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Quarterly Operation, Maintenance, and Monitoring Report for the Soil Gas Interim Remedial Measure

March 2012

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

NYSDEC ID # 1-30-003A

ARCADIS

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NYSDEC ID# 1-30-003A

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March 2012

1. Introduction

Pursuant to the Administrative Order on Consent (AOC) Index # W1-0018-04-01 (NYSDEC 2005), ARCADIS of New York, Inc. (ARCADIS), on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), has prepared this Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) Quarterly Operation, Maintenance, and Monitoring (OM&M) Report for submittal to the New York State Department of Environmental Conservation (NYSDEC). The present day Bethpage Community Park property (Park) and the Former Grumman Plant 24 Access Road, which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, are referred to herein as the "Site Area". A Site Area location map is provided on Figure 1.

The soil gas IRM has been operational since February 18, 2008. This quarterly OM&M report summarizes the soil gas IRM OM&M activities performed between January 1, and March 31, 2012 (i.e., the "reporting period"). During this reporting period, the soil gas IRM system OM&M was conducted in accordance with the NYSDEC-approved OU3 Soil Gas IRM OM&M Manual (ARCADIS 2009) and the NYSDEC-approved Sampling and Analysis Plan (SAP) (ARCADIS 2008).

As discussed in the OU3 Site Area Remedial Investigation Report (Site Area RI) (ARCADIS 2011a), Northrop Grumman does not take responsibility for certain compounds (e.g., Freon 12 and Freon 22) which are present in the Site Area. Throughout this report, a distinction is made between the "project" and "non-project" Volatile Organic Compounds (VOCs), which are defined as follows:

- "Project VOCs": VOCs that may be related to former Grumman activities. For this report, Project VOCs include 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": VOCs, such as Freon 12, Freon 22, and acetone that are understood to be unrelated to former Grumman activities but have been detected in the Site Area. As noted in the Site Area RI (ARCADIS 2011a), a sub-plume of Freon 22 has been identified originating from the area of the Town of Oyster Bay's (Town's) former ice rink. Based on Town information (Zervos, Theodore 2007), Freon 22 was used by the Town and released to the environment.

2. Soil Gas Interim Remedial Measure System Description and Objectives

The soil gas IRM was constructed in accordance with the NYSDEC-approved (NYSDEC 2007) Soil Gas IRM 95% Design Report and Design Drawings (ARCADIS 2007). A general site plan, provided on Figure 2, shows the treatment building that houses the major process equipment (two [2] 20-horsepower [hp] and one [1] 30-hp regenerative-type depressurization blowers, three [3] 52-gallon moisture separators and associated transfer pumps, one [1] heat exchanger, and one [1] 33-foot tall by 16-inch diameter stack) and the locations of the 18 depressurization wells and 47 induced vacuum monitoring wells. Monitoring well vacuum measurements are also provided on Figure 2. A process flow diagram that shows sampling and monitoring locations is provided on Figure 3. A detailed description of the system and a complete set of record drawings are provided in the OM&M Manual (ARCADIS 2009).

The remedial action objectives of the soil gas IRM are as follows:

- To mitigate the off-site migration of project VOCs in the on-site soil gas through the implementation of a soil gas control system installed along the former Plant 24 access roads south and west of the Park.

- To comply with applicable NYSDEC Standards, Criteria and Guidelines (SCGs).

The performance objectives of the soil gas IRM are as follows:

- To mitigate the off-site migration of soil gas, the system was designed to maintain 0.1 inches of water column (iwc) of negative pressure within a negative pressure curtain established along the former Plant 24 Access Road (southern and western legs), based on a twelve-month rolling average.

- To initially collect and treat vapors until it is demonstrated that all VOCs in the influent (untreated) vapor stream are less than the NYSDEC Division of Air Resources Guide-1 (DAR-1) Annual Guidance Concentrations (AGCs) on a twelve-month rolling average and Short-Term Guidance Concentrations (SGCs) for any given grab sample (NYSDEC 2010). On December 29, 2008, NYSDEC approved removal of vapor phase treatment (NYSDEC 2008).

- To collect and transfer collected condensate to the Nassau County Publically Owned Treatment Works (POTW) intake (i.e., the point of discharge) under the existing approval for OU3 wells. The point of discharge ultimately discharges to the

Town of Oyster Bay's Cedar Creek treatment facility. Condensate transfer activities are to be completed in accordance with the requirements set forth by the Nassau County Department of Public Works (NCDPW 2007; NCDPW 2008).

3. Operation and Maintenance Activities

In general, the soil gas IRM operated continuously during the reporting period. Routine monthly operation and maintenance (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. Additionally, the following non-routine maintenance activities or system shut downs occurred during the reporting period:

The system was manually shut down for approximately twenty four (24)-hours between March 8 and 9, 2012 for maintenance associated with the removal of condensate and/or storm water from the depressurization pipelines. Approximately 1,230 gallons of condensate and/or storm water were removed from depressurization pipelines on March 8, 2012, and the influent manifold control valves were subsequently adjusted to compensate for vacuum and flow rate changes caused by the removal of the condensate/storm water. The control valve adjustments were completed in an effort to return the overall induced vacuum in compliance monitoring wells to design criteria (i.e., -0.1 inches of water column [iwc]), to the extent feasible. Because of the significant volume of water generated, collected condensate was initially transferred to a 21,000-gallon Baker Tank being used as part of the redevelopment of OU-2 Remedial Well RW-1 and Monitoring Wells GM-73D3 and MW3-1. The water was ultimately transferred to the Nassau County publicly owned treatment works (POTW) intake for disposal on March 21, 2012, in accordance with the Nassau County Department of Public Works approval letter (NCDPW 2012).

4. Monitoring Activities and Results

The following subsections of this report summarize the monitoring activities and results of routine performance and compliance monitoring for the reporting period. The objectives of the performance monitoring program are to demonstrate that the system components are operating in accordance with the manufacturer's specifications and that the operating parameters are within acceptable operating ranges, as provided in revised Table 3 from the OM&M Manual (ARCADIS 2011b). The objective of the compliance monitoring program (consisting of the collection of compliance-related

induced vacuum readings and effluent vapor/water samples) is to demonstrate compliance with the performance objectives described in Section 2.

4.1 Routine Performance Monitoring

The routine quarterly performance monitoring event was completed on March 9, 2012 (hereinafter referred to as the "March monitoring event"). A brief discussion of the monitoring results obtained is provided below.

4.1.1 System Operating Parameters

System operating parameters measured during the March monitoring event are summarized in Tables 1 and 2. Except as summarized below, system operating parameters remained consistent with the recommended values summarized in revised Table 3 of the OM&M Manual (ARCADIS 2011b). Additionally, during the reporting period, system components operated in accordance with manufacturers' recommendations, approximately 250-gallons of condensate water was recorded as being transferred to Storage Tank ST-510 by operations staff based on measurements recorded from Storage Tank ST-510, and the heat exchanger influent temperature remained lower than the design influent temperature (i.e., 150 degrees Fahrenheit). Accordingly, the heat exchanger was kept on stand-by.

System operating parameters that were not consistent with the recommended values in revised Table 3 of the OM&M Manual (ARCADIS 2011b) are as follows:

- Depressurization Well DW-2S had a manifold vacuum slightly lower than the minimum recommended range. The observed lower manifold vacuum is likely the results of normal seasonal fluctuation.

- Depressurization Well DW-11S had a manifold flow rate slightly higher than the maximum recommended range. The observed higher manifold flow rate is likely the result of the subsurface condensate removal event completed on March 8, 2012.

- Blower BL-300 had an influent vacuum slightly higher than the maximum recommended range. The observed higher influent vacuum is likely the result of normal seasonal fluctuation.

4.1.2 Vapor Sample

The total effluent screening level vapor sample photoionization detector (PID) reading measured during the reporting period is provided in Table 1. The screening result was 0.2 parts per million by volume which is consistent with December 2011 and historical data.

4.2 Routine Compliance Monitoring

Routine compliance monitoring was conducted during the March monitoring event. A brief discussion of the compliance monitoring results is provided below.

