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Northrop Grumman Systems Corporation

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

2010 Annual Summary Report

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

NYSDEC ID # 1-30-003A

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Operation, Maintenance, and Monitoring Report for the Soil Gas Interim Remedial Measure 2010 Annual Summary Report

Operable Unit 3 (Former Grumman Settling Ponds) Bethpage, New York
NYSDEC ID # 1-30-003A

1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) Operation, Maintenance, and Monitoring (OM&M) Annual 2010 Summary Report was prepared by ARCADIS of New York, Inc. (ARCADIS),on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), pursuant to the Administrative Order on Consent (AOC) Index # W1-0018-04-01 (NYSDEC 2005). The present day Bethpage Community Park property (Park), which the New York State Department of Environmental Conservation (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 OM&M activities for the soil gas IRM performed between August 31, 2010 and January 5, 2011 (hereinafter referred to as the fourth quarter monitoring event). Additionally, an annual summary of the results of OM&M for the soil gas IRM performed from January 1, 2010 to January 5, 2011 is also provided. Finally, an evaluation and engineering certification of the soil gas IRM system performance, with respect to the design objectives specified in the Soil Gas Interim Remedial Measure Work Plan (ARCADIS 2007a) and 95% Design Report (ARCADIS 2007b), are also provided herein.

2. Soil Gas Interim Remedial Measure System Description

The soil gas IRM was constructed in accordance with the Soil Gas IRM 95% Design Report, which was approved by NYSDEC (NYSDEC 2007b), and the associated Design Drawings. A general site plan that shows the major process equipment and the 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 detailed description of the system and a complete set of record drawings are provided in the OM&M Manual (ARCADIS 2009).

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

- 18 depressurization wells and 47 associated induced vacuum monitoring wells (Figure 2).

- Two (2) "dry-van" type storage containers, which contain the following equipment:

- Ø Three (3) 52-gallon moisture separators to remove condensate from the influent vapor stream;
- Ø Two (2) 20-horsepower(hp) and one (1) 30-hp regenerative-type depressurization blowers;
- Ø A programmable logic controller-based control system;
- Ø An autodialer;
- Ø Associated piping, valves, sample ports, gauges, electrical equipment, and other devices necessary to safely control, operate, and monitor the system.

- One (1) heat exchanger; and,
- One (1) 33-foot tall by 16-inch diameter stack and associated ductwork.

3. Response Action Objectives

The specific objectives of the soil gas IRM specified in the NYSDEC-approved Soil Gas Interim Remedial Measure Work Plan (ARCADIS 2007a) are:

- Ø To mitigate the off-site migration of site-related volatile organic compounds (VOCs) (i.e., VOCs other than Freon 12 and Freon 22) in the on-site soil gas through the implementation of a soil gas control system installed along the former Plant 24 access road south of the Park.
- Ø To comply with applicable NYSDEC Standards, Criteria and Guidelines (SCGs).

Subsequent to submittal of the Soil Gas Interim Remedial Measure Work Plan (ARCADIS 2007a), site-related VOCs were detected along the southwestern Park boundary. Accordingly, the following additional soil gas IRM objective was specified in the 95% Design Report (ARCADIS 2007b):

- Ø To mitigate the off-site migration of site-related VOCs (i.e., VOCs other than Freon 12 and Freon 22) in the on-site soil gas through the implementation of a soil gas control system installed along the former Plant 24 access road west of the Park.

Based on the response action objectives described above, the following design objectives were specified in the 95% Design Report (ARCADIS 2007b):

- To mitigate the offsite migration of soil gas, the system will be designed to maintain 0.1 inches of water column (iwc) of negative pressure within a negative pressure curtain established along the southern and western access roads, based on a twelve-month rolling average.

- Collected vapors will initially be treated 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 2007a).

