

**CSSA B-3 BIOREACTOR OPERATIONS
ANNUAL PERFORMANCE STATUS REPORT
(QUARTER 45 – QUARTER 48, MAY 2018 – APRIL 2019)**

JUNE 18, 2019

This status report summarizes the operation of a bioreactor at Solid Waste Management Unit (SWMU) B-3 from May 2018 through April 2019, comprising the twelfth year of bioreactor operations and monitoring since system start-up. This status report includes descriptions of current conditions, field observations, analytical results, and an anticipated schedule of activities for the next reporting period. Analytical results from monthly and quarterly regulatory and performance sampling through April 2019 are attached for reference. Parsons personnel responsible for bioreactor operation during the reporting period include Ken Rice, Bradly Dietert, Samantha Elliott, Adrien Lindley, Elisa Rice, Richard Fincke, Fabian Bocanegra, and Scott Pearson.

Executive Summary

For the year (May 2018 through April 2019) a total of 46.84 inches of rain was recorded on site, 10.55 inches above average. Injection of extracted groundwater continued through the year with few interruptions. Minor interruptions include: system maintenance, reaching automatic cut-off levels in the wells and/or storage tank, and B-3 bioreactor system upgrade activities. During the reporting period, pumping at wells CS-MW16-LGR, B3-EXW02, and B3-EXW04 was suspended temporarily for well maintenance. Well maintenance included pump replacements at each of these wells and well redevelopment at B3-EXW04. Currently, all wells are operational, however, production rates were reduced during the reporting period due to low water levels from May through July and pump outages at extraction wells.

Through the reporting period, approximately 20,812,000 gallons of groundwater, extracted from wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05, were injected into bioreactor trenches 1, 2, and 6. Currently, only trenches 1, 2 and 6 are receiving extracted groundwater.

During the reporting period, most of the injected groundwater, ~5,133,000 gallons, was extracted from B3-EXW03, followed by ~4,982,000 gallons from B3-EXW05. Wells B3-EXW01, EXW02, EXW04 and CS-MW16-LGR were less productive with ~2,951,000, ~707,000, ~2,983,000 and ~1,127,000 gallons extracted, respectively, and ~2,929,000 gallons were extracted from well CS-MW16-CC. The total groundwater production for the year (20,812,000 gallons) is approximately 13% higher than the previous year's total (18,425,000 gallons). Since the start of normal operations in 2007, approximately 227,240,000 gallons of extracted groundwater have been injected into the bioreactor.

Data from monitoring efforts indicate that the B-3 bioreactor has continued to maintain appropriate geochemical conditions for effective anaerobic dechlorination of chlorinated aliphatic hydrocarbons (CAHs). Geochemical parameters indicating optimal conditions include the following:

- Concentrations of dissolved oxygen (DO) are generally less than 0.5 milligrams per liter (mg/L) and oxidation-reduction potential (ORP) values are less than 100 millivolts (mV), indicating an anaerobic environment conducive to dechlorination of CAHs within the trenches;
- Production of methane indicating that fermentation is occurring; and

- Hydrogen concentrations are greater than 1.0 nanomoles per liter (nmol/L), indicating that there is sufficient electron donor present to stimulate anaerobic dechlorination of CAHs.

Analytical results from trench sumps samples provides evidence that biotic and abiotic dechlorination of tetrachloroethene (PCE) and trichloroethene (TCE) is occurring. The presence of ethene indicates that the biotic reductive dechlorination process appears to be the major degradation pathway for CAHs within the trenches and that complete reductive dechlorination is occurring. Additionally, the presence of reduced iron [Fe(II)] and trans-DCE may indicate the presence of a secondary abiotic process at work within the bioreactor.

Summary of Bioreactor Operation

Analytical results from biannual sampling at the bioreactor sumps indicate that SWMU B-3 trenches contain a range of *cis*-DCE levels (non-detect (ND) to 25 µg/L) as well as concentrations of other dechlorination products (e.g., VC, ethene). A summary of the analytical data collected for the reporting period (year 12) is included in Table 1. A summary of biannual monitoring results from the bioreactor trench sumps are attached, analytical results of the surrounding SWMU B-3 multi-port monitoring wells (MPMW or Westbay®) and monitoring wells are also attached.

Results of volatile organic carbon (VOC) analyses indicate that groundwater from the uppermost saturated zone (LGR-03B) of Westbay® wells CS-WB05, CS-WB06, and CS-WB08 contain less than 100 micrograms per liter (µg/L) of PCE and TCE while well CS-WB07 contains less than 100 µg/L of PCE and greater than 100 µg/L TCE. Additionally, wells CS-WB06, CS-WB07, and CS-WB08 contain greater than 100 µg/L of *cis*-DCE, and CS-WB05 contains less than 100 µg/L of *cis*-DCE. Similar analysis of groundwater from extraction wells indicate wells CS-MW16-LGR, CS-MW16-CC, B3-EXW02, and B3-EXW04 all contain less than 100 µg/L of PCE, TCE, and *cis*-DCE while wells B3-EXW01, B3-EXW03 and B3-EXW05 contain less than 100 µg/L of PCE and greater than 100 µg/L of TCE, and *cis*-DCE.

VOC analytical results from operational bioreactor trench sumps samples indicate slight increases in contaminant mass (total molar concentration) in trench sumps T1-1 T1-3, T6-1 and T6-2 and decreases in trench sumps T1-2, since the last reporting period in April 2018. Over the bioreactor operational period (12 years), contaminant mass appears stable or decreasing. Currently, extracted groundwater is being applied to bioreactor trenches 1, 2 and 6. Applications in trench 1 began in 2006 as the bioreactor became operable and has been ongoing for 12 years. Applications in trench 2 began in 2009 (nine years of application), followed by applications in trench 6 in 2010 (eight years), and injections in trenches 3, 4, and 5 began in 2016 (two years of application) and ceased in 2018 due to low water availability during drought conditions.

Water quality field measurements from bioreactor trench 1 sumps indicate average annual values for DO, pH, ORP, and specific conductivity were 0.50 mg/L, 6.94, -93.18 mV, and 0.966 mS/cm, respectively, and temperatures ranged from ~17 °C to ~26 °C.

Field measurements from trench 2 during the year include average DO, pH, ORP, and specific conductivity of 0.50 mg/L, 6.73, -45.06 mV, and 1.123 mS/cm respectively; and temperatures ranged between ~20 °C to ~30 °C.

Water quality field measurements during the year of injection operations within trench 6 include average DO, pH, ORP, and specific conductivity of 1.07 mg/L, 6.99, 91.93 mV, and 0.653 mS/cm respectively; and temperatures ranged between 20 °C to 24 °C. While the annual average DO within trench 6 is above 0.50 mg/L, multiple quarterly measurements are recorded near or less than the desired concentration.

The geochemical parameters measured within each of the active trenches indicate adequate conditions exist for reductive anaerobic bioremediation of CAHs in trenches 1, 2, and 6.

Ground water elevation data from the shallow UGR monitoring wells (B3-MW26-UGR – MW34) combined with similar data from the Westbay UGR zones (CS-WB06-UGR-01, CS-WB08-UGR-01) and the bioreactor sumps helped confirm the presence of a groundwater “mound” around the bioreactor trenches. Analyses of samples from these wells indicates the presence of vinyl chloride with concentrations ranging from ND to 39 ppb (WB08-UGR-01) with the highest levels typically found north and west of the bioreactor. B3-MW28-UGR, located southwest of the bioreactor, has been consistently dry and therefore was not sampled. Water quality parameters in the UGR wells are collected every 9 months and were collected only one time in the reporting period. In general, anomalously high DO values were recorded for all but one UGR well. The DO concentration values recorded approach and exceed saturation in water (8.68 mg/L at 21 deg C and 1 atmosphere) and therefore, are considered erroneous. Field team noted that the DO probe was replaced following UGR field parameter collection.

During the reporting period, 46.84 inches of precipitation were measured on-post. Over the year, average water thicknesses within active trenches were 8.74, 4.5, and 5.26 feet in trenches 1, 2, and 6, respectively. Average water thickness greater than 1 foot indicate saturated conditions within the active bioreactor trenches are being maintained.

Attached are graphs including: trenches 1 and 6 average water thickness with rainfall data, VOC concentration summaries for extraction wells, storage tanks (UIC), trench 1 and 6 sumps, and in the defined uppermost saturated zones (zone LGR-03B) in the surrounding multi-port monitoring wells, cumulative precipitation, as well as water level elevations in the defined uppermost saturated zone (zone LGR-03B) of the B-3 multi-port monitoring wells with rainfall data.

Quarter 48 - Analytical Data Observations

1. Arsenic (As) was detected in concentrations exceeding the MCL (10 µg/L) in five Westbay well zones, CS-WB05-LGR-04B, CS-WB06-UGR-01, CS-WB07-LGR-01, CS-WB07-LGR-04, and CS-WB08-LGR-04 (23, 11, 14, 10, and 10 µg/L, respectively) during the year. Elevated levels of As were also reported in CS-B3-MW02 (13 µg/L), CS-B3-MW04 (28 µg/L), CS-B3-MW26-UGR (15 µg/L), CS-B3-MW27-UGR (15 µg/L), CS-B3-MW30-UGR (18 µg/L), CS-B3-MW33-UGR (14 µg/L), and CS-B3-MW34-UGR (15 µg/L). Additionally, As was reported in bioreactor trench 1 sump water samples, T1-1, T1-2, and T1-3 at concentrations of 10 µg/L, 14 µg/L, and 28 µg/L, respectively. All other multi-port monitoring well (MPMW) zones reported Arsenic levels below the MCL. The elevated levels are likely due to changing pH conditions of the groundwater and the reduction of naturally occurring arsenic within the limestone media to a more soluble form.
2. DO and ORP values were favorable for the reduction of CAHs, and it is likely that geochemical conditions will remain favorable for continued enhanced anaerobic continue to improve as normal bioreactor operations continue.
3. The volatile organic compound summary for the trenches indicates an end-product (DCE isomer, VC, and ethene) dominated chemical composition in water. Total molar concentrations within trenches 1 and 6 have fluctuated through the year and indicate a slight increase in total contaminant mass in sumps T1-1, T1-3 and T6-2, and slight decreases in sumps T1-2 and T6-1 since last year.
4. *Dehalococcoides* (DHC) bacteria have been identified within the trench sumps, indicating the reductive dechlorination of CAHs by microbial activity is occurring.

Over the last two reporting periods (Quarters 37 through 48), DHC cell counts have slightly declined or remained stable in active trenches. Comparison of CAH mole fractions of extracted groundwater (prior to injection) and trench sump water (after injection) confirms reductive dechlorination of VOCs is occurring within the bioreactor, with VOC parents (PCE, TCE) representing a higher portion of the total molar concentration pre-injection, and daughter products (DCE, VC, and ethene) representing the higher portion of the total molar concentration post-injection.

5. Saturated conditions within the bioreactor were maintained through the year with thicknesses ranging from 4.5 feet in trench 2 to 8.74 feet in trench 1.

The reductive dechlorination end products VC, ethene, and ethane are present in samples collected from shallow UGR zone wells around the periphery of SWMU B-3 indicating the lateral influence of the bioreactor in the shallow subsurface. VC is present in samples from shallow UGR wells MW26, MW27, MW31, and MW33, (4.8, 14, 0.23 and 21 µg/L, respectively), and in samples from the MPMW well UGR-01 zones in WB06 and WB08 (3.6 and 39 µg/L, respectively). Ethene is present in shallow UGR wells MW26, MW27, and MW34, (1.6, 1.3, and 3.1 µg/L, respectively) and ethane was observed at MW34 (0.70 µg/L).

In addition to reductive dechlorination end products within the UGR, these products are also observed at depth. VC is observed in the LGR-01, -02, -03A, -03B, -04A, -04B, and BS-01 zones within WB05 (1.5, 2.9, 15, 22, 54, 53, and 3.8 µg/L, respectively); in the LGR-01, LGR-02, LGR-03A, and LGR-04 zones in WB06 (0.30, 1.6, 0.26, and 1.9 µg/L, respectively); in all LGR zones in WB-07 (LGR-01, -02, -03A, -03B, and -04 at 22, 0.88, 0.64, 1.3, and 0.26 µg/L, respectively); and within WB08 in zones LGR-01 and LGR-02 (1.9 and 0.33 µg/L). Ethene was observed only within WB05-LGR-04B (1.2 µg/L) during the reporting period and ethane was not observed at depth.

Recommendations

Recommendation for further remedial action include:

- Continue monitoring bioreactor and surrounding wells for UIC Permit and Performance parameters.

Anticipated Schedule for Next Period (May 2019 – April 2020):

- Continue monitoring and maintenance activities for delivery of groundwater to the bioreactor trenches.
- Conduct semi-annual monitoring events for the bioreactor system.
- Continue UIC monitoring with annual reporting due July 2019.
- Continue SCADA control and automation integration.
- Refresh deciduous mulch/gravel mixture within trenches 1 and 2

Specific Data Observation Notes for Attachments

- Table 48.1.1 presents field collected data from bioreactor trench sumps, and indicates saturated conditions were maintained during the year.
- Analytical results from the B-3 trench sump (trenches 1, 2, and 6) samples, shown in Table 48.1.2, present data from the twelfth year of bioreactor operations.

- Table 48.1.2 presents the VOC concentrations from biannual samples collected in bioreactor trench sumps. These data indicate that dechlorination products are being generated within the bioreactor. VC was present at variable concentrations in trench sumps, ranging from, ND to 7.7 µg/L during the year. Ethene was observed in concentrations ranging from ND to 12 µg/L, and ethane was observed within sump T1-2 at 3.0 µg/L.
- Table 48.1.3 indicates the presence of Fe(II) at concentrations consistent with alternative degradation pathways.
- Table 48.2.3a indicates VC concentrations of 54 µg/L in WB05-LGR04A and 53 µg/L in WB05-LGR04B, indicating reductive dechlorination is occurring at depth and suggest a connection between this zone and CS-B3-MW01. Additionally, ethene was observed in WB05 zone LGR04B during the reporting period at a concentration of 1.2 µg/L.
- Table 48.4.4 indicates moderate to low populations of *Dehalococcoides* (DHC) bacteria exist in trenches 1, 2, and 6 and larger populations exist at greater depths in injection wells CS-B3-MW01 – MW04.
- Figure 48.1.2 presents the changes in molar fraction and total molar concentrations at sumps in trenches 1, 2, and 6 and indicate slight increases in contaminant mass.
- Table 48.6.2 indicates contaminant mass, provided by seven extraction wells, is available for injection into the bioreactor. Parent products (PCE and TCE) make up the majority of the contaminant mass, though *cis*-DCE is also present.
- Figure 48.2.5 shows that the water levels in Westbay wells are significantly influenced by drought conditions and precipitation, while pumping at CS-MW16-LGR and CS-B3-EXW01 shows strong influence in the deeper LGR zones. Pumping at CS-MW16-CC appears to have no influence on UGR or upper LGR zones.
- Table 48.7.3 indicates the presence of VC in four of the shallow UGR wells with concentrations ranging from ND to 21 µg/L. Additionally, Table 48.7.3 provides evidence of the biotic anaerobic degradation pathway as indicated by elevated concentrations of Mn and CO₂.

Analytical Summary Data

Table 1 Summary of Analysis Presented for Reporting Period

Event	VOCs	TDS	TOC	MEE & CO₂	SO₃²⁻	Chloride, Sulfate	Fe²⁺	Mn	Metals*	H⁺	DHC
Semi-Annual Sampling ^a (Quarter 46)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Semi-Annual Sampling ^a (Quarter 48)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

^a - Semi-annual sampling includes samples from B3-trench sumps, Monitoring Wells, Extraction Wells, and Multi-port (Westbay) wells.

* - Metals analyses were reduced to include only arsenic results beginning with the Month 44 sampling event.

