	1044
Conductivity (µmhos/cm)				
Temperature (°C)	7.7	9.4	8.6	9.7
DO (mg/L)	7.19	4.91	3.87	2.69
Turbidity (NTU)	54	1131 NU	1264 NU	1498 NU
Time	1020	1025	1035	1042
DTW (ft bmp)	2.78	2.80	2.82	
ORP	123.3	125.0	124.7	120.0

Remarks:
Water Quality Meter: YSI DSS Pro
System On/Off:
Initial Purge:

Constituents Sampled: See COC Sampling Personnel: ST/JR

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO | Project No.: AY000220.0022.5 | Page: 1 of

Site Location: Broadway, Cheektowaga, NY | Date: 12/18/19

Site/Well No.: MW-11 | Replicate No.: —

Weather: Clear 24° | Sampling Time: Begin 0840 (1020) End Sampled @ 1000

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	12.18
Depth to Water (ft bmp)	10.04
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	2.14
Casing Diameter	2"
Gallons in Well	0.34
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 0840 End ____

Field Parameters

Color: cloudy brown

Odor: none

Appearance: Turbid

	1	1V	2V	3V
pH (s.u.)	7.01	8.34		
Conductivity (mS/cm)	4.2	4.6		
(µmhos/cm)				
Temperature (°C)	8.9	6.7		
DO (mg/L)	7.24	9.72		
Turbidity (NTU)	2867 AU	4092 AU		
Time	0844	0855		
DTW (ft bmp)		11.81	DRY →	
ORP	194.4	199.1		

*Return to collect sample @ 1000

Remarks:
Water Quality Meter: YSI DSS Pro
System On/Off:
Initial Purge:

Constituents Sampled: See COC | Sampling Personnel: ST/JB

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

1

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.00225 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: MW-13 Replicate No.: DUP-01-20191218

Weather: Clear, 24° Sampling Time: Begin 0906 End 0938 (0938)

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	23.41
Depth to Water (ft bmp)	11.61
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	11.80
Casing Diameter	2"
Gallons in Well	1.88
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 0906 End 0938

Field Parameters

Color: N/A

Odor:

Appearance: Slightly turbid

	I	1V	2V	3V
pH (s.u.)	7.98	7.76	7.66	7.58
Conductivity (mS/cm)	361.8	654	697	700
Conductivity (µmhos/cm)				
Temperature (°C)	11.0	12.8	12.5	13.0
DO (mg/L)	3.41	2.97	3.54	3.15
Turbidity (NTU)	105.2	2429 AU	5268 AU	3384 AU
Time	0907	0916	0925	0935
DTW (ft bmp)	16.44	18.08	19.22	20.58
ORP	168.0	152.8	139.1	86.5

Remarks:
Water Quality Meter: YSI DSS Pro
System On/Off:
Initial Purge:

Constituents Sampled: See COC Sampling Personnel: ST/JB

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.00225 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: MW-20 Replicate No.:

Weather: Sampling Time: Begin: End: 10:15

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	24.61
Depth to Water (ft bmp)	6.35
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	18.26
Casing Diameter	2"
Gallons in Well	2.92
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time Begin / End	

Field Parameters

Color: Clear

Odor: None

Appearance: —

	I	1V	2V	3V
pH (s.u.)	7.66	7.11	7.18	7.01
Conductivity (mS/cm)	~~0.827~~ 5.34	0.822	0.836	0.840
(µmhos/cm)				
Temperature (°C)	7.1	10.0	9.5	9.6
DO (mg/L)	5.09 ~~20.1~~	3.28	3.97	2.87
Turbidity (NTU)	20.4	108	695.0	160
Time	9:38	9:46	9:55	10:05
DTW (ft bmp)				
ORP	165.3	161.4	156.8	148.0

Remarks:
Water Quality Meter: YSI DSJ Pro
System On/Off:
Initial Purge:

Constituents Sampled: See COC Sampling Personnel: JB

Well Casing Volumes

Gal./Ft.	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.0027.5 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: MW-22 Replicate No.: —

Weather: Cold 20° + Snow Sampling Time: Begin: — End: 9:25

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	20.89
Depth to Water (ft bmp)	5.42
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	15.47
Casing Diameter	2"
Gallons in Well	2.48
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer/peristaltic pump
Sampling Method	Bailer/peristaltic pump
Purge Time	Begin: — End: —

Field Parameters

Color: Lt Brown

Odor: None

Appearance: Slightly Turbid

	I	1V	2V	3V
pH (s.u.)	6.96	6.97	7.07	6.8
Conductivity (mS/cm)	0.992	0.925	0.902	N.O.E3
Conductivity (µmhos/cm)				
Temperature (°C)	6.5	7.9	7.3	6.3
DO (mg/L)	3.03	2.97	3.27	4.13
Turbidity (NTU)	143	175	200	467
Time	8:57	9:02	9:12	9:17
DTW (ft bmp)	7.23	7.56	7.93	8.27
ORP	150	160	160	161.4

Remarks:

Water Quality Meter: YST DSS Pro

System On/Off:

Initial Purge:

Constituents Sampled: See COC Sampling Personnel: T. Baker

Well Casing Volumes

Gal./Ft.				
	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO | Project No.: AY000220.0025 | Page: 1 of