4.2.1 System Operating Parameters

Instantaneous vacuum measurements in compliance monitoring wells from the March monitoring event and annual time-weighted rolling averages are summarized in Table 2. March measurements are also shown (in text box format) on Figure 2. The soil gas IRM design objectives are outlined in Section 2. As shown on Table 2, the negative pressure annual time-weighted rolling average at all compliance related monitoring points to date is greater than or equal to -0.1 iwc, which meets the performance standard (the March monitoring event average negative pressure was -0.16 iwc).

4.2.2 Vapor Sample

A total effluent vapor sample was collected on March 9, 2012. As shown in the laboratory results in Table 3 and Appendix A, the total volatile organic compound (TVOC) concentration of 1,220 micrograms per cubic meter ($\mu g/m^3$) was lower than the December 2011 concentration (1,407 $\mu g/m^3$) and historical data. The Project TVOC concentration of 926 $\mu g/m^3$ and the Non-project TVOC concentration of 294 $\mu g/m^3$ were also consistent with the December 2011 concentrations (1,152 $\mu g/m^3$ and 255 $\mu g/m^3$, respectively) and historical data.

No environmentally "A" rated compounds (as defined in Division of Air Resources [DAR-1] Annual Guideline Concentration [AGC]/Short-Term Guideline Concentration [SGC] tables revised October 18, 2010) were detected in the effluent vapor sample during March 2012. Air emissions modeling, completed to confirm compliance with applicable air discharge standards, is discussed in Section 5 of this report.

No TICs were identified by the laboratory (Appendix A) in the effluent vapor sample during March 2012.

4.2.3 Condensate Samples

A routine condensate sample was collected for laboratory analysis from Storage Tank ST-510 (sample ID ST-510) on March 9, 2012. In addition, a non-routine condensate sample was collected as a composite grab sample (sample ID CON-1) from the 1,230-gallons of condensate water generated during the March 2012 subsurface pipeline condensate removal event. As shown in the laboratory results in Table 4 and Appendix B, the TVOC concentrations in the two samples were below the discharge criteria set forth in the Nassau County Department of Public Works approval letter (NCDPW 2012) (i.e., 1,000 micrograms per liter [ug/L] of TVOCs).

5. Air Emissions Model

Effluent vapor laboratory results were compared to the NYSDEC DAR-1 SGCs. In addition, effluent vapor laboratory analytical results were compared to a site-specific modeled annual maximum allowable stack concentration (MASC). The annual MASC was calculated during each monitoring event for individual compounds using the output from a USEPA SCREEN3 model in conjunction with the NYSDEC DAR-1 AGCs. 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.

The soil gas IRM effluent vapor met applicable air discharge criteria based on the following:

- The measured concentrations of individual VOCs in the effluent did not exceed applicable SGCs (Table 3).

- The measured concentration of individual VOCs in the effluent did not exceed applicable instantaneous MASCs, as calculated using the USEPA SCREEN 3

Model (Table 5). Similarly, the time-weighted rolling average for all detected compounds is well below the MASCs.

6. Conclusions and Recommendations

6.1 Conclusions

In summary, the OU3 Soil Gas IRM continued to operate as designed and met applicable induced vacuums and discharge limits during the monitoring period.

- The soil gas IRM maintained -0.16 iwc of induced pressure at the vacuum monitoring points (based on a twelve-month rolling average), which meets the performance standard.
- Vapor emissions met applicable guidance and regulatory criteria during the reporting period.
- Condensate water quality met applicable guidance and regulatory criteria during the reporting period.

6.2 Recommendations

Based on the information provided herein, ARCADIS makes the following recommendations for the April to June 2012 monitoring period:

- Continue operation of the soil gas IRM.
- Monitor the manifold vacuum, manifold flow rate and operating parameters at Depressurization Wells DW-2S and DW-11S.

7. References

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New York State Department of Environmental Conservation, 2010. Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991 and the AGC/SGC Tables dated October 18, 2010.

United States Environmental Protection Agency (USEPA), 1993, Radon Reduction Techniques for Existing Detached Houses: Technical Guidance (Third Edition) for Active Depressurization Systems, October 1993.

Zervos, Theodore, 2007. Deposition of Theodore Zervos in the matter Town of Oyster Bay v. Northrop Grumman Systems Corporation et al. Case No. 05-CV-1945 (TCP)(AKT). January 22, 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)
06/06/11	71	-16	64	NM	-1.2	7.0	-7.9	66	NM	-0.41	8.0	-8.4	64	NM	-0.30	14	-7.5	66	NM	-0.44	93	-17	64	NM	-1.5	14	-9.5	66	NM	-2.2
09/19/11	72	-16	67	NM	-1.3	7.0	-7.8	66	NM	-0.37	7.0	-8.5	67	NM	-0.29	13	-7.3	66	NM	-0.42	95	-18	67	NM	-1.7	14	-9.5	66	NM	-2.1
12/05/11	105	-21	53	NM	-1.5	8.0	-8.5	53	NM	-0.47	6.0 (4)	-5.0 (4)	54	NM	-0.29	15	-8.0	54	NM	-0.42	90	-20	54	NM	-1.7	15	-11	(5)	NM	-2.8
03/09/12	115	-18	47	NM	-2.0	5.0	-7.5	47	NM	-0.44	6.0	-5.0	48	NM	-0.23	9.0	-6.0	47	NM	-0.31	85	-17	48	NM	-1.5	14	-10	47	NM	-2.4

Notes and Abbreviations:

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

1. The system has been operating with Blower BL-300 online only since May 5, 2009.
2. Total effluent air velocity in feet per minute was measured using a hand-held anemometer at the stack effluent location. The total effluent flow rate in standard cubic feet per minute was calculated by multiplying the measured air velocity by the pipe area, the ratio of the standard air temperature to the measured air temperature, and the ratio of the measured air pressure to the standard air pressure.
3. Totalizers not recording flow due to fouling. There was no condensate collected in Storage Tank ST-510 between June 6 and September 19, 2011.
4. Values were remeasured on December 22, 2011 due to erroneous values recorded on December 5, 2011.
5. Temperature reading not recorded.
6. Totalizer removed and cleaned during the fourth quarter 2011 due to fouling. This accounts for the high volume of water recovered calculated using the two consecutive totalizer readings. Actual volume of water recovered was zero gallons based on measurements from Storage Tank ST-510.
7. Totalizers not recording flow due to fouling. Actual volume of condensate recorded by operations staff between December 5, 2011 to March 9, 2012 was 250-gallons based on measurement from Storage Tank ST-510.

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-6S Parameters					**Extraction Well DW-6D 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
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
06/06/11	95	-17	64	NM	-1.8	7.8	-5.5	66	NM	-1.6
09/19/11	100	-17	67	NM	-2.1	7.5	-5.5	66	NM	-1.7
12/05/11	93	-19	(5)	NM	-2.0	8.2	-6.0	(5)	NM	-1.8
03/09/12	72	-14	48	NM	-1.3	6.0	-5.0	47	NM	-1.5

	Extraction Well DW-1S Parameters					**Extraction Well DW-1D 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
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
06/06/11	81	-23	64	NM	-2.0	6.1	-4.0	66	NM	-1.7
09/19/11	95	-27	67	NM	-2.2	6.0	-3.5	66	NM	-1.8
12/05/11	95	-22	(5)	NM	-2.3	6.7	-4.0	(5)	NM	-2.0
03/09/12	90	-20	48	NM	-2.0	4.5	-3.0	48	NM	-1.8

	Extraction Well DW-4S Parameters					**Extraction Well DW-4D 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
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
06/06/11	67	-15	64	NM	-1.6	5.0	-12	66	NM	-0.62
09/19/11	68	-15	66	NM	-1.4	8.0	-6.0	66	NM	-0.76
12/05/11	83	-16	(5)	NM	-1.7	9.0	-6.0	(5)	NM	-0.84
03/09/12	85	-16	48	NM	-1.7	7.2	-6.0	48	NM	-0.79

Notes and Abbreviations:

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

1. The system has been operating with Blower BL-300 online only since May 5, 2009.
2. Total effluent air velocity in feet per minute was measured using a hand-held anemometer at the stack effluent location. The total effluent flow rate in standard cubic feet per minute was calculated by multiplying the measured air velocity by the pipe area, the ratio of the standard air temperature to the measured air temperature, and the ratio of the measured air pressure to the standard air pressure.
3. Totalizers not recording flow due to fouling. There was no condensate collected in Storage Tank ST-510 between June 6 and September 19, 2011.
4. Values were remeasured on December 22, 2011 due to erroneous values recorded on December 5, 2011.
5. Temperature reading not recorded.
6. Totalizer removed and cleaned during the fourth quarter 2011 due to fouling. This accounts for the high volume of water recovered calculated using the two consecutive totalizer readings. Actual volume of water recovered was zero gallons based on measurements from Storage Tank ST-510.
7. Totalizers not recording flow due to fouling. Actual volume of condensate recorded by operations staff between December 5, 2011 to March 9, 2012 was 250-gallons based on measurement from Storage Tank ST-510.

