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Northrop Grumman Systems Corporation

Operable Unit 3- Interim Operation, Maintenance and Monitoring Report

July 2008 to August 2008

Operable Unit 3 – Soil Gas Interim Remedial Measure
Former Grumman Settling Ponds
Bethpage, New York

NYSDEC ID # 1-30-003A

ARCADIS

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Tables

Figures

Appendices

1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) Interim Operation, Maintenance, and Monitoring Report was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman). This report is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, is referred to herein as the Site. A Site location map is provided on Figure 1.

This report summarizes the routine operation, maintenance and monitoring (OM&M) activities for the soil gas IRM performed from July 8, 2008 through August 6, 2008. System O&M was completed in accordance with the Operable Unit 3 Soil Gas Interim Remedial Measure OM&M Manual that was submitted to the NYSDEC on August 26, 2008 (ARCADIS 2008a). System monitoring was completed in accordance with the Sampling and Analysis Plan (SAP), which was provided to the NYSDEC as Appendix C of the Soil Gas Interim Remedial Measure 95% Design Report and Design Drawings dated September 7, 2007 (ARCADIS 2007) and the OM&M Manual. The Sampling and Analysis Plan (ARCADIS 2008b) was approved by the NYSDEC in a letter dated August 1, 2008 (NYSDEC 2008).

A description of the soil gas IRM system OM&M activities completed during the reporting period is provided below.

2. Soil Gas Interim Remedial Measure System Description

The OU3 soil gas IRM was constructed in accordance with the Soil Gas Interim Remedial Measure 95% Design Report and Design Drawings, which was approved by the NYSDEC on September 19, 2007. A general site plan that shows the major process equipment, depressurization, and monitoring well locations is provided on Figure 2. A process flow diagram that shows sampling and monitoring locations is provided on Figure 3. A complete set of as-built drawings is provided in the OM&M Manual (ARCADIS 2008a).

In summary, the soil gas IRM consists of the following major components:

- 18 depressurization wells and 47 associated induced vacuum monitoring wells at the locations shown on Figure 2.
- Two (2) "dry-van" type storage containers, which contain the following equipment:
  - Three (3) 52-gallon moisture separators to remove condensate from the influent vapor stream;
  - Two (2) 20-horsepower(hp) and one (1) 30-hp regenerative type depressurization blowers;
  - A programmable logic controller (PLC) based control system;
  - An autodialer;
  - Associated piping, valves, sample ports, gauges, electrical equipment, and other devices necessary to safely control, operate, and monitor the system.
- One (1) heat exchanger to condition the effluent vapor stream prior to treatment; and,
- One (1) 10,000 pound (lb) vapor phase granular activated carbon bed (VPGAC).
- One (1) 33-foot tall by 16-inch diameter stack and associated ductwork.

A detailed description of the system is provided in the OM&M Manual (ARCADIS 2008a).

3. Operation and Maintenance Activities

The soil gas IRM operated continuously during the reporting period with only brief system shutdowns to perform routine maintenance or troubleshooting activities. The routine, monthly O&M site visit was conducted on August 6, 2008. Routine monthly O&M activities included inspection of all piping, appurtenances, and mechanical equipment for leaks, defects, or other problems and maintenance of equipment in accordance with the manufacturers' specifications and as described in the OM&M

Manual. In addition to the routine O&M site visit, supplemental site visits were completed on a weekly basis to monitor the physical condition of the temporary site controls (i.e., temporary fence).

Discussion of the routine OM&M monitoring program and results is provided in the subsequent sections of this report.

4. Monitoring Activities

The following sections summarize the methodology used for routine performance monitoring and routine compliance monitoring during the current reporting period. The performance monitoring program is completed to ensure that the system components are operating in accordance with the manufacturers specifications, to ensure that the VPGAC unit is operating as designed (if applicable), and to ensure that the general system operating parameters remain consistent with design data and/or historical operating data. The compliance monitoring program consists of the collection of effluent vapor and/or water samples to demonstrate compliance with regulatory discharge criteria and the collection of induced vacuum readings from key monitoring points to demonstrate the soil gas IRM is achieving the design vacuum of -0.1 inches of water (iwc) within the subsurface.

A description of the monitoring activities completed during the reporting period is provided below.

4.1 Routine Performance Monitoring

Routine performance monitoring was completed on August 6, 2008, in accordance with Table C-1 of the SAP (ARCADIS 2008b). A brief discussion of the routine performance monitoring methodology and/or deviations from the methodology described in the SAP is provided below.

4.1.1 System Operating Parameters

System operating parameters that fall under the performance monitoring program include the parameters listed in Attachments C-3.2 and C-3.3 of the SAP (ARCADIS 2008b). There were no significant deviations from the recording of these parameters during the routine monitoring event.

4.1.2 Vapor Samples

One (1) routine performance monitoring vapor sample was collected for laboratory analysis from the total influent sample location (VSP-601) during the August 6, 2008 monitoring event. The sample was collected and submitted to the laboratory in accordance with the requirements set forth in the SAP (ARCADIS 2008b). The sample was analyzed using USEPA Method TO-15 with the site-specific compound list provided in the SAP (ARCADIS 2008b). As requested by the NYSDEC, Freon 12 was quantified using USEPA Method TO-15 and the top 20 tentatively identified compounds (TICs) were reported. As referenced in previous correspondence to the NYSDEC, the analytical laboratory does not currently have a calibration standard for the compound Freon 22. Accordingly, Freon 22 is scanned for and reported as a TIC. The analytical laboratory anticipates acquiring the Freon 22 calibration standard during the Fall/Winter of 2008.

In addition, a screening level vapor sample was collected and monitored from VSP-601 using a photoionization detection (PID). In accordance with previous recommendations, PID measurements were not collected from individual depressurization wells during the reporting period.

4.2 Routine Compliance Monitoring

Routine compliance monitoring was completed on August 6, 2008 in accordance with Table C-1 of the SAP (ARCADIS 2008b). A brief discussion of the routine compliance monitoring methodology and/or deviations from the methodology described in the SAP is provided below.

4.2.1 System Operating Parameters

System operating parameters that fall under the compliance monitoring program include the compliance-related induced vacuum measurements listed in Table 2 of the OM&M Manual (ARCADIS 2008a). There were no significant deviations from the recording of these parameters during the routine monitoring event.

4.2.2 Vapor Samples

One (1) routine, compliance monitoring vapor sample was collected for laboratory analysis from the total effluent sample location (VSP-602) during the August 6, 2008 monitoring event. The sample was collected and submitted for laboratory analysis in

accordance with the requirements set forth in the SAP (ARCADIS 2008b). The sample was analyzed using USEPA Method TO-15 with the site-specific compound list provided in the SAP (ARCADIS 2008b). As requested by the NYSDEC, Freon 12 was quantified using USEPA Method TO-15 and the top 20 TICs were reported. As referenced in previous correspondence to the NYSDEC, the analytical laboratory does not currently have a calibration standard for the compound Freon 22. Accordingly, Freon 22 is scanned for and reported as a TIC. The analytical laboratory anticipates acquiring the Freon 22 calibration standard during the Fall/Winter of 2008.

In addition, a screening level sample was collected and monitored from VSP-602 using a PID.

4.2.3 Condensate Samples

Due to the lack of condensate generation, a compliance monitoring condensate sample was not collected for laboratory analysis during the reporting period.

5. Monitoring Results and Discussion

The following sections summarize and briefly discuss the results for routine performance monitoring and routine compliance monitoring during the current reporting period.

5.1 Routine Performance Monitoring

This following section summarizes the results of the routine system performance monitoring event completed on August 6, 2008.

5.1.1 System Operating Parameters

A summary of the performance monitoring system operating parameters for the August 6, 2008 monitoring event is provided in Table 1. A summary of induced vacuum measurements is provided in Table 2.

As shown in Table 1, the majority of system operating parameters recorded in August 2008 remained generally consistent with operating parameters recorded during July 2008. These data indicate that the system is running as designed and is maintaining a negative pressure curtain along the southern and western property boundaries.

Additional key data and observations are as follows:

- Wellhead vacuum and extraction flow rate decreased at Depressurization Wells DW-3S, DW-3D, DW-5D, and DW-4S; however, induced vacuum data for each respective depressurization well indicate the decrease did not result in a reduction of induced vacuum to below the design criteria of -0.1 iwc. The observed wellhead vacuum and extraction flow rate at the remaining depressurization wells are generally consistent when comparing July 7, 2008 to August 6, 2008 monitoring data.

- The average induced vacuum reading at non-compliance monitoring points was approximately-0.320 iwc for all monitoring points measured during the August 2008 monitoring event, which is consistent with data obtained during the July 2008 monitoring event (i.e., -0.317 iwc).

- Condensate water was not generated between July 8, 2008 and August 6, 2008.

- Perched water was not encountered in induced Vacuum Monitoring Wells VMWC-1C or VMWC-5B.

- The heat exchanger influent temperature (98 deg F) remained lower than the design influent temperature of 150 degrees. Accordingly, the heat exchanger was kept on standby between July 8, 2008 and August 6, 2008.

5.1.2 Vapor Samples

A summary of the August 2008 qualitative vapor sample analytical results is provided in Table 1. A summary of the August 2008 total influent vapor sample laboratory analytical results for detected compounds is provided in Table 3. A summary of all vapor sample analytical results (including detected, non-detect, and TICs is provided in Appendix A.

Qualitative vapor analyses (i.e., PID readings) were consistent with previous data and were below the limits of detection for vapor sample location VSP-601. Total influent (VSP-601) laboratory analytical results for the August 6, 2008 monitoring event were generally consistent with analytical results from July 7, 2008. Specifically, TVOC concentrations were 2,630 ug/m3 during the August 2008 monitoring event, and the VC concentration was below the limits of detection. Trichloroethylene (TCE) was detected at a concentration of 1,400 ug/m3.