Figures

Figure 48.1.2 T1-1

B-3 Bioreactor Trench 1 Sump 1 VOC Summary
Mar 2018 - Apr 2019

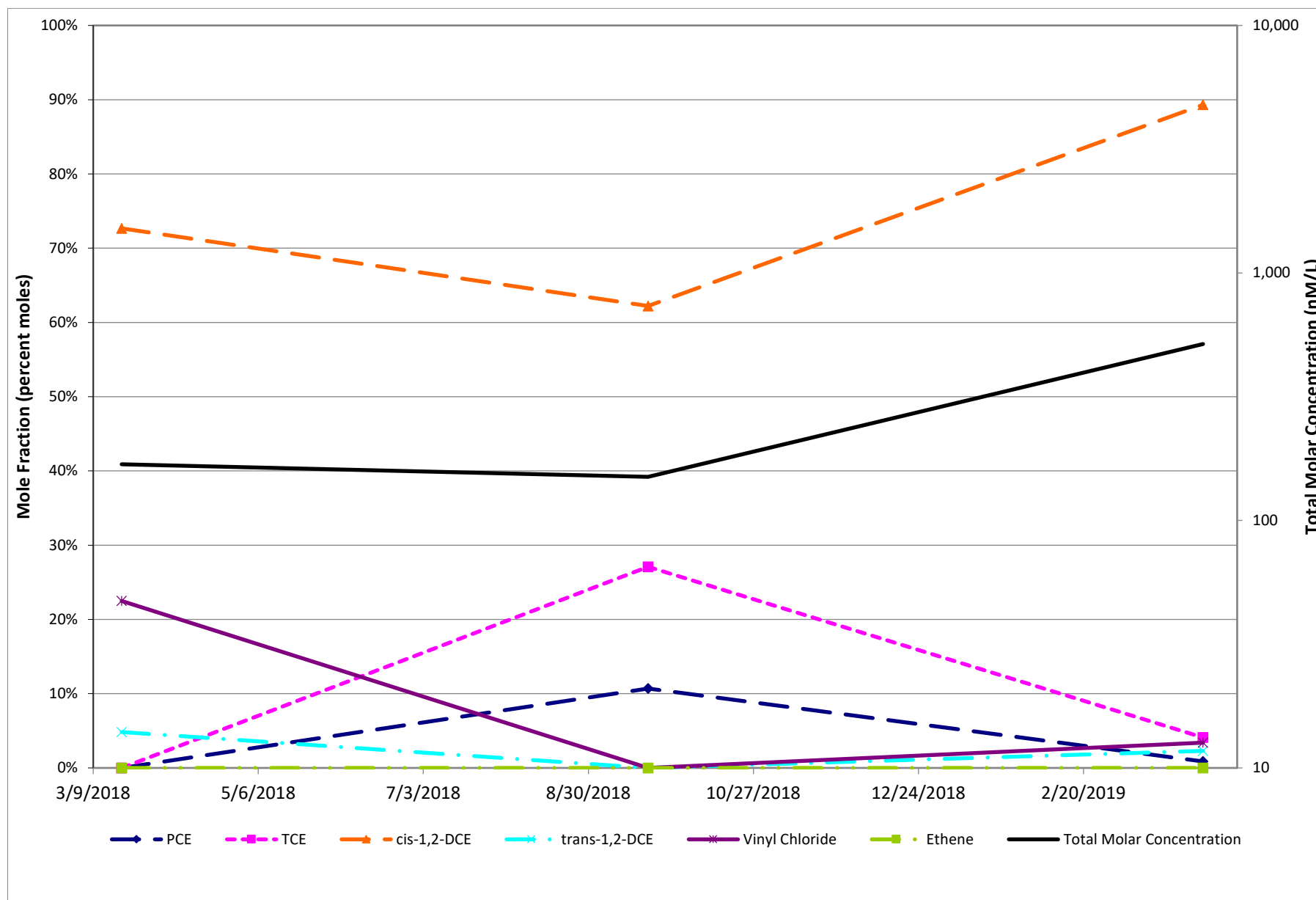


Figure 48.1.2 T1-2

B-3 Bioreactor Trench 1 Sump 2 VOC Summary
Mar 2018 - Apr 2019

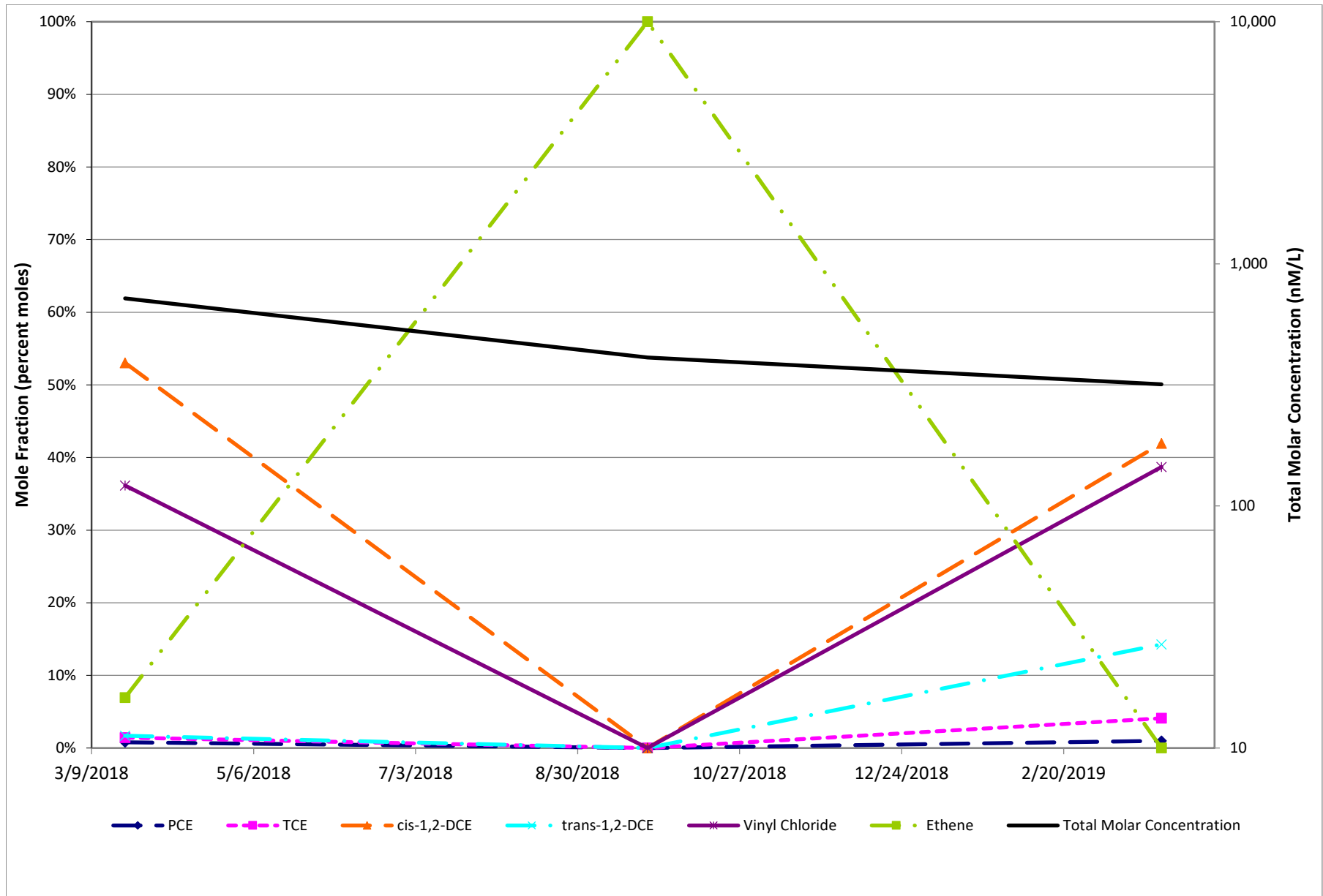


Figure 48.1.2 T1-3

B-3 Bioreactor Trench 1 Sump 3 VOC Summary
Mar 2018 - Apr 2019

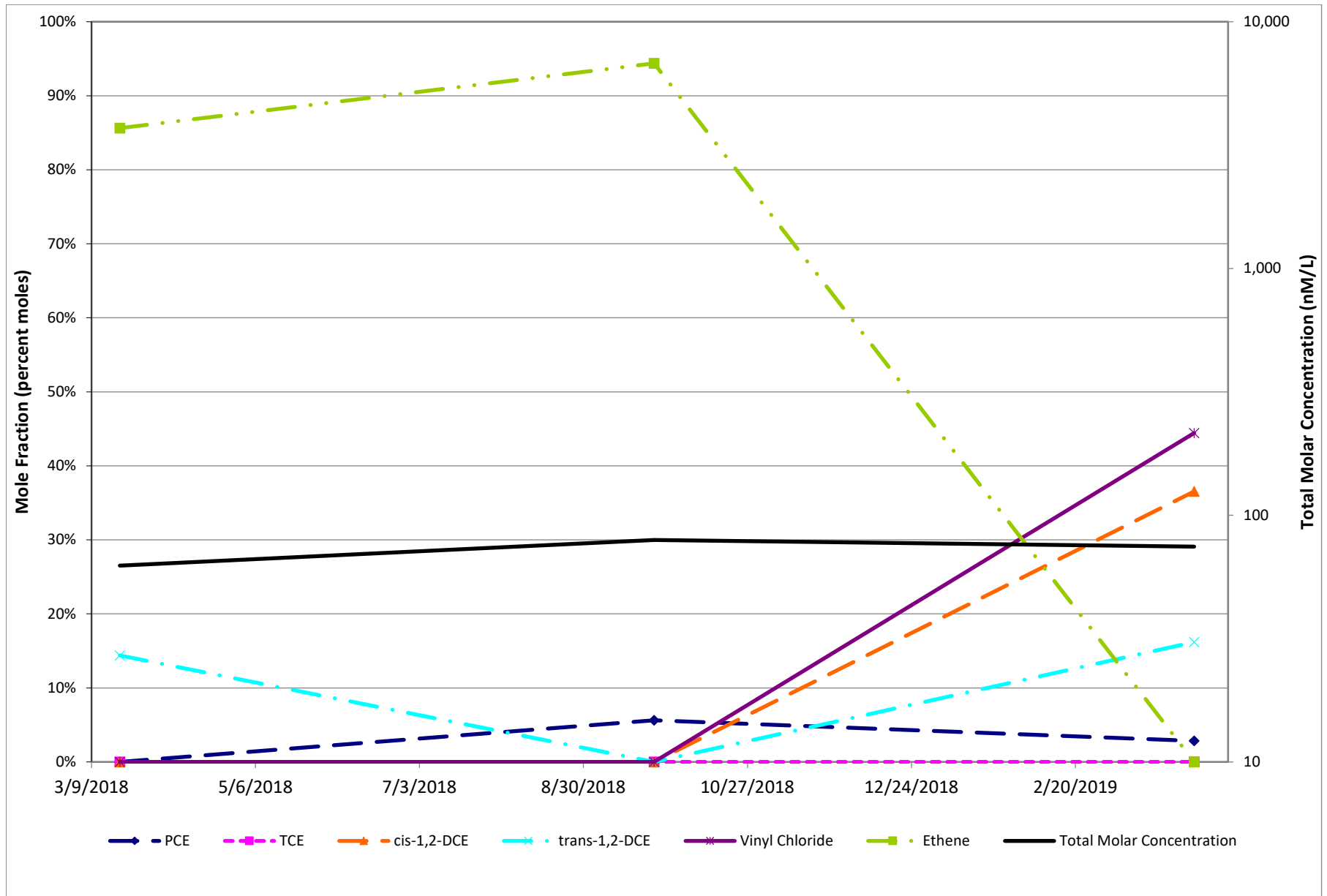


Figure 48.1.2 T6-1

B-3 Bioreactor Trench 6 Sump 1 VOC Summary
Mar 2018 - Apr 2019

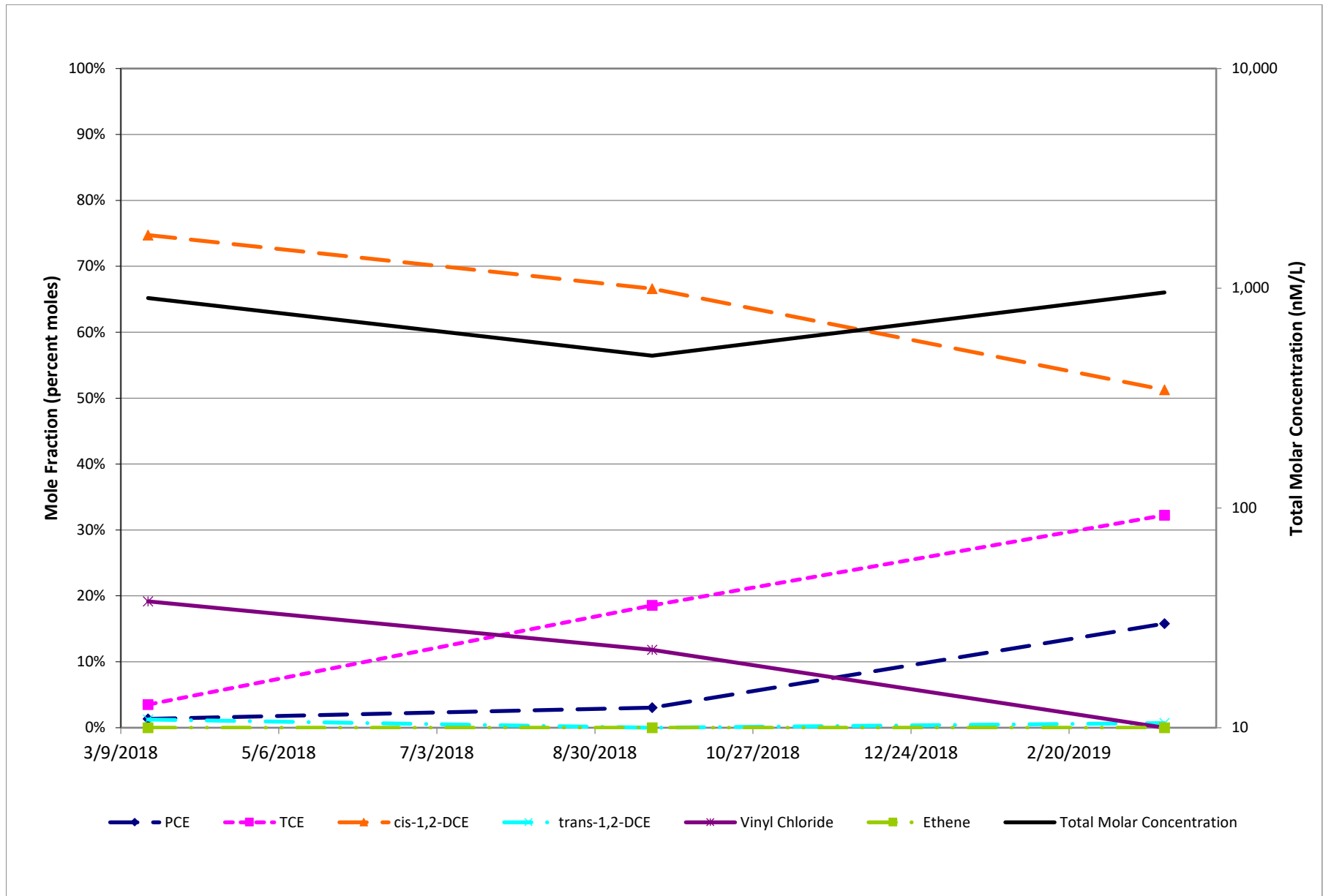


Figure 48.1.2 T6-2

B-3 Bioreactor Trench 6 Sump 2 VOC Summary
Mar 2018 - Apr 2019

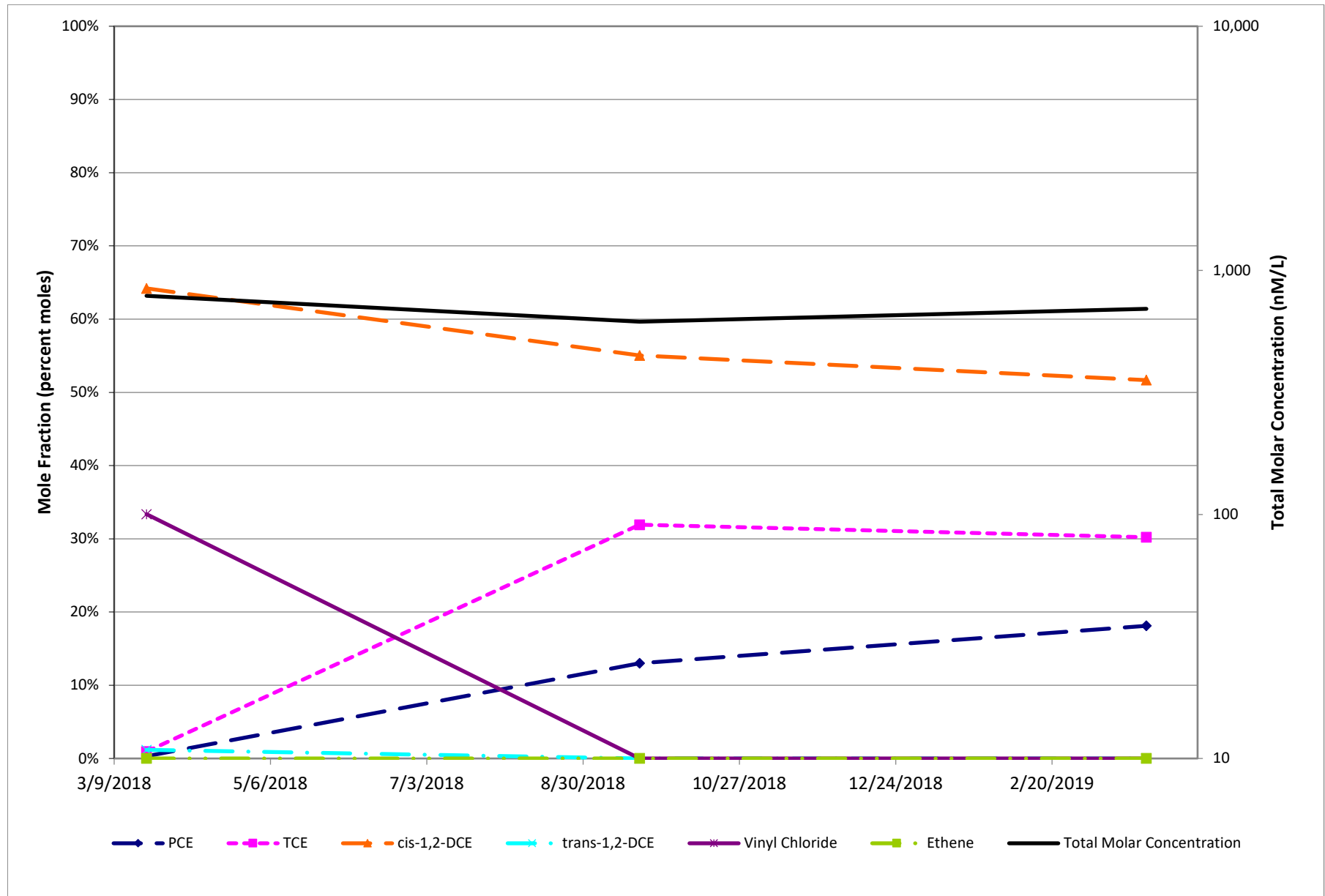


Figure 48.2.5

Lower Glen Rose Groundwater Elevations (feet above MSL) Measured in Westbay Wells May 2014 - April 2019