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-8S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-9S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
06/06/11	84	-23	64	NM	-2.3	31	-14	64	NM	-1.2
09/19/11	83	-22	65	NM	-2.4	31	-14	65	NM	-1.3
12/05/11	70	-25	[5]	NM	-2.1	35	-15[4]	[5]	NM	-1.6
03/09/12	65	-17	48	NM	-2.1	30	-13	48	NM	-1.3

Date	Extraction Well DW-2S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-2D Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
06/06/11	37	-21	64	NM	-1.6	41	-26	66	NM	-2.7
09/19/11	32	-22	65	NM	-1.7	42	-26	65	NM	-2.9
12/05/11	33[4]	-22[4]	[5]	NM	-1.8	44	-29	[5]	NM	-3.0
03/09/12	30	-16	48	NM	-1.4	36	-22	48	NM	-2.4

Date	Extraction Well DW-10S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Extraction Well DW-11S Parameters: Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
06/06/11	31	-14	64	NM	-1.7	31	-26	64	NM	-2.4
09/19/11	30	-15	64	NM	-1.8	29	-26	65	NM	-2.3
12/05/11	25	-10[4]	[5]	NM	-0.9	35[4]	-22[4]	[5]	NM	-1.3
03/09/12	30	-13	48	NM	-1.6	44	-20	48	NM	-2.8

Notes and Abbreviations:

°F	Degrees Fahrenheit.
DW	Depressurization well.
ft bmp	Feet below measuring point.
iwc	Inches of water column.
NM	Not measured.
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1. The system has been operating with Blower BL-300 online only since May 5, 2009.
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6. Totalizer removed and cleaned during the fourth quarter 2011 due to fouling. This accounts for the high volume of water recovered calculated using the two consecutive totalizer readings. Actual volume of water recovered was zero gallons based on measurements from Storage Tank ST-510.
7. Totalizers not recording flow due to fouling. Actual volume of condensate recorded by operations staff between December 5, 2011 to March 9, 2012 was 250-gallons based on measurement from Storage Tank ST-510.

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[1] BL-200				Blower Parameters[1] BL-300				Blower Parameters[1] BL-400				Combined Blower 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[2]	Total Influent PID	Heat Exchanger Influent Temp.	Total Effluent Pressure	Heat Exchanger Effluent Temp.	Effluent PID	Discharge Temperature	Effluent Relative Humidity	VMWC-1D	VMWC-5D	B24MW-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)
06/06/11	0	-27	0	132.67	9,996,285.25	36.94	NM	NM	NM	NM	-34.0	2.0	NM	NM	NM	NM	NM	NM	582.94	0.0	105	2.5	96	NM	NM	NM	52.20	48.98	53.38	38.10	NM
09/19/11	0	-28	0	132.67	9,996,285.25[3]	36.94	NM	NM	NM	NM	-32.0	2.0	NM	NM	NM	NM	NM	NM	572.16	0.0	110	2.5	92	NM	NM	NM	51.62	49.32	52.65	38.18	18.44
12/05/11	0	-32	0	132.67	10,000,177.33[6]	36.94	NM	NM	NM	NM	-38.0	3.0	NM	NM	NM	NM	NM	NM	589.90[4]	0.0	100[4]	2.5	80	NM	NM	NM	51.34	48.23	52.41	38.19	18.19
03/09/12	0	-26	0	132.67	10,000,177.33[7]	36.94	NM	NM	NM	NM	-38.0	2.0	NM	NM	NM	NM	NM	NM	626.88	0.2	94	2.5	90	NM	NM	NM	51.75	48.55	52.38	38.12	18.48

Notes and Abbreviations:

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

1. The system has been operating with Blower BL-300 online only since May 5, 2009.
2. Total effluent air velocity in feet per minute was measured using a hand-held anemometer at the stack effluent location. The total effluent flow rate in standard cubic feet per minute was calculated by multiplying the measured air velocity by the pipe area, the ratio of the standard air temperature to the measured air temperature, and the ratio of the measured air pressure to the standard air pressure.
3. Totalizers not recording flow due to fouling. There was no condensate collected in Storage Tank ST-510 between June 6 and September 19, 2011.
4. Values were remeasured on December 22, 2011 due to erroneous values recorded on December 5, 2011.
5. Temperature reading not recorded.
6. Totalizer removed and cleaned during the fourth quarter 2011 due to fouling. This accounts for the high volume of water recovered calculated using the two consecutive totalizer readings. Actual volume of water recovered was zero gallons based on measurements from Storage Tank ST-510.
7. Totalizers not recording flow due to fouling. Actual volume of condensate recorded by operations staff between December 5, 2011 to March 9, 2012 was 250-gallons based on measurement from Storage Tank ST-510.

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

Well ID:	DW-7S			DW-7D	DW-3S				DW-3D			DW-5S		DW-5D	DW-1S									
Date	VMWC-14A [3]	VMWC-14B [3]	VMWC-14D [3]	VMWC-9A	VMWC-9B	VMWC-10B	VMWC-11B [3]	VMWC-10D	VMWC-11D	VMWC-12D [3]	VMWC-15A [3]	VMWC-15B [3]	VMWC-15D [3]	VMWC-1A	VMWC-2A	VMWC-4A	VMWC-3A [3]	VMWC-1B	VMWC-4B	VMWC-3B [3]	VMWC-1C	VMWC-2C	VMWC-4C	VMWC-3C [3]
06/06/11	-0.088	-0.16	-0.15	NM	NM	NM	-0.11	NM	NM	-0.11	-0.14	-0.14	-0.14	NM	NM	NM	-0.14	NM	NM	-0.15	NM	NM	NM	-0.16
09/19/11	-0.092	-0.11	-0.11	NM	NM	NM	-0.11	NM	NM	-0.10	-0.13	-0.13	-0.13	NM	NM	NM	-0.13	NM	NM	-0.14	NM	NM	NM	-0.14
12/05/11	-0.11	-0.19	-0.20	NM	NM	NM	-0.15	NM	NM	-0.15	-0.11	-0.11	-0.14	NM	NM	NM	-0.13	NM	NM	-0.14	NM	NM	NM	-0.15
03/09/12	-0.10	-0.14	-0.19	NM	NM	NM	-0.13	NM	NM	-0.14	-0.12	-0.11	-0.11	NM	NM	NM	-0.18	NM	NM	-0.18	NM	NM	NM	-0.18
Time Weighted[4] Rolling Average:	-0.10	-0.15	-0.16	NA	NA	NA	-0.12	NA	NA	-0.12	-0.13	-0.12	-0.13	NA	NA	NA	-0.15	NA	NA	-0.15	NA	NA	NA	-0.16

Gross Average Compliance Points[5]

03/09/12	-0.16

Notes and Abbreviations:

DW Depressurization well.
NA Not applicable.
NM Not measured.
VMWC Vapor monitoring well cluster.

1. All induced vacuum measurements units in inches of water column (iwc). Values shown have been rounded to include two significant figures.
2. Compliance goal is -0.1 iwc induced vacuum at all compliance monitoring points.
3. Compliance related monitoring point.
4. Time weighted average calculated by summing the products of the instantaneous induced vacuum readings and the number of days between readings for a 12-month monitoring period, and dividing by the total time period between the first and last quarterly induced vacuum readings.
5. Gross average compliance points calculated by summing the induced vacuum values for the noted monitoring event and dividing by the number of readings.
6. Values were remeasured on December 6, 2011 due to erroneous values recorded on December 5, 2011.
7. Value was remeasured on December 22, 2011 due to erroneous values recorded on December 5 and 6, 2011.
8. Value was measured on March 21, 2012. This value was inadvertently not recorded on March 9, 2012 due to operator error.