Chlorodifluoromethane and Freon 142 were reported as TICSs by the laboratory during the August 2008 monitoring event. As requested by the NYSDEC, chlorodifluoromethane will be added to the quantitative laboratory compound list during Fall 2008 as soon as the calibration standard is received by the laboratory.

5.2 Routine Compliance Monitoring

This following section summarizes the results of the routine system compliance monitoring event completed on August 6, 2008.

5.2.1 Induced Vacuum Measurements

Induced vacuum measurements collected during the August 6, 2008 monitoring event are summarized in Table 2. As referenced in the 95% Design Report, the soil gas IRM was designed to maintain a negative pressure of -0.1 iwc on a time-weighted rolling average within all monitoring points. Accordingly, the time-weighted rolling average for all induced vacuum monitoring points has been provided in Table 2. As shown on Table 2, the rolling average for all individual monitoring points was greater than -0.1 iwc as of August 6, 2008. In addition, the average induced vacuum for compliance monitoring wells during the August 6, 2008 monitoring event was -0.20 iwc, which indicate that the soil gas IRM is operating as designed. These data are consistent with data from the July 7, 2008 monitoring event.

5.2.2 Vapor Samples

A summary of the August 2008 qualitative vapor sample analytical results is provided in Table 1. A summary of the August 2008 total effluent vapor sample laboratory analytical results for detected compounds is provided in Table 3. A summary of all vapor sample analytical results (including detected, non-detect, and TICs is provided in Appendix A.

Qualitative vapor analyses (i.e., PID readings) for total effluent sample port VSP-602 were consistent with previous data and were below the limits of detection. Total effluent (VSP-602) laboratory analytical results for the August 6, 2008 monitoring event were consistent with analytical results from July 7, 2008. Specifically, the TVOC concentration was 361 ug/m3 during the August 2008 monitoring event. VC was detected at a concentration (4.9 ug/m3) that is slightly above the limits of detection. Similarly, TCE was detected at a concentration (9.2 ug/m3) that is slightly above the limits of detection. A summary of the air emissions model, completed to confirm

compliance with applicable air discharge standards, is discussed in Section 6 of this report.

5.2.3 Condensate Samples

As discussed previously, a condensate sample was not collected from Storage Tank ST-510 for laboratory analysis during the reporting period due to the lack of condensate water generation. Nonetheless, a table that indicates no samples were collected during the reporting period is provided as Table 4. A similar appendix table has been provided in Appendix B.

6. Air Emissions Model

Effluent vapor laboratory analytical results were compared to the NYSDEC Division of Air Resources Air Guide-1 (DAR-1) Short-term Guideline Concentrations (SGCs). In addition, effluent vapor laboratory analytical results were compared to a site-specific modeled annual maximum allowable stack concentration. The annual maximum allowable stack concentration (MASC) was calculated during each monitoring event for individual compounds using the output from a United States Environmental Protection Agency (USEPA) Screen 3 model in conjunction with the NYSDEC DAR-1 Annual Guideline Concentrations (AGCs). Specifically, a scaling factor was calculated using the SCREEN3 model with site-specific physical layout (e.g., building dimension, stack height, terrain, etc.) and operating data (e.g., discharge flow rate, temperature, etc.) inputs for each monitoring event. The scaling factor was then used to adjust (scale) the NYSDEC DAR-1 AGC to a site-specific annual MASC. A summary of the instantaneous percent (e.g., not time-weighted) of the site-specific annual MASC for detected compounds is provided in Table 5. A summary of the cumulative annual percent (i.e., time-weighted) of the site-specific MASC for detected compounds is also provided on Table 5. A summary of the model input, outputs, and backup calculations is provided in Appendix C.

In summary, the soil gas IRM effluent vapor met applicable air discharge criteria based on the following:

- The actual concentrations of individual VOCs in the vapor effluent did not exceed their respective SGCs during all monitoring events (Table 3). It should also be noted that all influent (i.e., prior to treatment) individual VOC concentrations were also below their respective SGCs.

- The actual concentration of individual VOCs in the vapor effluent did not exceed their respective instantaneous MASCs as calculated using the USEPA SCREEN 3 Model (Table 5). Similarly, the time-weighted rolling average for all detected compounds is currently well below the MASCs.

7. Conclusions and Recommendations

7.1 Conclusions

Based on the information provided herein, ARCADIS makes the following conclusions:

- VPGAC effluent data indicate that the VPGAC unit is removing TCE from the influent vapor stream as designed.

- August 2008 compliance monitoring results indicate that the system continues to operate as designed. Specifically, a time-weight average induced vacuum of greater than -0.1 iwc was achieved in all induced vacuum monitoring points.

- The actual concentrations of individual VOCs in the vapor effluent did not exceed their respective SGCs during the reporting period.

- The actual concentration of individual VOCs in the vapor effluent did not exceed their respective MASCs as calculated using the USEPA SCREEN 3 model. In addition, the instantaneous percent of the site-specific annual MASC for all detected compounds was less than 1-percent during the August 2008 monitoring event.

7.2 Recommendations

Based on the information provided herein, ARCADIS makes the following recommendations:

- Continue operating the system in accordance with system operating parameters recorded in July/August 2008.

- Evaluate September 2008 vacuum and flow rate data from depressurization wells DW-3S, DW-3D, DW-5D, and DW-4S in conjunction with each wells respective induced vacuum monitoring points. If flow rates continue to decline,

consider making system adjustments to increase the flow at the respective location.

- Continue to collect system operational data and influent and effluent vapor samples for laboratory analysis on a monthly basis for the next operating month (i.e., September 2008) as requested by the NYSDEC. If data is favorable and continue to indicate a stable trend for all operating parameters and vapor analytical data, perform performance and compliance monitoring on a quarterly basis thereafter.

8. References

ARCADIS of New York, Inc. 2007. 95% Design Report, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A September 7, 2007.

ARCADIS of New York, Inc. 2008a. Operable Unit 3 –Operation, Maintenance, and Monitoring Manual, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A August 26, 2008.

ARCADIS of New York, Inc. 2008b. 95% Design Report, Appendix C, Sampling and Analysis Plan, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A February 8, 2008.

New York State Department of Environmental Conservation (NYSDEC), 2008, Approval Letter regarding Former Grumman Settling Ponds, NYSDEC Nassau County Site No. 1-30-003A OU3 (Bethpage Community Park), August 1, 2008.

New York State Department of Environmental Conservation (NYSDEC), 2005, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991 and the AGC/SGC Tables dated September 10, 2007.

Table 1 Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York

	Extraction Well DW-7S Parameters					Extraction Well DW-7D Parameters					Extraction Well DW-3S Parameters					Extraction Well DW-3D Parameters					Extraction Well DW-5S Parameters					Extraction Well DW-5D Parameters				
Date	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
02/18/08(1)	58	-3.55	55.7	7.2	-2.0	76	-7.2	56.1	29.3	-2.5	80	-7.3	55.7	2.8	-2.5	113	-15.43	53.9	13.3	-4.5	100	-4.0	57.2	0.0	-4.0	52	-16.1	56.8	0.0	-13.5
02/19/08(1)	53	-3.80	NM	8.7	-2.0	78	-7.4	NM	26.7	-2.5	45	-2.5	NM	6.5	-1.75	108	-16.3	NM	16 4	-3.5	57	-2.5	NM	0,0	-2.0	52	-18	NM	0.0	-13.5
02/25/08(1)	55	-5.5	NM	4.2	-2.0	74	-13	NM	5.8	-2.7	37	-2.03	NM	2.1	-1.5	71	-26	NM	6.6	-2.7	20	-1.05	NM	0.4	-1.5	56	-24.1	NM	0.0	-17.5
03/03/08(1)	53	-6	NM	2.8	-2.0	84	-13.0	NM	0.8	-2.7	45	-2.5	NM	1.2	-1.5	88	-16	NM	1.9	-2.7	20	-1.4	NM	0.8	-1.5	66	-27	NM	0.0	-15.2
03/17/08(1)	76	-9	NM	2.6	-2.5	50	-8.00	NM	0.4	-2.0	45	-2.8	NM	1.1	-2.0	83	-16	NM	0.1	-2.7	20	-1.5	NM	0.0	-2.5	70	-32	NM	0.0	-25.0
04/16/08	84.97	-10.46	50.3	2.7	NM	41.10	-2	55.4	2.0	NM	15.48	-0.41	58.6	0.6	NM	28.56	-1.07	57.0	4.6	NM	34.44	-0.77	55.0	0.0	NM	33.95	-0.22	57.5	0.6	NM
05/19/08	72.43	-5.0	57.0	5.0	-4.0	19.76	-0.800	62.2	2.1	-1.5	14.98	-0.45	62.2	0.0	-2.0	23.35	-2.0	59.3	3.5	-3.0	77.92	-2.5	59.9	2.5	-2.5	19.73	-14.0	59.0	0.0	-10.5
06/02/08	86.01	-5.8	65.8	0.0	-1.8	23.40	-0.7	72.8	0.0	-0.9	16.09	-0.4	71.0	0.0	-1.1	26.95	-2.0	71.7	0.0	-1.3	86.18	-2.3	65.4	0.0	-2.8	16.56	-14.0	74.3	0.0	-10.0
07/07/08	49.33	-4.4	69.4	4.7	-2.2	18.04	-1.2	76.1	2.6	-1.0	17.56	-0.4	74.1	2.3	-1.2	17.63	-11	77.9	3.1	-2.2	121.21	-2.2	71.0	2.1	-2.7	15.22	-14.2	82.2	2.3	-10
08/06/08(5,8)	78.62	-4.5	76.3	NM	-2.5	19.49	-0.9(9)	80.6	NM	-1.7	9.84	-2.0(6)	76.8	NM	-1.0	12.84	-11.5	80.0	NM	-1.1	82.68	-2.1	75.1	NM	-2.0	4.62	-14.5	81.6	NM	-0.9

Notes and Abbreviations:

- °F - Degrees Fahrenheit
- DW- Depressurization well
- ft bmp - Feet below measuring point
- iwc - Inches of water column
- NM -Not measured
- scfm - Standard cubic feet per minute
- ppmv - Parts per million by volume
- VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.