- Collected condensate will initially be transferred to the point of discharge under the existing approval for OU3 wells. The point of discharge, located near the Northrop Grumman, Plant 26, ultimately discharges to the Town of Oyster Bay's Cedar Creek treatment facility. Condensate transfer activities will be completed in accordance with the requirements set forth by the Nassau County Department of Public Works (NCDPW 2007; NCDPW 2008).

4. Operation and Maintenance Activities

4.1 Quarterly OM&M Activities

In general, the soil gas IRM operated continuously during the fourth quarter 2010 except as described below. Routine monthly OM&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 equipment manufacturers' specifications and as described in the OM&M Manual (ARCADIS 2009). Additionally, the following non-routine system shut down occurred during this period:

- The system shut down for approximately 4 days, from October 14 to 18, 2010 as a result of a blower (i.e., BL-300) motor fault alarm condition. This alarm condition was suspected, although not confirmed, to have been caused by a power failure. Operations staff noted that the OU-3 Groundwater IRM system had shut down at approximately the same time, leading to the conclusion that the shutdown was power related. The system was inspected on Monday,

October 18, 2010, the alarm was cleared, and the system was restarted on the same day. The system operated normally after it was restarted.

4.2 Annual Summary of OM&M Activities

In general, the soil gas IRM operated continuously during 2010 with scheduled system shut downs for routine maintenance activities except as described below. Routine monthly OM&M activities conducted throughout 2010 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 (ARCADIS 2009). Additionally, the following non-routine maintenance activities or system shut downs occurred during 2010:

- The system was shut down for a total of approximately 43 hours between January 2 and 4, 2010 as a result of a blower (BL-300) motor fault alarm condition. This alarm condition was suspected to have been caused by a brief power failure. The system was inspected and restarted on January 4, 2010 after the alarm was cleared. The system operated normally after it was restarted.

- The system was shut down for a total of approximately 21 hours between February 4 and 5, 2010 due to a heat exchanger high effluent temperature alarm condition. The system was inspected on February 5, 2010, and onsite personnel determined that the heat exchanger effluent temperature transmitter had most likely malfunctioned as a result of extremely cold ambient temperatures. Onsite personnel cleared the alarm condition and restarted the system. The system was monitored throughout the day, with no further alarm conditions occurring.

- The system was shut down for a total of approximately 13 hours on Saturday, March 20, 2010 as a result of a blower (i.e., BL-300) motor fault alarm condition. This alarm condition was suspected, although not confirmed, to have been caused by a power failure. The system was inspected, the alarm was cleared, and the system was restarted on the same day. The system operated normally after it was restarted.

- The system was shut down for a total of approximately 9 hours on Thursday, May 27, 2010 as a result of a blower (i.e., BL-300) motor fault alarm condition. This alarm condition was confirmed to be caused by a power failure. The system was inspected, the alarm was cleared, and the system was restarted on the same day. The system operated normally after it was restarted.

- As described in Section 4.1 of this report, the system was shut down for approximately 4 days on Thursday, October 14, 2010 as a result of a blower (i.e., BL-300) motor fault alarm condition that was suspected to be caused by a power failure (the OU-3 Groundwater IRM had shut down at approximately the same time). The system was successfully restarted on Monday, October 18, 2010.

Additional details of the maintenance activities described above are provided in the 2010 quarterly monitoring reports (ARCADIS 2010a; ARCADIS 2010b; ARCADIS 2010c). Discussions of the routine monitoring program and results are provided in the subsequent sections of this report.

5. Monitoring Activities and Results

Section 5.1 summarizes the routine performance monitoring and routine compliance monitoring activities completed during the fourth quarter 2010 operating period. An annual summary of the routine performance and compliance monitoring activities performed during 2010 is provided in Section 5.2.