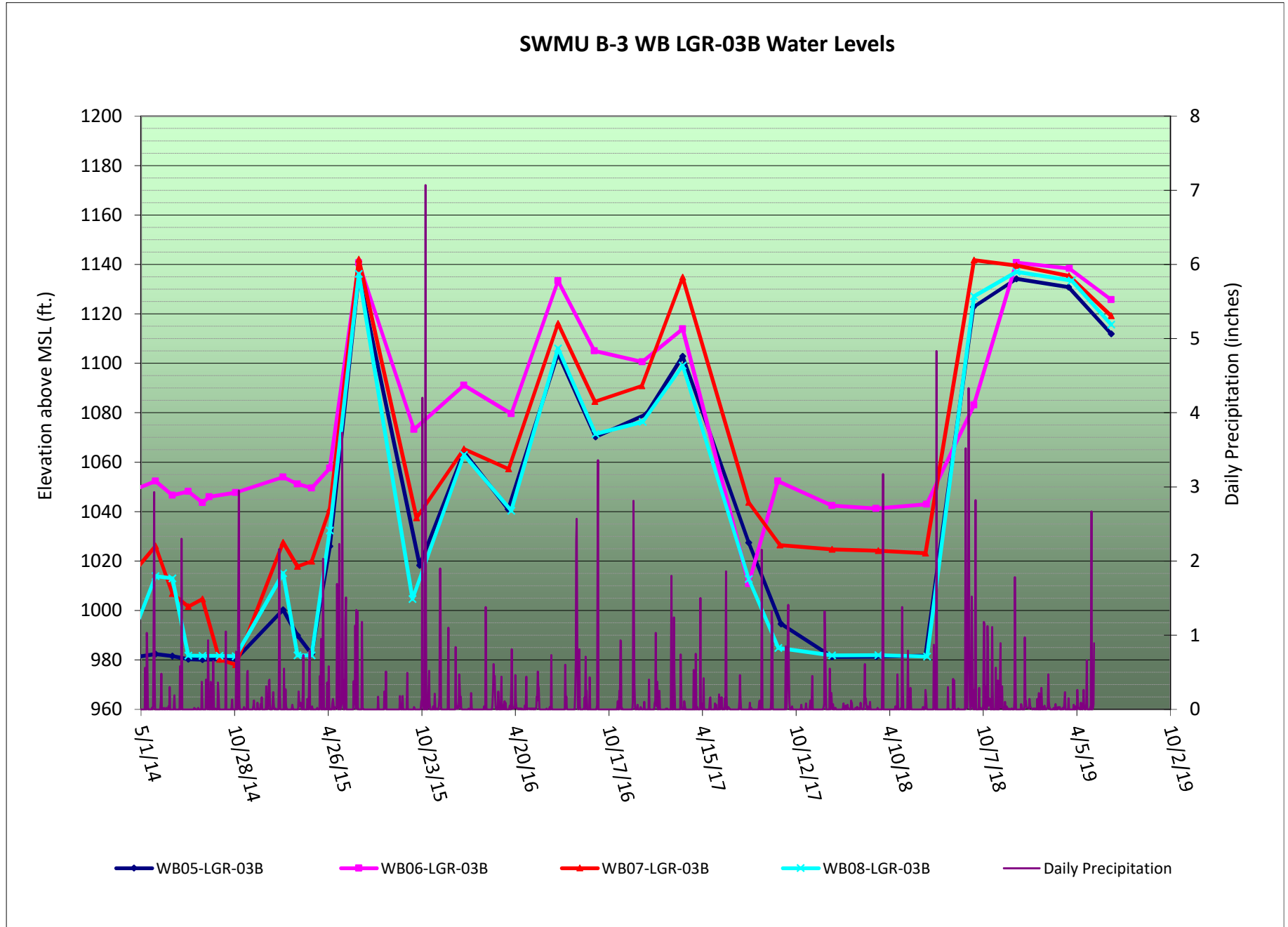


Figure 48.2.2a

CS-WB05-LGR03B VOC Summary
Mar 2018 - Mar 2019

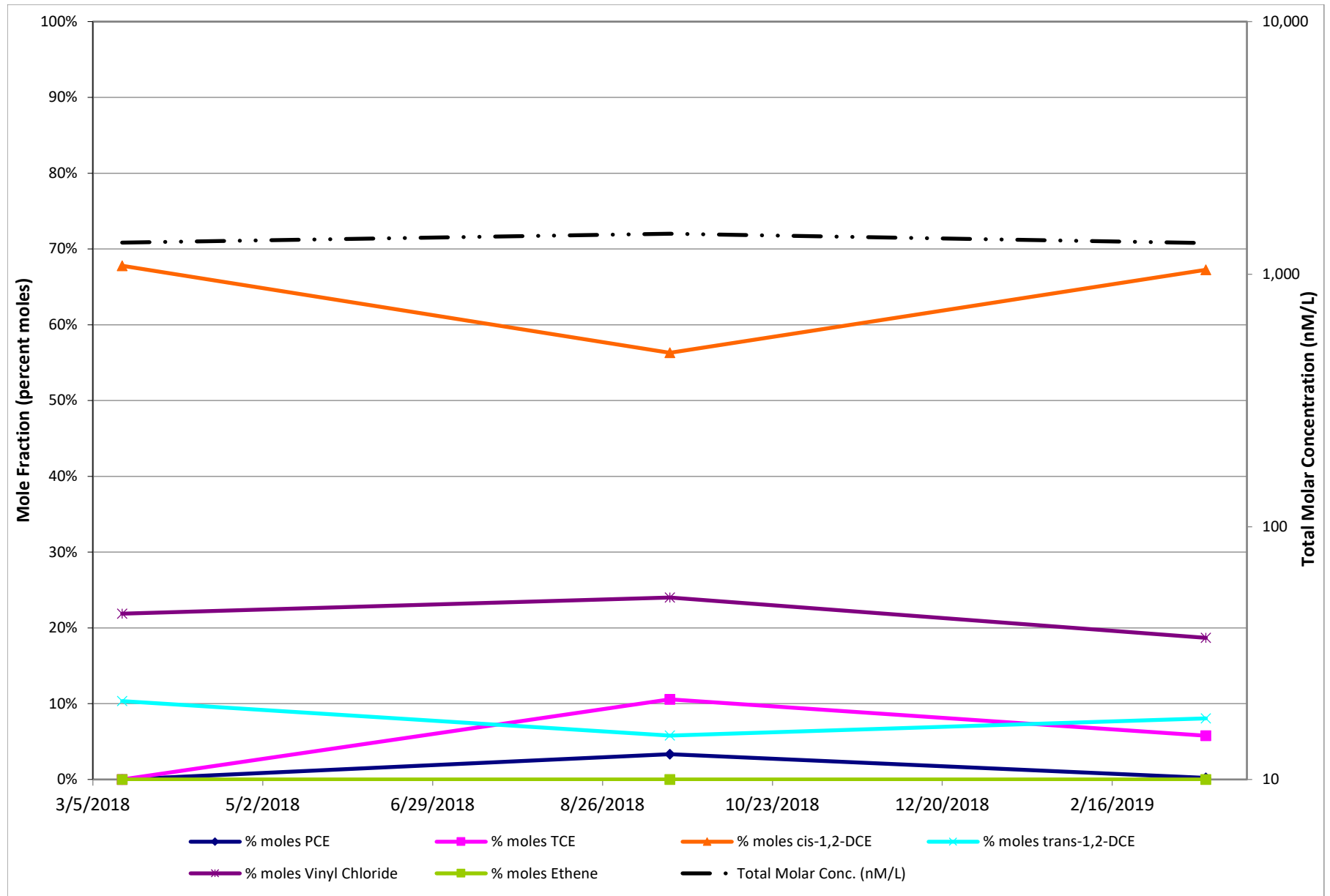


Figure 48.2.2b

CS-WB06-LGR03B VOC Summary
Mar 2018 - Mar 2019

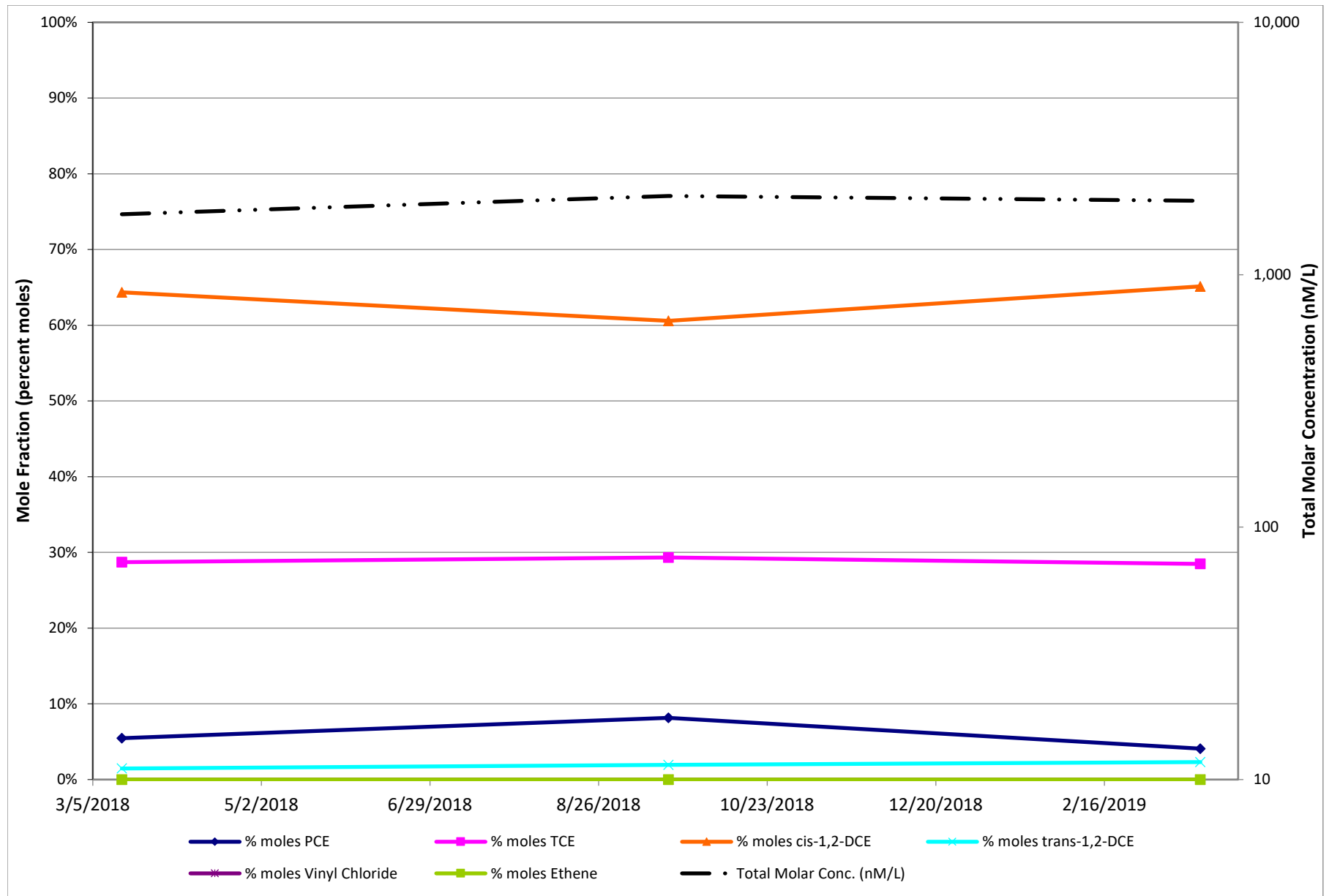


Figure 48.2.2c

CS-WB07-LGR03B VOC Summary
Mar 2018 - Mar 2019

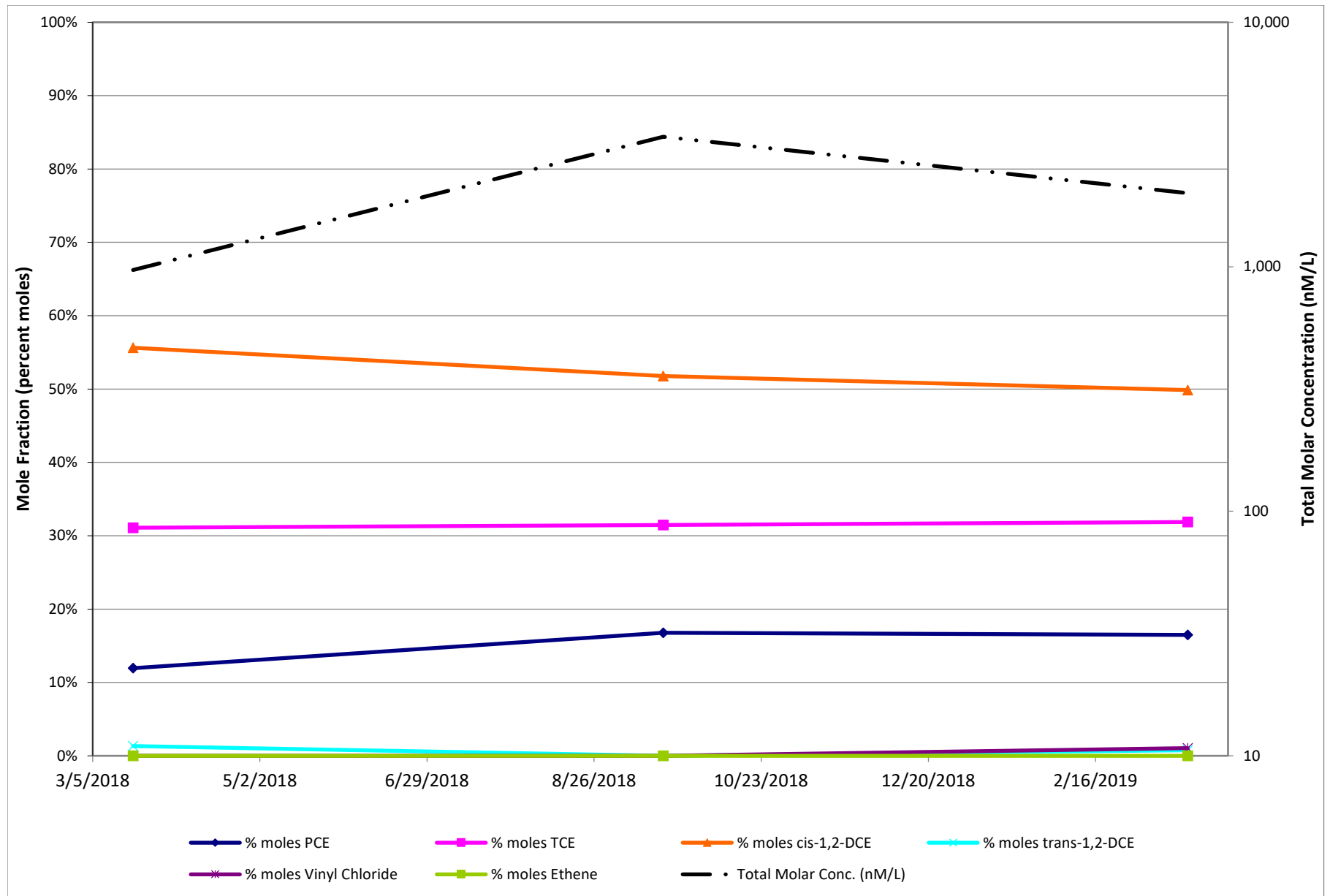


Figure 48.2.2d

CS-WB08-LGR03B VOC Summary
Mar 2018 - Mar 2019

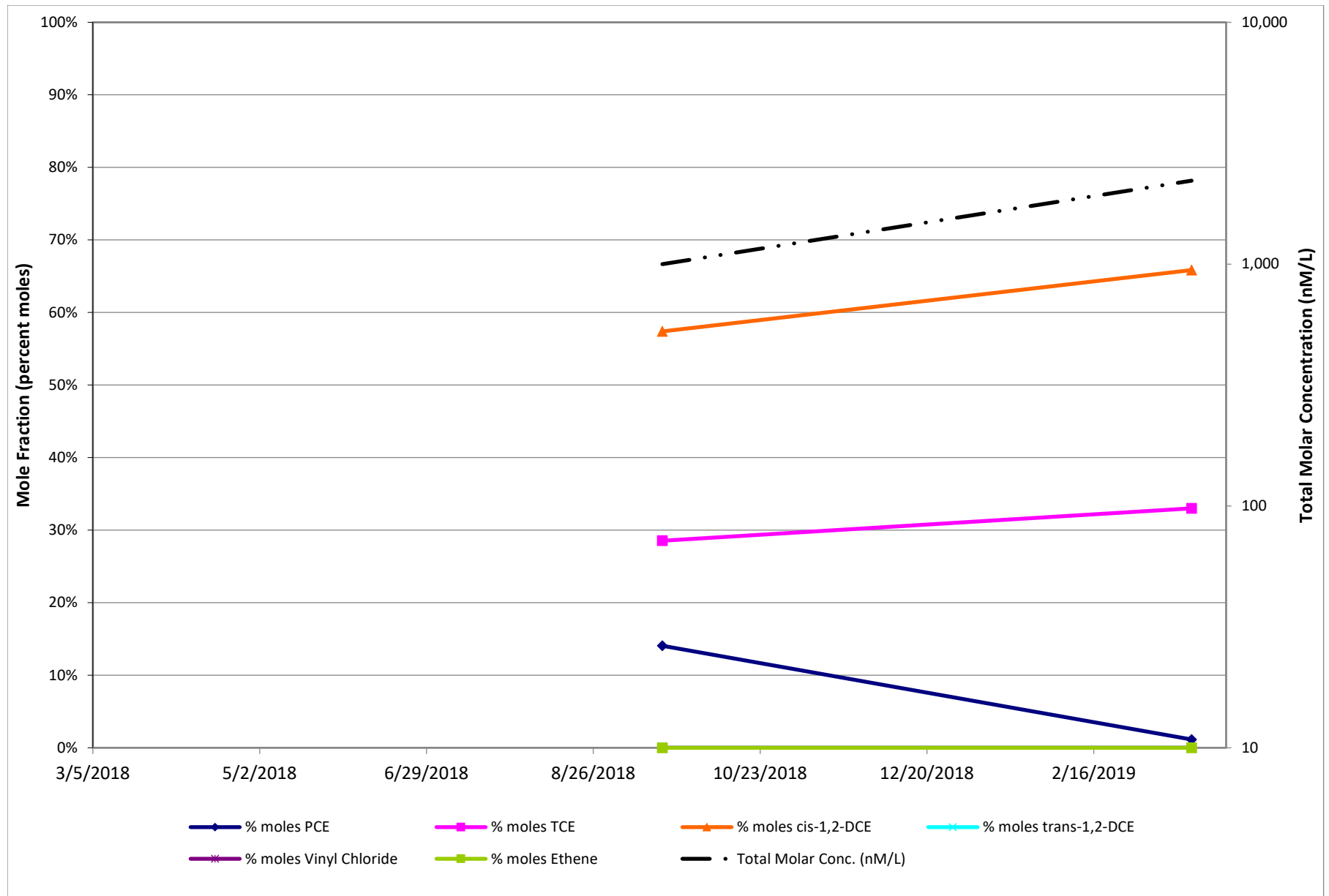


Figure 48.5.2

Changes in Mole Fraction and Total Molar Concentration at Storage Tank (UIC) Mar 2018 - Mar 2019