Standard Conditions Calculation:

$$scfm = Flow\ rate*Area*(Ts/Tm)*(Pm/Ps)$$

Flow rate in feet per minute
Area in square feet
Ts - Standard Temperature in Rankine
Tm - Measured Temperature in Rankine
Pm - Measured Pressure in pounds per square inch
Ps - Standard Pressure in pounds per square inch

Table 1 Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York

Date	Extraction Well DW-6S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-6D Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08(1)	170	-13.1	55.0	0.0	-6.0	44	-16.0	60.2	0.0	-14.0
02/19/08(1)	167	-13.6	NM	0.0	-6.0	48	-17.5	NM	0.0	-14.0
02/25/08(1)	167	-16.0	NM	0.0	-6.0	94	-23.5	NM	0.0	-20.5
03/03/08(1)	170	-16.0	NM	0.5	-5.5	55	-25.2	NM	0.0	-20
03/17/08(1)	185	-22	NM	0.0	-6.0	65	-31	NM	1.2	-22
04/16/08	49.50	-1.44	53.6	0.2	NM	10.55	-1.86	57.5	1.9	NM
05/19/08	42.93	-1.2	61.8	2.5	-1.3	11.47	-2.6	60.0	0.0	-2.0
06/02/08	48.18	-1.2	68.0	0.0	-1.2	14.88	-2.2	72.5	0.0	-2.5
07/07/08	52.63	-1.5	71.6	1.2	-2.0	14.89	-2.1	75.2	3.3	-2.2
08/06/08(5,8)	41.38	-1.2	75.4	NM	-1.0	11.75	-2.1	79.9	NM	-0.9(6)

Date	Extraction Well DW-1S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-1D Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08(1)	160	-11.8	54.1	0.0	-5.0	20	-16.8	62.4	0.0	-15.0
02/19/08(1)	235	-19.78	NM	0.0	-8.0	20	-18	NM	0.0	-16.0
02/25/08(1)	228	-25.4	NM	NM	-7.2	28	-24.25	NM	0.0	-25.0
03/03/08(1)	208	-26.79	NM	0.1	-7.0	32	-26.5	NM	0.0	-25.0
03/17/08(1)	208	-29	NM	0.0	-7.5	32	-32.6	NM	0.0	-30
04/16/08	89.48	-3.31	52.3	0.0	NM	3.97	-0.79	61.3	0.0	NM
05/19/08	147.62	-10.5	55.5	0.0	-4.5	6.60	-1.8	64.4	0.3	-2.5
06/02/08	179.95	-10.3	61.3	0.0	-4.2	8.54	-1.8	74.1	0.0	-5.1
07/07/08	153.47	-6	68.5	2.3	-3.8	8.71	-1.3	77.3	2.2	-4.7
08/06/08(5,8)	137.92	-6.2	75	NM	-3.0	12.86	-1.2	80.7	NM	-1.1

Date	Extraction Well DW-4S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-4D Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08(1)	170	-12.0	54.6	0.0	-3.0	8	-2.0	60.8	0.0	-3.0
02/19/08(1)	155	-13.5	NM	0.0	-5.5	8	-1.95	NM	0.0	-1.5
02/25/08(1)	160	-16.0	NM	0.0	-5.5	8	-1.1	NM	0.0	-2.0
03/03/08(1)	160	-16.0	NM	1.1	-5.70	8	-1.0	NM	0.0	-2.0
03/17/08(1)	176	-26	NM	0.0	-6.0	8	-1.25	NM	0.0	-1.75
04/16/08	48.16	-1.43	55.5	0.0	NM	9.27	-0.48	60.6	0.0	NM
05/19/08	32.14	-1.0	61.7	1.7	-2.7	15.01	-1.1	63.3	0.6	-2.2
06/02/08	30.98	-0.7	66.2	0.0	-2.1	17.44	-1.2	71.6	0.0	-2.7
07/07/08	38.23	-0.2	72.8	1.2	-2.1	18.41	-1.1	73	2.5	-1.8
08/06/08(5,8)	12.93	-0.8	87	NM	-0.6	12.97	-1.0	80.7	NM	0(10)

Notes and Abbreviations:

°F - Degrees Fahrenheit
DW- Depressurization well
ft bmp - Feet below measuring point
iwc - Inches of water column
NM -Not measured
scfm - Standard cubic feet per minute
ppmv - Parts per million by volume
VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.

Standard Conditions Calculation:

$$scfm = \text{flow rate} \times \text{Area} \times (Ts/Tm) \times (Pm/Ps)$$

flow rate in feet per minute
Area in square feet
Ts - Standard Temperature in Rankine
Tm - Measured Temperature in Rankine
Pm - Measured Pressure in pounds per square inch
Ps - Standard Pressure in pounds per square inch

Table 1. Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York

Extraction Well DW-8S Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	135	-0.1	55.0	0,0	-3.0
02/19/08[1]	140	-12.0	NM	0.0	-3.5
02/25/08[1]	138	-14.90	NM	0.3	-3.5
03/03/08[1]	140	-18.2	NM	0.9	-3.7
03/17/08[1]	140	-18	NM	0.2	-4.0
04/16/08	35.32	-2.13	55.4	0.2	NM
05/19/08	65.68	-9.0	59.1	2.2	-3.5
06/02/08	72.85	-9.2	62.0	0.0	-3.9
07/07/08	102.21	-9	70.5	2.5	-4.1
08/06/08[5,8]	94.43	-9.0	80.1	NM	-2.7

Extraction Well DW-9S Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	72	-10.0	57.3	0.0	-4.5
02/19/08[1]	72	-10.4	NM	0.0	-4.5
02/25/08[1]	72	-12.3	NM	0.4	-4.7
03/03/08[1]	76	-13.4	NM	0.1	-5.0
03/17/08[1]	76	-12.0	NM	0.1	-5.5
04/16/08	28.89	-1.47	56.1	0.2	NM
05/19/08	64.77	-6.8	59.0	0.8	-4.2
06/02/08	68.01	-6.8	62.4	0.0	-4.5
07/07/08	87.48	-7.0	70.1	0.7	-4.5
08/06/08[5,8]	68.18	-7.1	80.9	NM	-2.5

Extraction Well DW-2S Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	45	-5.1	61.1	0.0	-2.5
02/19/08[1]	65	-10	NM	0.0	-3.6
02/25/08[1]	67	-12.2	NM	0.4	-4.0
03/03/08[1]	67	-13.85	NM	0.0	-4.5
03/17/08[1]	65	-15.2	NM	0.0	-4.5
04/16/08	34.18	-2.2	56.8	0.1	NM
05/19/08	33.64	-3.5	61.7	0.8	-1.7
06/02/08	34.15	-4.1	67.6	0.0	-1.8
07/07/08	41.33	-3.7	71.7	2.0	-1.8
08/06/08[5,8]	30.27	-3.1	81.9	NM	-1.9

Extraction Well DW-2D Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	80	-11.9	55.2	0.0	-7.0
02/19/08[1]	82	-12.7	NM	0.0	-8.0
02/25/08[1]	40	-6.2	NM	0.0	-5.7
03/03/08[1]	40	-5.1	NM	0.0	-4.9
03/17/08[1]	50	-6	NM	0.0	-5.0
04/16/08	19.24	-0.8	58.6	0.0	NM
05/19/08	46.61	-4.3	59.3	1.2	-4.0
06/02/08	50.56	-4.4	66.3	0.0	-4.1
07/07/08	56.29	-4.4	71.0	2.1	-4.0
08/06/08[5,8]	50.43	-4.5	83.9	NM	-3.0

Extraction Well DW-10S Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	75	-13.5	57.5	0.0	-5.0
02/19/08[1]	75	-13.7	NM	0.0	-5.2
02/25/08[1]	75	-16.0	NM	0.4	-5.5
03/03/08[1]	78	-17.16	NM	0.2	-5.5
03/17/08[1]	77	-17.6	NM	0.1	-5.5
04/16/08	24.42	-1.64	57.3	0.0	NM
05/19/08	48.22	-7.2	59.0	0.7	-3.5
06/02/08	52.84	-9.0	65.8	0.0	-3.8
07/07/08	68.91	-7.9	70.5	2.1	-2.5
08/06/08[5,8]	61.75	-7.8	80.8	NM	-3.5

Extraction Well DW-11S Parameters

Date	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
02/18/08[1]	60	-1.5	55.2	0.0	-13.0
02/19/08[1]	70	-16.04	NM	0.0	-10
02/25/08[1]	77	-19.5	NM	0.3	-9.0
03/03/08[1]	72	-21	NM	0.0	-9.8
03/17/08[1]	77	-20	NM	0.0	-9.0
04/16/08	32.38	-3.14	55.2	0.4	NM
05/19/08	42.94	-6.0	59.9	1.1	-3.7
06/02/08	46.34	-6.0	66.3	0.0	-3.7
07/07/08	56.39	-6.2	71.2	1.9	-3.8
08/06/08[5,8]	47.67	-6.4	82.2	NM	-3.5

Notes and Abbreviations:

°F - Degrees Fahrenheit
DW- Depressurization well
ft bmp - Feet below measuring point
iwc - Inches of water column
NM -Not measured
scfm - Standard cubic feet per minute
ppmv - Parts per million by volume
VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.

