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Subject:  
Results of Second Quarter 2020 System Operation and Monitoring, Bethpage  
Park Groundwater Containment System (BPGWCS), Operable Unit 3 (Former  
Grumman Settling Ponds), Bethpage, New York, NYSDEC Site  
#1-30-003A.

ENVIRONMENT

Date:  
August 26, 2020

Contact:  
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Our ref:  
30037969

Dear Jason:

Enclosed is one electronic PDF copy of the Second Quarter 2020 Report for the BPGWCS operation and monitoring, performed in accordance with the NYSDEC-approved OU3 Groundwater IRM OM&M Manual (Arcadis 2009) and the NYSDEC-approved Sampling and Analysis Plan (SAP; Arcadis 2009). As we have transitioned to electronic submittals (via PDF) in line with NYSDEC's paper reduction program, hard copies of the report can be provided on request.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Arcadis of New York, Inc.



Christopher Engler, PE  
New York PE-069748

Vice President

Enclosure

Mr. Jason Pelton  
August 26, 2020

Copies:

Edward Hannon, Northrop Grumman Corporation  
Donald Hesler, NYSDEC  
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John Lovejoy, Nassau County Dept. of Health  
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**Table 1**  
**Operational Summary**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

MONTH	DAY																															Days Operational <sup>1</sup>
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
2009 Total																																160
2010 Total																																352
2011 Total																																351
2012 Total																																353
2013 Total																																354
2014 Total																																349
2015 Total																																348
2016 Total																																351
2017 Total																																354
2018 Total																																348
2019 Total																																355
Apr 2020																																30
May 2020																																31
Jun 2020																																30
2Q 2020																																91
2020 Total																																173
<b>TOTAL</b>																																<b>3848</b>

**Legend:**

- Indicates system online the majority or all of the day.
- Indicates system operated with reduced flow rates.
- Indicates system off-line the majority or all of the day.



Notes, Abbreviations, and Units on last page.

**Table 1**  
**Operational Summary**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

**Notes:**

1. Days the system was operational for the majority of the day are counted as one day.

**Second Quarter 2020**

2. System operated at a reduced flowrate due to RW-2 pump maintenance.

**Abbreviations/Units:**

2Q          Second Quarter

**Table 2**  
**Summary of Influent Water Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound	09/06/19 (µg/L)	11/05/19 (µg/L)	02/06/20 (µg/L)	05/14/20 (µg/L)
<b><u>Project VOCs</u></b>				
1,1,1 - Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1 - Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2 - Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1 - Dichloroethene	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	<b>3.0</b>	<b>3.6</b>	<b>3.9</b>	<b>4.5</b>
Vinyl Chloride	<b>1.8</b>	<b>1.3</b>	<b>3.1</b>	<b>4.1</b>
cis 1,2-Dichloroethene	<b>5.7</b>	<b>6.0</b>	<b>10.0</b>	<b>9.8</b>
trans 1,2-Dichloroethene	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	< 1.0	< 1.0	< 1.0	< 1.0
m,p-Xylene	< 1.0	< 1.0	< 1.0	< 1.0
<b>Subtotal Project VOCs</b>	<b>10.5</b>	<b>10.9</b>	<b>17.0</b>	<b>18.4</b>
<b><u>Non-Project VOCs</u></b>				
1,1,1,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	< 10	< 10	< 10	< 10
Bromodichloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodifluoromethane (Freon 22)	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	<b>0.56</b>	<b>0.57</b>
Chloromethane	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0

Notes, Abbreviations, Qualifiers, and Units on last page.

**Table 2**  
**Summary of Influent Water Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound	09/06/19 (µg/L)	11/05/19 (µg/L)	02/06/20 (µg/L)	05/14/20 (µg/L)
<b>Non-Project VOCs</b>				
Dichlorodifluoromethane (Freon 12)	< 2.0	< 2.0	< 2.0	< 2.0
Dichloromethane	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone	< 5.0	< 5.0	< 5.0	< 5.0
Methyl Tert-Butyl Ether	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane (Freon 11)	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorotrifluoroethane (Freon 113)	< 5.0	< 5.0	< 5.0	< 5.0
1-Chloro-1,1-difluoroethane (Freon 142b)	< 5.0	< 5.0	< 5.0	< 5.0
<b>Subtotal Non-Project VOCs</b>	<b>0.0</b>	<b>0.0</b>	<b>0.6</b>	<b>0.6</b>
<b>Total VOCs<sup>1</sup></b>	<b>11</b>	<b>11</b>	<b>18</b>	<b>19</b>
1,4-Dioxane	<b>0.70</b>	<b>0.71</b>	<b>1.0</b>	<b>1.3</b>
pH <sup>2</sup>	5.5	5.5	5.1	5.6

**Notes, Abbreviations, Qualifiers, and Units:**

- "Total VOCs" represents the sum of individual concentrations of the compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.
  - Influent pH samples collected and measured in the field by Arcadis personnel on the dates listed using a field calibrated pH/conductivity meter. pH units are standard units.
- USEPA United States Environmental Protection Agency  
VOC Volatile Organic Compound
- 3.0** Bold value indicates a detection.  
< 1.0 Compound not detected at or above the laboratory quantification limit.  
µg/L micrograms per liter

**Table 3**  
**Summary of Effluent Water Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound	Discharge Limit <sup>1</sup> (µg/L)	07/02/19 (µg/L)	08/02/19 (µg/L)	09/06/19 (µg/L)	10/15/19 (µg/L)	11/05/19 (µg/L)	12/04/19 (µg/L)	01/14/20 (µg/L)	02/06/20 (µg/L)	03/03/20 (µg/L)	04/15/20 (µg/L)	05/14/20 (µg/L)	06/04/20 (µg/L)
<b>Project VOCs</b>													
1,1,1-Trichloroethane	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans 1,2-Dichloroethene	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>Subtotal Project VOCs</b>		0	0	0	0	0	0	0	0	0	0	0	0
Compound	Discharge Limit <sup>1</sup> (µg/L)	07/02/19 (µg/L)	08/02/19 (µg/L)	09/06/19 (µg/L)	10/15/19 (µg/L)	11/05/19 (µg/L)	12/04/19 (µg/L)	01/14/20 (µg/L)	02/06/20 (µg/L)	03/03/20 (µg/L)	04/15/20 (µg/L)	05/14/20 (µg/L)	06/04/20 (µg/L)
<b>Non-Project VOCs</b>													
Chloroform	5 <sup>2</sup>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5 <sup>2</sup>	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorotrifluoroethane (Freon 113)	5 <sup>2</sup>	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
<b>Subtotal Non-Project VOCs</b>		0	0	0	0	0	0	0	0	0	0	0	0
<b>Total VOCs<sup>3</sup></b>		0	0	0	0	0	0	0	0	0	0	0	0
Treatment Efficiency <sup>4</sup>		> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%
Compound	Discharge Limit <sup>1</sup> (µg/L)	07/02/19 (µg/L)	08/02/19 (µg/L)	09/06/19 (µg/L)	10/15/19 (µg/L)	11/05/19 (µg/L)	12/04/19 (µg/L)	01/14/20 (µg/L)	02/06/20 (µg/L)	03/03/20 (µg/L)	04/15/20 (µg/L)	05/14/20 (µg/L)	06/04/20 (µg/L)
<b>Inorganics</b>													
Total Iron	600	102	133	133	201	110	< 100	< 100	< 100	144	< 100	144	113
Total Manganese	600	49.4	50.1	51.2	46.1	47.6	43.1	50.1	49.7	51.9	45.3	44.2	46.5
Nitrate and Nitrite	10,000	2,500	2,500	2,700	2,700	2,700	2,900	2,400	2,900	2,800	2,600	2,800	2,900
Toal Kjeldahl Nitrogen	10,000	< 200	< 200	310	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Total Nitrogen	10,000	2,500	2,500	3,000	2,700	2,900	3,100	2,400	2,900	2,800	2,600	2,800	2,900
1,4-Dioxane	NE	0.68	0.34	0.71	0.70	0.68	0.87	0.76	1.0	0.79	1.2	1.4	1.3
pH <sup>5</sup>	5.5-8.5	7.0	6.7	6.7	6.2	6.3	6.8	6.3	6.1	6.1	5.9	6.9	6.5

Notes, Abbreviations, Qualifiers, and Units on last page.

**Table 3**  
**Summary of Effluent Water Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

**Notes, Abbreviations, Qualifiers, and Units:**

1. Discharge limits per the interim SPDES equivalency program or Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Quality Standards and Guidance Values and Groundwater Effluent Limitations, if the compound is not part of the SPDES Permit Equivalency.
2. As of September 2017, the 10 SPDES VOCs discharge limits are per Site Number 1-30-003A Operable Unit 3 SPDES Permit Equivalency.
3. "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.
4. Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration.
5. Effluent pH measured on site using a handheld pH meter. pH units are standard units.

NYSDEC New York State Department of Environmental Conservation  
SPDES State Pollutant Discharge Elimination System  
USEPA United States Environmental Protection Agency  
VOC Volatile Organic Compound  
NE Not Established

**102** Bold value indicates a detection.

< 0.50 Compound not detected above the laboratory quantification limit.