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

Well ID:	DW-1D					DW-4D	DW-8S	DW-2S								DW-2D							DW-11S	
Date	VMWC-1D	VMWC-2D	VMWC-4D	VMWC-3D [3]	VMWC-16D [3]	VMWC-16A [3]	VMWC-16B [3]	VMWC-5A	VMWC-6A	VMWC-8A	VMWC-7A [3]	VMWC-5B	VMWC-6B	VMWC-8B	VMWC-7B [3]	VMWC-5D	VMWC-6D	VMWC-8D	VMWC-7D	VMWC-13D [3]	VMWC-17D [3]	VMWC-18A [3]	VMWC-18B [3]
06/06/11	NM	NM	NM	-0.21	-0.23	-0.070	-0.19	NM	NM	NM	-0.10	NM	NM	NM	-0.12	NM	NM	NM	NM	-0.28	-0.24	-0.11	-0.17
09/19/11	NM	NM	NM	-0.20	-0.20	-0.19	-0.21	NM	NM	NM	-0.12	NM	NM	NM	-0.13	NM	NM	NM	NM	-0.17	-0.27	-0.10	-0.12
12/05/11	NM	NM	NM	-0.22	-0.21	-0.18	-0.20	NM	NM	NM	-0.10[6]	NM	NM	NM	-0.10[6]	NM	NM	NM	NM	-0.25	-0.23	-0.048	-0.039[7]
03/09/12	NM	NM	NM	-0.19	-0.19	-0.21	-0.17	NM	NM	NM	-0.10	NM	NM	NM	-0.11	NM	NM	NM	NM	-0.18	-0.28[8]	-0.15	-0.13
Time Weighted[4] Rolling Average:	NA	NA	NA	-0.20	-0.21	-0.16	-0.19	NA	NA	NA	-0.11	NA	NA	NA	-0.12	NA	NA	NA	NA	-0.22	-0.26	-0.10	-0.12

Notes and Abbreviations:

DW Depressurization well.
NA Not applicable.
NM Not measured.
VMWC Vapor monitoring well cluster.

1. All induced vacuum measurements units in inches of water column (iwc). Values shown have been rounded to include two significant figures.
2. Compliance goal is -0.1 iwc induced vacuum at all compliance monitoring points.
3. Compliance related monitoring point.
4. Time weighted average calculated by summing the products of the instantaneous induced vacuum readings and the number of days between readings for a 12-month monitoring period, and dividing by the total time period between the first and last quarterly induced vacuum readings.
5. Gross average compliance points calculated by summing the induced vacuum values for the noted monitoring event and dividing by the number of readings.
6. Values were remeasured on December 6, 2011 due to erroneous values recorded on December 5, 2011.
7. Value was remeasured on December 22, 2011 due to erroneous values recorded on December 5 and 6, 2011.
8. Value was measured on March 21, 2012. This value was inadvertently not recorded on March 9, 2012 due to operator error.

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

Compound[2] (units in µg/m^3)		Sample ID: / Sample Date:	VSP-601 6/8/2011[6]	VSP-601 9/19/2011	VSP-601 12/5/2011	VSP-601 3/9/2012
Project VOCs	CAS No.	SGC				
1,1,1-Trichloroethane	71-55-6	9,000	**11**	**17**	**11**	**7.3**
1,1-Dichloroethane	75-34-3	NS	**11**	**14**	**11**	**7.7**
1,1-Dichloroethene	75-35-4	380[4]	**5.7**	**4.3**	**3.3**	< 2.8
Benzene	71-43-2	1,300	< 0.78	< 1.6	**2.5**	< 2.8
cis-1,2-Dichloroethene	156-59-2	190,000[5]	**620 D**	**580 D**	**540 D**	**460**
Tetrachloroethene	127-18-4	1,000	**21**	**25**	**15**	**11**
Toluene	108-88-3	37,000	< 0.78	< 1.6	**1.8**	< 2.8
trans-1,2-Dichloroethene	156-60-5	190,000[5]	**4.8**	**6.5**	**3.8**	< 2.8
Trichloroethylene	79-01-6	14,000	**590 D**	**680 D**	**560 D**	**440**
Vinyl chloride	75-01-4	180,000	**1.3**	**1.7**	**1.6**	< 2.8
Xylenes - M,P	1330-20-7	4,300	< 1.6	< 3.2	**1.6**	< 5.6
Subtotal Project VOCs			**1,265**	**1,329**	**1,152**	**926**
Non-Project VOCs						
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	NS	**560 D**	**360 D**	**150 D**	**270**
Acetone	67-64-1	180,000	**14**	< 16	< 7.5	< 28
Bromodichloromethane	75-27-4	NS	< 0.78	< 1.6	**1.1**	< 2.8
Chlorodifluoromethane (Freon 22)	75-45-6	NS	**24**	**25**	**17**	**13**
Chloroform	67-66-3	150	**23**	**98**	**83**	**11**
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	**3.2**	**5.3**	**2.6**	< 2.8
Trichlorofluoromethane (Freon 11)	75-69-4	9,000	**1.7**	**1.9**	**1.4**	< 2.8
Subtotal Non-Project VOCs			**626**	**490**	**255**	**294**
TVOC[3]			**1,891**	**1,819**	**1,407**	**1,220**

Notes and abbreviations on last page.

Table 3. Summary of Total Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[(1)]

Notes and Abbreviations:

AGC	Annual guideline concentration.
Bold	Compound detected above method detection limit.
CAS No.	Chemical abstracts service list number.
D	Compound detected at a secondary dilution.
DAR-1	Division of Air Resources-1.
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010. An interim SGC was not developed for these compounds because they have low toxicity ratings, as specified in the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010.
NYSDEC	New York State Department of Environmental Conservation.
SGC	Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010.
TVOC	Total volatile organic compounds.
$\mu g/m^3$	Micrograms per cubic meter.

1. Samples were collected by operation and maintenance personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA) for volatile organic compound analyses using United States Environmental Protection Agency Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the past year of system operation.
2. Table summarizes detected compounds only.
3. TVOC determined by summing individual detections and rounding to the nearest whole number.
4. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated October 18, 2010. An interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- 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 1,600 $\mu g/m^3$ / 4.2 = approximately 380 $\mu g/m^3$. An interim SGC was developed for this compound because it has a moderate toxicity rating, as specified in the DAR-1 AGC/SGC Tables, dated October 18, 2010.
5. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated October 18, 2010. An interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene and trans-1,2 dichloroethene, which are not defined as a high-toxicity compounds, the interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 790,000 $\mu g/m^3$ / 4.2 = approximately 190,000 $\mu g/m^3$. An interim SGC was developed for these compounds because they have moderate toxicity ratings, as specified in the DAR-1 AGC/SGC Tables, dated October 18, 2010.
6. The total effluent vapor sample was collected on June 8, 2011 as a result of a faulty summa canister.

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.[1]

Compound[2] (units in µg/L)	Sample ID: / Sample Date:	CON-1[4] 3/8/2012	ST-510[5] 3/9/2012
Project VOCs	CAS No.		
1,1,1-Trichloroethane	71-55-6	< 5.0	< 5.0
1,1-Dichloroethane	75-34-3	< 5.0	< 5.0
1,1-Dichloroethene	75-35-4	< 5.0	< 5.0
Benzene	71-43-2	< 5.0	< 5.0
cis-1,2-Dichloroethene	156-59-2	< 5.0	< 5.0
Tetrachloroethene	127-18-4	< 5.0	< 5.0
Toluene	108-88-3	< 5.0	< 5.0
trans-1,2-Dichloroethene	156-60-5	< 5.0	< 5.0
Trichloroethylene	79-01-6	< 5.0	< 5.0
Vinyl chloride	75-01-4	< 5.0	< 5.0
Xylenes - M,P	1330-20-7	< 5.0	< 5.0
Subtotal Project VOCs		ND	ND
Non-Project VOCs			
Subtotal Non-Project VOCs		ND	ND
TVOC[3]		ND	ND

Notes and abbreviations on last page.