Standard Conditions Calculation:

scfm = flow rate*Area*(Ts/Tm)*(Pm/Ps)

flow rate in feet per minute
Area in square feet
Ts - Standard Temperature in Rankine
Tm - Measured Temperature in Rankine
Pm - Measured Pressure in pounds per square inch
Ps - Standard Pressure in pounds per square inch

Table 1 Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York

	Knock Out Tank Parameters						Blower Parameters[3] BL-200				Blower Parameters[3] BL-300				Blower Parameters[3] BL-400				Combined Effluent Parameters VSP-601					Stack Parameters VSP-602			Water levels in Wells				
	Vacuum			Totalizer																										
Date	Influent KO-200	Influent KO-300	Influent KO-400	Effluent KO-200	Effluent KO-300	Effluent KO-400	Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Total Effluent Flow Rate	Total Effluent PID	Heat Exchanger Influent Temp.	Total Effluent Pressure	VPGAC Influent Temperature	VPGAC Effluent PID	Discharge Temperature	Effluent Relative Humidity	VMWC-10	VMWC-5D	BPMW-3	VMWC-1C	VMWC-5B
	(iwc)	(iwc)	(iwc)	(Gallons)	(Gallons)	(Gallons)	(iwc)	(iwc)	(scfm)	(ppmv)	(iwc)	(iwc)	(scfm)	(ppmv)	(iwc)	(iwc)	(scfm)	(ppmv)	(scfm)	(ppmv)	(°F)	(iwc)	(°F)	(ppmv)	(°F)	(%)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)
02/18/08[1]	-17.9	-37.9	-34.8	33.66	9,996,124	35.99	-19.5	6.2	499.50	6.4	-40	12.0	594.88	0.0	-38	11.5	643.39	0.0	1963.69	0.0	100	9.6	93	0.0	NM	NM	52.13	Dry	53.75	Dry	Dry
02/19/08[1]	-19.5	-39.5	-36.0	33.66	9,996,124	35.99	-20.5	9.0	432.20	2.7	-40.6	12.0	841.92	1.6	-38.5	10.0	604.74	1.3	1673.81	NM	95	9.8	84	NM	NM	NM	52.17	Dry	53.77	Dry	Dry
02/25/08[1]	-27.4	-42.0	-39.8	57.34	9,996,124	35.99	-28.3	8.2	433.60	NM	-42.9	10.4	821.99	NM	-42.1	10.2	653.35	NM	1678.65	2.4	94	9.0	94	0.0	NM	NM	52.19	49.12	53.89	38.20	Dry
03/03/08[1]	-26.5	-44.0	-42.0	128.57	9,996,124	35.99	-28.5	7.6	391.71	NM	-45.2	10.1	752.16	NM	-43.9	10.0	685.41	NM	1792.84	0.5	104	8.6	94	0.0	NM	NM	Dry	Dry	53.90	Dry	Dry
03/17/08[1]	-33	-43	-41	132.70	9,996,272.5[4]	35.99	-34.3	7.6	411.73	NM	-45.4	10.1	717.83	NM	-43.8	10.0	805.36	NM	1773.50	0.0	102.5	8.0	96	0.0	NM	NM	Dry	Dry	53.62	Dry	Dry
04/16/08	0	-32	0	132.67	9,996,202.72	35.94	0	0	0	NM	-35	1	641	1.0	0	0	0	NM	NM	1.0	90	0.9	82	0.7	NM	NM	51.55	48.47	53.25	Dry	Dry
05/19/08	0	-18	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.5	1.5	666	3.1	0	0	NM	NM	NM[2]	4.6	85	1.4	74	1.7	NM	NM	51.53	48.50	53.20	Dry	Dry
06/02/08	0	-15.5	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.5	1.2	746	0.0	0	0	NM	NM	NM[2]	0.0	85	1.6	85	0.0	NM	NM	51.71	50.55	53.33	Dry	Dry
07/07/08	0	-17	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.8	1.5	829	0.9	0	0	NM	NM	NM[2]	0.7	85	1.5	90	0.0	NM	NM	52.25	Dry	53.9	Dry	Dry
08/06/08	0	-18	0	132.67	9,996,202.72	35.94	NM	NM	NM	NM	-20.0	1.5	640	NM	NM	NM	NM	NM	NM[2]	0.0	98	1.6	95	0.0	NM	NM	52.62[7]	Dry[7]	54.2	Dry	Dry

Notes and Abbreviations:

°F - Degrees Fahrenheit
DW- Depressurization well
ft bmp - Feet below measuring point
iwc - Inches of water column
M -Not measured
scfm - Standard cubic feet per minute
ppmv - Parts per million by volume
VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.

Standard Conditions Calculation:

$$scfm = \text{flow rate} * Area * (Ts/Tm) * (Pm/Ps)$$

flow rate in feet per minute
Area in square feet
Ts - Standard Temperature in Rankine
Tm - Measured Temperature in Rankine
Pm - Measured Pressure in pounds per square inch
Ps - Standard Pressure in pounds per square inch

Table 2. Summary of Induced Vacuum Readings, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[1]

Well ID:		DW-7S		DW-7D	DW-3S				DW-3D			DW-5S		DW-5D	DW-1S									
Date	VMWC-14A [4]	VMWC-14B [4]	VMWC-14D [4]	VMWC-9A	VMWC-9B	VMWC-10B	VMWC-11B [4]	VMWC-10D	VMWC-11D	VMWC-12D [4]	VMWC-15A [4]	VMWC-15B [4]	VMWC-15D [4]	VMWC-1A	VMWC-2A	VMWC-4A	VMWC-3A [4]	VMWC-1B	VMWC-4B	VMWC-3B [4]	VMWC-1C	VMWC-2C	VMWC-4C	VMWC-3C [4]
02/18/08	-0.05	-0.26	-0.31	-0.51	-0.67	-0.50	-0.41	-0.57	-0.43	-0.34	-0.52	-0.41	-0.35	-0.12	-0.10	-0.07	-0.07	-0.15	-0.08	-0.08	-0.11	-0.11	-0.09	-0.08
02/19/08	-0.09	-0.27	-0.30	-0.42	-0.53	-0.40	-0.33	-0.48	-0.40	-0.31	-0.30	-0.30	-0.35	-0.74	-0.61	-0.50	-0.42	-0.93	-0.58	-0.42	-0.78	-0.66	-0.61	-0.46
02/25/08	-0.09	-0.26	-0.31	-0.39	-0.49	-0.39	-0.34	-0.44	-0.36	-0.31	-0.23	-0.23	-0.27	-0.70	-0.58	-0.44	-0.40	-0.88	-0.54	-0.42	-0.74	-0.62	-0.55	-0.44
03/03/08	-0.11	-0.28	-0.31	-0.38	-0.44	-0.37	-0.31	-0.41	-0.33	-0.27	-0.19	-0.21	-0.25	-0.62	-0.48	-0.40	-0.32	-0.78	-0.46	-0.38	-0.66	-0.54	-0.49	-0.39
03/17/08	-0.11	-0.28	-0.31	-0.39	-0.50	-0.36	-0.29	-0.39	-0.36	-0.54	-0.25	-0.25	-0.28	-0.70	-0.60	-0.44	-0.38	-0.89	-0.50	-0.40	-0.68	-0.60	-0.52	-0.43
04/16/08	-0.11	-0.16	-0.18	-0.15	-0.17	-0.14	-0.13	-0.14	-0.13	-0.11	-0.09	-0.09	-0.08	-0.20	-0.16	-0.16	-0.11	-0.24	-0.16	-0.11	-0.19	-0.16	-0.16	-0.11
05/19/08	-0.099	-0.143	-0.163	-0.170	-0.199	-1.490	-0.154	-0.083	-0.219	-0.143	-0.159	-0.125	-0.159	-0.425	-0.369	-1.377	-0.221	-0.410	-0.299	-0.283	-0.423	-0.372	-0.333	-0.218
06/02/08	-0.095	-0.146	-0.148	-0.165	-0.171	-0.165	-0.165	-0.142	-0.135	-0.127	-0.150	-0.140	-0.133	-0.437	-0.339	-0.492	-0.200	-0.505	-0.299	-0.213	-0.408	-0.335	-0.313	-0.212
07/07/08	-0.097	-0.146	-0.149	-0.123	-0.135	-0.129	-0.122	-0.131	-0.129	-0.125	-0.127	-0.126	-0.133	-0.303	-0.258	-0.193	-0.152	-0.409	-0.227	-0.160	-0.331	-0.263	-0.219	-0.164
08/06/08	-0.10	-0.15	-0.15	-0.10	-0.16	-0.11	-0.146[5]	-0.11	-0.11	-0.11	-0.13	-0.13	-0.11	-0.34	-0.241[5]	-0.26	-1.14	-0.39	-0.30	-0.16	-0.32	-0.290[5]	-0.29	-0.16
Time Weighted Rolling Average:	-0.102	-0.194	-0.211	-0.233	-0.277	-0.334	-0.199	-0.228	-0.217	-0.225	-0.168	-0.163	-0.176	-0.450	-0.370	-0.428	-0.239	-0.550	-0.328	-0.252	-0.449	-0.379	-0.340	-0.256

Gross Average Non Compliance points		Gross Average Compliance Points	
08/06/08	-0.32	08/06/08	-0.20

Notes and Abbreviations:

DW	Depressurization Well
NM	Not measured due to temporary inaccessibility
VMWC	Vapor monitoring well cluster

1. All induced vacuum measurements units in inches of water column (iwc).
2. Data point appears to be erroneous based on vacuum readings at further vapor point greater than that recorded at the closer location.
3. Data point is average of readings taken which fluctuated between -0.22 and -0.29 iwc.
4. Compliance vapor monitoring point.
5. Original parameter collected on 8/6/08 was erroneous, data point reported is second reading taken on 08/07/08.
6. Compliance goal is -0.1 iwc induced vacuum at all compliance montioring points.