µg/L micrograms per liter



**Table 4**  
**Influent Vapor Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound <sup>1</sup>	09/06/19 (µg/m <sup>3</sup> )	11/26/19 (µg/m <sup>3</sup> )	03/30/20 (µg/m <sup>3</sup> )	05/14/20 (µg/m <sup>3</sup> )
<b>Project VOCs</b>				
1,1,1 - Trichloroethane	0.93	0.82	1.2	1.0
1,1 - Dichloroethane	4.5	3.8	7.3	5.7
1,2 - Dichloroethane	< 0.81	< 0.81	0.45 J	< 0.81
1,1 - Dichloroethene	1.1	0.99	1.3	0.91
Tetrachloroethene	2.6	2.2	2.6	1.9
Trichloroethene	54.8	49	58.6	69.9
Vinyl Chloride	30.7	23.0	50.1	56.2
cis 1,2-Dichloroethene	103	108	182	170
trans 1,2-Dichloroethene	< 0.79	< 0.79	0.52 J	0.48 J
Benzene	< 0.64	1.90	0.58 J	0.35 J
Toluene	0.49 J	2.30	0.83	0.57 J
o-Xylene	0.52 J	0.78 J	1.0	0.83 J
m,p-Xylene	< 0.87	1.7	0.65 J	< 0.87
<b>Subtotal Project VOCs</b>	<b>193</b>	<b>194</b>	<b>307</b>	<b>308</b>
<b>Non-Project VOCs</b>				
1,1,2,2-Tetrachloroethane	< 0.69	< 0.69	< 0.69	< 0.69
1,1,2-Trichloroethane	< 0.55	< 0.55	< 0.55	< 0.55
1,2-Dichloropropane	< 0.92	< 0.92	0.60 J	0.51 J
1,3-Butadiene	< 0.44	0.42 J	< 0.44	< 0.44
2-Butanone	0.65	< 0.59	< 0.59	< 0.59
4-Methyl-2-Pentanone	< 0.82	< 0.82	< 0.82	< 0.82
Acetone	5.5	4.5	< 0.48	6.9
Bromodichloromethane	< 0.67	< 0.67	< 0.67	< 0.67
Bromoform	< 0.41	< 0.41	< 0.41	< 0.41
Bromomethane	< 0.78	< 0.78	< 0.78	< 0.78
Carbon Disulfide	< 0.62	< 0.62	< 0.62	< 0.62
Carbon Tetrachloride	< 0.25	< 0.25	0.48	< 0.25
Chlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92
Chlorodibromomethane	< 0.85	< 0.85	< 0.85	< 0.85
Chlorodifluoromethane (Freon 22)	8.4	6.3	< 0.70	5.6
Chloroethane	< 0.53	< 0.53	< 0.53	< 0.53
Chloroform	7.8	7.3	11	9.3
Chloromethane	0.87	1.3	2.1	1.3
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91
Dichlorodifluoromethane (Freon 12)	2.2	< 0.99	< 0.99	1.8
Dichloromethane	0.94	4.2	0.83	0.73
Ethylbenzene	< 0.87	0.65 J	0.56 J	< 0.87
Methyl N-Butyl Ketone	< 0.82	< 0.82	< 0.82	< 0.82
Methyl Tert-Butyl Ether	0.43 J	< 0.72	0.69 J	< 0.72
Styrene (Monomer)	< 0.85	< 0.85	< 0.85	< 0.85
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91
Trichlorofluoromethane (Freon 11)	2.0	1.6	< 0.56	1.2
Trichlorotrifluoroethane (Freon 113)	1.8	1.5	1.7	1.5
1-Chloro-1,1-difluoroethane (Freon 142b)	< 0.82	< 0.82	< 0.82	< 0.82
<b>Subtotal Non-Project VOCs</b>	<b>20</b>	<b>28</b>	<b>18</b>	<b>29</b>
<b>Total VOCs<sup>2</sup></b>	<b>213</b>	<b>222</b>	<b>325</b>	<b>337</b>

Notes, Abbreviations, Qualifiers, and Units on last page.

**Table 4**  
**Influent Vapor Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

**Notes, Abbreviations, Qualifiers, and Units:**

1. Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15. A VOC analyte list is provided in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). Influent samples were collected at Vapor Sampling Port-1 (VSP-1); refer to Figure 3 of this OM&M Report for the location of VSP-1.

2. "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
OM&M	Operation, Maintenance, and Monitoring
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

<b>0.93</b>	Bold value indicates a detection.
< 0.81	Compound not detected above the laboratory quantification limit.
J	Result is estimated.
µg/m <sup>3</sup>	micrograms per cubic meter

**Table 5**  
**Summary of Effluent Vapor Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound <sup>1</sup>	09/06/19 (µg/m <sup>3</sup> )	11/26/19 (µg/m <sup>3</sup> )	03/30/20 (µg/m <sup>3</sup> )	05/14/20 (µg/m <sup>3</sup> )
<b>Project VOCs</b>				
1,1,1 - Trichloroethane	0.76	0.82	0.93	0.76
1,1 - Dichloroethane	4.5	4.5	6.1	4.9
1,2 - Dichloroethane	< 0.81	< 0.81	0.45 J	< 0.81
1,1 - Dichloroethene	0.87	0.99	1.0	0.71
Tetrachloroethene	1.9	1.8	1.7	1.2
Trichloroethene	26	31	29	30
Vinyl Chloride	15.0	16	26.3	26.1
cis 1,2-Dichloroethene	65.8	85.6	109	99.5
trans 1,2-Dichloroethene	< 0.79	< 0.79	< 0.79	< 0.79
Benzene	< 0.64	1.5	0.38 J	< 0.64
Toluene	1.5	2.8	1.4	1.4
o-Xylene	< 0.87	0.61 J	0.74 J	0.48 J
m,p-Xylene	< 0.87	1.4	0.61 J	0.56 J
<b>Subtotal Project VOCs</b>	<b>116</b>	<b>147</b>	<b>178</b>	<b>166</b>
<b>Non-Project VOCs</b>				
1,1,2,2-Tetrachloroethane	< 0.69	< 0.69	< 0.69	< 0.69
1,1,2-Trichloroethane	< 0.55	< 0.55	< 0.55	< 0.55
1,2-Dichloropropane	< 0.92	< 0.92	0.46 J	< 0.92
1,3-Butadiene	< 0.44	< 0.44	< 0.44	< 0.44
2-Butanone	1.8	4.7	< 0.59	< 0.59
4-Methyl-2-Pentanone	< 0.82	< 0.82	< 0.82	< 0.82
Acetone	21	38.5	< 0.48	24.9
Bromodichloromethane	< 0.67	< 0.67	< 0.67	< 0.67
Bromoform	< 0.41	< 0.41	< 0.41	< 0.41
Bromomethane	< 0.78	< 0.78	< 0.78	< 0.78
Carbon Disulfide	< 0.62	< 0.62	< 0.62	< 0.62
Carbon Tetrachloride	< 0.25	< 0.25	0.45	< 0.25
Chlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92
Chlorodibromomethane	< 0.85	< 0.85	< 0.85	< 0.85
Chlorodifluoromethane (Freon 22)	8.4	7.7	< 0.70	5.6
Chloroethane	< 0.53	< 0.53	< 0.53	< 0.53
Chloroform	10	11	11	9.3
Chloromethane	0.85	1.3	1.4	1.1
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91
Dichlorodifluoromethane (Freon 12)	2.1	< 0.99	< 0.99	1.8
Dichloromethane	< 0.69	< 0.69	4.5	0.76
Ethylbenzene	< 0.87	0.48 J	0.48 J	< 0.87
Methyl N-Butyl Ketone	< 0.82	< 0.82	< 0.82	< 0.82
Methyl Tert-Butyl Ether	< 0.72	< 0.72	< 0.72	< 0.72
Styrene (Monomer)	< 0.85	< 0.85	< 0.85	< 0.85
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91
Trichlorofluoromethane (Freon 11)	1.6	1.7	< 0.56	1.2
Trichlorotrifluoroethane (Freon 113)	2.1	2.0	1.9	1.6
1-Chloro-1,1-difluoroethane (Freon 142b)	< 0.82	< 0.82	< 0.82	< 0.82
<b>Subtotal Non-Project VOCs</b>	<b>39</b>	<b>67</b>	<b>20</b>	<b>46</b>
<b>Total VOCs<sup>2</sup></b>	<b>156</b>	<b>214</b>	<b>198</b>	<b>212</b>

Notes, Abbreviations, Qualifiers, and Units on last page.

**Table 5**  
**Summary of Effluent Vapor Sample Analytical Results**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

**Notes, Abbreviations, Qualifiers, and Units:**

1. Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15. A VOC analyte list is provided in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5.

2. "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

ELAP Environmental Laboratory Approval Program

NYSDOH New York State Department of Health

OM&M Operation, Maintenance, and Monitoring

USEPA United States Environmental Protection Agency

VOC Volatile Organic Compound

**0.76** Bold value indicates a detection.

< 0.81 Compound not detected above the laboratory quantification limit.

J Result is estimated.

$\mu\text{g}/\text{m}^3$  micrograms per cubic meter

**Table 6**  
**Summary of Effluent Vapor Tentatively Identified Compounds**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Compound <sup>1</sup>	09/06/19 (ppbv)	11/26/19 (ppbv)	03/30/20 (ppbv)	05/14/20 (ppbv)
<b><u>Tentatively Identified Compounds</u></b>				
Acetone	ND	ND	<b>8.9 JN</b>	ND
Alkane	ND	<b>3.3 J</b>	ND	ND
C3 alkyl benzene	ND	<b>3.9 J</b>	ND	ND
Carbon Dioxide	<b>220 JB</b>	<b>29 JNB</b>	<b>15 JNB</b>	<b>170 JB</b>
Difluorochloromethane	ND	ND	<b>1.5 JN</b>	ND
Ethanol	ND	ND	<b>1.3 JN</b>	ND
Unknown (A)	<b>3.3 J</b>	ND	ND	ND
Unknown (B)	ND	ND	<b>1.1 J</b>	ND
<b>Total VOC TICs<sup>2</sup></b>	<b>3.3 J</b>	<b>7.2 J</b>	<b>12.8 J</b>	ND

**Notes, Abbreviations, Qualifiers, and Units:**

1. Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15. A VOC analyte list is provided in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5.