5.1 Quarterly Monitoring Activities and Results

The following subsections of this report summarize the monitoring activities and results for routine performance and compliance monitoring for the fourth quarter 2010 operating period. The objectives of the performance and compliance monitoring program are to demonstrate that the system components are operating in accordance with manufacturer's specifications and that the operating parameters are within the acceptable operating ranges provided in revised Table 3 from the OM&M Manual (ARCADIS 2011). The objectives of the compliance monitoring program (consisting of the collection of compliance-related induced vacuum readings and effluent vapor/water samples) are to demonstrate compliance with regulatory discharge criteria and that the soil gas IRM is achieving the design negative pressure of - 0.1 inches of water column (iwc) within the subsurface.

5.1.1 Routine Performance Monitoring and Results

The routine performance monitoring event was completed on December 3, 2010 (hereinafter referred to as the "December monitoring event") in accordance with Table C-1 of the SAP (ARCADIS 2008). Brief discussions of the monitoring methodology and results are provided below.

5.1.1.1 System Operating Parameters

System operating parameters that were measured are shown in Table 1 (and are listed in Attachments C-3.2 and C-3.3 of the SAP). Operating parameters remained consistent with the values in revised Table 3 from the OM&M Manual (ARCADIS 2011), except as summarized below. System components also operated in general accordance with manufacturers' recommendations.

- Depressurization Well DW-7D had a manifold vacuum slightly greater than the maximum recommended range set forth in revised Table 3 from the OMM Manual (ARCADIS 2011). The observed change in manifold vacuum is likely the result of condensate and/or storm water accumulation in the subsurface piping.

- Depressurization Well DW-11S had a lower flow rate than the minimum recommended range in revised Table 3 from the OMM Manual (ARCADIS 2011). Additionally, as discussed in Section 5.1.2.1, the induced vacuum measured at associated monitoring well cluster, VMWC-18A, decreased during the December monitoring event resulting in an annual time-weighted rolling average below the design minimum negative pressure of -0.1 iwc. Accordingly, the manifold flow rate for Depressurization Well DW-11S will be evaluated and increased as necessary during the next reporting period to address the observed decrease in flow rate.

- Depressurization Wells DW-10S and DW-11S had lower wellhead vacuums than the minimum recommended range in revised Table 3 from the OMM Manual (ARCADIS 2011). The observed change in wellhead vacuum at Depressurization Well DW-10S is likely the result of condensate and/or storm water accumulation in the subsurface piping and normal seasonal fluctuation. The observed change in wellhead vacuum at Depressurization Well DW-11S will be evaluated and addressed, as necessary during the next reporting

period, in conjunction with increasing the depressurization well flow rate, as discussed in the bullet above.

- Approximately 1.1 gallons of condensate was collected in knockout tank KO-300 and transferred to storage tank ST-510.

- The heat exchanger influent temperature, (i.e., 80 degrees Fahrenheit), remained lower than the design influent temperature of 150 degrees Fahrenheit. Accordingly, the heat exchanger was kept on standby during the reporting period.

5.1.1.2 Vapor Samples

A screening level vapor sample was collected from the total effluent sample location (i.e., VSP-601) (see Figure 2) using a photoionization detector (PID) during the December monitoring event.

The screening level vapor sample PID reading is provided in Table 1. The screening result was less than the detection limit, which was consistent with the August 2010 data.

5.1.2 Routine Compliance Monitoring and Results

Routine compliance monitoring was conducted during the December monitoring event in accordance with Table C-1 of the SAP. A brief discussion of the compliance monitoring methodology and results is provided below.

5.1.2.1 System Operating Parameters

System operating parameters measured this reporting period consisted of induced vacuum measurements from compliance-related monitoring points, as shown in Table 2 (and listed in Table 2 of the OM&M Manual).