Table 2. Summary of Induced Vacuum Readings, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. [1]

Well ID:	DW-1D					DW-4D	DW-8S		DW-2S								DW-2D						DW-11S	
Date	VMWC-1D	VMWC-2D	VMWC-4D	VMWC-3D [4]	VMWC-16D [4]	VMWC-16A [4]	VMWC-16B [4]	VMWC-5A	VMWC-6A	VMWC-8A	VMWC-7A [4]	VMWC-5B	VMWC-6B	VMWC-6B	VMWC-7B [4]	VMWC-5D	VMWC-6D	VMWC-6D	VMWC-7D	VMWC-13D [4]	VMWC-17D [4]	VMWC-18A [4]	VMWC-18B [4]
02/18/08	-1.16	-0.99	-0.16	-0.90	-0.51	-0.04	-0.10	-0.07	-0.04	-0.40	-0.08	-0.10	-0.05	-0.02	-0.03	-1.91	-1.47	-0.03 [2]	-1.03	-0.17	-0.39	-0.05	-0.07
02/19/08	-1.31	-1.08	-0.86	-0.96	-0.54	-0.26	-0.26	-0.62	-0.37	-0.29	-0.22	-0.74	-1.73	-0.33	-0.23	-2.19	-0.37 [2]	-1.88	-1.4	-0.44	-0.53	-0.25	-0.26 [3]
02/25/08	-1.56	-1.23	-0.97	-1.07	-0.39	-0.29	-0.30	-0.70	-0.42	-0.31	-0.28	-0.82	-0.46	-0.35	-0.29	-1.21	-1.09	-0.88	-0.89	-0.39	-0.22	-0.24	-0.3
03/03/08	-1.56	-1.20	-0.90	-0.98	-0.27	-0.26	-0.27	-0.68	-0.40	-0.31	-0.27	-0.83	-0.44	-0.35	-0.30	-0.90	-0.72	-0.65	-0.53	-0.24	-0.16	-0.24	-0.27
03/17/08	-1.72	-1.51	-0.96	-1.15	-0.43	-0.31	-0.35	-0.69	-0.41	-0.33	-0.25	-0.78	-0.42	-0.36	-0.28	-1.15	-0.92	-0.82	-0.65	NM	-0.25	-0.29	-0.34
04/16/08	-0.18	-0.15	-0.18	-0.13	-0.09	-0.08	-0.08	-0.26	-0.14	NM	-0.09	-0.22	-0.15	NM	-0.09	-0.23	-0.21	NM	-0.17	NM	-0.08	-0.08	-0.09
05/19/08	-0.424	-0.391	-0.309	-0.310	-0.147	-0.162	-0.170	-0.328	-0.209	-0.180	-0.157	-0.327	-0.213	-0.156	-0.164	-1.097	-0.879	-0.763	-0.694	-0.223	-0.237	-0.139	-0.163
06/02/08	-0.345	-0.283	-0.253	-0.227	-0.195	-0.159	-0.168	-0.310	-0.190	-0.148	-0.142	-0.311	-0.199	-0.169	-0.141	-1.047	-0.838	-0.730	-0.743	-0.180	NM	-0.129	-0.151
07/07/08	-0.366	-0.269	-0.238	-0.311	-0.170	-0.160	-0.171	-0.310	-0.185	-0.156	-0.136	-0.344	-0.201	-0.170	-0.148	-1.047	-0.846	-0.757	-0.501	-0.189	NM	-0.132	-0.160
08/06/08	-0.32	-0.27	-0.30	-0.22	-0.14	-0.14	-0.16	-0.24	-0.19	-0.19	-0.16	-0.34	-0.20	-0.19	-0.15	-0.95	-0.77	-0.75	-0.55	-0.19	-0.17	-0.13	-0.16
Time Weighted Rolling Average:	-0.757	-0.629	-0.471	-0.521	-0.237	-0.188	-0.201	-0.426	-0.253	-0.247	-0.171	-0.463	-0.315	-0.267	-0.181	-0.956	-0.728	-0.811	-0.585	-0.231	-0.172	-0.168	-0.195

Notes and Abbreviations:

DW	Depressurization Well
NM	Not measured due to temporary inaccessibility
VMWC	Vapor monitoring well cluster

1. All induced vacuum measurements units in inches of water column (iwc).
2. Data point appears to be erroneous based on vacuum readings at further vapor point greater than that recorded at the closer location.
3. Data point is average of readings taken which fluctuated between -0.22 and -0.29 iwc.
4. Compliance vapor monitoring point.
5. Original parameter collected on 8/6/08 was erroneous, data point reported is second reading taken on 08/07/08.
6. Compliance goal is -0.1 iwc induced vacuum at all compliance montioring points.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

Compound[3] (units in ug/m3)		Location ID:	VSP-601	VSP-602	VSP-601	VSP-602	VSP-601	VSP-602
		Sample Date:	2/18/2008	2/18/2008	2/19/2008	2/19/2008	2/25/2008	2/25/2008
	CAS No.	SGC						
1,1,1-Trichloroethane	71-55-6	68,000	**110**	< 0.62	**71**	< 0.61	**35**	< 0.63
1,1-Dichloroethane	75-34-3	NS	**43**	< 0.62	**33**	< 0.61	**45**	< 0.63
2-Butanone	78-93-3	13,000	**16**	< 0.62	< 11	< 0.61	< 25	< 0.63
Acetone	67-64-1	180,000	< 140	< 6.2	< 110	< 6.1	< 250	< 6.3
Benzene	71-43-2	1,300	**67**	< 0.62	**22**	< 0.61	< 25	< 0.63
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 14	< 0.62	< 11	< 0.61	< 25	< 0.63
Chloroform	67-66-3	150	**34**	< 0.62	**24**	< 0.61	< 25	< 0.63
cis-1,2-Dichloroethene	156-59-2	190,000[1]	**5800**	< 0.62	**4600**	< 0.61	**2900**	< 0.63
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	< 14	< 0.62	< 11	**0.71**	< 25	**5.7**
Tetrachloroethene	127-18-4	1,000	**340**	< 0.62	**200**	< 0.61	**82**	< 0.63
Toluene	108-88-3	37,000	**92**	< 0.62	**98**	< 0.61	**34**	< 0.63
trans-1,2-Dichloroethene	156-60-5	NS	**120**	< 0.62	**71**	< 0.61	< 25	< 0.63
Trichloroethylene	79-01-6	14,000	**14000**	< 0.62	**9400**	< 0.61	**5100**	< 0.63
Vinyl Chloride	75-01-4	180,000	< 14	< 0.62	< 11	< 0.61	< 25	**1.1**
TVOC			**20,622**	0.0	**14,519**	**0.71**	**8,196**	**6.8**

Notes and Abbreviations:

Bold Compound detected above method detection limit
CAS No. Chemical abstracts service list number
D Compound detected at a secondary dilution
NS Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
SGC Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
TVOC Total volatile organic compounds
ug/m^3 Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] =- Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m3 / 4.2 = 190,000 ug/m3.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period February - August 2008.
3. Table summarizes detected compounds only.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

Compound[3] (units in ug/m3)		Location ID:	VSP-601	VSP-602	VSP-601	VSP-602	VSP-601	VSP-602
		Sample Date:	3/3/2008	3/3/2008	3/17/2008	3/17/2008	4/16/2008	4/16/2008
	CAS No.	SGC						
1,1,1-Trichloroethane	71-55-6	68,000	**26**	< 0.63	**35**	< 14	<25	< 15
1,1-Dichloroethane	75-34-3	NS	**47**	< 0.63	**59**	< 11	**31**	< 11
2-Butanone	78-93-3	13,000	< 13	< 0.63	< 16	< 16	< 16	< 16
Acetone	67-64-1	180,000	< 130	< 6.3	< 31	< 31	< 31	< 31
Benzene	71-43-2	1,300	< 13	< 0.63	< 8.4	< 8.4	< 8.4	< 8.4
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 13	< 0.63	< 15	< 15	< 15	< 15
Chloroform	67-66-3	150	**27**	< 0.63	**35**	< 13	<22	< 13
cis-1,2-Dichloroethene	156-59-2	190,000[1]	**1600**	< 0.63	**1400 D**	< 10	**1100**	**78**
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	**13**	**8.3**	**46**	< 26	<46	< 26
Tetrachloroethene	127-18-4	1,000	**45**	< 0.63	**39**	< 3.6	**54**	< 3.7
Toluene	108-88-3	37,000	**61**	< 0.63	**140**	< 10	**37**	< 10
trans-1,2-Dichloroethene	156-60-5	NS	< 13	< 0.63	**10**	< 10	<19	< 10
Trichloroethylene	79-01-6	14,000	**2500**	< 0.63	**1500 D**	< 2.8	**1300**	< 2.9
Vinyl Chloride	75-01-4	180,000	**200**	**40**	**980 D**	**920 D**	**120**	**710**
TVOC			**4,519**	**48.3**	**4,244**	**920**	**2,642**	**788**

Notes and Abbreviations:

Bold	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
SGC	Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
TVOC	Total volatile organic compounds
ug/m^3	Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] =- Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m3 / 4.2 = 190,000 ug/m3.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period February - August 2008.
3. Table summarizes detected compounds only.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