2. Compounds found in associated method blank are not included in Total VOC TICs.

- ECU            Emission Control Unit
- ELAP        Environmental Laboratory Approval Program
- NYSDOH    New York State Department of Health
- OM&M      Operation, Maintenance, and Monitoring
- TIC         Tentatively Identified Compound
- USEPA     United States Environmental Protection Agency
- VOC        Volatile Organic Compound
  
- 3.3**        Bold value indicates a detection.
- ND         TIC were not detected.
- B**         TIC was detected in the associated method blank.
- J**         Result is estimated.
- N**         Indicates presumptive evidence of a compound.
- ppbv        parts per billion by volume

**Table 7**  
**Summary of System Parameters**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

Date <sup>1</sup>	Water Flow Rates						Water Pressures					Air Flow Rate <sup>2</sup>	Air Pressures <sup>5</sup>				Air Temp. <sup>5</sup>	
	Remedial Well <sup>2</sup>				Combined Influent <sup>3</sup>	Effluent <sup>2</sup>	Remedial Well Effluent <sup>2,4</sup>				Effluent <sup>5</sup>	Effluent	ECU Influents				Effluent	Effluent
	RW-1	RW-2	RW-3	RW-4			RW-1	RW-2	RW-3	RW-4			GAC-501	GAC-502	PPZ-601	PPZ-602		
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(psi)	(psi)	(psi)	(psi)	(psi)	(scfm)	(iwc)	(iwc)	(iwc)	(iwc)	(iwc)	(°R)
07/02/19	29.6	71.7	72.7	29.0	203	212	54	66	43	53	29	1,491	0.0	0.0	0.0	0.0	0.0	541
08/02/19	28.4	64.9	70.1	28.4	192	200	54	60	44	54	13	1,463	0.0	0.0	0.0	0.0	0.0	541
09/06/19	29.7	63.4	74.1	30.3	198	207	57	15	39	56	13	1,522	0.0	0.0	0.0	0.0	0.0	542
10/15/19	29.9	74.5	75.1	30.3	210	219	57	69	35	56	17	1,510	0.0	0.0	0.0	0.0	0.0	538
11/05/19	30.1	73.3	75.4	29.8	209	218	57	66	33	56	14	1,496	0.0	0.0	0.0	0.0	0.0	535
12/04/19	30.1	72.1	75.5	30.0	208	218	57	6	40	56	13	1,542	0.0	0.0	0.0	0.0	0.0	532
01/16/20	30.3	75.8	75.6	30.6	212	231	57	44	42	56	14	1,526	0.0	0.0	0.0	0.0	0.0	531
02/06/20	31.5	75.5	76.3	30.1	213	225	56	42	38	56	14	1,575	0.0	0.0	0.0	0.0	0.0	530
03/03/20	30.7	75.8	75.5	30.6	213	227	56	33	40	56	15	1,600	0.0	0.0	0.0	0.0	0.0	538
04/15/20	31.2	70.1	75.4	30.8	208	213	56	6	36	56	16	1,570	0.0	0.0	0.0	0.0	0.0	538
05/14/20	30.2	75.8	75.2	30.2	211	226	57	50	36	57	25	1,572	0.0	0.0	0.0	0.0	0.0	548
06/04/20	30.8	75.0	75.0	31.3	212	219	56	46	33	55	14	1,500	0.0	0.0	0.0	0.0	0.0	544

Notes, Abbreviations, and Units on last page.

**Table 7**  
**Summary of System Parameters**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**

**Notes, Abbreviations, and Units:**

1. Operational data collected by Arcadis on days noted. Parameters listed were typically recorded during compliance monitoring events. Data in this table correspond to approximately the past year of system operation.
2. Instantaneous parameters obtained from the SCADA HMI: Water Flow Rate, Water Pressure, Air Flow Rate.
3. Combined influent water-flow rate is the sum of individual well flow rates via the SCADA System.
4. Remedial Well effluent pressure readings measured at the influent manifold within the treatment system building.
5. Instantaneous values recorded from field-mounted instruments during weekly site visits. On 5/14/2020 effluent air temperature was recorded using SCADA daily average temperature due to gauge calibration.

ECU	Emission Control Unit
GAC	Granular Activated Carbon
HMI	Human-Machine Interface
RW	Remedial Well
SCADA	Supervisory Control and Data Acquisition
Temp	Temperature
gpm	gallons per minute
iwc	inches of water column
psi	pounds per square inch
°R	degrees Rankine
scfm	standard cubic feet per minute

**Table 8**  
**Summary of Groundwater Recovered, VOC Mass Recovered, and VOC Mass Recovery Rates**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Bethpage, New York**

Operating Period <sup>1</sup>	Volume of Groundwater Recovered (x1,000 gal) <sup>2</sup>					VOC Mass Recovered (lbs) <sup>3</sup>										VOC Mass Recovery Rate (lbs/day) <sup>4</sup>																								
						Total VOCs <sup>5</sup>					Project VOCs <sup>6</sup>					Non-Project VOCs <sup>7</sup>					Total VOCs <sup>5</sup>					Project VOCs <sup>6</sup>					Non-Project VOCs <sup>7</sup>									
	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total
<b>System Pilot Test, Shakedown and Startup Totals<sup>8</sup></b>	137	270	251	150	808	NA	NA	NA	NA	1.1	NA	NA	NA	NA	1.0	NA	NA	NA	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>2010 Totals</b>	15,726	35,127	38,160	15,689	104,702	0.56	172	412	89	672	0.56	171	28	0.10	200	< 0.01	0.17	383	89	469	< 0.01	0.46	1.1	0.24	1.8	< 0.01	0.46	0.075	< 0.01	0.54	< 0.01	< 0.01	1.0	0.24	1.3					
<b>2011 Totals</b>	15,218	36,570	37,682	15,196	104,666	0.36	167	271	78	516	0.36	167	35	0.090	203	< 0.01	1.1	236	78	314	< 0.01	0.45	0.73	0.21	1.4	< 0.01	0.45	0.095	< 0.01	0.55	< 0.01	< 0.01	0.64	0.21	0.85					
<b>2012 Totals</b>	15,260	35,178	36,111	15,336	101,885	0.28	114	113	40	267	0.25	113	12	0.39	126	< 0.01	1.5	101	40	141	< 0.01	0.31	0.31	0.11	0.73	< 0.01	0.31	0.032	< 0.01	0.35	< 0.01	< 0.01	0.28	0.11	0.39					
<b>2013 Totals</b>	15,968	37,514	36,622	16,036	106,140	0.14	111	41	18	171	0.14	110	4.3	0.36	113	< 0.01	1.6	37	18	57	< 0.01	0.30	0.11	0.050	0.47	< 0.01	0.30	0.012	< 0.01	0.31	< 0.01	< 0.01	0.10	0.049	0.16					
<b>2014 Totals</b>	15,690	33,222	31,199	15,691	95,802	0.063	67	9.9	8.1	85	0.063	65	2.0	0.20	67	< 0.01	1.5	8.1	7.9	17	< 0.01	0.19	0.028	0.023	0.24	< 0.01	0.18	< 0.01	< 0.01	0.19	< 0.01	< 0.01	0.023	0.022	0.047					
<b>2015 Totals</b>	15,859	38,082	34,961	14,755	103,657	0.028	47	7.1	4.5	57	0.021	45	1.5	0.20	45	< 0.01	1.7	5.6	4.2	12	< 0.01	0.13	0.019	0.012	0.16	< 0.01	0.12	< 0.01	< 0.01	0.12	< 0.01	< 0.01	0.015	0.012	0.032					
<b>2016 Totals</b>	15,826	34,539	39,349	15,826	105,540	< 0.01	38	3.2	2.2	44	< 0.01	37	1.4	0.20	39	< 0.01	1.5	1.7	2.0	5.2	< 0.01	0.10	< 0.01	< 0.01	0.12	< 0.01	0.10	< 0.01	< 0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01	0.014					
<b>2017 Totals</b>	16,005	31,600	37,614	15,965	101,184	< 0.01	13	2.2	1.2	17	< 0.01	13	1.1	0.16	14	< 0.01	0.56	1.1	1.1	2.7	< 0.01	0.037	< 0.01	< 0.01	0.046	< 0.01	0.035	< 0.01	< 0.01	0.038	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>2019 Totals</b>	15,456	32,470	38,416	15,343	101,685	< 0.01	11.51	1.36	0.22	13.10	< 0.01	11.51	1.07	< 0.01	12.59	< 0.01	< 0.01	0.29	0.18	0.63	< 0.01	0.032	< 0.01	< 0.01	0.036	< 0.01	0.032	< 0.01	< 0.01	0.034	< 0.01	< 0.01	< 0.01	0.001	< 0.01					
<b>January 2020 through March 2020</b>																																								
01/01/20 - 02/01/20	934	2,343	2,331	938	6,545	< 0.01	1.04	0.08	< 0.01	1.13	< 0.01	1.0	0.07	< 0.01	1.1	< 0.01	< 0.01	0.01	< 0.01	0.011	< 0.01	0.034	< 0.01	< 0.01	0.036	< 0.01	0.034	< 0.01	< 0.01	0.036	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
02/01/20 - 03/01/20	1,265	3,122	3,141	1,252	8,780	< 0.01	1.39	0.11	< 0.01	1.50	< 0.01	1.4	0.10	< 0.01	1.5	< 0.01	< 0.01	0.02	< 0.01	0.015	< 0.01	0.048	< 0.01	< 0.01	0.052	< 0.01	0.048	< 0.01	< 0.01	0.051	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
03/01/20 - 04/01/20	1,315	3,333	3,347	1,342	9,337	< 0.01	1.48	0.12	< 0.01	1.60	< 0.01	1.5	0.11	< 0.01	1.6	< 0.01	< 0.01	0.02	< 0.01	0.016	< 0.01	0.048	< 0.01	< 0.01	0.052	< 0.01	0.048	< 0.01	< 0.01	0.051	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>Subtotal Jan - Mar 2020</b>	3,514	8,798	8,818	3,532	24,662	< 0.01	3.91	0.32	< 0.01	4.23	< 0.01	3.9	0.28	< 0.01	4.2	< 0.01	< 0.01	0.04	< 0.01	0.042	< 0.01	0.043	< 0.01	< 0.01	0.046	< 0.01	0.043	< 0.01	< 0.01	0.046	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>April 2020 through June 2020</b>																																								
04/01/20 - 05/01/20	1,325	3,018	3,247	1,321	8,911	< 0.01	1.51	0.10	< 0.01	1.60	< 0.01	1.5	0.06	< 0.01	1.6	< 0.01	< 0.01	0.04	< 0.01	0.038	< 0.01	0.050	< 0.01	< 0.01	0.053	< 0.01	0.050	< 0.01	< 0.01	0.052	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
05/01/20 - 06/01/20	1,350	3,069	3,334	1,338	9,090	< 0.01	1.53	0.10	< 0.01	1.63	< 0.01	1.5	0.06	< 0.01	1.6	< 0.01	< 0.01	0.04	< 0.01	0.039	< 0.01	0.049	< 0.01	< 0.01	0.053	< 0.01	0.049	< 0.01	< 0.01	0.051	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
06/01/20 - 07/01/20	1,304	3,203	3,219	1,309	9,036	< 0.01	1.60	0.09	< 0.01	1.70	< 0.01	1.6	0.06	< 0.01	1.7	< 0.01	< 0.01	0.04	< 0.01	0.038	< 0.01	0.053	< 0.01	< 0.01	0.057	< 0.01	0.053	< 0.01	< 0.01	0.055	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>Subtotal Apr - June 2020<sup>9</sup></b>	3,979	9,289	9,801	3,968	27,037	< 0.01	4.64	0.29	< 0.01	4.93	< 0.01	4.6	0.17	< 0.01	4.8	< 0.01	< 0.01	0.12	< 0.01	0.12	< 0.01	0.051	< 0.01	< 0.01	0.054	< 0.01	0.051	< 0.01	< 0.01	0.053	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>2020 Totals</b>	7,493	18,087	18,619	7,500	51,699	< 0.01	8.6	0.6	< 0.01	9.2	< 0.01	8.6	0.45	< 0.01	9.01	< 0.01	< 0.01	0.16	< 0.01	0.16	< 0.01	0.047	< 0.01	< 0.01	0.050	< 0.01	0.047	< 0.01	< 0.01	0.049	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01					
<b>Total Since System Start Up</b>	170,375	384,208	397,902	168,979	1,121,464	2	1,038	916	256	2,209	2	1,027	106	2	1,137	< 0.01	10	809	254	1,067	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					