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.(1)

Notes and Abbreviations:

CAS No.	Chemical abstracts service list number.
ND	Not detected.
TVOC	Total volatile organic compounds.
VOC	Volatile organic compound.
µg/L	Micrograms per liter.

1. Samples were collected by operation and maintenance personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for volatile organic compound analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to January to March 2012.
2. Table summarizes Project VOCs and detected Non-Project VOCs only.
3. TVOC determined by summing individual detections and rounding to the nearest whole number.
4. Sample CON-1 was a non-routine condensate sample collected as a composite grab sample from condensate water that was generated during the March 8, 2012 below grade pipeline condensate removal activities.
5. Sample ST-510 was a non-routine condensate sample collected as a composite grab sample from the condensate water generated through normal system operation.

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

Compound[1]	AGC[2] ($\mu g/m^3$)	Percent of MASC Per Event[3] 6/8/2011[5]	9/19/2011	12/5/2011	3/9/2012	Cumulative % MASC[4]
1,1,1-Trichloroethane	5,000	0.00%	0.00%	0.00%	0.00%	0.0%
1,1-Dichloroethane	0.63	0.05%	0.07%	0.05%	0.03%	0.050%
1,1-Dichloroethene	70	0.00%	0.00%	0.00%	0.00%	0.0%
Acetone	30,000	0.00%	0.00%	0.00%	0.00%	0.0%
Benzene	0.13	0.00%	0.00%	0.06%	0.00%	0.0%
Bromodichloromethane	70	0.00%	0.00%	0.00%	0.00%	0.0%
Trichlorofluoromethane (Freon 11)	5,000	0.00%	0.00%	0.00%	0.00%	0.0%
Chloroform	0.043	1.64%	6.90%	5.68%	0.72%	3.7%
cis-1,2-Dichloroethene	63	0.03%	0.03%	0.03%	0.02%	0.027%
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.0%
Tetrachloroethene	1.0	0.06%	0.08%	0.04%	0.03%	0.054%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.0%
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.0%
Trichloroethylene	0.5	3.63%	4.12%	3.30%	2.47%	3.4%
Vinyl chloride	0.11	0.04%	0.05%	0.04%	0.00%	0.032%
Xylenes - M,P	100	0.00%	0.00%	0.00%	0.00%	0.0%
Chlorodifluoromethane (Freon 22)	50,000	0.00%	0.00%	0.00%	0.00%	0.0%
1-Chloro-1,1-difluoroethane (Freon 142b)	50,000	0.00%	0.00%	0.00%	0.00%	0.0%

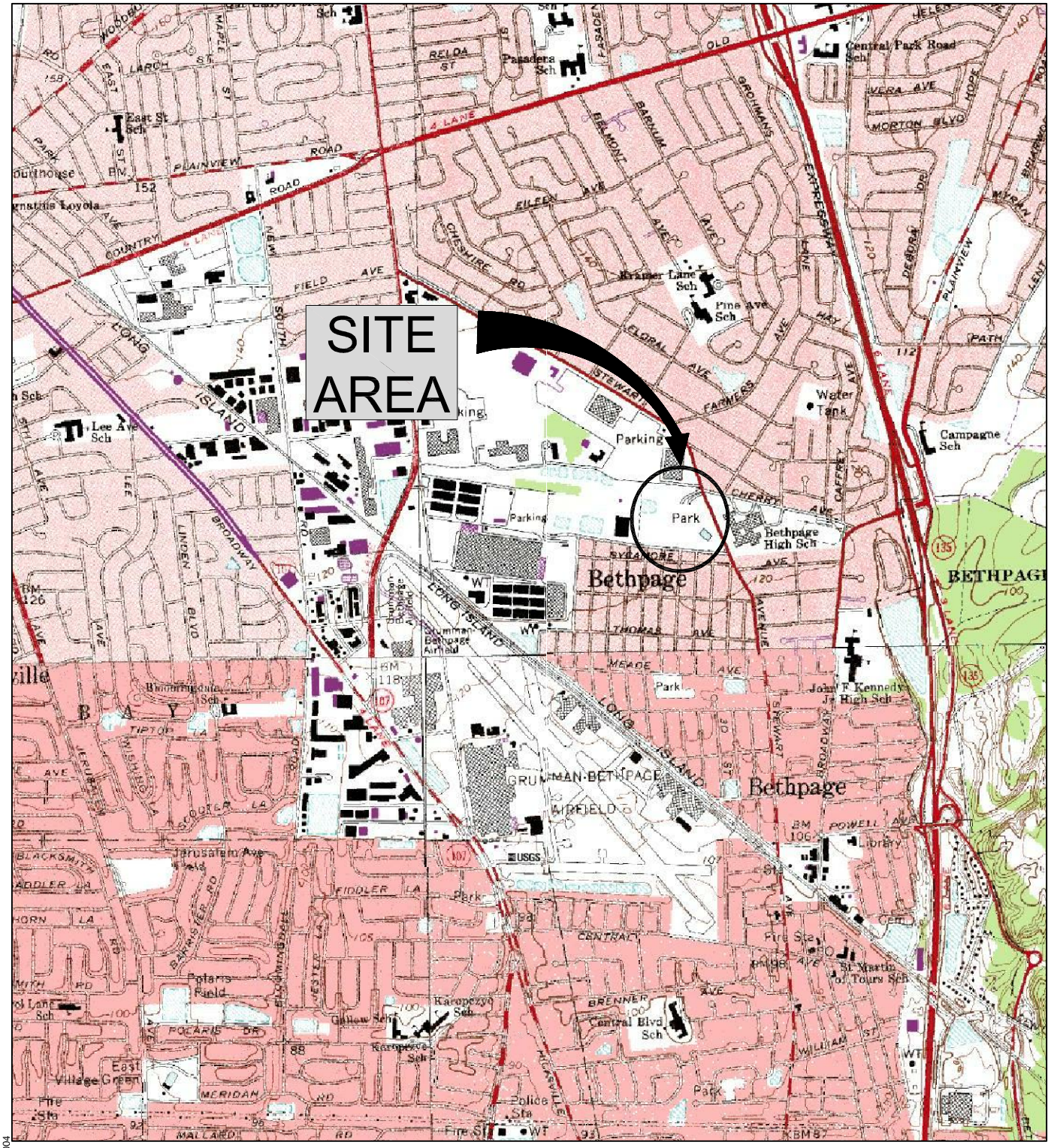
Notes and abbreviations on last page.

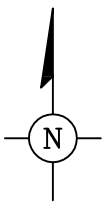
Table 5. Summary of Air Emissions Model Output, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes and Abbreviations:

AGC	Annual guideline concentration.
DAR-1	Division of Air Resources-1.
MASC	Maximum allowable stack concentration.
NYSDEC	New York State Department of Environmental Conservation.
SGC	Short-term guideline concentration.
$\mu g/m^3$	Micrograms per cubic meter.

1. Table summarizes detected compounds only.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised October 18, 2010. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific United States Environmental Protection Agency SCREEN 3 model to calculate the annual MASC per monitoring event.
3. Percent of MASC per event 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. Values shown have been rounded to include two significant figures.
5. The total effluent vapor sample was collected on June 8, 2011 as a result of a faulty summa canister.