Compound[3] (units in ug/m3)		Location ID:	VSP-601	VSP-602	VSP-601	VSP-602	VSP-601	VSP-602
		Sample Date:	5/19/2008	5/19/2008	6/2/2008	6/2/2008	7/7/2008	7/7/2008
	CAS No.	SGC						
1,1,1-Trichloroethane	71-55-6	68,000	**38**	< 2.7	**44**	< 2.5	**48**	< 6.5
1,1-Dichloroethane	75-34-3	NS	**25**	**5.8**	**27**	**7.6**	**28**	**11**
2-Butanone	78-93-3	13,000	< 28	< 2.9	**28**	< 2.7	**27**	< 7
Acetone	67-64-1	180,000	< 57	< 5.8	< 55	**8.4**	< 53	< 14
Benzene	71-43-2	1,300	**19**	< 1.6	< 15	< 1.5	**150**	< 3.8
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 27	< 2.8	< 26	< 2.6	< 25	< 6.7
Chloroform	67-66-3	150	**44**	< 2.4	**55**	**3**	**88**	**8.4**
cis-1,2-Dichloroethene	156-59-2	190,000[1]	**950**	**180**	**930**	**230 D**	**1100**	**350**
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	< 48	< 4.9	< 45	< 4.5	< 44	< 12
Tetrachloroethene	127-18-4	1,000	**42**	< 0.67	**48**	**2.2**	**61**	< 1.6
Toluene	108-88-3	37,000	< 18	< 1.8	< 17	< 1.7	< 17	< 4.5
trans-1,2-Dichloroethene	156-60-5	NS	< 19	< 1.9	< 18	**2.8**	< 18	< 4.7
Trichloroethylene	79-01-6	14,000	**1000**	**5.3**	**1100**	**6.5**	**1500**	**7.7**
Vinyl Chloride	75-01-4	180,000	< 12	**65**	< 12	**13**	< 11	**5.9**
TVOC			**2,118**	**256.1**	**2,232**	**273.5**	**3,002**	**383**

Notes and Abbreviations:

Bold Compound detected above method detection limit
CAS No. Chemical abstracts service list number
D Compound detected at a secondary dilution
NS Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
SGC Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
TVOC Total volatile organic compounds
ug/m^3 Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] =- Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m3 / 4.2 = 190,000 ug/m3.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period February - August 2008.
3. Table summarizes detected compounds only.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

Compound[3] (units in ug/m3)		Location ID:	VSP-601	VSP-602
		Sample Date:	8/6/2008	8/6/2008
	CAS No.	SGC		
1,1,1-Trichloroethane	71-55-6	68,000	**47**	< 4.4
1,1-Dichloroethane	75-34-3	NS	**26**	**9.2**
2-Butanone	78-93-3	13,000	< 32	< 4.7
Acetone	67-64-1	180,000	< 65	< 9.6
Benzene	71-43-2	1,300	**22**	< 2.6
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 31	**5.5**
Chloroform	67-66-3	150	**89**	**8.2**
cis-1,2-Dichloroethene	156-59-2	190,000[1]	**990**	**320 D**
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	< 54	< 8
Tetrachloroethene	127-18-4	1,000	**56**	< 1.1
Toluene	108-88-3	37,000	< 20	< 3
trans-1,2-Dichloroethene	156-60-5	NS	< 22	**3.6**
Trichloroethylene	79-01-6	14,000	**1400**	**9.2**
Vinyl Chloride	75-01-4	180,000	< 14	**4.9**
TVOC			**2,630**	**361**

Notes and Abbreviations:

Bold	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
SGC	Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
TVOC	Total volatile organic compounds
ug/m^3	Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] =- Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m3 / 4.2 = 190,000 ug/m3.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period February - August 2008.
3. Table summarizes detected compounds only.

ARCADIS

Table 4. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. [2]

Compound[3] (units in ug/L)	Location ID: / Sample Date:	NA / NA
	CAS No.	
1,1-Dichloroethane	75-34-3	
2-Butanone	78-93-3	
Acetone	67-64-1	
cis-1,2-Dichloroethene	156-59-2	No Sampling Performed
Isopropylbenzene	98-82-8	During The Report
Toluene	108-88-3	Period
trans-1,2-Dichloroethene	156-60-5	
Trichloroethylene	79-01-6	
Vinyl Chloride	75-01-4	
TVOC [1]		NA

Notes and Abbreviations:

Bold	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
TVOC	Total volatile organic compounds
ug/L	Micorgrams per liter
NA	Not applicable

1. Total volatile organic compounds determined by summing individual detections and rounding to the nearest whole number.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period July - August 2008.
3. Table summarizes detected compounds only.

ARCADIS

Table 5. Air Emissions Model Output Summary, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound [1]	AGC [2]	Percent of MASC Per Event [3]										Cumulative % MASC [4]
	($\mu g/m^3$)	2/18/2008	2/19/2008	2/25/2008	3/3/2008	3/17/2008	4/16/2008	5/19/2008	6/2/2008	7/7/2008	8/6/2008	
Vinyl chloride	0.11	0.00%	0.00%	0.04%	1.60%	36.84%	20.63%	1.91%	0.41%	0.20%	0.14%	6.89%
1,1-Dichloroethane	0.63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.04%	0.06%	0.05%	0.02%
Trichloroethylene	0.5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.05%	0.06%	0.06%	0.03%
Tetrachloroethylene	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
cis-1,2-Dichloroethylene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.02%	0.02%	0.01%
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	28,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%	0.68%	0.62%	0.20%
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

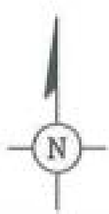
Notes:

1. Compounds listed include all compounds detected in the system effluent vapor stream.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual maximum allowable stack concentration (MASC) per monitoring event.
3. Percent of AGC was calculated by dividing the actual effluent concentration by the site-specific annual MASC. Detailed calculations are included in Appendix C.
4. Cumulative percent of the MASC was calculated using a time-weighted average of the percent MASC per event.

$\mu g/m^3$ - Micrograms per cubic meter.
AGC - Annual guideline concentration.

SOURCE:
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, NY. 1994
USGS 7.5 MIN. FREEPORT QUADRANGLE, FREEPORT, NY., 1994
USGS 7.5 MIN. HICKSVILLE QUADRANGLE, HICKSVILLE, NY., 1967, PHOTOREVISED 1979
USGS 7.5 MIN. HUNTINGTON QUADRANGLE, HUNTINGTON, NY. 1967, PHOTOREVISED 1979

QUADRANGLE LOCATION



0 2000' 4000'