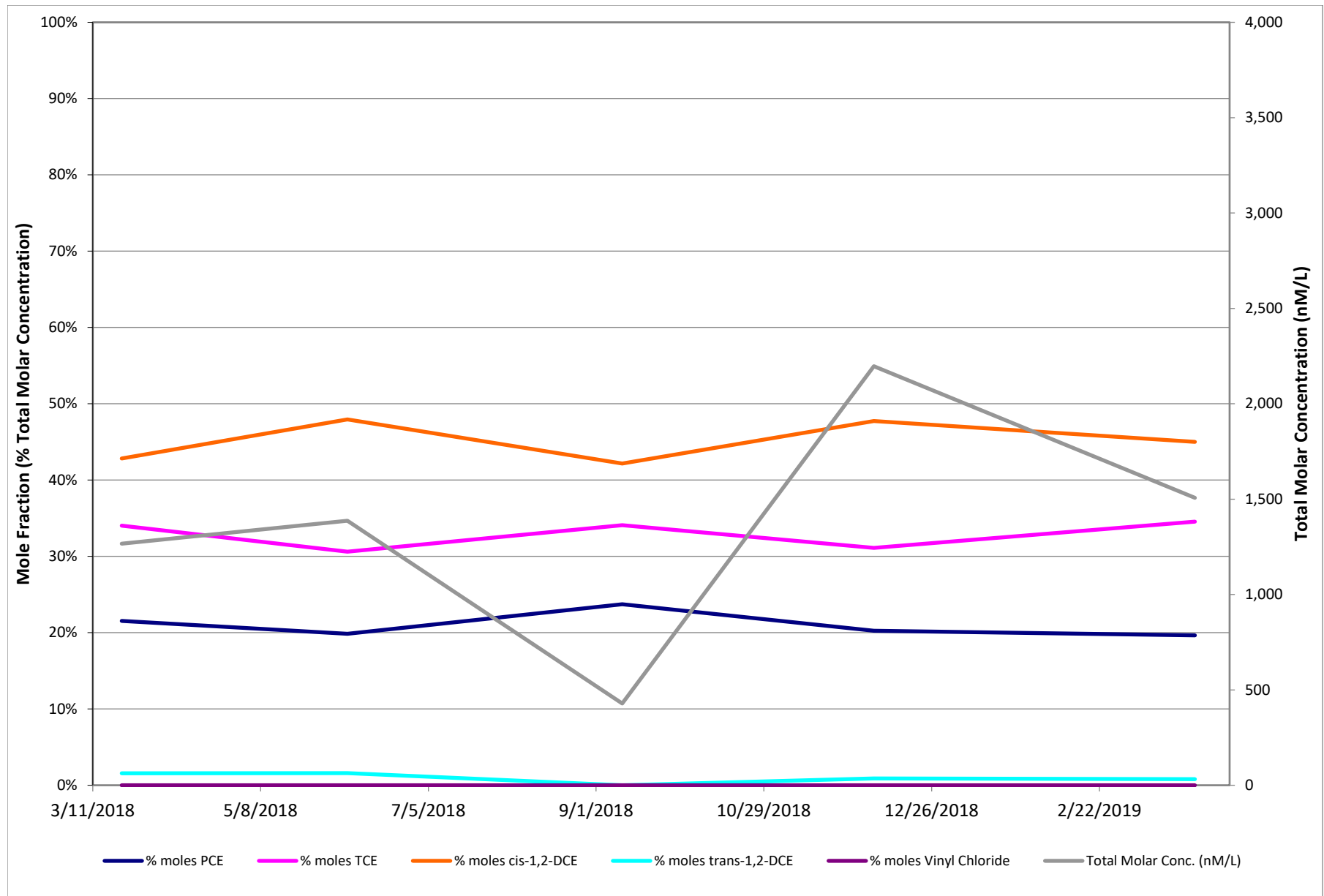


Figure 48.5.6

SWMU B-3 Bioreactor Trench Sump Average Water Thickness/ Daily Precipitation

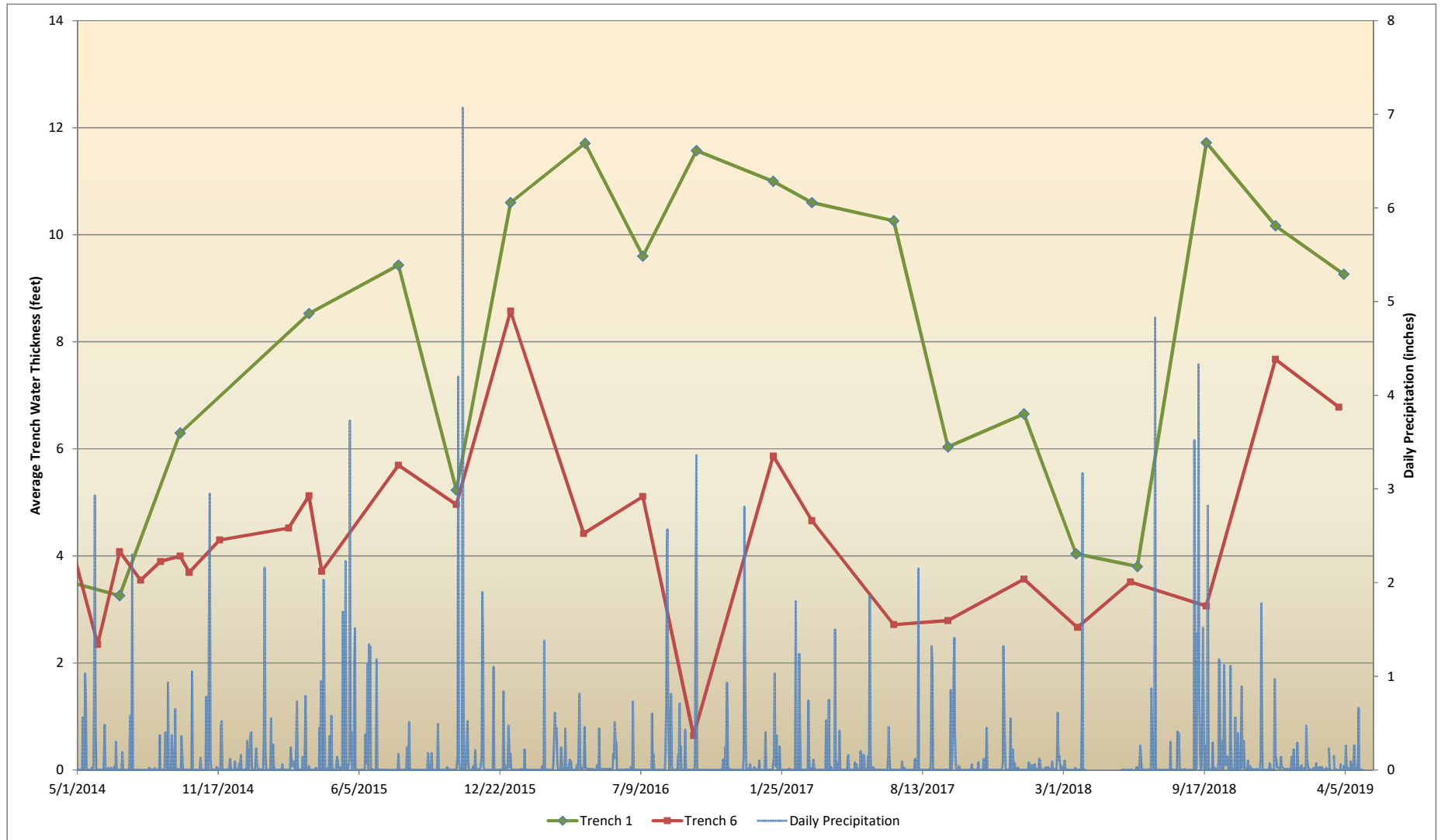


Figure 48.6.2 16-CC

CS-MW16-CC VOC Summary
Jun 2018 - Mar 2019

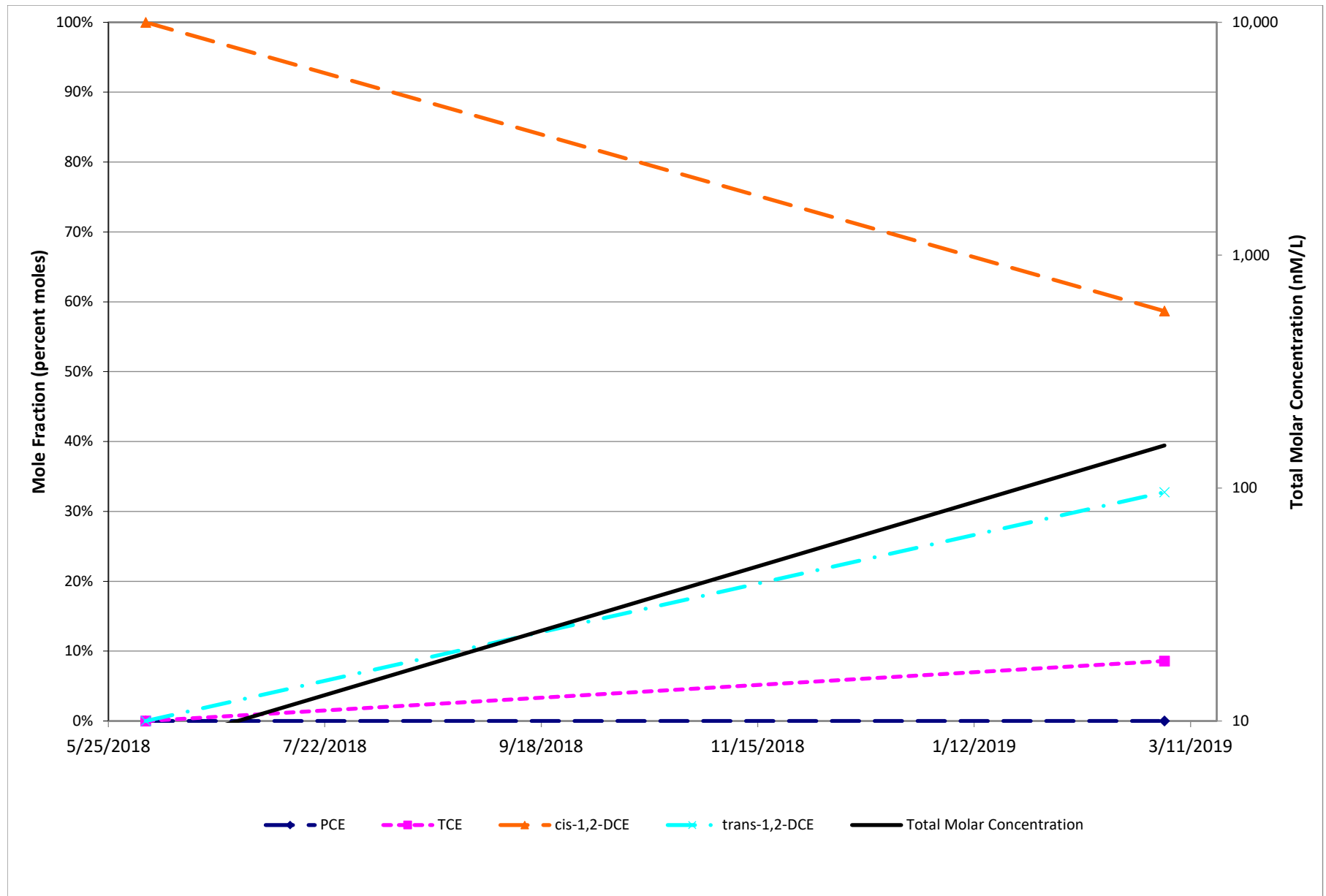


Figure 48.6.2 EXW01

B3-EXW01 VOC Summary