**Notes, Abbreviations, Qualifiers, and Units:**

1. Represents operating period between consecutive monitoring events.
2. Volume of groundwater recovered is based on individual local well totalized flow readings. Listed value is the difference between totalized flow values recorded between consecutive monitoring events. The total groundwater recovered during a given operating period is the sum of the individual well flow totals. Values shown are rounded to the nearest gallon, but should only be considered accurate to two significant figures to account for error associated with field measurements.
3. Mass recovered per well was calculated by multiplying the Total VOC concentration from the most recent sampling event by the number of gallons extracted during the reporting period. The total amount recovered during a given operating period is the sum of masses recovered from each of the individual wells. Values less than ten pounds are presented using two significant figures and values greater than ten pounds have been rounded to the nearest whole number; however, these values should only be considered accurate to two significant figures to account for error associated with field measurements and analytical data.
4. Mass recovery rates were calculated by dividing the total mass recovered for each well and for the system by the number of days in the respective operating period. Values are presented using two significant figures.
5. "Total VOCs" represents the sum of individual concentrations of the VOCs detected.
6. "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethylene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and xylenes-o,m, p.
7. "Non-Project VOCs" represents the difference between Total VOCs and Project VOCs.
8. Values based on operational data recorded prior to system startup on July 21, 2009.
9. The volume of groundwater recovered and mass recovered calculations represent the operational period between April 1st, 2020 and July 1st, 2020.

NA Not Applicable  
VOC Volatile Organic Compound.  
< Less than  
gal Gallons  
lbs Pounds  
lbs/day Pounds per day



**Table 9**  
**Summary of Air Quality Impact Analysis**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**



Toxic Air Contaminant <sup>4</sup>	CAS#	VSP-05 Vapor Effluent (µg/m <sup>3</sup> )	Emission Rate <sup>1</sup>			Scaled Impact - Hourly <sup>2</sup> (µg/m <sup>3</sup> )	Scaled Impact - Annual <sup>2</sup> (µg/m <sup>3</sup> )	SGC <sup>3</sup> (µg/m <sup>3</sup> )	AGC <sup>3</sup> (µg/m <sup>3</sup> )	% of SGC	% of AGC
		5/14/2020	lb/yr	lb/hr	g/s						
<b>Project VOCs</b>											
1,1,1-Trichloroethane	71-55-6	0.76	0.04	4.47E-06	5.6E-07	1.8E-03	5.4E-05	9,000	5,000	0.0%	0.0%
1,1-Dichloroethane	75-34-3	4.9	0.25	2.88E-05	3.6E-06	1.1E-02	3.5E-04	--	0.63	--	0.1%
1,1-Dichloroethene	75-35-4	0.71	0.04	4.17E-06	5.3E-07	1.7E-03	5.1E-05	--	200	--	0.0%
cis-1,2-Dichloroethene	156-59-2	99.5	5.12	5.85E-04	7.4E-05	2.3E-01	7.1E-03	--	63	--	0.0%
Tetrachloroethene	127-18-4	1.2	0.06	7.05E-06	8.9E-07	2.8E-03	8.6E-05	300	4	0.0%	0.0%
Toluene	108-88-3	1.4	0.07	8.23E-06	1.0E-06	3.3E-03	1.0E-04	37,000	5,000	0.0%	0.0%
Trichloroethene	79-01-6	30	1.54	1.76E-04	2.2E-05	7.0E-02	2.1E-03	20	0.2	0.4%	1.1%
Vinyl Chloride	75-01-4	26.1	1.34	1.53E-04	1.9E-05	6.1E-02	1.9E-03	180,000	0.11	0.0%	1.7%
Xylene-O	1330-20-7	0.48 J	0.02	2.00E-06	2.5E-07	7.9E-04	2.4E-05	22,000	100	0.0%	0.0%
Xylenes - M,P	1330-20-7	0.56 J	0.03	3.29E-06	4.1E-07	1.3E-03	4.0E-05	22,000	100	0.0%	0.0%
<b>Non-Project VOCs</b>											
Acetone	67-64-1	24.9	1.28	1.46E-04	1.8E-05	5.8E-02	1.8E-03	180,000	30,000	0.0%	0.0%
Chlorodifluoromethane (Freon 22)	75-45-6	5.6	0.29	3.29E-05	4.1E-06	1.3E-02	4.0E-04	--	50,000	--	0.0%
Chloroform	67-66-3	9.3	0.48	5.46E-05	6.9E-06	2.2E-02	6.6E-04	150	14.7	0.0%	0.0%
Chloromethane	74-87-3	1.1	0.06	6.46E-06	8.1E-07	2.6E-03	7.9E-05	22,000	90	0.0%	0.0%
Dichloromethane	75-09-2	0.76	0.04	4.47E-06	5.6E-07	1.8E-03	5.4E-05	14,000	60	0.0%	0.0%
Trichlorofluoromethane (Freon 11)	75-69-4	1.2	0.06	7.05E-06	8.9E-07	2.8E-03	8.6E-05	9,000	5,000	0.0%	0.0%
Trichlorotrifluoroethane (Freon 113)	76-13-1	1.6	0.08	9.40E-06	1.2E-06	3.7E-03	1.1E-04	960,000	180,000	0.0%	0.0%

Notes, Abbreviations, and Units on last page.

**Table 9**  
**Summary of Air Quality Impact Analysis**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Northrop Grumman Systems Corporation**  
**Bethpage, New York**



**Notes, Abbreviations, and Units:**

- Emission rate calculated based on VSP-05 effluent concentration and a daily average exit air flow rate of 1,572 ft<sup>3</sup>/min for 5/15/2020. Emission rate standardized at 70 °F and 1 atm.  
 $1,1,1\text{-Trichloroethane (lb/hr)} = \text{TCE } [\mu\text{g/m}^3] \times \text{Air Flow Rate [ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min/hr}) \times (0.000001 \text{ g/1 } \mu\text{g}) \times (0.0022 \text{ lb/g})$   
 $\text{lb/yr} = \text{lb/hr} \times 8,760 \text{ hrs/yr}$   
 $\text{g/s} = \text{lb/hr} \times \text{hr}/3,600 \text{ sec} \times 453.59 \text{ g/lb}$
- Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Brookhaven/Farmingdale) for the years 2011 through 2015. The maximum impact from all the years was used for the calculations.  
 $\text{Scaled hourly impact } (\mu\text{g/m}^3) = \text{AERMOD predicted hourly ambient impact at 1 g/s } ([\mu\text{g/m}^3]/[\text{g/s}]) \times \text{Actual emission rate (g/s)}$   
 $\text{Scaled annual impact } (\mu\text{g/m}^3) = \text{AERMOD predicted annual ambient impact at 1 g/s } ([\mu\text{g/m}^3]/[\text{g/s}]) \times \text{Actual emission rate (g/s)}$

AERMOD Normalized Ambient Impact at 1 g/s	
Hourly ([ $\mu\text{g/m}^3$ ]/[g/s])	Annual ([ $\mu\text{g/m}^3$ ]/[g/s])
3,153.03	96.49

- Short-term and annual guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.
- Compounds not detected above the laboratory reporting limit are excluded from the air quality impact analysis summary.