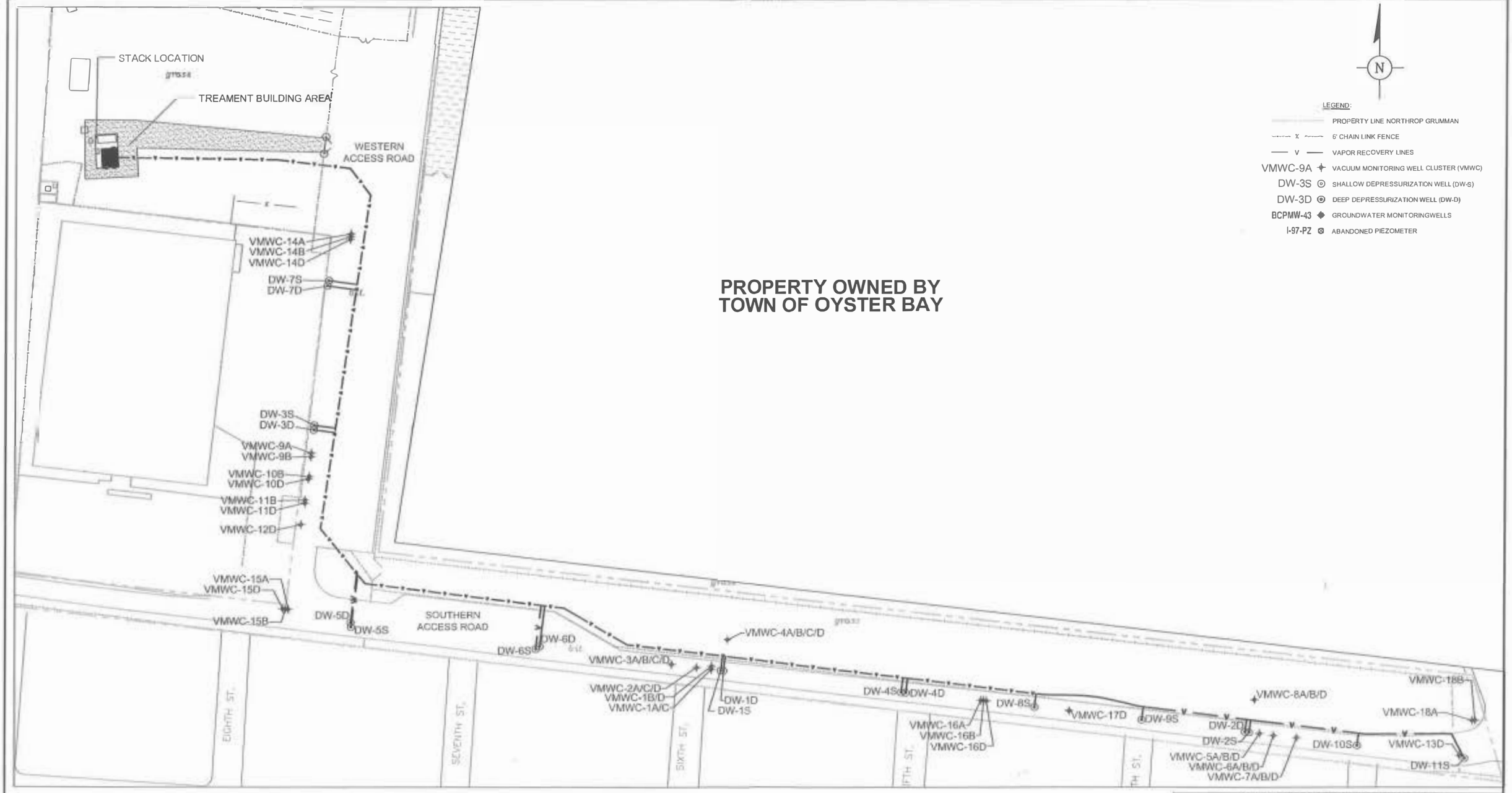
SCALE IN FEET

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS

SITE LOCATION MAP
SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE
1



PROPERTY OWNED BY TOWN OF OYSTER BAY

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK

OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS

GENERAL SITE PLAN SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE 2

DISCHARGE TO ATMOSPHERE

VSP-602

TEMPORARY VAPOR PHASE GAC VP-600

AMBIENT AIR OUTLET

TT 602 TI 602 HEAT EXCHANGER HX-600

PIT 601 PI 601 TI 601 V-26 VSP-601

AMBIENT AIR INLET

VSP-201 FE PI 201 BLOWER BL-200 PI 202 VIT 202

VSP-301 FE PI 301 BLOWER BL-300 PI 302 VIT 302

VSP-401 PI PI 401 BLOWER BL-400 PI 402 VIT 402

AIR FILTER AF-200 KNOCK OUT TANK KO-200 VI 201 WSP-210 FE 210 FQI 210 TRANSFER PUMP TP-210

AIR FILTER AF-300 KNOCK OUT TANK KO-300 VI 301 WSP-310 FE 310 FQI 310 TRANSFER PUMP TP-310

AIR FILTER AF-400 KNOCK OUT TANK KO-400 VI 401 WSP-410 FE 410 FQI 410 TRANSFER PUMP TP-410

STORAGE TANK ST-510 WSP-510

V-24 V-19 V-21 V-25 V-22 V-20 V-23

V-1 FE FI 101 VI 118 VSP-101 FROM DW-7D

V-2 FE FI 102 VI 120 VSP-102 FROM DW-3D

V-3 FE FI 103 VI 121 VSP-103 FROM DW-5D

V-4 FE FI 104 VI 122 VSP-104 FROM DW-6D

V-5 FE FI 105 VI 123 VSP-105 FROM DW-1D

V-6 FE FI 106 VI 124 VSP-106 FROM DW-4D

V-7 FE FI 107 VI 125 VSP-107 FROM DW-2D

VI 101 DEPRESSURIZATION WELL VAULT (TYPICAL OF 7 DEEP)

V-8 FE FI 108 VI 126 VSP-108 FROM DW-11S

V-9 FE FI 109 VI 127 VSP-109 FROM DW-10S

V-10 FE FI 110 VI 128 VSP-110 FROM DW-2S

V-11 FE FI 111 VSP-111 FROM DW-9S

V-12 FE FI 112 VI 130 VSP-112 FROM DW-8S

V-13 FE FI 113 VI 131 VSP-113 FROM DW-4S

V-14 FE FI 114 VI 132 VSP-114 FROM DW-1S

V-15 FE FI 115 VI 133 VSP-115 FROM DW-6S

V-16 FE FI 116 VI 134 VSP-116 FROM DW-5S

V-17 FE FI 117 VI 135 VSP-117 FROM DW-3S

V-18 FE FI 118 VI 136 VSP-118 FROM DW-7S

VI 108 DEPRESSURIZATION WELL VAULT (TYPICAL OF 11 SHALLOW)

PVC VENT TO OUTSIDE

LIMIT OF TREATMENT BUILDING 2

LIMIT OF TREATMENT BUILDING 1

LEGEND:

- CONDENSATE LINE
- LIMITS OF TREATMENT BUILDING
- PROCESS VAPOR LINE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE (NORMALLY OPEN)
- BUTTERFLY VALVE (NORMALLY CLOSED)
- CHECK VALVE
- UNION
- SAMPLE PORT/DRAIN
- FLOW ELEMENT ACCESS
- INLINE INSTRUMENT
- ISOLATED INSTRUMENT CONNECTED TO PROCESS LINE
- INSTRUMENT CONNECTED TO PROCESS LINE

FE	FLOW MONITORING ELEMENT
FI	FLOW RATE INDICATOR
FQI	FLOW TOTALIZER INDICATOR
PI	PRESSURE INDICATOR
PIT	PRESSURE INDICATING TRANSMITTER
TT	TEMPERATURE TRANSMITTER
VI	VACUUM INDICATOR
VIT	VACUUM INDICATING TRANSMITTER
VSP	VAPOR SAMPLE POINT
WSP	WATER SAMPLE POINT

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 3
FORMER GUMMAN SETTLING PONDS

PROCESS FLOW DIAGRAM
SOIL GAS INTERIM REMEDIAL MEASURE

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FIGURE 3

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Appendix A

Summary of Vapor Sample
Analytical Results Including
Tentatively Identified Compounds

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Appendix A-1. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[1]

Compound (units in ug/m3)	Location ID: Sample Date:	VSP-601 8/6/2008	VSP-602 8/6/2008
	CAS No.		
1,1,1-Trichloroethane	71-55-6	**47**	< 4.4
1,1,2,2-Tetrachloroethane	79-34-5	< 7.5	< 1.1
1,1,2-Trichloroethane	79-00-5	< 30	< 4.4
1,1-Dichloroethane	75-34-3	**26**	**9.2**
1,1-Dichloroethene	75-35-4	< 22	< 3.2
1,2-Dichloroethane	107-06-2	< 22	< 3.3
1,2-Dichloropropane	78-87-5	< 25	< 3.7
1,3-Butadiene	106-99-0	< 24	< 3.6
2-Butanone	78-93-3	< 32	< 4.7
2-Hexanone	591-78-6	< 22	< 3.3
4-Methyl-2-Pentanone	108-10-1	< 45	< 6.6
Acetone	67-64-1	< 65	< 9.6
Benzene	71-43-2	**22**	< 2.6
Bromodichloromethane	75-27-4	< 7.3	< 1.1
Bromoform	75-25-2	< 56	< 8.3
Bromomethane	74-83-9	< 21	< 3.1
Carbon Disulfide	75-15-0	< 17	< 2.5
Carbon Tetrachloride	56-23-5	< 6.8	< 1
Trichlorofluoromethane (CFC-11)	75-69-4	< 31	**5.5**
Chlorobenzene	108-90-7	< 25	< 3.7
Chlorodibromomethane	124-48-1	< 9.3	< 1.4
Chloroethane	75-00-3	< 29	< 4.2
Chloroform	67-66-3	**89**	**8.2**
Chloromethane	74-87-3	< 22	< 3.3
cis-1,2-Dichloroethene	156-59-2	**990**	**320 D**
cis-1,3-Dichloropropene	10061-01-5	< 49	< 7.3
Ethylbenzene	100-41-4	< 47	< 7
Trichlorotrifluoroethane (Freon 113)	76-13-1	< 8.3	< 1.2
Dichlorodifluoromethane (Freon 12)	75-71-8	< 54	< 8
Methyl Tert-Butyl Ether	1634-04-4	< 39	< 5.8
Methylene Chloride	75-09-2	< 19	< 2.8
Styrene	100-42-5	< 46	< 6.9
Tetrachloroethene	127-18-4	**56**	< 1.1
Toluene	108-88-3	< 20	< 3
trans-1,2-Dichloroethene	156-60-5	< 22	**3.6**
trans-1,3-Dichloropropene	10061-02-6	< 25	< 3.7
Trichloroethylene	79-01-6	**1400**	**9.2**
Vinyl Chloride	75-01-4	< 14	**4.9**
Xylene-o	95-47-6	< 47	< 7
Xylenes - m,p	NA	< 94	< 14
TVOC		2,630	361

Notes and Abbreviations on last page.

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Appendix A-2. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Tentatively Identified Compounds, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

Tentatively Identified Compounds [3,4] (units in ppbv)	Location ID: Sample Date:	VSP-601 08/06/08	VSP-602 08/06/08
Chlorodifluoromethane + Propene + Propane		--	--
Hexamethylcyclotrisiloxane [1]		--	--
2-Ethyl-1-hexanol		--	--
n-Nonanal		--	--
Chlorodifluoromethane (Freon 22)		**170**	**150**
Ethanol		--	--
Acetophenone		--	--
alpha-Cumyl Alcohol		--	--
Chloroethene		--	--
Methylcyclohexane		--	--
Propane		--	--
Acetaldehyde		--	--
Unknown CFC		--	--
3-Methyl-Hexane		--	--
Heptane		--	--
Unknown cyclic hydrocarbon		--	--
1,2,4-trimethylcyclopentane		--	--
Unknown aliphatic hydrocarbon		--	--
Unknown aliphatic hydrocarbon		--	--
1,3-dimethyl-cis-cyclohexane		--	--
Ethane, 1-chloro-1,1-difluoro (Freon 142)[5]		**200**	**170**

Notes and Abbreviations:

--	Not Reported during this sampling event.
Bold	Detected
ppbv	Parts per billion by volume.

1. Possible laboratory artifact.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period July - August 2008.
3. Tentatively Identified Compounds (TICs) are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
4. All results are estimated.
5. Freon 142 was detected for the first time during the July - August 2008 sampling period. It was qualified with J- "estimated" and N-"Presumptive evidence of particular compound".