Jun 2018 - Mar 2019

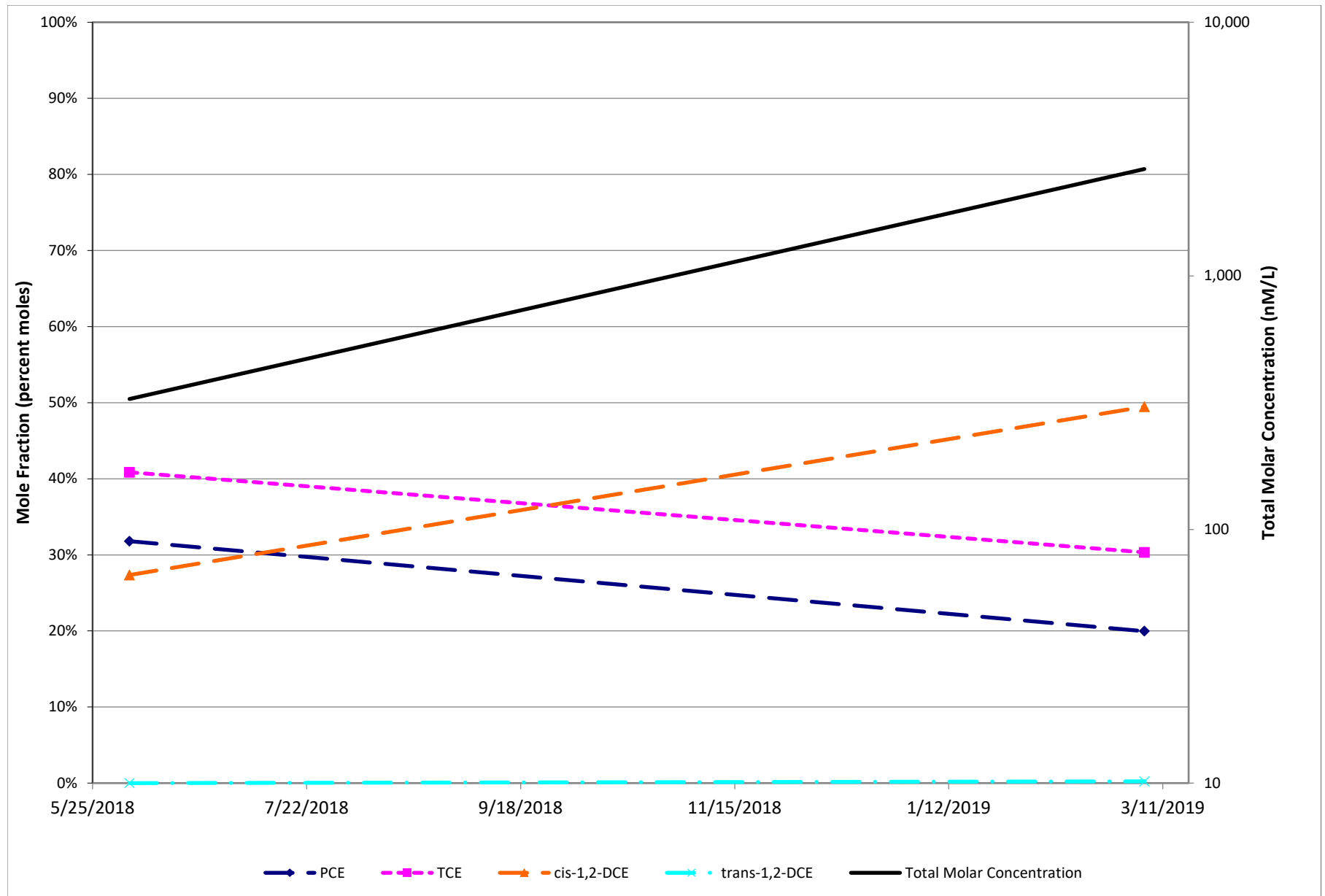


Figure 48.6.2 EXW03

B3-EXW03 VOC Summary
Jun 2018 - Mar 2019

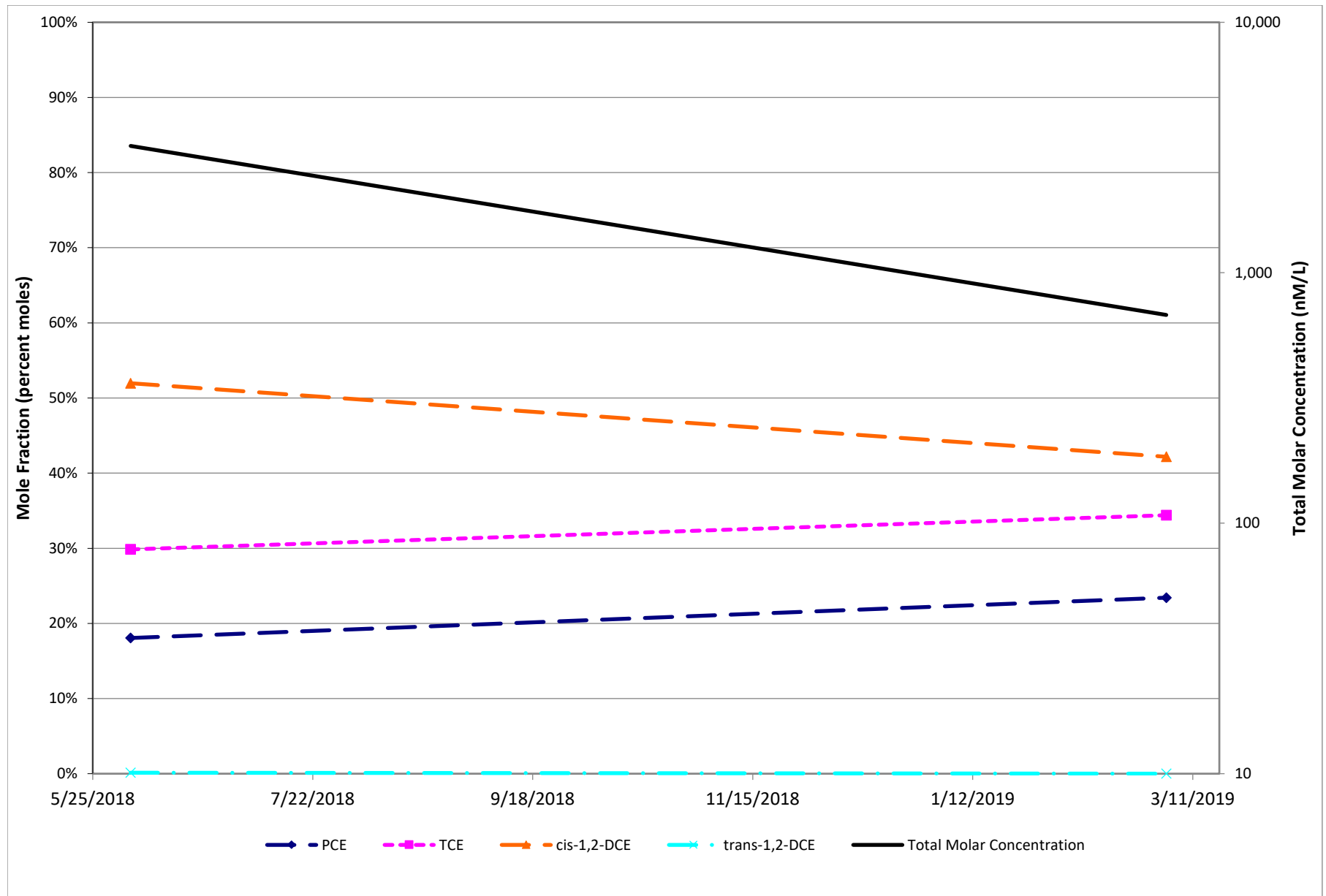


Figure 48.6.2 EXW04

B3-EXW04 VOC Summary
Jun 2018 - Mar 2019

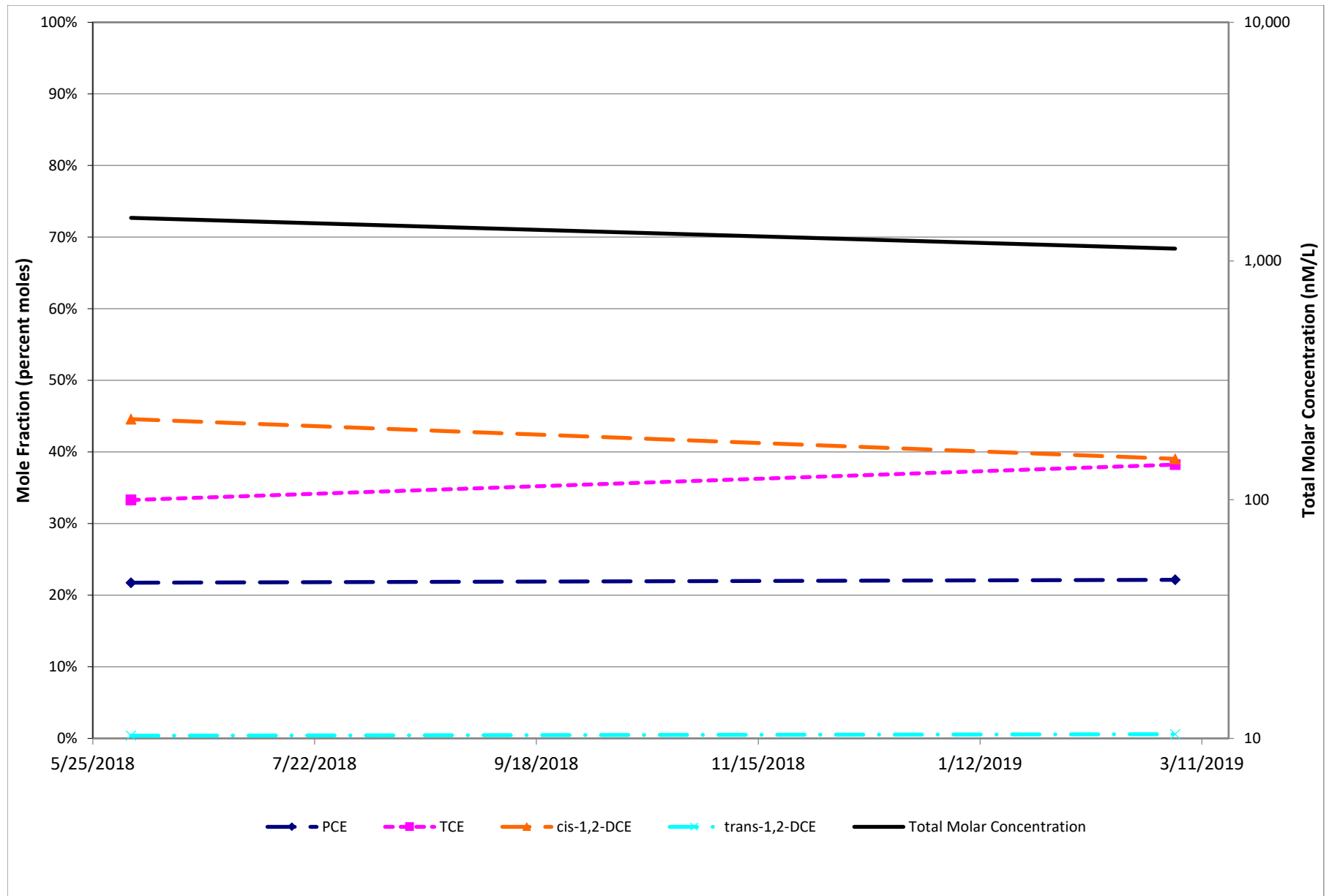
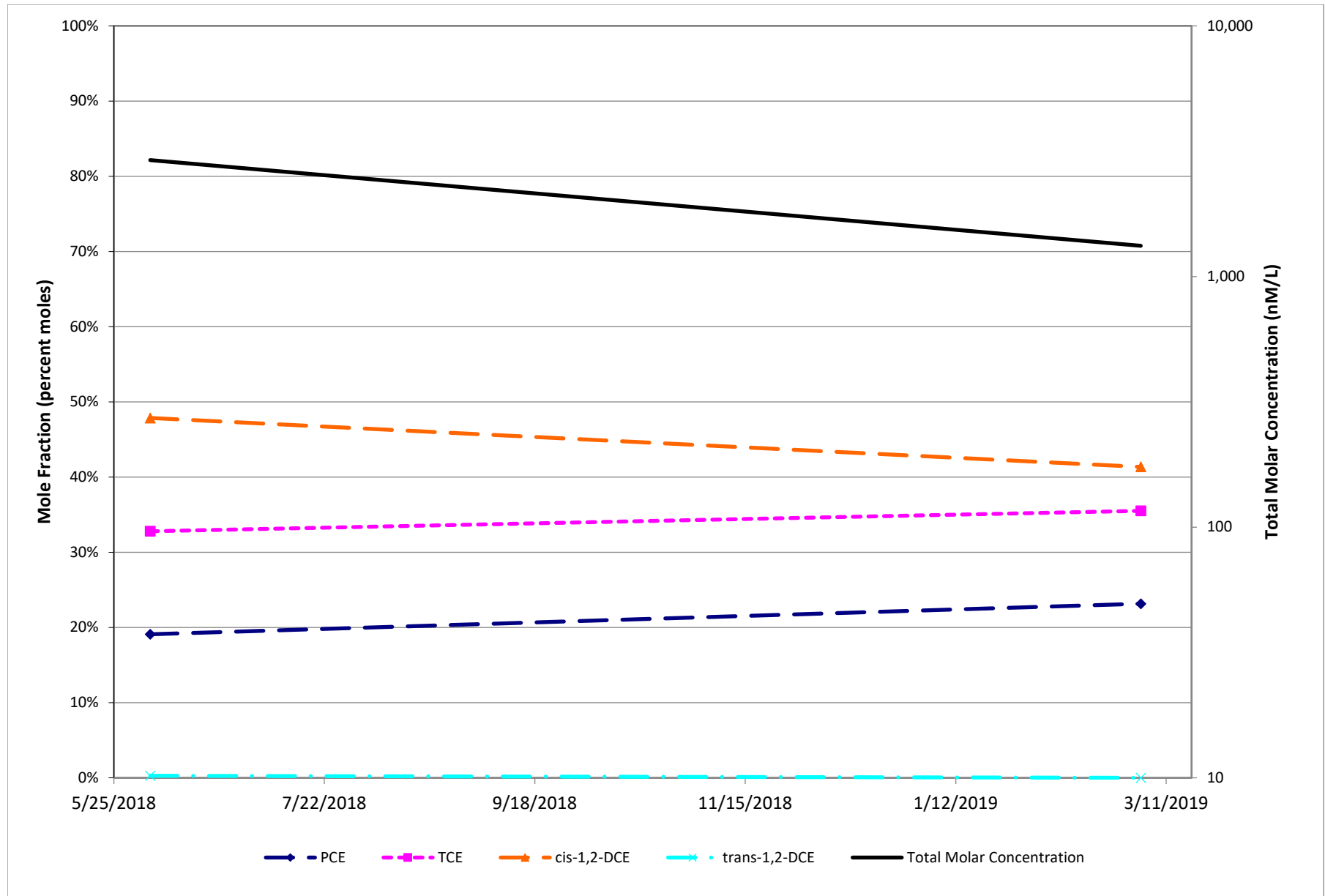