AGC	Annual Guideline Concentration
DAR-1	Division of Air Resources-1
--	None Specified
NYSDEC	New York State Department of Environmental Conservation
SGC	Short-term Guideline Concentration
VSP	Vapor Sampling Point
cfm	cubic feet per minute
g/s	grams per second
lb/hr	pounds per hour
lb/yr	pounds per year
$\mu\text{g/m}^3$	micrograms per cubic meter

**Table 10**  
**Summary of Remedial Well Groundwater Sample Analytical Results - VOCs**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Bethpage, New York**

Compound <sup>1</sup> (µg/L)	Sample Location: Sample Date: NYSDEC SCGs	RW-1 9/6/2019	RW-1 11/5/2019	RW-1 2/6/2020	RW-1 5/14/2020	RW-2 9/6/2019	RW-2 11/5/2019	RW-2 2/6/2020	RW-2 5/14/2020	RW-3 9/6/2019	RW-3 11/5/2019	RW-3 2/6/2020	RW-3 5/14/2020	RW-4 9/6/2019	RW-4 11/5/2019	RW-4 2/6/2020	RW-4 5/14/2020
<b>Project VOCs</b>																	
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.58 J</b>	<b>0.65</b>	<b>0.84 J</b>	<b>0.98 J</b>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>10.2</b>	<b>10.8</b>	<b>10.5</b>	<b>13.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.2</b>	<b>0.63 J</b>	< 1.0	<b>0.64</b>	< 1.0	<b>0.63 J</b>
Vinyl Chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	<b>8</b>	<b>4.9</b>	<b>10.3</b>	<b>13.6</b>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>19.9</b>	<b>21.9</b>	<b>31.7</b>	<b>32.4</b>	<b>1.1</b>	<b>1.2</b>	<b>1.6</b>	<b>1.5</b>	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylenes-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>Subtotal Project VOCs</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>38.1</b>	<b>38.3</b>	<b>53.3</b>	<b>60.0</b>	<b>3.1</b>	<b>3.2</b>	<b>3.8</b>	<b>2.1</b>	<b>0</b>	<b>0.6</b>	<b>0</b>	<b>0.6</b>
<b>Non-Project VOCs</b>																	
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Butadiene	0.5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Butanone	NE	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-methyl-2-pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	NE	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	60	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodifluoromethane (Freon 22)	NE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	<b>3.1</b>	< 5.0	< 5.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.91 J</b>	<b>1.1</b>	<b>0.56 J</b>	<b>1.4</b>	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-dichloropropene	0.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane (Freon 12)	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl tert-Butyl Ether	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-dichloropropene	0.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane (Freon 11)	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorotrifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1-Chloro-1,1-difluoroethane (Freon 142b)	NE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
<b>Subtotal Non-Project VOCs</b>		<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.9</b>	<b>1.1</b>	<b>0.6</b>	<b>1.4</b>	<b>0.0</b>	<b>3.1</b>	<b>0.0</b>	<b>0.0</b>
<b>Total VOCs<sup>2</sup></b>		<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>38.1</b>	<b>38.3</b>	<b>53.3</b>	<b>60.0</b>	<b>4.0</b>	<b>4.3</b>	<b>4.4</b>	<b>3.5</b>	<b>0.0</b>	<b>3.7</b>	<b>0.0</b>	<b>0.6</b>
<b>1,4-Dioxane</b>		<b>0.41</b>	<b>0.47</b>	<b>0.38</b>	<b>0.32</b>	<b>1.7</b>	<b>1.5</b>	<b>2.3</b>	<b>3.0</b>	<b>0.35</b>	<b>0.39</b>	<b>0.56</b>	<b>0.59</b>	<b>0.17 J</b>	<b>0.23 J</b>	<b>0.20 J</b>	<b>0.18 J</b>

Notes, Abbreviations, Qualifiers, and Units on last page.

**Table 10**  
**Summary of Remedial Well Groundwater Sample Analytical Results - VOCs**  
**Bethpage Park Groundwater Containment System**  
**Operable Unit 3 (Former Grumman Settling Ponds)**  
**Bethpage, New York**

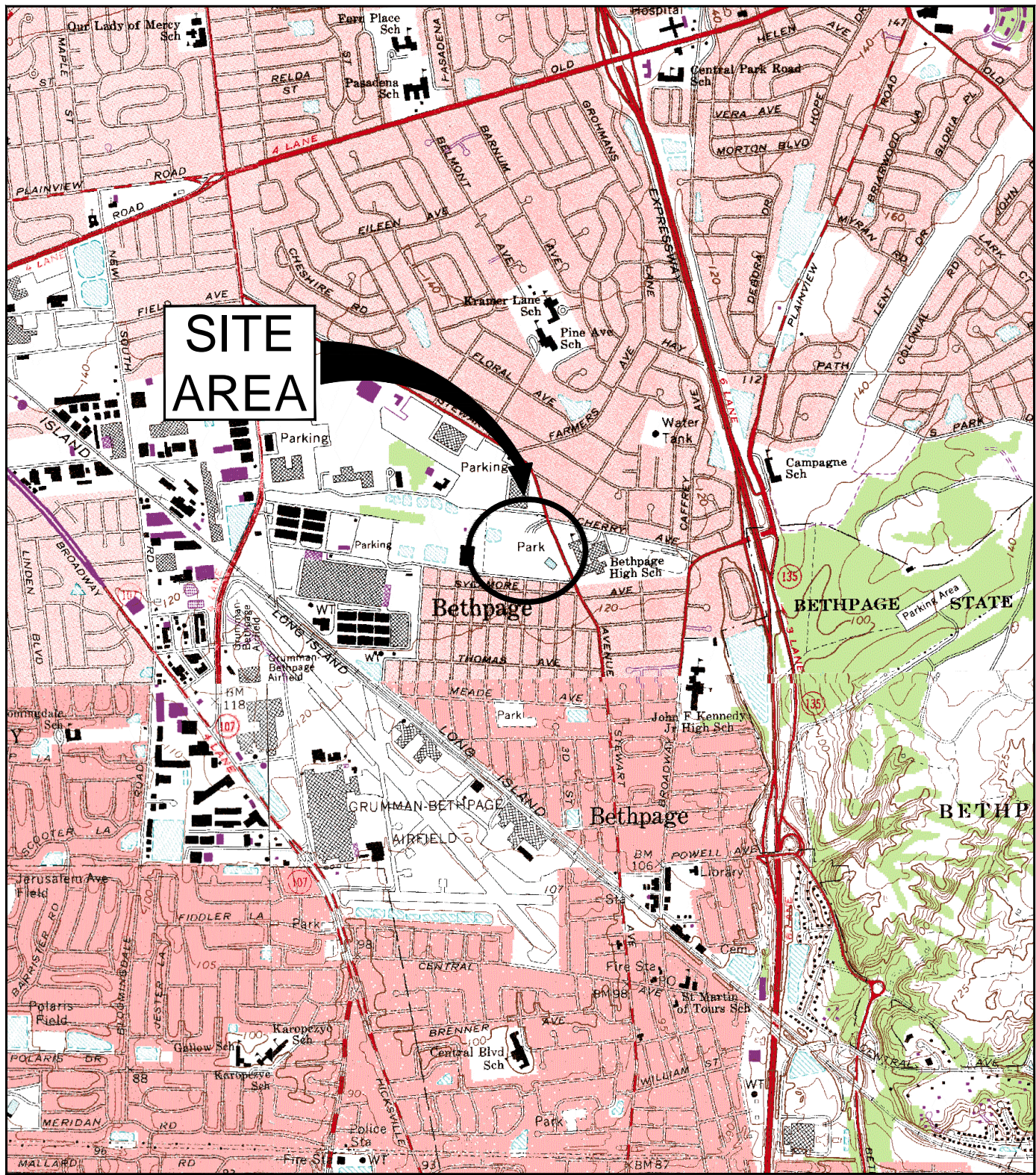
**Notes, Abbreviations, Qualifiers, and Units:**

1. Water samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per NYSDEC ASP 2005, Method OLM 4.3 (prior to September 1, 2014) and per EPA Method 8260C (after September 1, 2014). Results validated following protocols specified in Sampling and Analysis Plan in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). See previous quarterly reports for historical analytical results.
2. "Total VOCs" represents the sum of individual concentrations of the VOCs detected.

ASP	Analytical Services Protocol
ELAP	Environmental Laboratory Approval Program
NE	Not Established
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OLM	Ozone Limited Method
OM&M	Operation, Maintenance, and Monitoring
SCGs	Standards, Criteria, and Guidance values
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.4	Bold cell outline indicates an exceedance of an SCG
1.4	Bold data indicates a detection
< 1.0	Compound not detected above its laboratory quantification limit
J	Compound detected below its reporting limit; value is estimated
µg/L	micrograms per liter

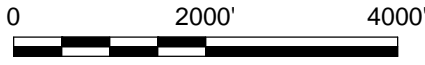
CITY:SYRACUSE,NY DIV:GROUP:ENV DB:A.SANCHEZ LD: PIC:(Op) PM:(Reop) TM:(Op) LVR:(Op)ON:"OFF"REF: G:\ENV\CAD\STRACUSE\ACT\1001496114\DOMINANT\1496\_BUI.dwg LAYOUT: BETHPAGE PARK. SAVED: 11/11/2015 4:51 PM ACADVER: 19.1.S (LMS TECH) PAGES: 19. PAGESETUP: PLOTSTYLETABLE: PLOTTED: 11/11/2015 4:54 PM BY: STOWELL,GARY



**SITE  
AREA**



NEW YORK



SCALE IN FEET

BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM  
OPERABLE UNIT 3  
(FORMER GRUMMAN SETTLING PONDS)  
BETHPAGE, NEW YORK