Site Location: Broadway, Cheektowaga, NY | Date: 12/18/19

Site/Well No.: MW-23 | Replicate No.: —

Weather: | Sampling Time: Begin 1200 End 1240 (1240)

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	19.48
Depth to Water (ft bmp)	5.29
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	14.19
Casing Diameter	2"
Gallons in Well	2.27
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1205 End 1240

Field Parameters

Color: clear, floating black particles to cloudy

Odor: n/a

Appearance: slight turbid

	1	1V	2V	3V
pH (s.u.)	7.24	7.18	7.15	7.27
Conductivity (mS/cm)	615.3	588.3	650.5	684.6
(µmhos/cm)				
Temperature (°C)	7.9	8.8	9.3	9.3
DO (mg/L)	5.05	5.76	4.73	4.05
Turbidity (NTU)	18.1	98.3	1009 AU	1221 AU
Time	1205	1210	1220	1235
DTW (ft bmp)	6.11	8.16	8.22	8.31
ORP	149.6	142.0	137.0	149.5

Remarks:

Water Quality Meter: YSI DSS Pro

System On/Off:

Initial Purge:

Constituents Sampled: See COC | Sampling Personnel: ST / SB

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.0025 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: MW-24 Replicate No.: —

Weather: Sunny 24° Sampling Time: Begin 1105 End 1140

1140

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	17.53
Depth to Water (ft bmp)	2.51
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	15.02
Casing Diameter	2"
Gallons in Well	2.4
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time	Begin 1105 End 1140

Field Parameters

Color: clear to cloudy

Odor: n/a

Appearance: slightly turbid

	I	1V	2V	3V
pH (s.u.)	7.15	6.97	7.01	6.99
Conductivity (mS/cm)	748	1024	1031	1014
(µmhos/cm)				
Temperature (°C)	10.1	9.9	11.3	12.3
DO (mg/L)	4.90	2.38	2.24	2.56
Turbidity (NTU)	18.5	79.8	82.5	1094
Time	1108	1115	1125	1137
DTW (ft bmp)	3.78	5.60	7.98	11.75
ORP	126.9	123.2	121.1	121.7

Remarks:

Water Quality Meter: YSI DSS Pro

System On/Off:

Initial Purge:

Constituents Sampled: See COC Sampling Personnel: ST/JB

Well Casing Volumes

Gal./Ft.	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO | Project No.: AY000220.0025 | Page: 1 of

Site Location: Broadway, Cheektowaga, NY | Date: 12/18/19

Site/Well No.: MW-29 | Replicate No.:

Weather: | Sampling Time: Begin: | End: 11:00

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	18.32
Depth to Water (ft bmp)	2.48
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	15.84
Casing Diameter	2"
Gallons in Well	2.5
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time Begin	End

Field Parameters

Color: Clear

Odor: None

Appearance: —

	1	1V	2V	3V
pH (s.u.)	7.90	7.38	7.35	7.37
Conductivity (mS/cm)	0.589	0.542	0.536	0.528
Conductivity (µmhos/cm)				
Temperature (°C)	5.9	7.7	7.7	8.2
DO (mg/L)	4.89	3.29	2.84	3.24
Turbidity (NTU)	50.28	87.00	143	112
Time	10:35	10:39	10:46	10:55
DTW (ft bmp)	2.48	2.90	3.02	~~3.07~~ 2.91
ORP	138.7	117.7	113.9	112.7

Remarks: Water Quality Meter: YSI DSS Pro

System On/Off:

Initial Purge:

Constituents Sampled: See COC | Sampling Personnel:

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams per liter	COC	Chain of Custody		

ARCADIS

Water Sampling Log

Project: Ingersol Rand - ARO Project No.: AY000220.0022[illegible]5 Page: 1 of

Site Location: Broadway, Cheektowaga, NY Date: 12/18/19

Site/Well No.: RW-11 Replicate No.:

Weather: Sampling Time: Begin: End: 13:20

Evacuation Data

Measuring Point	TOC
Sounded Well Depth (ft bmp)	19.63
Depth to Water (ft bmp)	5.06 / 2.72
Depth to Packer (ft bmp)	—
Water Column in Well (ft)	14.57
Casing Diameter	4"
Gallons in Well	9.47
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	—
Packer Pressure (psi)	—
Pumping Rate (ml/min)	—
Evacuation Method	Bailer
Sampling Method	Bailer
Purge Time Begin / End	

Field Parameters

Color: Clear Lt Brown

Odor: None

Appearance: Slightly Turbid

	I	1V	2V	3V
pH (s.u.)	7.21			
Conductivity (mS/cm)	0.775			
Conductivity (µmhos/cm)				
Temperature (°C)	7.5			
DO (mg/L)	4.45			
Turbidity (NTU)	55.3			
Time	13:20			
DTW (ft bmp)	7.51			
ORP	144.2			

Remarks:
Water Quality Meter: YSI DSS Pro
System On/Off: Purged With System
Initial Purge:

Constituents Sampled: See COC Sampling Personnel:

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 1/2" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Millisiemens per centimeter	VOC	Volatile Organic Compounds
°C	Degrees Celsius	s.u.	Standard units	umhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Miligrams per liter	COC	Chain of Custody		

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