0 2000' 4000'

SCALE IN FEET

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

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

SITE AREA LOCATION MAP
SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE
1

CITY:MELVILLE-NY DIV/GROUP:ENV/cad DE:ALS LD: PIC: PM:CSG TM:KZ LYR:ON=*;OFF=*REF*
G:\ENVCAD\Melville-NY\ACTIVITY\001496\1211\SGSI\401_Location Map.dwg LAYOUT: 1 SAVED: 2/16/2009 4:00 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: PDF PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 5/9/2011 8:37 AM BY: SANCHEZ, ADRIAN
XREFS:
PROJECTNAME: NY001464.0908.00004

PROPERTY OWNED BY TOWN OF OYSTER BAY

STACK LOCATION

GRASS

TREATMENT BUILDING AREA

WESTERN ACCESS ROAD

SOUTHERN ACCESS ROAD

B24MW-3

VMWC-14A
VMWC-14B
VMWC-14D
DW-7S
DW-7D
DW-3S
DW-3D
VMWC-9A
VMWC-9B
VMWC-10B
VMWC-10D
VMWC-11B
VMWC-11D
VMWC-12D
VMWC-15A
VMWC-15B
VMWC-15D
DW-5D
DW-5S
DW-6D
DW-6S
VMWC-1A/C
VMWC-4A/B/C/D
VMWC-3A/B/C/D
VMWC-2A/C/D
VMWC-1B/D
DW-1D
DW-1S
DW-4S
DW-4D
VMWC-16B
VMWC-16A
VMWC-16D
VMWC-17D
DW-8S
DW-9S
DW-2S
DW-2D
VMWC-8A/B/D
VMWC-7A/B
VMWC-7D
VMWC-5A/B/D
VMWC-6A/B/D
DW-10S
VMWC-13D
DW-11S
VMWC-18B
VMWC-18A

EIGHTH ST.
SEVENTH ST.
SIXTH ST.
FIFTH ST.
FOURTH ST.

VMWC-14A	
Date	IV (IWC)
3/9/2012	−0.10

VMWC-14B	
Date	IV (IWC)
3/9/2012	−0.14

VMWC-14D	
Date	IV (IWC)
3/9/2012	−0.19

VMWC-11B	
Date	IV (IWC)
3/9/2012	−0.13

VMWC-12D	
Date	IV (IWC)
3/9/2012	−0.14

VMWC-15D	
Date	IV (IWC)
3/9/2012	−0.11

VMWC-15B	
Date	IV (IWC)
3/9/2012	−0.11

VMWC-15A	
Date	IV (IWC)
3/9/2012	−0.12

VMWC-3A	
Date	IV (IWC)
3/9/2012	−0.18

VMWC-3B	
Date	IV (IWC)
3/9/2012	−0.18

VMWC-3C	
Date	IV (IWC)
3/9/2012	−0.18

VMWC-3D	
Date	IV (IWC)
3/9/2012	−0.19

VMWC-16B	
Date	IV (IWC)
3/9/2012	−0.17

VMWC-16A	
Date	IV (IWC)
3/9/2012	−0.21

VMWC-16D	
Date	IV (IWC)
3/9/2012	−0.19

VMWC-17D	
Date	IV (IWC)
3/21/2012	−0.28

VMWC-7A	
Date	IV (IWC)
3/9/2012	−0.10

VMWC-7B	
Date	IV (IWC)
3/9/2012	−0.11

VMWC-13D	
Date	IV (IWC)
3/9/2012	−0.18

VMWC-18A	
Date	IV (IWC)
3/9/2012	−0.15

VMWC-18B	
Date	IV (IWC)
3/9/2012	−0.13

0 50' 100'
SCALE IN FEET

LEGEND:

- PROPERTY LINE NORTHROP GRUMMAN
- 6' CHAIN LINK FENCE
- VAPOR RECOVERY LINES
- VMWC-9A — NON-COMPLIANCE-RELATED VACUUM MONITORING WELL CLUSTER
- VMWC-14A — COMPLIANCE-RELATED VACUUM MONITORING WELL CLUSTER
- DW-3S — COMPLIANCE-RELATED SHALLOW DEPRESSURIZATION WELL
- DW-3D — COMPLIANCE-RELATED DEEP DEPRESSURIZATION WELL
- B24MW-3 — MONITORING WELL
- IV — INDUCED VACUUM MEASUREMENT
- (IWC) — INCHES OF WATER COLUMN

N

NOTE:

1. ALL INDUCED VACUUM MEASUREMENT UNITS ARE EXPRESS IN IWC.
2. EPA'S RADON GUIDANCE RECOMMENDS NEGATIVE PRESSURE OF 0.035 INCHES OF WATER FOR THE CONTROL OF SOIL VAPOR (EPA 625/R-93-011, 1993).
3. SYSTEM DESIGN OBJECTIVE IS TO MAINTAIN -0.1 IWC OF INDUCED VACUUM AT ALL COMPLIANCE ONLY MONITORING WELLS ON A 12-MOUNTH ROLLING AVERAGE (ARCADIS 2007).
4. DATA SHOWN HEREIN ARE COLLECTED FROM COMPLIANCE-RELATED MONITORING WELLS ONLY.

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

GENERAL SITE PLAN AND MONITORING WELL VACUUM MEASUREMENTS SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE
2

CITY:MELVILLE-NY DIV/GROUP:ENV cad DB:ALS LD: PIC: PM:CSG TM: LYR:ON=*;OFF=*REF*
G:\ENVCAD\Melville-NY\ACTIVITY\01496\03312\GW\2011 4qtr Report\Fig02_2012IVR1Qtr_041312.dwg LAYOUT: 2 SAVED: 4/13/2012 4:32 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 4/17/2012 5:32 PM BY: BEGA, ALBANA
XREFS: IMAGES: PROJECTNAME: NY001464.0909.00001
Xref_01

DISCHARGE TO ATMOSPHERE

DISCHARGE TO ATMOSPHERE

VSP-602

V-27

TEMPORARY VAPOR PHASE GAC VP-600 (REMOVED FROM OPERATION DECEMBER 2008)

AMBIENT AIR OUTLET

TI 602

TT 602

HEAT EXCHANGER HX-600

ON STANDBY

AMBIENT AIR INLET

PIT 601

PI 601

TI 601

FE

V-26

VSP-601

VSP-201

FE

PI 201

BLOWER BL-200 ON STANDBY

VI 202

VIT 202

VSP-301

FE

PI 301

BLOWER BL-300

VI 302

VIT 302

VSP-401

FE

PI 401

BLOWER BL-400 ON STANDBY

VI 402

VIT 402

WSP-510

SG 510

STORAGE TANK ST-510

VENT

LIMIT OF TREATMENT BUILDING 2

WSP-210

SG 200

AIR FILTER AF-200

KNOCK OUT TANK KO-200

VI 201

RECIRCULATION LINE (TYP. OF 3)

FE 210

FQI 210

TRANSFER PUMP TP-210

WSP-310

SG 300

AIR FILTER AF-300

KNOCK OUT TANK KO-300

VI 301

FE 310

FQI 310

TRANSFER PUMP TP-310

WSP-410

SG 400

AIR FILTER AF-400

KNOCK OUT TANK KO-400

VI 401

FE 410

FQI 410

TRANSFER PUMP TP-410

V-24

V-19

V-21

V-25

V-22

V-20

V-23

V-1

V-2

V-3

V-4

V-5

V-6

V-7

V-8

V-9

V-10

V-11

V-12

V-13

V-14

V-15

V-16

V-17

V-18

VI 119 VSP-101 FI 101

VI 120 VSP-102 FI 102

VI 121 VSP-103 FI 103

VI 122 VSP-104 FI 104

VI 123 VSP-105 FI 105

VI 124 VSP-106 FI 106

VI 125 VSP-107 FI 107

VI 126 VSP-108 FI 108

VI 127 VSP-109 FI 109

VI 128 VSP-110 FI 110

VI 129 VSP-111 FI 111

VI 130 VSP-112 FI 112

VI 131 VSP-113 FI 113

VI 132 VSP-114 FI 114

VI 133 VSP-115 FI 116

VI 134 VSP-116 FI 116

VI 135 VSP-117 FI 117

VI 136 VSP-118 FI 118

FE

FROM DW-7D

FROM DW-3D

FROM DW-5D

FROM DW-6D

FROM DW-1D

FROM DW-4D

FROM DW-2D

FROM DW-11S

FROM DW-10S

FROM DW-2S

FROM DW-9S

FROM DW-8S

FROM DW-4S

FROM DW-1S

FROM DW-6S

FROM DW-5S

FROM DW-3S

FROM DW-7S

VI 101

VI 108

DEPRESSURIZATION WELL (TYPICAL OF 7 DEEP)

DEPRESSURIZATION WELL (TYPICAL OF 11 SHALLOW)