**SITE LOCATION**

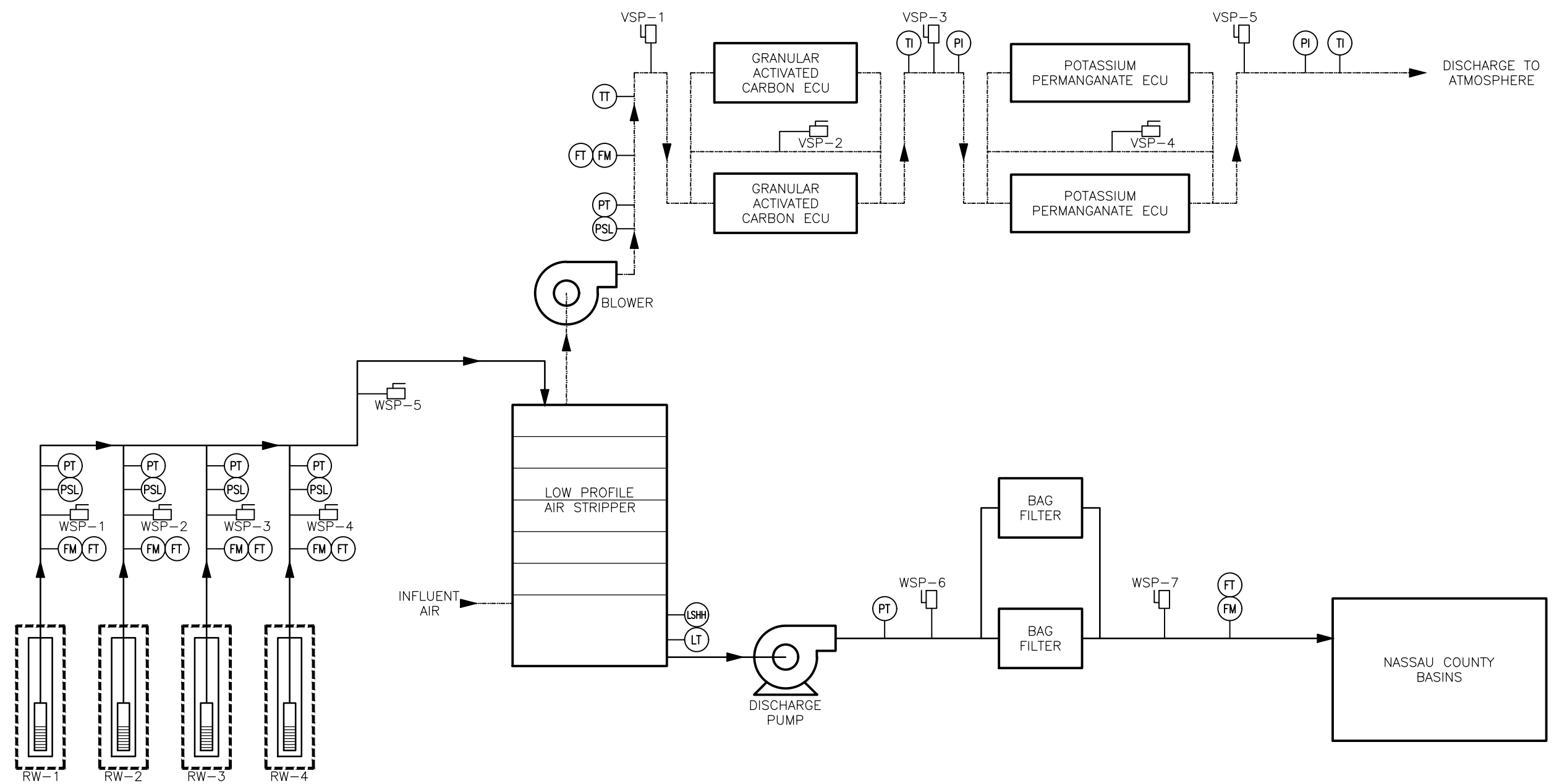


FIGURE

**1**



CITY:SYRACUSE-ENV DIV\GROUP:ENV DB:A-SANCHEZ\_LD\AS PIC:Opt) PM:(Read) TM:(Opt) Lyr:(Option)-OFF=REF- PLOT:11/11/2015 4:57 PM ACADVER:21.05 (LMS TECH) PAGES:3 LAYOUT:3 SAVED:11/11/2015 4:57 PM BY: SANCHEZ, ADRIAN



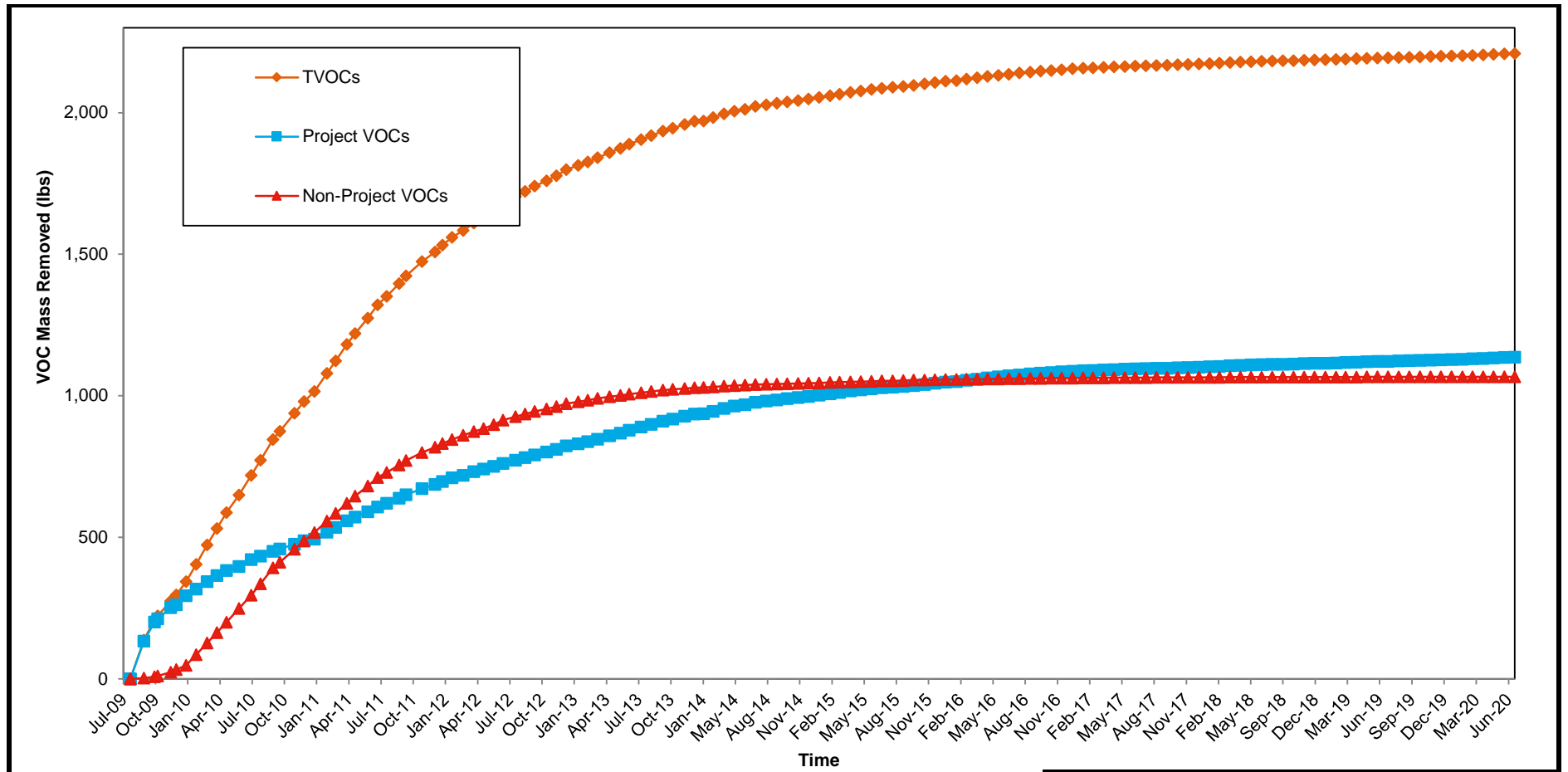
- LEGEND:**
- PROCESS WATER
  - - - PROCESS AIR
  - ⊗ INSTRUMENT
  - SAMPLE PORT
  - ▶ FLOW DIRECTION
  - FM FLOW METER
  - FT FLOW RATE TRANSMITTER
  - PSL PRESSURE VACUUM LOW
  - PT PRESSURE TRANSMITTER
  - PI PRESSURE INDICATOR
  - LSHH LEVEL SWITCH HIGH HIGH
  - LT LEVEL TRANSMITTER
  - TT TEMPERATURE TRANSMITTER
  - TI TEMPERATURE INDICATOR
  - WSP WATER SAMPLE PORT
  - VSP VAPOR SAMPLE PORT
  - ECU EMISSION CONTROL UNIT

BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM  
OPERABLE UNIT 3  
(FORMER GRUMMAN SETTLING PONDS)  
BETHPAGE, NEW YORK

**GROUNDWATER TREATMENT SYSTEM  
PROCESS SCHEMATIC AND  
MONITORING LOCATIONS**







**Abbreviations, Notes, and Units:**

VOC = Volatile Organic Compound  
 TVOCs = Total VOCs detected

Project VOCs = sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.

Non-Project VOCs = sum of VOCs that are not Project VOCs.