Figure 48.6.2 EXW05

B3-EXW05 VOC Summary
Jun 2018 - Mar 2019



Tables

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 1								
Sump 1-1								
Sump Depth: 15.95 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1450	12.10	6.56	22.06	1.122	2.50	-92.6	3.85
6/14/2018	900	12.08	6.78	24.28	1.137	0.26	-178.3	3.87
9/20/2018	1110	4.60	6.78	24.61	1.149	0.10	42.5	11.35
12/27/2018	800	5.68	7.10	20.94	0.672	0.73	41.5	9.84
4/3/2019	1045	6.27	7.00	21.63	0.654	2.03	69.3	9.25

TRENCH 1								
Sump 1-2								
Sump Depth: 15.52 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/21/2019	945	11.47	6.65	22.06	1.129	0.45	-122.6	4.05
6/14/2018	900	11.87	6.94	24.22	1.253	0.23	-245	3.65
9/20/2018	810	4.03	6.88	25.81	1.44	0.39	-186.2	11.49
12/27/2018	810	5.40	6.96	20.11	0.629	0.28	23.7	9.57
3/27/2019	1305	6.41	6.84	21.36	0.833	0.57	-158.2	8.56

TRENCH 1								
Sump 1-3								
Sump Depth: 14.97 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	10.75	6.46	23.35	0.828	0.21	-106.1	4.22
6/14/2018	900	11.09	6.67	25.12	0.907	0.14	-211.6	3.88
9/20/2018	950	2.65	7.04	26.00	1.427	0.43	36.3	12.32
12/27/2018	815	3.88	7.19	17.69	0.733	0.20	-347.7	11.09
4/3/2019	945	4.99	7.04	21.02	0.752	0.61	-4.5	9.98

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 2								
Sump 2-1								
Sump Depth: 11.78 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	11.11	6.42	20.62	1.031	0.41	39.9	0.67
6/4/2018	900	11.06	6.61	23.99	1.167	0.45	-27.7	0.72
9/20/2018		5.05	6.73	30.11	1.239	0.17	18.8	6.73
12/27/2018		6.1	6.8	20.08	0.863	0.23	112.2	5.68
3/27/2019	1025	6.89	6.78	20.26	0.842	1.67	42.6	4.89

TRENCH 2								
Sump 2-1								
Sump Depth: 11.78 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	10.81	6.49	22.57	0.741	1.16	-104.2	0.31
6/4/2018	900	10.75	6.61	26.64	2.143	0.26	-92.4	0.37
9/20/2018		4.31	6.78	29.37	1.177	0.35	-210.5	6.81
12/27/2018		5.4	6.87	20.67	0.786	0.17	-37.7	5.72
4/3/2019	1015	6.05	6.67	20.30	0.770	0.69	-165.8	5.07

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 3								
Sump 3-1								
Sump Depth: 11.05 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	Dry						0.00
6/4/2018	900	Dry						0.00
9/20/2018		6.79	6.45	27.58	2.819	0.15	-204.10	4.26
12/27/2018		7.45	6.78	20.83	0.742	0.23	36.80	3.60
3/27/2019		8.05	6.71	18.67	0.787	1.32	140.40	3.00

TRENCH 3								
Sump 3-2								
Sump Depth: 7.4 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	Dry						0.00
6/4/2018	900	Dry						0.00
9/20/2018		5.77	7.23	29.61	0.930	0.33	40.40	1.63
12/27/2018		6.31	6.83	19.72	0.812	1.62	81.10	1.09
3/27/2019		Dry						0.00

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 4								
Sump 4-1								
Sump Depth: 8.42 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/19/2018	1430	Dry						0.00
6/4/2018	900	Dry						0.00
9/20/2018		7.32	7.04	29.80	0.930	0.33	40.4	1.10
12/27/2018		6.96	6.69	20.89	0.774	1.36	138.5	1.46
3/27/2019		Dry						0.00

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 5								
Sump 5-1								
Sump Depth: 11.55 feet BTOC								
Sample Date	Sample Time	Sump H2O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H2O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	11.18	6.40	21.84	0.976	1.51	73.3	0.37
6/4/2018	900	11.03	6.62	23.97	0.916	4.07	-31.4	0.52
9/20/2018		10.17	6.81	23.62	0.564	0.80	73.7	1.38
12/27/2018		7.6	6.99	20.63	0.607	1.15	168.2	3.95
3/27/2019		7.85	7.14	20.82	0.695	3.65	413.2	3.70

TRENCH 5								
Sump 5-2								
Sump Depth: 11.04 feet BTOC								
Sample Date	Sample Time	Sump H2O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H2O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1318	12.78	6.90	22.09	0.715	1.80	30.50	1.81
6/4/2018	900	11.62	7.16	23.99	0.714	0.63	-174.50	2.97
9/20/2018	855	12.51	6.85	23.48	0.560	0.41	-135.80	2.08
12/27/2018		7.49	7.00	19.85	0.623	1.18	177.40	7.10
3/27/2019		10.38	6.52	22.02	1.135	4.38	-198.2	0.66

Table 48.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2018 - April 2019

TRENCH 6								
Sump 6-1								
Sump Depth: 14.63 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/19/2018	1430	Dry						0.00
6/4/2018	900	Dry						0.00
9/20/2018		7.82	6.84	31.73	1.439	0.44	-97	3.22
12/27/2018		7.25	7.19	20.97	0.860	0.44	154.6	3.79
3/27/2019	1000	8.32	7.00	21.46	0.712	1.85	458.00	6.27

TRENCH 6								
Sump 6-2								
Sump Depth: 15.56 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/21/2018	840	11.98	6.81	22.2	0.691	0.22	-137.0	3.52
6/4/2018	900	11.45	6.97	24.13	0.727	0.20	-211.7	4.05
9/20/2018	915	11.45	6.77	23.15	0.570	0.20	54.7	4.05
12/27/2018		7.25	7.19	20.67	0.612	3.51	173.1	8.25
3/27/2019	820	8.21	7.01	21.3	0.711	0.64	394.3	7.29

Table 48.1.2

B-3 Bioreactor Trench VOC Summary
Mar 2018 - Apr 2019

Q48 Date	T1-1			T1-2			T1-3			T2-1	T2-2	T6-1			T6-2		
	3/19/2018	9/20/2018	4/3/2019	3/21/2018	9/24/2018	3/27/2019	3/19/2018	9/24/2018	4/3/2019	3/27/2019	4/3/2019	3/19/2018	9/20/2018	3/27/2019	3/21/2018	9/20/2018	3/27/2019
PCE (µg/L)	0	2.7	0.76	0.93	0	0.52	0	0.74	0.35	0.86	0.27	2.0	2.5	25	0.41	13	21
TCE (µg/L)	0	5.3	2.8	1.4	0	1.7	0	0	0	7.4	0.37	4.2	12	41	0.97	26	28
cis-1,2-DCE (µg/L)	12	9.0	45	37	0	13	0	0	2.6	24	2.1	65	32	48	49	33	35
trans-1,2-DCE (µg/L)	0.79	0	1.1	1.2	0	4.4	0.87	0	1.2	0.72	0	1.1	0	0.65	0.90	0	0
Vinyl chloride (µg/L)	2.4	0	1.1	16	0	7.7	0	0	2.1	0	0.93	11	3.6	0	16	0	0
Ethene (µg/L)	0	0	0	1.4	12	0	1.5	2.1	0	0	0	0	0	0	0	0	0
PCE (nM/L)	0.000	16.041	4.583	5.608	0.000	3.136	0.000	4.462	2.111	5.186	1.628	12.061	14.955	151.179	2.472	80.203	125.852
TCE (nM/L)	0.000	40.642	21.082	10.275	0.000	13.015	0.000	0.000	0.000	56.169	2.816	31.738	91.559	308.623	7.383	196.666	209.909
cis-1,2-DCE (nM/L)	122.537	93.347	461.062	381.743	0.000	133.368	0.000	0.000	27.231	243.837	21.351	674.884	328.520	490.665	504.796	339.144	358.948
trans-1,2-DCE (nM/L)	8.149	0.000	11.862	12.068	0.000	45.384	8.974	0.000	12.068	7.427	0.000	11.243	0.000	6.704	9.283	0.000	0.000
Vinyl chloride (nM/L)	37.914	0.000	17.597	260.278	0.000	123.020	0.000	0.000	33.115	0.000	14.878	173.092	58.231	0.000	262.358	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	49.911	409.982	0.000	53.476	74.866	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	168.60	150.03	516.19	719.88	409.98	317.92	62.45	79.33	74.52	312.62	40.67	903.02	493.27	957.17	786.29	616.01	694.7
% moles PCE	0.0%	10.7%	0.9%	0.8%	0.0%	1.0%	0.0%	5.6%	2.8%	1.7%	4.0%	1.3%	3.0%	15.8%	0.3%	13.0%	18.1%
% moles TCE	0.0%	27.1%	4.1%	1.4%	0.0%	4.1%	0.0%	0.0%	0.0%	18.0%	6.9%	3.5%	18.6%	32.2%	0.9%	31.9%	30.2%
% moles cis-1,2-DCE	72.7%	62.2%	89.3%	53.0%	0.0%	42.0%	0.0%	0.0%	36.5%	78.0%	52.5%	74.7%	66.6%	51.3%	64.2%	55.1%	51.7%
% moles trans-1,2-DCE	4.8%	0.0%	2.3%	1.7%	0.0%	14.3%	14.4%	0.0%	16.2%	2.4%	0.0%	1.2%	0.0%	0.7%	1.2%	0.0%	0.0%
% moles Vinyl Chloride	22.5%	0.0%	3.4%	36.2%	0.0%	38.7%	0.0%	0.0%	44.4%	0.0%	36.6%	19.2%	11.8%	0.0%	33.4%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	6.9%	100.0%	0.0%	85.6%	94.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 48.1.3

B-3 Bioreactor Analytical Summary
Mar 2018 - Apr 2019

Q48		Bioreactor Active Trench Sumps																																									
Well ID	Sample Date	Y1-1						Y1-2						Y1-3						Y2-1						Y2-2						Y6-1						Y6-2					
		3/19/2018	9/20/2018	4/3/2019	3/21/2018	9/24/2018	3/27/2019	3/19/2018	9/24/2018	4/3/2019	3/27/2019	3/19/2018	9/24/2018	4/3/2019	3/27/2019	3/19/2018	9/24/2018	4/3/2019	3/27/2019	3/19/2018	9/20/2018	3/27/2019	3/21/2018	9/20/2018	3/27/2019	3/21/2018	9/20/2018	3/27/2019															
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag										
Total Organic Carbon	mg/L	5.0		56		4.0		3.3		143		11		5.7		102		16		5.0		7.2		2.5		3.9		2.1		3.2		5.3		2.2									
Methane	µg/L	63		14		1.3		130		1,370		50		894		558		2.1		0		2,110		9.6		0		0		230		0.50		0.50									
Ethane	µg/L	0		0		0		1.4	F	12		0		1.5	F	2.1	F	0		0		0		0		0		0		0		0		0									
Ethane	µg/L	0		0		0		0		3.0		0		0		0		0		0		0		0		0		0		0		0		0									
Carbon Dioxide	µg/L	112,000		71,000		7,750		90,600		78,500		54,300		155,000		46,000		8,660		55,900		63,300		23,400		38,900		12,800		57,400		42,700		8,420									
Sulfate	mg/L	196		195		31		230		2.9		18		5.9		198		13		21		32		19		26		35		22		28		28									
Chloride	mg/L	13		12		16		12		10		15		13		9.4		15		15		13		11		17		12		11		17		17									
Ferrous Iron	mg/L	5.0		1.1		0.58	F	2.9		13		11		7.4		2.5		2.7		0.78	F	5.1		1.5		2.0		0.28	F	5.2		0.62	F	0.37	F								
Manganese	µg/L	556		296		458		179		819		322		392		590		464		168		543		42		127		12		6.4		13		24									
Hydrogen	nM					13	B	42		1.6										1.1								2.8	B	5.8		1.1		1.1									
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Total Dissolved Solids	mg/L	748		870		396		776		1,170		426		483		1,210		482		419		450		411		351		362		417		373		366									
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Dichloroethene, cis-1,2-	µg/L	12		9.0		45		37		0		13		0		2.6		24		2.1		65		32		48		49		33		35		35									
Dichloroethene, trans-1,2-	µg/L	0.79		0		1.1		1.2		0		4.4		0.87		0		1.2		0.72		0		1.1		0		0.65		0.90		0		0									
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Tetrachloroethene	µg/L	0		2.7		0.76	F	0.93	F	0		0.52	F	0		0.74	F	0.35	F	0.86	F	0.27	F	2.0		2.5		0.41	F	13		21		21									
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0									
Trichloroethene	µg/L	0		5.3		2.8		1.4		0		1.7		0		0		7.4		0.37	F	4.2		12		41		0.97	F	26		28		28									
Vinyl chloride	µg/L	2.4		0		1.1		16		0		7.7		0		0		2.1		0		0.93	F	11		3.6		0		16		0		0									
Arsenic	µg/L	16	F	9.9	F	10	F	3.9	F	14	F	0.70	F	5.6	F	28	F	9.0	F	0		2.8	F	0.30	F	0		6.9	F	0		7.0	F	7.0	F								
		Month 131		Month 137		Month 143		Month 131		Month 137		Month 143		Month 131		Month 137		Month 143		Month 143		Month 131		Month 137		Month 143		Month 131		Month 137		Month 143		Month 143									

Note: 0 sample indicates a non-detect analyte value

Table 48.2.2

Upper Saturated Zone (Zone 03B) VOC Summary
Mar 2018 - Mar 2019

Q48 Date	CS-WB05-LGR03B			CS-WB06-LGR03B			CS-WB07-LGR03B			CS-WB08-LGR03B	
	3/15/2018	9/18/2018	3/20/2019	3/15/2018	9/19/2018	3/21/2019	3/19/2018	9/19/2018	3/20/2019	9/19/2018	3/22/2019
PCE (µg/L)	0	8.0	0.47	16	28	13	19	95	55	23	4.2
TCE (µg/L)	0	20	10	66	79	74	40	141	84	38	96
cis-1,2-DCE (µg/L)	88	79	87	108	120	124	52	171	97	56	141
trans-1,2-DCE (µg/L)	13	8.1	10	2.5	3.9	4.4	1.2	0	1.5	0	0
Vinyl chloride (µg/L)	18	22	16	0	0	0	0	0	1.3	0	0
Ethene (µg/L)	0	0	0	0	0	0	0	0	0	0	0
PCE (nM/L)	0.000	48.242	2.834	95.037	167.159	80.263	115.902	570.765	329.494	140.626	25.327
TCE (nM/L)	0.000	152.904	76.870	498.592	601.568	559.632	301.697	1070.553	637.796	285.410	730.878
cis-1,2-DCE (nM/L)	903.559	814.440	893.450	1117.277	1242.496	1279.835	539.763	1761.217	997.731	574.007	1458.174
trans-1,2-DCE (nM/L)	137.803	83.755	107.272	25.374	39.917	45.384	12.893	0.000	15.059	0.000	0.000
Vinyl chloride (nM/L)	291.633	347.304	248.280	0.000	0.000	0.000	0.000	0.000	20.957	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	1332.99	1446.65	1328.71	1736.28	2051.14	1965.11	970.26	3402.54	2001.04	1000.04	2214.4
% moles PCE	0.0%	3.3%	0.2%	5.5%	8.2%	4.1%	11.9%	16.8%	16.5%	14.1%	1.1%
% moles TCE	0.0%	10.6%	5.8%	28.7%	29.3%	28.5%	31.1%	31.5%	31.9%	28.5%	33.0%
% moles cis-1,2-DCE	67.8%	56.3%	67.2%	64.3%	60.6%	65.1%	55.6%	51.8%	49.9%	57.4%	65.9%
% moles trans-1,2-DCE	10.3%	5.8%	8.1%	1.5%	1.9%	2.3%	1.3%	0.0%	0.8%	0.0%	0.0%
% moles Vinyl Chloride	21.9%	24.0%	18.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 48.2.3a