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
- REDUCER
- FERNCO
- FLEXIBLE HOSE
- FLANGE
- FE — FLOW ELEMENT ACCESS
- VI 109 — 1/4" BARB INDUCED VACUUM MONITORING CONNECTION
- 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
- SG — SIGHT GLASS
- TT — TEMPERATURE TRANSMITTER
- VI — VACUUM INDICATOR
- VIT — VACUUM INDICATING TRANSMITTER
- VSP — VAPOR SAMPLE POINT
- WSP — WATER SAMPLE POINT

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

PROCESS FLOW DIAGRAM
SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE
3

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Appendix **A**

Summary of Vapor Sample
Analytical Results Including
Tentatively Identified Compounds

Appendix A-1. Summary of Total 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 µg/m^3)	Sample ID:	VSP-601
	Sample Date:	3/9/2012
	CAS No.	
1,1,1-Trichloroethane	71-55-6	**7.3**
1,1,2,2-Tetrachloroethane	79-34-5	< 2.8
1,1,2-Trichloroethane	79-00-5	< 2.8
1,1-Dichloroethane	75-34-3	**7.7**
1,1-Dichloroethene	75-35-4	< 2.8
1,2-Dichloroethane	107-06-2	< 2.8
1,2-Dichloropropane	78-87-5	< 2.8
1,3-Butadiene	106-99-0	< 2.8
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	**270**
2-Butanone	78-93-3	< 28
2-Hexanone	591-78-6	< 2.8
4-Methyl-2-Pentanone	108-10-1	< 2.8
Acetone	67-64-1	< 28
Benzene	71-43-2	< 2.8
Bromodichloromethane	75-27-4	< 2.8
Bromoform	75-25-2	< 2.8
Bromomethane	74-83-9	< 2.8
Carbon Disulfide	75-15-0	< 28
Carbon Tetrachloride	56-23-5	< 2.8
Chlorobenzene	108-90-7	< 2.8
Chlorodibromomethane	124-48-1	< 2.8
Chlorodifluoromethane (Freon 22)	75-45-6	**13**
Chloroethane	75-00-3	< 2.8
Chloroform	67-66-3	**11**
Chloromethane	74-87-3	< 2.8
cis-1,2-Dichloroethene	156-59-2	**460**
cis-1,3-Dichloropropene	10061-01-5	< 2.8
Ethylbenzene	100-41-4	< 2.8
Dichlorodifluoromethane (Freon 12)	75-71-8	< 2.8
Methyl Tert-Butyl Ether	1634-04-4	< 2.8
Methylene Chloride	75-09-2	< 2.8
Styrene	100-42-5	< 2.8
Tetrachloroethene	127-18-4	**11**
Toluene	108-88-3	< 2.8
trans-1,2-Dichloroethene	156-60-5	< 2.8
trans-1,3-Dichloropropene	10061-02-6	< 2.8
Trichloroethylene	79-01-6	**440**
Trichlorofluoromethane (Freon 11)	75-69-4	< 2.8
Trichlorotrifluoroethane (Freon 113)	76-13-1	< 2.8
Vinyl chloride	75-01-4	< 2.8
Xylene-o	95-47-6	< 2.8
Xylenes - m,p	179601-23-1	< 5.6
TVOC[2]		**1,220**

Notes and abbreviations on last page.

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

Notes and Abbreviations:

Bold	Compound detected above method detection limit.
µg/m^3	Micrograms per cubic meter.
TVOC	Total volatile organic compounds.
CAS No.	Chemical abstracts service list number.

1. Samples were collected by operation and maintenance personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA) for volatile organic compound analyses using United States Environmental Protection Agency Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to January to March 2012.
2. TVOC determined by summing individual detections and rounding to the nearest whole number.

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Appendix A-2. Summary of Total 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.[1,2,3]

	Sample ID:	VSP-601
	Sample Date:	3/9/2012
	Units:	ppbv
Acetophenone		
Isobutane		
Isobutene		
Isooctane		
1- Dodedene		
2,3,3, Trimethylpentane		
Trimethylcyclohexane isomer		
Trimethylcyclohexane isomer		
Trimethylcyclohexane isomer		
Trimethylcyclohexane isomer		
C_9H_{18} Compound		
C_9H_{18} Compound		
Unidentified Compound		
$C_{10}H_{20}$ Compound		
$C_{10}H_{20}$ Compound		
$C_{12}H_{24}$ Compound		

No Tentatively Identified Compounds Detected

Notes and Abbreviations:

ppbv Parts per billion by volume.

1. Samples were collected by operation and maintenance personnel on the date shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA) for volatile organic compound analyses using United States Environmental Protection Agency Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to January to March 2012.
2. Tentatively identified compounds are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
3. All results are estimated.

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Appendix **B**

Summary of Condensate Sample Analytical Results Including Tentatively Identified Compounds

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.[1]

Compound		CON-1[3]	ST-510[4]
(units in µg/L)		3/8/2012	3/9/2012
	CAS No.		
1,1,1-Trichloroethane	71-55-6	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane	79-34-5	< 5.0	< 5.0
1,1,2-Trichloroethane	79-00-5	< 5.0	< 5.0
1,1-Dichloroethane	75-34-3	< 5.0	< 5.0
1,1-Dichloroethene	75-35-4	< 5.0	< 5.0
1,2-Dichloroethane	107-06-2	< 5.0	< 5.0
1,2-Dichloropropane	78-87-5	< 5.0	< 5.0
2-Butanone	78-93-3	< 10	< 10
2-Hexanone	591-78-6	< 10	< 10
4-Methyl-2-Pentanone	108-10-1	< 10	< 10
Acetone	67-64-1	< 10	< 10
Benzene	71-43-2	< 5.0	< 5.0
Bromodichloromethane	75-27-4	< 5.0	< 5.0
Bromoform	75-25-2	< 5.0	< 5.0
Bromomethane	74-83-9	< 5.0	< 5.0
Carbon Disulfide	75-15-0	< 10	< 10
Carbon Tetrachloride	56-23-5	< 5.0	< 5.0
Chlorobenzene	108-90-7	< 5.0	< 5.0
Chlorodibromomethane	124-48-1	< 5.0	< 5.0
Chloroethane	75-00-3	< 5.0	< 5.0
Chloroform	67-66-3	< 5.0	< 5.0
Chloromethane	74-87-3	< 5.0	< 5.0
cis-1,2-Dichloroethene	156-59-2	< 5.0	< 5.0
cis-1,3-Dichloropropene	10061-01-5	< 5.0	< 5.0
Dichlorodifluoromethane (Freon 12)	75-71-8	< 5.0	< 5.0
Ethylbenzene	100-41-4	< 5.0	< 5.0
Methylene Chloride	75-09-2	< 5.0	< 5.0
Styrene	100-42-5	< 5.0	< 5.0
Tetrachloroethene	127-18-4	< 5.0	< 5.0
Toluene	108-88-3	< 5.0	< 5.0
trans-1,2-Dichloroethene	156-60-5	< 5.0	< 5.0
trans-1,3-Dichloropropene	10061-02-6	< 5.0	< 5.0
Trichloroethylene	79-01-6	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113)	76-13-1	< 5.0	< 5.0
Vinyl Chloride	75-01-4	< 5.0	< 5.0
Xylene-o	95-47-6	< 5.0	< 5.0
Xylenes - m,p	1330-20-7	< 5.0	< 5.0
TVOC[2]		ND	ND

Notes and abbreviations on last 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.[(1)]

Notes and Abbreviations:

CAS No.	Chemical abstracts service list number.
ND	Not detected.
TVOC	Total volatile organic compounds.
µg/L	Micrograms per liter.

1. Samples were collected by operation and maintenance personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for volatile organic compound analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to January to March 2012.
2. TVOC determined by summing individual detections and rounding to the nearest whole number.
3. Sample CON-1 was a non-routine condensate sample collected as a composite grab sample from condensate water that was generated during the March 8, 2012 below grade pipeline condensate removal activities.
4. Sample ST-510 was a non-routine condensate sample collected as a composite grab sample from the condensate water generated through normal system operation.