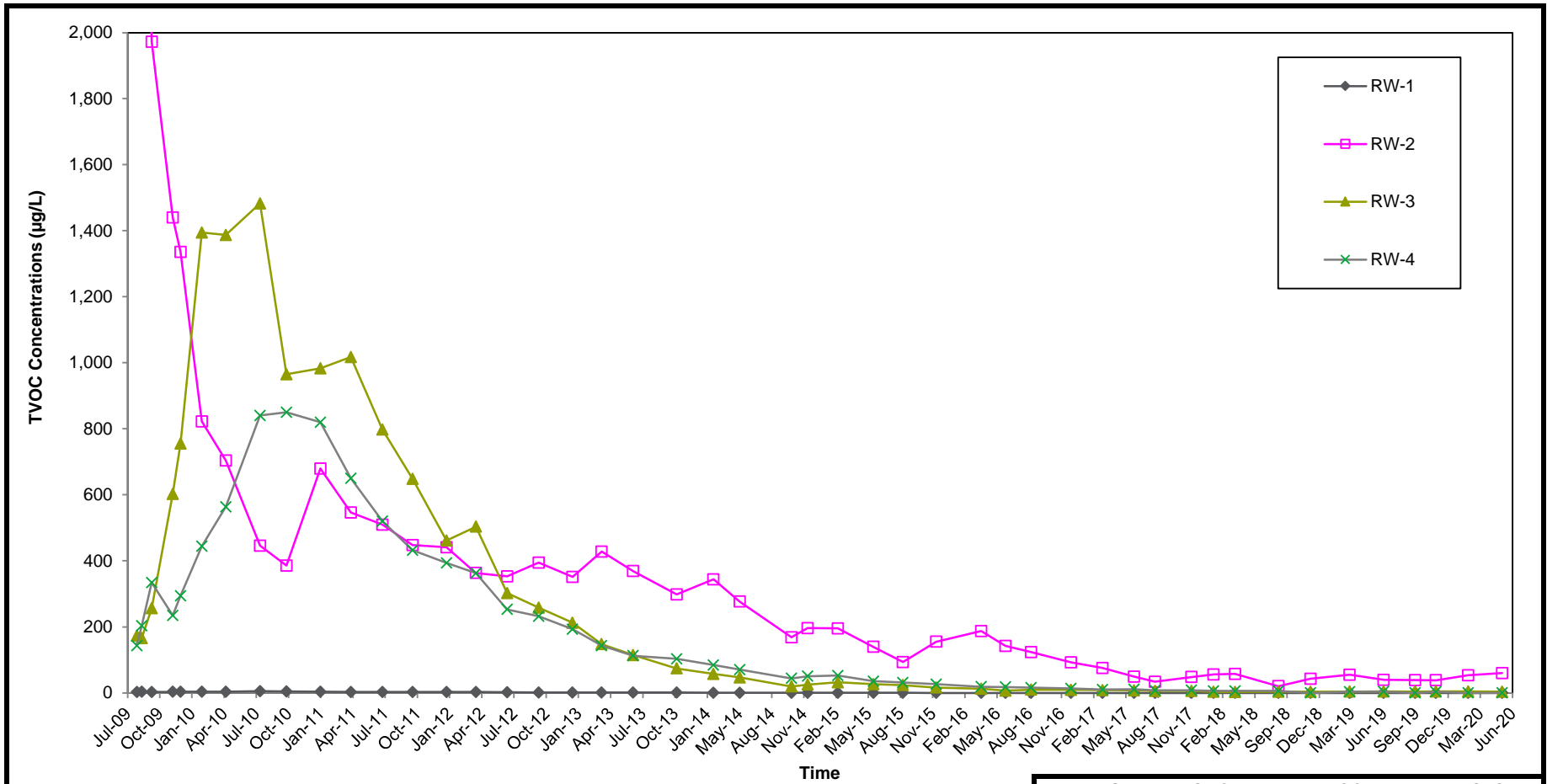
lbs = pounds

BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM  
 OPERABLE UNIT 3  
 (FORMER GRUMMAN SETTLING PONDS)  
 BETHPAGE, NEW YORK

**CUMULATIVE TOTAL, PROJECT, AND  
 NON-PROJECT VOC MASS REMOVED**



FIGURE  
**5**



**Abbreviations, Notes, and Units:**

VOC = Volatile Organic Compound  
 TVOCs = Total VOCs detected

1. Results prior to September 10, 2009 are not shown to improve figure clarity. The TVOC concentrations are greater than 2,000 µg/L. See previous reports for full data set.

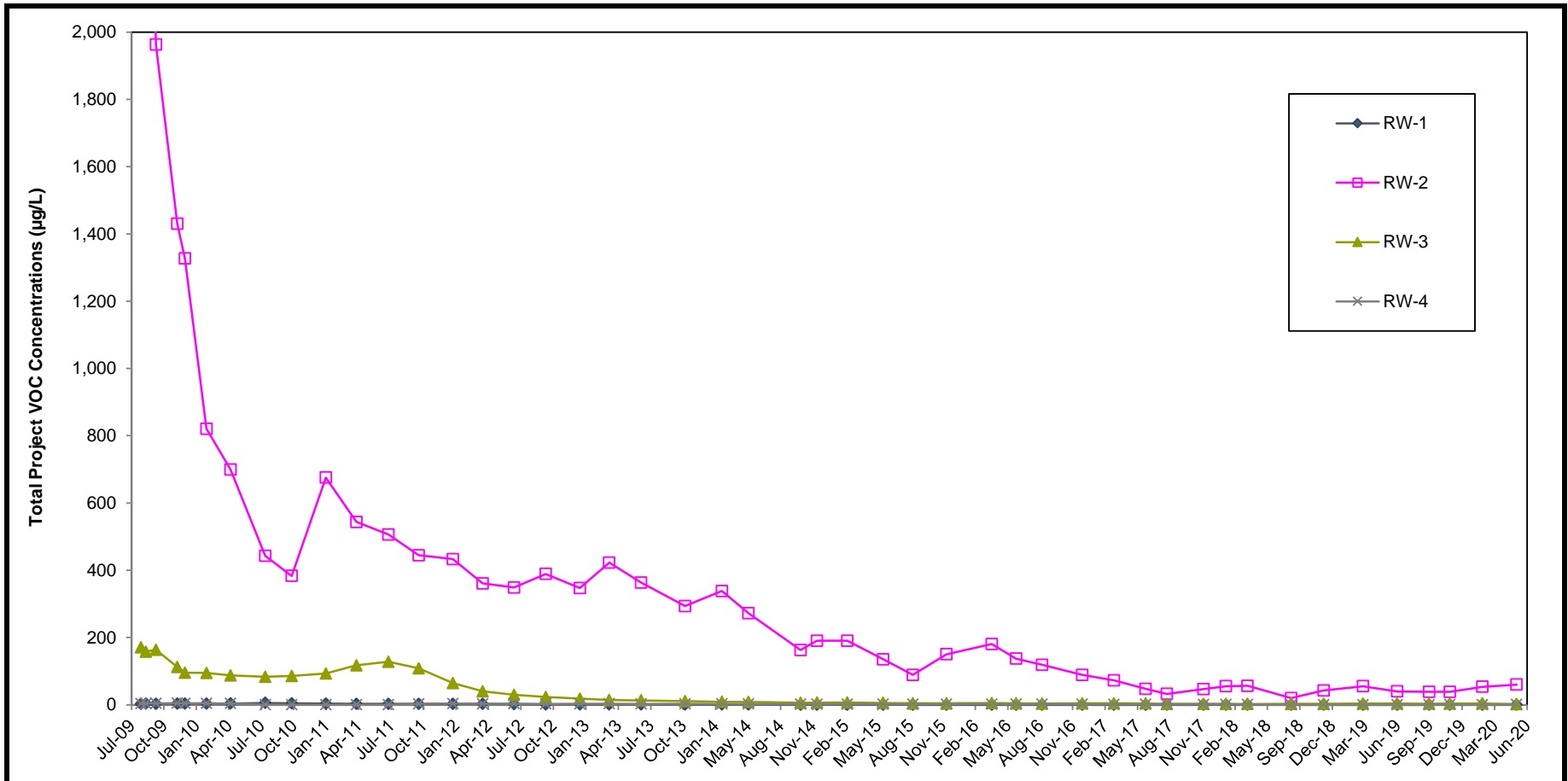
µg/L = micrograms per liter

BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM  
 OPERABLE UNIT 3  
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 BETHPAGE, NEW YORK

**REMEDIAL WELL TOTAL VOC  
 CONCENTRATIONS**



FIGURE  
**6A**



**Abbreviations, Notes, and Units:**

VOC = Volatile Organic Compound  
 TVOCs = Total VOCs detected

Project VOCs = sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.

1. Results prior to September 10, 2009 are not shown to improve figure clarity. Total Project VOC concentrations are greater than 2,000 µg/L. See previous reports for full data set.