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Appendix B

Summary of Condensate Sample Analytical Results Including Tentatively Identified Compounds

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Appendix B-1. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. [2]

Compound (units in ug/L)	CAS No.	Location ID: NA Sample Date: NA
1,1,1-Trichloroethane	71-55-6	
1,1,2,2-Tetrachloroethane	79-34-5	
1,1,2-Trichloroethane	79-00-5	
1,1-Dichloroethane	75-34-3	
1,1-Dichloroethene	75-35-4	
1,2,4-Trichlorobenzene	120-82-1	
1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	
1,2-Dibromoethane (EDB)	106-93-4	
1,2-Dichlorobenzene	95-50-1	
1,2-Dichloroethane	107-06-2	
1,2-Dichloropropane	78-87-5	
1,4-Dichlorobenzene	106-46-7	
2-Butanone	78-93-3	
2-Hexanone	591-78-6	
4-Methyl-2-Pentanone	108-10-1	
Acetone	67-64-1	
Benzene	71-43-2	
Bromodichloromethane	75-27-4	
Bromoform	75-25-2	
Bromomethane	74-83-9	
Carbon Disulfide	75-15-0	
Carbon Tetrachloride	56-23-5	No Sampling Performed During The Report Period
Trichlorofluoromethane (CFC-11)	75-69-4	
Chlorobenzene	108-90-7	
Chlorodibromomethane	124-48-1	
Chloroethane	75-00-3	
Chloroform	67-66-3	
Chloromethane	74-87-3	
cis-1,2-Dichloroethene	156-59-2	
cis-1,3-Dichloropropene	10061-01-5	
Cyclohexane	110-82-7	
Ethylbenzene	100-41-4	
Trichlorotrifluoroethane (Freon 113)	76-13-1	
Dichlorodifluoromethane (Freon 12)	75-71-8	
Isopropylbenzene	98-82-8	
m-Dichlorobenzene	541-73-1	
Methyl Acetate	79-20-9	
Methyl tert-butyl ether	1634-04-4	
Methylcylohexane	108-87-2	
Methylene Chloride	75-09-2	
Styrene	100-42-5	
Tetrachloroethene	127-18-4	
Toluene	108-88-3	
trans-1,2-Dichloroethene	156-60-5	
trans-1,3-Dichloropropene	10061-02-6	
Trichloroethylene	79-01-6	
Vinyl Chloride	75-01-4	
Xylene-o	95-47-6	
Xylenes - m,p	179601-23-1	
TVOC		NA

Notes and abbreviations on next page

Appendix B-1. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. [2]

Notes and Abbreviations:

Bold	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
TVOC	Total volatile organic compounds
ug/L	Micorgrams per liter
NA	Not applicable

1. Total volatile organic compounds determined by summing individual detections and rounding to the nearest whole number.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period July - August 2008.

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Appendix B-2. Summary of Condensate Sample Analytical Results, Tentatively Identified Compounds (TICs), Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. [2]

Tentatively Identified Compounds [1,3] (units in ug/L)	Sample ID:	NA
	Date:	NA
Unknown Ethanol Furan, tetrahydro- Unknown alcohol Cyclohexanone Isoproply Alcohol Butanal Heptanal 1-Hexanol, 2-ethyl-	No Sampling Performed During The Report Period	

Notes and Abbreviations:

--	Not Reported
Bold	Detected
J	Estimated value
N	Presumptive evidence of this constituent. Calibrations were not run for these constituents; therefore, the results should be used for qualitative purposes only.
NA	Not applicable
ug/L	Micorgrams per liter

1. TICs are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period July -August 2008.
3. All results are estimated.

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Appendix C

Air Modeling Calculations

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Table C-1 Summary of SCREEN3 Model Input and Outputs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter	Date Sampled:	2/18/2008	2/19/2008	2/25/2008	3/3/2008	3/17/2008	4/16/2008	5/19/2008	6/2/2008	7/7/2008	8/6/2008
SCREEN3 Model Input											
Source Type		Point	Point	Point	Point	Point	Point	Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1	1	1	1	1	1	1
Stack Height (ft)		33	33	33	33	33	33	33	33	33	33
Stack Height (m)		10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Stack Inside Diameter (m)		0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Air Flow Rate (scfm) [1]		1,964	1,674	1,679	1,793	1,774	641	666	746	829	640
Air Flow Rate (acfm @ stack temp) [2]		2,048	1,717	1,754	1,873	1,859	655	671	766	860	670
Stack Gas Exit Temperature (K) [1]		307	302	308	308	309	301	296	303	305	308
Ambient Air Temperature (K) [3]		283	275	274	275	276	281	284	294	298	299
Receptor Height (m) [4]		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Urban/Rural		Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban
Building Height (m)		2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Min Horizontal Bldg Dim (m)		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Max Horizontal Bldg Dim (m)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Consider Bldg Downwash?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Simple/Complex Terrain Above Stack		Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Simple/Complex Terrain Above Stack Base		Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Meteorology		Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Automated Distances Array		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Terrain Height Above Stack Base		0	0	0	0	0	0	0	0	0	0
SCREEN3 Model Output											
1-HR Max		596.3	698.3	638.3	622.9	627.6	1,292	1,278	1,200	1,129	1,279
Annualization Factor [6]		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height (ug/m^3) [		47.7	55.9	51.1	49.8	50.2	103.4	102.2	96	90.3	102.3
Distance To Max Concentration (m) [8]		66	61	64	64	64	45	45	47	48	45

See notes last page.

Table C-1. Summary of SCREEN3 Model Input and Outputs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes

1. The stack air flow rate (in scfm) and temperature were measured using a handheld thermo-anemometer. Values were measured immediately prior to where the effluent air stream enters the vapor-phase carbon unit.
2. The stack air flow rate at the stack temperature (in acfm) was calculated by dividing the stack air flow rate in scfm by the ratio of the standard temperature to the actual stack gas exit temperature.
3. The ambient temperature was recorded from the weather.newday.com website for Islip, New York. The mean actual temperature from the website was used in model calculation.
4. The receptor height corresponds to the average inhalation level.
5. SCREEN3 calculated constituent concentration at listed conditions at the specified inhalation level.
6. A USEPA time averaging conversion factor of 1/0.08 was used to convert the 1-hour maximum concentration output to an annual average.
7. Average annual constituent concentration at the receptor height was calculated by multiplying the one hour maximum concentration by the annualization factor.
8. SCREEN3 calculated distance to the 1-hour maximum concentration.

g/s - Grams per second
ft - Feet
m - Meters
scfm - Standard cubic feet per minute
acfm - Actual cubic feet per minute
K - Kelvin
$\mu g/m^3$ - Micrograms per cubic meter

Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Actual Effluent Concentrations [1] (µg/m^3)									
	2/18/2008	2/19/2008	2/25/2008	3/3/2008	3/17/2008	4/16/2008	5/19/2008	6/2/2008	7/7/2008	8/6/2007
Vinyl chloride	0	0	1.1	40	920	710	65	13	6	4.9
1,1-Dichloroethane	0	0	0	0	0	0	5.8	7.6	11	9.2
Trichloroethylene	0	0	0	0	0	0	5.3	6.5	7.7	9.2
Tetrachloroethylene	0	0	0	0	0	0	0	2.2	0	0
cis-1,2-Dichloroethylene	0	0	0	0	0	78	180	230	350	320
Dichlorodifluoromethane (Freon 12)	0	0.71	5.7	8.3	0	0	0	0	0	0
Acetone	0	0	0	0	0	0	0	8.4	0	0
Chloroform	0	0	0	0	0	0	0	3	8	8.2
trans-1,2-Dichloroethene	0	0	0	0	0	0	0	2.8	0	3.6
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	0	0	0	0	5.5

Compound	AGC [2] (µg/m^3)	Annual Maximum Allowable Stack Concentration (µg/m^3)									
		2/18/2008	2/19/2008	2/25/2008	3/3/2008	3/17/2008	4/16/2008	5/19/2008	6/2/2008	7/7/2008	8/6/2008
Vinyl chloride	0.11	2.39E+03	2.43E+03	2.60E+03	2.50E+03	2.50E+03	3.44E+03	3.40E+03	3.17E+03	3.00E+03	3.40E+03
1,1-Dichloroethane	0.63	1.37E+04	1.39E+04	1.49E+04	1.43E+04	1.43E+04	1.97E+04	1.95E+04	1.82E+04	1.72E+04	1.95E+04
Trichloroethylene	0.5	1.08E+04	1.10E+04	1.18E+04	1.14E+04	1.14E+04	1.56E+04	1.54E+04	1.44E+04	1.36E+04	1.55E+04
Tetrachloroethylene	1	2.17E+04	2.21E+04	2.36E+04	2.27E+04	2.27E+04	3.13E+04	3.09E+04	2.88E+04	2.73E+04	3.09E+04
cis-1,2-Dichloroethylene	63	1.37E+06	1.39E+06	1.49E+06	1.43E+06	1.43E+06	1.97E+06	1.95E+06	1.82E+06	1.72E+06	1.95E+06
Dichlorodifluoromethane (Freon 12)	12,000	2.60E+08	2.65E+08	2.84E+08	2.73E+08	2.72E+08	3.75E+08	3.71E+08	3.46E+08	3.27E+08	3.71E+08
Acetone	28,000	6.07E+08	6.18E+08	6.62E+08	6.36E+08	6.36E+08	8.76E+08	8.65E+08	8.07E+08	7.64E+08	8.66E+08
Chloroform	0.043	9.33E+02	9.49E+02	1.02E+03	9.77E+02	9.76E+02	1.35E+03	1.33E+03	1.24E+03	1.17E+03	1.33E+03
trans-1,2-Dichloroethene	63	1.37E+06	1.39E+06	1.49E+06	1.43E+06	1.43E+06	1.97E+06	1.95E+06	1.82E+06	1.72E+06	1.95E+06
Trichlorofluoromethane (Freon 11)	1,000	2.17E+07	2.21E+07	2.36E+07	2.27E+07	2.27E+07	3.13E+07	3.09E+07	2.88E+07	2.73E+07	3.09E+07

See notes last page.

Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Percent of Annual Maximum Allowable Stack Concentration [4]									
	2/18/2008	2/19/2008	2/25/2008	3/3/2008	3/17/2008	4/16/2008	5/19/2008	6/2/2008	7/7/2008	8/6/2008
Vinyl chloride	0.00%	0.00%	0.04%	1.60%	36.84%	20.63%	1.91%	0.41%	0.20%	0.14%
1,1-Dichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.04%	0.06%	0.05%
Trichloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.05%	0.06%	0.06%
Tetrachloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%
cis-1,2-Dichloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.02%	0.02%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%	0.68%	0.62%
trans-1,2-Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Notes:

1. Actual effluent concentrations are analytical results from air samples collected on the dates shown.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
3. Annual maximum allowable stack concentrations were calculated by dividing the product of the annual guideline concentration of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average annual concentration at receptor height by the air flow rate at the stack temperature and multiplying by the appropriate conversion factors.
4. Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for a given monitoring event.

$\mu g/m^3$ - Micrograms per cubic meter

AGC - Annual guideline concentration