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

Sample ID:	CON-1[4]	ST-510[5]
Sample Date:	3/8/2012	3/9/2012
Units:	ug/L	ug/L
Unknown	No Tentatively Identified Compounds Detected	No Tentatively Identified Compounds Detected
Ethanol		
Furan, tetrahydro-		
Unknown alcohol		
Cyclohexanone		
Isopropyl Alcohol		
Butanal		
Heptanal		
1-Hexanol, 2-ethyl-		

Notes and Abbreviations:

µg/L Micrograms per liter.

1. Samples were collected by operation and maintenance personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for volatile organic compound analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to January to March 2012.
2. Tentatively identified compounds are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
3. All results are estimated.
4. Sample CON-1 was a non-routine condensate sample collected as a composite grab sample from condensate water that was generated during the March 8, 2012 below grade pipeline condensate removal activities.
5. Sample ST-510 was a non-routine condensate sample collected as a composite grab sample from the condensate water generated through normal system operation.

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Appendix **C**

Air Modeling Calculations

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.

Parameters	Date Sampled:	6/6/2011	9/19/2011	12/5/2011	3/9/2012
SCREEN3 Model Input					
Source Type		Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1
Stack Height (ft)		33	33	33	33
Stack Height (m)		10.1	10.1	10.1	10.1
Stack Inside Diameter (m)		0.41	0.41	0.41	0.41
Air Flow Rate (scfm)(1)		583	572	590	641
Air Flow Rate (acfm @ stack temp)(2)		611	596	601	669
Stack Gas Exit Temperature (K)(1)		309	306	300	308
Ambient Air Temperature (K)(3)		294	291	277	276
Receptor Height (m)(4)		1.5	1.5	1.5	1.5
Urban/Rural		Urban	Urban	Urban	Urban
Building Height (m)		2.4	2.4	2.4	2.4
Min Horizontal Bldg Dim (m)		4.9	4.9	4.9	4.9
Max Horizontal Bldg Dim (m)		5.0	5.0	5.0	5.0
Consider Bldg Downwash?		Yes	Yes	Yes	Yes
Simple/Complex Terrain Above Stack		Simple	Simple	Simple	Simple
Simple/Complex Terrain Above Stack Base		Simple	Simple	Simple	Simple
Meteorology		Full	Full	Full	Full
Automated Distances Array		Yes	Yes	Yes	Yes
Terrain Height Above Stack Base		0	0	0	0
SCREEN3 Model Output					
1-HR Max Concentration at Receptor Height ($\mu g/m^3$)(5)		1,332	1,346	1,298	1,113
Annualization Factor(6)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(7)		106.6	107.7	103.8	89.0
Distance To Max Concentration (m)(8)		44	44	45	48

Notes and abbreviations on 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 and Abbreviations:

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

1. The stack air flow rate (in scfm) and exit temperature were measured using a handheld thermo-anemometer. Values were measured at the stack effluent location.
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 United States Environmental Protection Agency time averaging conversion factor of 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.

Table C-2. Summary of 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)			
	6/8/2011[5]	9/19/2011	12/5/2011	3/9/2012
1,1,1-Trichloroethane	11	17	11	7.3
1,1-Dichloroethane	11	14	11	7.7
1,1-Dichloroethene	5.7	4.3	3.3	0
Acetone	14	0	0	0
Benzene	0	0	2.5	0
Bromodichloromethane	0	0	1.1	0
Trichlorofluoromethane (Freon 11)	1.7	1.9	1.4	0
Chloroform	23	98	83	11
cis-1,2-Dichloroethene	620	580	540	460
Dichlorodifluoromethane (Freon 12)	3.2	5.3	2.6	0
Tetrachloroethene	21	25	15	11
Toluene	0	0	1.8	0
trans-1,2-Dichloroethene	4.8	6.5	3.8	0
Trichloroethylene	590	680	560	440
Vinyl chloride	1.3	1.7	1.6	0
Xylenes - M,P	0	0	1.6	0
Chlorodifluoromethane (Freon 22)	24	25	17	13
1-Chloro-1,1-difluoroethane (Freon 142b)	560	360	150	270

Notes and abbreviations on last page.

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

Compound	AGC[2] ($\mu g/m^3$)	Annual MASC[3] ($\mu g/m^3$)			
		6/8/2011[5]	9/19/2011	12/5/2011	3/9/2012
1,1,1-Trichloroethane	5,000	1.63E+08	1.65E+08	1.70E+08	1.78E+08
1,1-Dichloroethane	0.63	2.05E+04	2.08E+04	2.14E+04	2.24E+04
1,1-Dichloroethene	70	2.28E+06	2.31E+06	2.38E+06	2.49E+06
Acetone	30,000	9.76E+08	9.90E+08	1.02E+09	1.07E+09
Benzene	0.13	4.23E+03	4.29E+03	4.42E+03	4.63E+03
Bromodichloromethane	70	2.28E+06	2.31E+06	2.38E+06	2.49E+06
Trichlorofluoromethane (Freon 11)	5,000	1.63E+08	1.65E+08	1.70E+08	1.78E+08
Chloroform	0.043	1.40E+03	1.42E+03	1.46E+03	1.53E+03
cis-1,2-Dichloroethene	63	2.05E+06	2.08E+06	2.14E+06	2.24E+06
Dichlorodifluoromethane (Freon 12)	12,000	3.90E+08	3.96E+08	4.08E+08	4.27E+08
Tetrachloroethene	1.0	3.25E+04	3.30E+04	3.40E+04	3.56E+04
Toluene	5,000	1.63E+08	1.65E+08	1.70E+08	1.78E+08
trans-1,2-Dichloroethene	63	2.05E+06	2.08E+06	2.14E+06	2.24E+06
Trichloroethylene	0.5	1.63E+04	1.65E+04	1.70E+04	1.78E+04
Vinyl chloride	0.11	3.58E+03	3.63E+03	3.74E+03	3.91E+03
Xylenes - M,P	100	3.25E+06	3.30E+06	3.40E+06	3.56E+06
Chlorodifluoromethane (Freon 22)	50,000	1.63E+09	1.65E+09	1.70E+09	1.78E+09
1-Chloro-1,1-difluoroethane (Freon 142b)	50,000	1.63E+09	1.65E+09	1.70E+09	1.78E+09

Notes and abbreviations on last page.

Table C-2. Summary of 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 MASC[4]			
	6/8/2011[5]	9/19/2011	12/5/2011	3/9/2012
1,1,1-Trichloroethane	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.05%	0.07%	0.05%	0.03%
1,1-Dichloroethene	0.00%	0.00%	0.00%	0.00%
Acetone	0.00%	0.00%	0.00%	0.00%
Benzene	0.00%	0.00%	0.06%	0.00%
Bromodichloromethane	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%
Chloroform	1.64%	6.90%	5.68%	0.72%
cis-1,2-Dichloroethene	0.03%	0.03%	0.03%	0.02%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%
Tetrachloroethene	0.06%	0.08%	0.04%	0.03%
Toluene	0.00%	0.00%	0.00%	0.00%
trans-1,2-Dichloroethene	0.00%	0.00%	0.00%	0.00%
Trichloroethylene	3.63%	4.12%	3.30%	2.47%
Vinyl chloride	0.04%	0.05%	0.04%	0.00%
Xylenes - M,P	0.00%	0.00%	0.00%	0.00%
Chlorodifluoromethane (Freon 22)	0.00%	0.00%	0.00%	0.00%
1-Chloro-1,1-difluoroethane (Freon 142b)	0.00%	0.00%	0.00%	0.00%

Notes and abbreviations on last page.

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

Notes and Abbreviations:

AGC	Annual guideline concentration.
DAR-1	Division of Air Resources-1.
NYSDEC	New York State Department of Environmental Conservation.
MASC	Maximum allowable stack concentration.
SGC	Short-term guideline concentration.
$\mu g/m^3$	Micrograms per cubic meter.

1. Actual effluent concentrations are analytical results from air samples collected on the dates shown. Data in this table corresponds to the past year of system operation. Table summarizes detected compounds only.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised October 18, 2010.
3. Annual MASC was 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.
5. The total effluent vapor sample was collected on June 8, 2011 as a result of a faulty summa canister.