µg/L = micrograms per liter

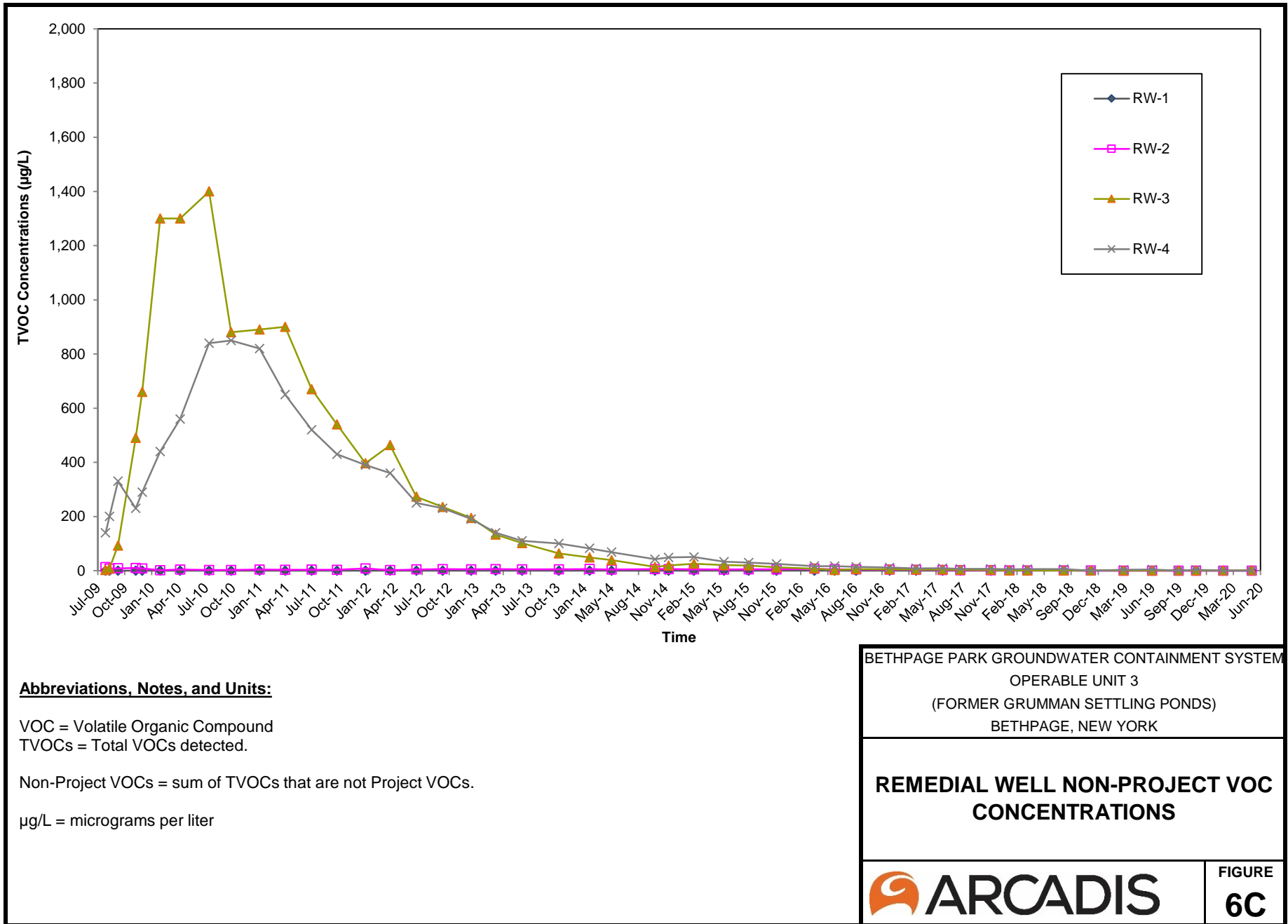
Time

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**REMEDIAL WELL PROJECT VOC  
 CONCENTRATIONS**

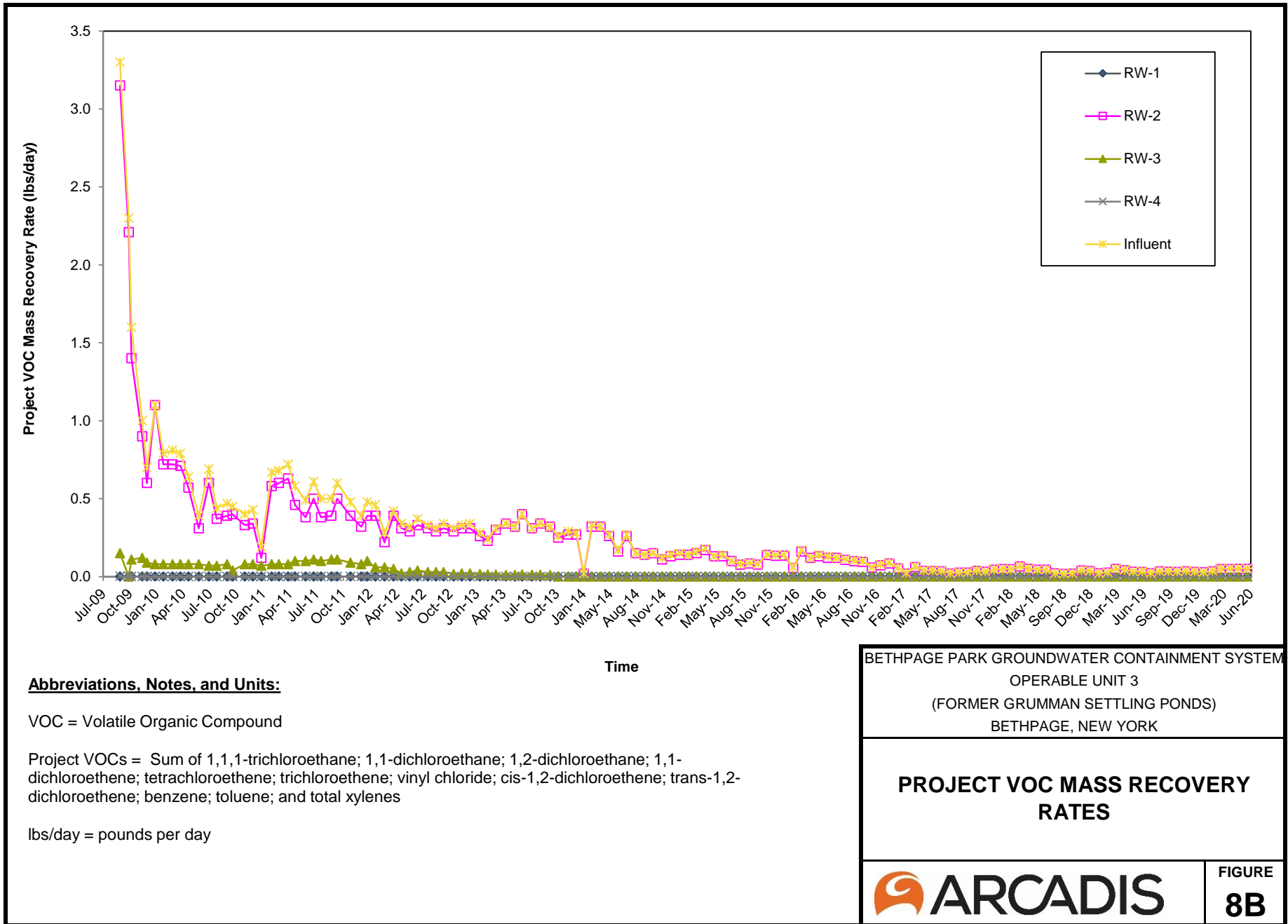


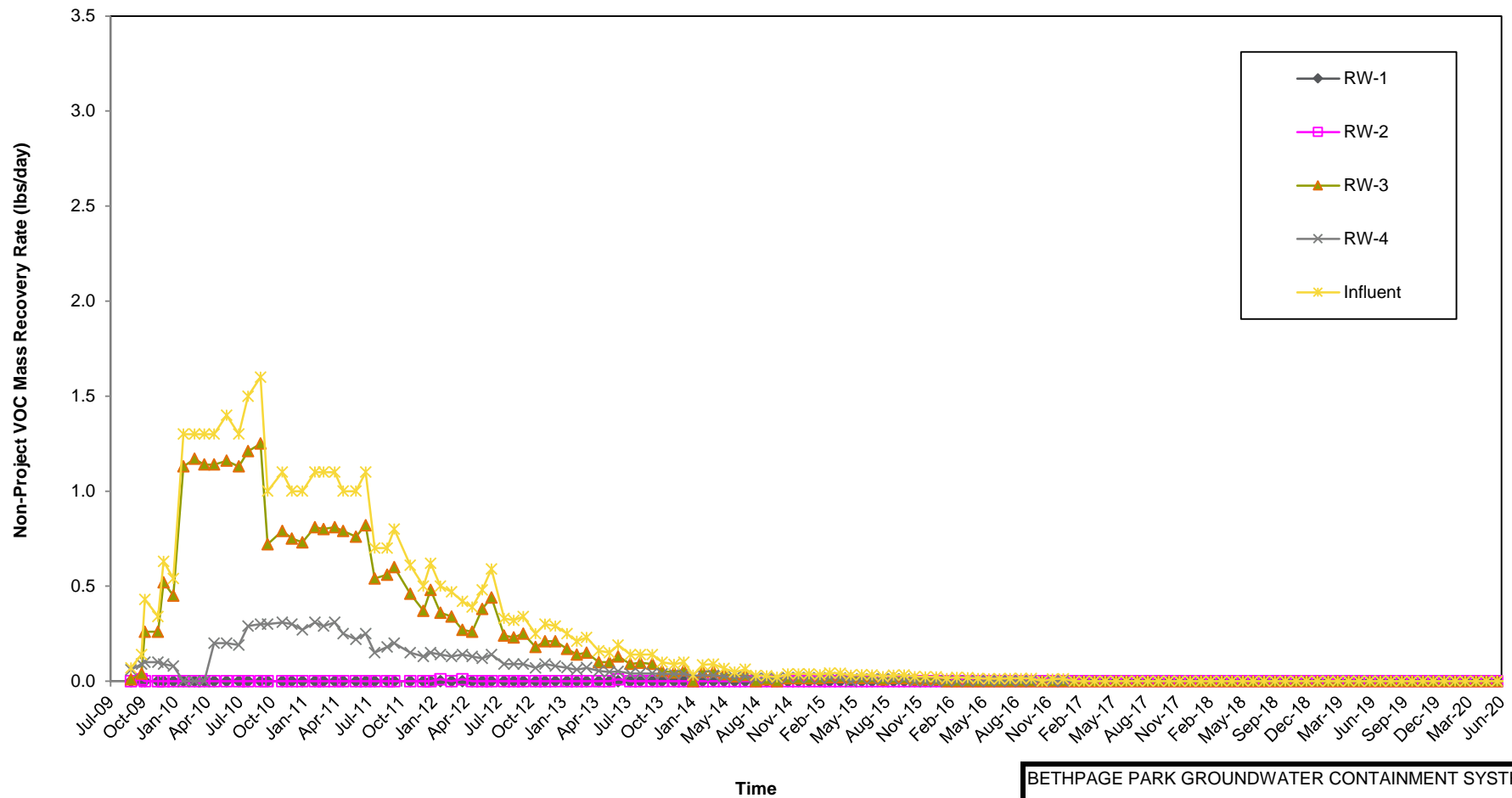
FIGURE  
**6B**











**Abbreviations, Notes, and Units:**

VOC = Volatile Organic Compound

Non-Project VOCs = sum of VOCs that are not Project VOCs.

lbs/day = pounds per day

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**NON-PROJECT VOC MASS RECOVERY RATES**



FIGURE  
**8C**