B-3 Bioreactor Multi-Port Well CS-WB05 Analytical Summary
Mar 2018 - Mar 2019

Q48		CS-WB05																																			
Well ID	Sample Date	CS-WB05-LGR-01				CS-WB05-LGR-02				CS-WB05-LGR03A				CS-WB05-LGR03B				CS-WB05-LGR-04A				CS-WB05-LGR-04B				CS-WB05-BS-01				CS-WB05-CC-01				CS-WB05-CC-02			
		6/18/2018	3/20/2019	3/20/2019	3/20/2019	3/20/2019	3/15/2018	9/18/2018	3/20/2019	3/20/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019	6/14/2018	3/18/2019							
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag						
Total Organic Carbon	mg/L	1.6		6.2		5.7		5.5		1.5		1.1		6.0		1.4		1.1		1.5		1.4		1.1		0.94		1.1		1.1							
Methane	µg/L	11		0		31		12		10		38		10		412		194		176		195		13		4.6		1.0		3.0							
Ethane	µg/L	0		0		0		0		0		0		0		0		0		1.2	F	0		0		0		0		0							
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Carbon Dioxide	µg/L	23,100		22,900		25,800		4,960		8,210		12,200		5,880		6,710		5,700		11,300		11,600		7,650		5,380		7,160		4,380							
Sulfate	mg/L	100		121	J	114	J	45		42		42		45		25		25		9.1		11		32		32		85		104	J						
Chloride	mg/L	13		13		12		11		11		11		11		11		11		12		12		11		17		17		18							
Ferrous Iron	mg/L	0.18	F	0		0		0		0.19	F	0		0.59	F	0.28	F	1.0		1.0		0.40	F	0		0.44	F	0.23	F	0.38	F						
Manganese	µg/L	0		0		0		0		0		0		0		4.0	F	36		32		4.0	F	0		0		0		0							
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Total Dissolved Solids	mg/L	597		503		460		339		412		398		346		366		320		347		291		347		321		439		404							
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Dichloroethene, cis-1,2-	µg/L	5.0		4.7		32		90		88		79		87		174		321		346		399		19		28		0.42	F	0							
Dichloroethene, trans-1,2-	µg/L	1.4		1.6		9.2		10		13		8.1		10		17		16		20		30		0.19	F	0		0.46	F	0							
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Tetrachloroethene	µg/L	0.54	F	0		0.34	F	0		8.0		0.47	F	0.98	F	0.45	F	108		51		0.47	F	0		1.8		0		20							
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0							
Trichloroethene	µg/L	0.94	F	0		0		12		0		20		10		0.82	F	1.1		222		272		0		0		0		0.37	F						
Vinyl chloride	µg/L	1.5		0		2.9		15		18		22		16		54		54		53		51		3.8		2.8		0		0							
Arsenic	µg/L	0		2.7	F	4.0	F	9.5	F	0		0		9.5	F	0		8.7	F	13	F	23	F	0		1.1	F	3.7	F	0.30	F						
		Q45-Month 134	Q48-Month 143	Q48-Month 143	Q48-Month 143	Q48-Month 143	Q44-Month 131	Q46-Month 137	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143	Q45-Month 134	Q48-Month 143								

Note: 0 sample indicates a non-detect analyte value

Table 48.2.3b

B-3 Bioreactor Multi-Port Well CS-WB06 Analytical Summary
Mar 2018 - Mar 2019

Q48		CS-WB06																									
Well ID	Sample Date	CS-WB06-UGR-01				CS-WB06-LGR-01				CS-WB06-LGR-02				CS-WB06-LGR03A				CS-WB06-LGR03B				CS-WB06-LGR-04					
		6/20/2018		3/22/2019		6/20/2018		3/22/2019		6/20/2018		3/22/2019		6/20/2018		3/22/2019		3/15/2018		9/19/2018		3/21/2019		6/18/2018		3/21/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	5.5		2.4		2.4		2.6		1.3		1.5		1.1		1.6		1.3		1.2		1.3		1.3		1.8	
Methane	µg/L	149		8.6		0		3.1		4.4		7.6		0		54		2.2		255		76		68		598	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	62,700		30,700		21,100		11,300		9,500		4,990		8,920		4,810		9,610		9,410		7,170		24,700		36,200	
Sulfate	mg/L	19		22		19		20		26		28		23		23		23		22		23		9.8		14	
Chloride	mg/L	14		15		13		13		9.3		9.7		11		12		12		12		12		12		15	
Ferrous Iron	mg/L	2.2		1.2		0.30	F	0		0.23	F	0		0		0		0		0.23	F	0		0		0	
Manganese	µg/L	2,100		494		89		34		0		0		0		0		0		2.0	F	0		0		0	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	566		405		467		402		391		345		381		333		362		362		322		387		356	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0.22	F	0		0		0		0		0.29	F	0	
Dichloroethene, cis-1,2-	µg/L	7.1		42		16		18		24		33		106		139		108		120		124		257		86	
Dichloroethene, trans-1,2-	µg/L	1.1		0		0.45	F	0		0.64		0		2.5		3.7		2.5		3.9		4.4		1.6		1.3	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		0.50	F	1.1	F	1.3	F	0.39	F	0		16		13		16		28		13		137		42	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	0.27	F	4.4		3.5		0		0.76	F	0		58		82		66		79		74		166		38	
Vinyl chloride	µg/L	3.6		2.2		0.30	F	0.24	F	1.6		1.1	F	0		0.26	F	0		0		0		1.2		1.9	
Arsenic	µg/L	11	F	5.9	F	0		0		0		5.2	F	0		0		0		0		0		2.0	F	9.7	F
		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q44-Month 131		Q46-Month 137		Q48-Month 143		Q45-Month 134		Q48-Month 143	

Note: 0 sample indicates a non-detect analyte value

Table 48.2.3c

B-3 Bioreactor Multi-Port Well CS-WB07 Analytical Summary
Mar 2018 - Mar 2019

Q48		CS-WB07																			
Well ID		CS-WB07-LGR-01				CS-WB07-LGR-02				CS-WB07-LGR03A				CS-WB07-LGR03B				CS-WB07-LGR-04			
Sample Date		6/18/2018		3/21/2019		6/18/2018		3/21/2019		3/21/2019		3/19/2018		9/19/2018		3/20/2019		6/18/2018		3/20/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	2.4		3.9		1.4		1.3		1.3		1.3		1.3		6.6		1.3		4.9	
Methane	µg/L	158		627		56		42		111		1.6		52		431		3.8		0	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	26,900		37,400		9,720		5,490		3,730		7,920		25,100		12,300		13,600		9,540	
Sulfate	mg/L	19		16		36		40		19		20		11		19		9.1		10	
Chloride	mg/L	16		18		11		13		10		10		12		11		12		12	
Ferrous Iron	mg/L	2.2		2.3		0.48	F	0.39	F	0		0		0.24	F	0.30	F	0		0	
Manganese	µg/L	630		851		11		12		0		32		12		0		0		0	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	463		451		426		351		328		353		361		316		369		292	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0.33	F	0	
Dichloroethene, cis-1,2-	µg/L	125		105		5.7		1.4		65		52		171		97		348		414	
Dichloroethene, trans-1,2-	µg/L	2.5		2.5		0		0		0.96		1.2		0		1.5		1.5		1.5	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0.36	F	0		3.0		0		26		19		95		55		241		259	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	2.6		0		3.7		0		44		40		141		84		310		347	
Vinyl chloride	µg/L	20		22		0.88	F	0.75	F	0.64	F	0		0		1.3		0.26	F	0	
Arsenic	µg/L	5.7	F	14	F	0		0		0		0		0		1.5	F	0		10	F
		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q48-Month 143		Q44-Month 131		Q46-Month 137		Q48-Month 143		Q45-Month 134		Q48-Month 143	

Note: 0 sample indicates a non-detect analyte value

Table 48.2.3d

B-3 Bioreactor Multi-Port Well CS-WB08 Analytical Summary
Jun 2018 - Mar 2019

Q48		CS-WB08																					
Well ID		CS-WB08-UGR-01				CS-WB08-LGR-01				CS-WB08-LGR-02				CS-WB08-LGR03A		CS-WB08-LGR03B				CS-WB08-LGR-04			
Sample Date		6/21/2018		3/26/2019		6/21/2018		3/26/2019		6/21/2018		3/26/2019		3/26/2019		9/19/2018		3/22/2019		6/21/2018		3/22/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	2.1		2.1		1.4		1.5		1.4		1.5		1.7		2.1		1.7		1.6	F	2.8	
Methane	µg/L	45		82		61		0.60	F	4.1		24		766		2,500		704		0		2.0	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	24,800		9,090		18,700		7,080		11,400		5,990		11,000		72,300		29,300		27,200		30,600	
Sulfate	mg/L	23		19		112		128	J	101		128	J	18		18		18		18		19	
Chloride	mg/L	14		16		10		12		10		11		12		12		12		14		15	
Ferrous Iron	mg/L	6.7		1.4		0.19	F	0		0.27	F	0		0.45	F	0.24	F	0.33	F	0.20	F	0	
Manganese	µg/L	1,260		697		0		0		0		0		29		151		38		2.0	F	85	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	421		360		623		540		574		535		415		467		371		471		402	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	140		80		17		13		22		5.2		126		56		141	J	16		18	
Dichloroethene, trans-1,2-	µg/L	1.8		1.3		1.0		0		0.66		0		0.72		0		0		0.23	F	0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		1.0	F	0.59	F	0		0		0		5.6		23		4.2		4.8		4.6	
Toluene	µg/L	0		0.63	F	0		1.4		0		2.5		4.0		0		0		0		0	
Trichloroethene	µg/L	0.41	F	0.66	F	0.50	F	0		0.32	F	1.3		95		38		96		5.6		5.9	
Vinyl chloride	µg/L	39		19		1.9		0.88	F	0.33	F	0		0		0		0		0		0	
Arsenic	µg/L	0		0		0		0		0		3.2	F	0		4.1	F	8.0	F	10	F	3.6	F
		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q45-Month 134		Q48-Month 143		Q48-Month 143		Q46-Month 137		Q48-Month 143		Q45-Month 134		Q48-Month 143	

Note: 0 sample indicates a non-detect analyte value

Table 48.3.3

B-3 Bioreactor Monitoring Well Analytical Summary
Mar 2018 - Mar 2019

Q48		Monitoring Wells																	
Well ID		CS-MW1-LGR						CS-D				CS-4		CS-MW5-LGR					
Sample Date		3/5/2018		9/6/2018		3/6/2019		9/6/2018		3/6/2019		9/7/2018		3/21/2018		9/6/2018		3/6/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	1.1		0.99	F	1.3		1.0		1.0				1.6		1.0		1.1	
Methane	µg/L	0		0		0		0		0				0		2.0		3.0	
Ethene	µg/L	0		0		0		0		0				0		0		0	
Ethane	µg/L	0		0		0		0		0				0		0		0	
Carbon Dioxide	µg/L	10,800		15,200		7,910		19,400		6,260				17,300		18,100		12,400	
Sulfate	mg/L	34		32		21		19		22				15		16		17	
Chloride	mg/L	11		11		9.7		9.7		9.9				8.0		8.0		7.9	
Ferrous Iron	mg/L	0		0		0.25	F	0		0.23	F			0.28	F	0		0.23	F
Manganese	µg/L	15		0		0		7.0	F	7.0				36		0		2.0	F
Hydrogen	nM	4.6		4.4		1.9	F												
Sulfide	mg/L	0		0		0		0		0				0		0		0	
Total Dissolved Solids	mg/L	344		326		336		308		311				338		243		311	
Benzene	µg/L	0				0				0				0				0	
Bromodichloromethane	µg/L	0				0				0				0				0	
Bromoform	µg/L	0				0				0				0				0	
Chloroform	µg/L	0				0				0				0				0	
Dibromochloromethane	µg/L	0				0				0				0				0	
Dichlorodifluoromethane	µg/L	0				0				0				0				0	
Dichloroethene, 1,1-	µg/L	0				0				0				0				0	
Dichloroethene, cis-1,2-	µg/L	10		17		17		2.8		2.1		0		4.3		4.6		2.0	
Dichloroethene, trans-1,2-	µg/L	0				0				0				1.0				0.67	
Methylene chloride	µg/L	0				0				0				0				0	
Naphthalene	µg/L	0				0				0				0				0	
Tetrachloroethene	µg/L	8.9		11		12		3.1		3.0		0		0.81	F	1.1	F	0	
Toluene	µg/L	0				0				0				0				0	
Trichloroethene	µg/L	13		12		17		4.0		3.3		0.47	F	2.5		2.7		1.1	
Vinyl chloride	µg/L	0		0		0		0		0		0		0		0		0	
Arsenic	µg/L	0		0		0		0		0				8.0	F	0.80	F	14	F
Mercury	µg/L	0																	

Note: 0 sample indicates a non-detect analyte value

SWMU B-3 Microbial Data Summary
Mar 2018 - Mar 2019

Trench Sump				
B3-T1-2	Sample Date:	3/21/2018	9/24/2018	3/27/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	1.79E+02	1.34E+02	8.35E+02
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	5.15E+01	8.83E+01	9.21E+02
BAV1 VC R-Dase (1)	cells/mL	9.47E+01	5.60E+00	4.23E+01
VC R-Dase	cells/mL	5.95E+01	1.80E+01	1.73E+02
B3-T2-1	Sample Date:	Not Sampled	Not Sampled	3/27/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	--	3.70E+00
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	--	1.27E+01
BAV1 VC R-Dase (1)	cells/mL	--	--	< 5.00E-01
VC R-Dase	cells/mL	--	--	2.59E+01
B3-T6-2	Sample Date:	3/21/2018	9/20/2018	3/27/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	9.67E+01	2.06E+02	4.03E+01
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	1.46E+01	1.20E+00	1.68E+01
BAV1 VC R-Dase (1)	cells/mL	5.56E+01	2.69E+01	4.00E-01 F
VC R-Dase	cells/mL	2.46E+01	2.37E+01	3.86E+01

Extraction Wells				
CS-MW16-LGR	Sample Date:	Not Sampled	6/4/2018	Not Sampled
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	< 5.00E-01	--
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	< 5.00E-01	--
BAV1 VC R-Dase (1)	cells/mL	--	< 5.00E-01	--
VC R-Dase	cells/mL	--	< 5.00E-01	--
B3-EXW01	Sample Date:	Not Sampled	6/4/2018	3/6/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	8.80E+00	6.50E+00
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	5.40E+00	1.40E+00
BAV1 VC R-Dase (1)	cells/mL	--	< 5.00E-01	< 5.00E-01
VC R-Dase	cells/mL	--	7.00E-01	1.00E+00

Monitoring Wells				
CS-MW1-LGR	Sample Date:	3/5/2018	9/6/2018	3/6/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	2.00E-01 F	3.00E-01 F	4.00E-01 F
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	< 5.00E-01	< 5.00E-01	< 5.00E-01
BAV1 VC R-Dase (1)	cells/mL	< 5.00E-01	< 5.00E-01	< 5.00E-01
VC R-Dase	cells/mL	< 5.00E-01	< 5.00E-01	< 5.00E-01
CS-B3-MW01	Sample Date:	Not Sampled	10/4/2018	Not Sampled
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	1.52E+02	--
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	4.05E+02	--
BAV1 VC R-Dase (1)	cells/mL	--	1.29E+01	--
VC R-Dase	cells/mL	--	4.17E+01	--
CS-B3-MW02	Sample Date:	Not Sampled	10/4/2018	Not Sampled
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	1.48E+02	--
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	2.26E+02	--
BAV1 VC R-Dase (1)	cells/mL	--	< 4.30E+00	--
VC R-Dase	cells/mL	--	1.68E+02	--
CS-B3-MW03	Sample Date:	Not Sampled	10/4/2018	Not Sampled
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	2.00E+04	--
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	1.02E+03	--
BAV1 VC R-Dase (1)	cells/mL	--	2.23E+03	--
VC R-Dase	cells/mL	--	2.35E+04	--
CS-B3-MW04	Sample Date:	Not Sampled	10/4/2018	Not Sampled
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	1.64E+03	--
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	1.92E+03	--
BAV1 VC R-Dase (1)	cells/mL	--	< 2.50E+00	--
VC R-Dase	cells/mL	--	1.13E+03	--

Westbay Multi-Port Wells				
CS-WB05-LGR-04B	Sample Date:	Not Sampled	6/14/2018	3/18/2019
Dechlorinating Bacteria	Units			
Dehalococcoides spp (1)	cells/mL	--	1.90E+00	2.00E-01 F
Functional Genes	Units			
TCE R-Dase (1)	cells/mL	--	1.00E-01 F	1.00E-01 F
BAV1 VC R-Dase (1)	cells/mL	--	< 5.00E-01	< 5.00E-01
VC R-Dase	cells/mL	--	< 5.00E-01	2.00E-01 F

Table 48.5.1

B3-UIC Analytical Results
March 2018 - March 2019

Sample ID Sample Date Sample Type Sampling Method Lab ID	B3-UIC 03/21/18 N1 Grab AZ70369			B3-UIC 06/07/18 N1 Grab AZ74632			B3-UIC 09/10/18 N1 Grab AZ79426			B3-UIC 12/06/18 N1 Grab AZ83727			B3-UIC 03/27/19 N1 Grab AZ88650		
	Lab MDL	Lab PQL	B3-UIC Criteria (RCRA Haz.)	Results	Flags	Dilution	Results	Flags	Dilution	Results	Flags	Dilution	Results	Flags	Dilution
SW8260B (µg/L)															
cis-DCE	0.07	1.2	--	53		1	64		1	18		1	102		1
trans-DCE	0.08	0.6	--	1.9		1	2.1		1	0.08	U	1	1.9		1
TCE	0.05	1.0	500	57		1	56		1	19		1	90		1
PCE	0.06	1.4	700	45		1	46		1	17		1	74		1
Toluene	0.06	1.1	--	0.06	U	1	0.06	U	1	0.06	U	1	0.06	U	1
Vinyl chloride	0.08	1.1	200	0.08	U	1	0.08	U	1	0.08	U	1	0.08	U	1
EPA 160.1 (mg/L)															
TDS	4.4	10	--	375		1	410		2	293		1	300		1

Tables present all laboratory results for analytes.
Data packages for laboratory results are presented in Attachment 1.
All samples were analyzed by APPL Laboratory Services.
pH results reported were field measured.
UIC criteria specified in 40 CFR 261.24 Table 1.

Data Qualifiers:
U - The analyte was analyzed for, but not detected. The associated numerical value is the MDL.

Abbreviations:
MDL Method Detection Limit
PQL Practical Quantitation Limit
N1 Environmental Sample
UIC Underground Injection Control

Table 48.5.2

Storage Tank (UIC) VOC Summary
Mar 2018 - Mar 2019

Q48	B3-UIC				
Date	3/21/2018	6/7/2018	9/10/2018	12/6/2018	3/27/2019
PCE (µg/L)	45	46	17	74	49
TCE (µg/L)	57	56	19	90	68
cis-1,2-DCE (µg/L)	53	64	18	102	66
trans-1,2-DCE (µg/L)	1.9	2.1	0	1.9	1.2
Vinyl chloride (µg/L)	0	0	0	0	0
Ethene (µg/L)	0	0	0	0	0
PCE (nM/L)	272.990	275.101	101.731	445.034	296.267
TCE (nM/L)	431.007	424.538	146.206	683.538	520.968
cis-1,2-DCE (nM/L)	542.754	664.879	180.815	1048.582	678.391
trans-1,2-DCE (nM/L)	20.010	22.073	0.000	19.804	12.068
Vinyl chloride (nM/L)	0.000	0.000	0.000	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	1266.8	1386.6	428.8	2197.0	1507.7
% moles PCE	21.6%	19.8%	23.7%	20.3%	19.7%
% moles TCE	34.0%	30.6%	34.1%	31.1%	34.6%
% moles cis-1,2-DCE	42.8%	48.0%	42.2%	47.7%	45.0%
% moles trans-1,2-DCE	1.6%	1.6%	0.0%	0.9%	0.8%
% moles Vinyl Chloride	0.0%	0.0%	0.0%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 48.5.3

SWMU B3-UIC Analytical Summary Table
Mar 2018 - Mar 2019

Q48		B3-UIC									
Well ID											
Sample Date		3/21/2018		6/7/2018		9/10/2018		12/6/2018		3/27/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Dissolved Solids	mg/L	375		410		293		300		353	
Benzene	µg/L	0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	53		64		18		102		66	
Dichloroethene, trans-1,2-	µg/L	1.9		2.1		0		1.9		1.2	
Methylene chloride	µg/L	0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0	
Tetrachloroethene	µg/L	45		46		17		74		49	
Toluene	µg/L	0		0		0		0		0	
Trichloroethene	µg/L	57		56		19		90		68	
Vinyl chloride	µg/L	0		0		0		0		0	

Table 48.6.2

B-3 Bioreactor Extraction Well VOC Summary

Jun 2018 - Mar 2019

Q48	16-LGR	16-CC		EXW01		EXW02	EXW03		EXW04		EXW05	
Date	6/4/2018	6/4/2018	3/4/2019	6/4/2018	3/6/2019	6/4/2018	6/4/2018	3/4/2019	6/4/2018	3/4/2019	6/4/2018	3/4/2019
PCE (µg/L)	0	0	0	17	87	9.9	96	26	55	41	92	51
TCE (µg/L)	1.7	0	1.7	18	105	11	126	31	66	57	126	62
cis-1,2-DCE (µg/L)	11	0.74	8.7	8.7	127	8.7	162	28	66	43	135	53
trans-1,2-DCE (µg/L)	5.2	0	4.8	0	0.59	0	0.40	0	0.56	0.64	0.76	0
Vinyl chloride (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Ethene (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
PCE (nM/L)	0.000	0.000	0.000	103.962	526.684	59.519	579.449	158.958	329.675	249.533	556.172	307.001
TCE (nM/L)	12.862	0.000	13.091	133.572	800.061	82.883	957.835	233.427	504.757	430.779	955.248	470.812
cis-1,2-DCE (nM/L)	110.057	7.633	89.428	89.428	1305.003	89.428	1667.457	286.230	676.019	439.917	1394.224	548.324
trans-1,2-DCE (nM/L)	53.533	0.000	49.923	0.000	6.086	0.000	4.126	0.000	5.776	6.601	7.839	0.000
Vinyl chloride (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	176.5	7.63	152.44	326.96	2637.83	231.83	3208.87	678.62	1516.23	1126.83	2913.48	1326.14
% moles PCE	0.0%	0.0%	0.0%	31.8%	20.0%	25.7%	18.1%	23.4%	21.7%	22.1%	19.1%	23.2%
% moles TCE	7.3%	0.0%	8.6%	40.9%	30.3%	35.8%	29.9%	34.4%	33.3%	38.2%	32.8%	35.5%
% moles cis-1,2-DCE	62.4%	100.0%	58.7%	27.4%	49.5%	38.6%	52.0%	42.2%	44.6%	39.0%	47.9%	41.3%
% moles trans-1,2-DCE	30.3%	0.0%	32.7%	0.0%	0.2%	0.0%	0.1%	0.0%	0.4%	0.6%	0.3%	0.0%
% moles Vinyl Chloride	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 48.6.3

B-3 Bioreactor Extraction Well Analytical Summary
Jun 2018 - Mar 2019

Q48		Extraction Wells																							
Well ID	Compound	CS-MW16-LGR		CS-MW16-CC				B3-EXW01				B3-EXW02		B3-EXW03				B3-EXW04			B3-EXW05				
		6/4/2018	6/4/2018	6/4/2018	3/4/2019	6/4/2018	3/6/2019	6/4/2018	6/4/2018	6/4/2018	3/4/2019	6/4/2018	3/4/2019	6/4/2018	3/4/2019	6/4/2018	3/4/2019	6/4/2018	3/4/2019						
Sample Date	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag				
Total Organic Carbon	mg/L	1.1		1.0		1.0		1.5		1.5		1.5		1.7		1.7		1.3		2.8		1.2		1.2	
Methane	µg/L	2.4		19		1.9		0		156		0.90	F	21		0		0		0		2.1		4.3	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	5,450		12,300		8,550		30,000		11,600		24,900		43,400		11,800		37,100		12,100		23,700		10,800	
Sulfate	mg/L	17		68		91	J	12		13		20		17		20		8.9		12		15		16	
Chloride	mg/L	9.3		19		19		12		13		13		14		21		12		12		9.8		9.9	
Ferrous Iron	mg/L	0.25	F	2.0		0.31	F	0.34	F	0.32	F	1.5		0.27	F	0		0		0.53	F	0.28	F	0.30	F
Manganese	µg/L	7.0	B	16	B	0		11	B	0		72		608		9.0		3.0	F	238		12	B	29	
Hydrogen	nM	4.9						4.1		1.6															
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	306		414		418		378		371		378		403		403		365		350		344		345	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	11		0.74	F	8.7		8.7		127		8.7		162		28		66		43		135		53	
Dichloroethene, trans-1,2-	µg/L	5.2		0		4.8		0		0.59	F	0		0.40	F	0		0.56	F	0.64		0.76		0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		0		0		17		87		9.9		96		26		55		41		92		51	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	1.7		0		1.7		18		105		11		126		31		66		57		126		62	
Vinyl chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Arsenic	µg/L	0		0		5.3	F	0		3.2	F	0		2.4	F	11	F	0		6.6	F	0		11	F

Note: 0 sample indicates a non-detect analyte value

B3-MW-26								
Elev. (ft. MSL)		Total Depth:						
1238.49		20.32 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	824	13.33	6.59	22.10	0.749	0.90	-180.80	1225.16
6/4/2018	833	14.19	6.27	20.57	0.723	2.36	45.40	1224.30
3/7/2019	1033	10.55	6.71	19.54	0.746	0.90	24.40	1227.94

B3-MW-28								
Elev. (ft. MSL)		Total Depth:						
1226.67		18.33 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017		Not enough water for field readings						
6/4/2018		Not enough water for field readings						
3/7/2019		Not enough water for field readings						

B3-MW-30								
Elev. (ft. MSL)		Total Depth:						
1246.01		23.90 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	903	21.78	6.70	21.48	0.804	1.87	72.1	1224.23
6/4/2018	1318	23.00	6.17	20.93	0.845	5.35	232.3	1223.01
3/7/2019	1322	21.65	6.87	21.45	0.758	8.21	100.4	1224.36

B3-MW-32								
Elev. (ft. MSL)		Total Depth:						
1266.98		58.45 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	1015	52.00	6.69	21.04	0.687	0.12	-73.0	1214.98
6/4/2018	935	55.40	6.40	21.14	0.67	1.59	54.10	1211.58
3/7/2019	1130	38.38	6.85	20.59	0.693	3.27	108.0	1228.60

B3-MW-34								
Elev. (ft. MSL)		Total Depth:						
1244.51		25.40 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	1050	18.60	6.60	22.14	0.803	0.04	-239.7	1225.91
6/4/2018	852	19.45	6.65	21.45	0.707	0.59	5.8	1225.06
3/7/2019	1052	15.75	6.66	20.81	0.512	7.96	75.3	1228.76

B3-MW-27								
Elev. (ft. MSL)		Total Depth:						
1233.42		17.00 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	845	9.28	6.59	22.80	0.830	0.36	-175.7	1224.14
6/4/2018	815	10.18	6.31	20.93	0.791	2.00	19.9	1223.24
3/7/2019	1015	6.30	6.69	18.58	0.758	8.74	47.2	1227.12

B3-MW-29								
Elev. (ft. MSL)		Total Depth:						
1233.25		20.40 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	928	19.10	6.59	20.85	0.76	0.94	-200.10	1214.15
6/4/2018		Dry						
3/7/2019	1340	14.34	6.78	19.76	0.55	9.25	113.30	1233.25

B3-MW-31								
Elev. (ft. MSL)		Total Depth:						
1257.20		39.06 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	955	34.42	6.61	21.31	0.766	0.39	-104.0	1222.78
6/4/2018	1303	34.81	6.22	21.55	0.908	0.65	99.8	1222.39
3/7/2019	1302	32.17	6.79	21.62	0.764	2.18	89.6	1225.03

B3-MW-33								
Elev. (ft. MSL)		Total Depth:						
1249.55		29.55 feet BTOC						
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
9/6/2017	1110	23.53	6.68	21.56	0.780	0.23	-235.6	1226.02
6/4/2018	913	24.44	6.49	21.27	0.855	1.50	8.3	1225.11
3/7/2019	1108	20.46	6.87	21.01	0.343	8.14	95.4	1229.09

Table 48.7.3

B-3 Bioreactor UGR Well Analytical Summary
Jun 2018 - Mar 2019

Q48		Shallow UGR Wells																													
Well ID		B3-MW26-UGR				B3-MW27-UGR				B3-MW29-UGR		B3-MW30-UGR				B3-MW31-UGR				B3-MW32-UGR				B3-MW33-UGR				B3-MW34-UGR			
Sample Date	Units	6/4/2018		3/7/2019		6/4/2018		3/7/2019		3/7/2019		6/4/2018		3/7/2019		6/4/2018		3/7/2019		6/4/2018		3/7/2019		6/4/2018		3/7/2019		6/4/2018		3/7/2019	
Compound		Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	2.4		3.5		2.7		3.4		2.0		4.3		3.6		2.4		4.5		8.0		2.9		2.3		4.8		3.0		0	
Methane	µg/L	515		810		150		3,200		10		0		1.2		1.3		2.8		3.0		0		0		726		0		0	
Ethane	µg/L	1.6	F	0		0		1.3	F	0		0		0		0		0		0		0		0		3.1		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0.70		0		F	
Carbon Dioxide	µg/L	69,600		62,300		65,100		67,400		6,600		61,000		38,400		35,300		70,300		54,700		79,600		51,400		49,500		94,900		0	
Sulfate	mg/L	22		18		18		19		33		47		27		87		45		17		30		27		13		27		0	
Chloride	mg/L	14		20		14		17		25		11		12		12		11		12		13		16		15		36		0	
Ferrous Iron	mg/L	0.84	F	0.64	F	1.1		0.96	F	0		0		0		0.56	F	0.62	F	0.37	F	0.53	F	0		2.4		0		0	
Manganese	µg/L	1,070		1,090		327		298		5.0		48		17		79		70		122		436		39		891		179		0	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	428		473		465		483		342		523		479		589		497		460		496		400		415		534		0	
Benzene	µg/L	0.47		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	7.3		10.0		42		7.2		0		0		2.7		3.8		5.0		11		51		34		0		22		0	
Dichloroethene, trans-1,2-	µg/L	2.2		1.0		0.98		1.1		0		0		0		0.39	F	0		0		1.7		0		0		0		0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		0		0		0		0		0		3.2		2.8		2.4		0.95	F	0		15		2.4		0		0	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	0		0		0		0		0		10		2.8		2.4		1.7		0.85	F	0		21		0		1.2		0	
Vinyl chloride	µg/L	15		4.8		14		8.4		0		0		0		0.23	F	0		0		21		0		0		0		0	
Arsenic	µg/L	0		8.8	F	2.4	F	15	F	9.8	F	0		18	F	0		4.6	F	1.1	F	0		14	F	0		15	F	0	

Note: 0 sample indicates a non-detect analyte value