Induced vacuum measurements are summarized in Table 2. As described in the 95% Design Report (ARCADIS 2007b), the soil gas IRM was designed to maintain a negative pressure of -0.1 iwc on an annual time-weighted rolling average at all compliance related induced vacuum monitoring points. As shown on Table 2, the negative pressure annual time-weighted rolling average at all compliance related monitoring points, except for VMWC-18A, is greater than or equal to -0.1. The

December monitoring event average negative pressure was -0.13 iwc). The annual time-weighted rolling average at VMWC-18A decreased to -0.09 iwc. As described in Section 5.1.1.1, the manifold flow rate will be increased during the next reporting period, as necessary, to return the induced vacuum at VMWC-18A to greater than or equal to -0.1 iwc. It should be noted that a constant vacuum was maintained at VMWC-18A during the fourth quarter 2010 monitoring period and the data (-0.054 iwc) indicate the vacuum is sufficient to prevent soil gas from migrating off-site. Typical industry guidance recommends a negative pressure of -0.035 iwc for the control of soil vapor (USEPA 1993).

5.1.2.2 Vapor Samples

One vapor sample was collected from the total effluent sample location (VSP-601) on December 3, 2010 and submitted for laboratory analysis for volatile organic compounds (VOCs) in accordance with the SAP. Analytical results from this sample indicated a sample collection or laboratory error; therefore, the December 3, 2010 total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent sample location was re-sampled on January 5, 2011, and this data is provided and used in calculations referenced in this report. Both samples were analyzed by United States Environmental Protection Agency (USEPA) Method TO-15 for the compound list provided in the SAP. As requested by the NYSDEC, additional parameters, including Freon 12, Freon 22, and Freon 142, were also quantified by USEPA Method TO-15, and the top 20 tentatively identified compounds (TICs) were reported.

The January 5, 2011 total effluent vapor sample laboratory analytical results are provided in Table 3 and in Appendix A. As shown in Table 3 and Appendix A, the total volatile organic compound (TVOC) concentration of 1,612 micrograms per cubic meter ($\mu g/m^3$) was lower than the August 2010 concentration (2,972 $\mu g/m^3$) and was consistent with historical data.

One environmentally "A" rated compounds (as defined in Division of Air Resources [DAR-1] Annual Guideline Concentration [AGC]/Short-Term Guideline Concentration [SGC] tables revised September 10, 2007), i.e., vinyl chloride, was detected in the effluent vapor sample during December 2010. The mass emission rate for vinyl chloride was 3.86×10^{-6} pounds per hour (lbs/hr), which is well below the NYSDEC recommended action level of 0.01 lb/hr, and, therefore, no treatment is required. A summary of the air emissions modeling, completed to confirm compliance with applicable air discharge standards, is discussed in Section 6 of this report.

No TICs were identified by the laboratory (Appendix A) in the effluent vapor sample during December 2010.

5.1.2.3 Condensate Samples

A compliance monitoring condensate sample was not collected for laboratory analysis during the reporting period. 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. .

5.2 Annual Summary of Monitoring Activities and Results

Routine performance and compliance monitoring was completed during 2010 in accordance with Table C-1 of the SAP (ARCADIS 2008).

A detailed description of the monitoring methodology implemented during each monitoring event (or supplemental monitoring event) during 2010 is provided in each of the respective interim OM&M reports.

5.2.1 Routine Performance Monitoring and Results

Similar to the fourth quarter operating period, system performance monitoring completed in 2010 consisted of the collection of system operating parameters and system performance vapor samples (i.e., PID measurements). In general, the majority of system operating parameters (i.e., individual well flow rates, system vacuums, etc.) remained consistent and within their respective operating ranges provided in revised Table 3 from the OMM Manual (ARCADIS 2011). A detailed description of changes in system operating parameters is included in each monitoring period respective quarterly OM&M report.

5.2.2 Routine Compliance Monitoring and Results

Similar to the fourth quarter operating period, system compliance monitoring completed in 2010 consisted of the collection of system compliance vapor samples and the collection of compliance-only induced vacuum readings. A detailed description of the system compliance monitoring results is included in each monitoring period's respective quarterly OM&M report.

Key compliance monitoring results from 2010 include the following:

- As of December 3, 2010, the time-weighted rolling average induced vacuum for all compliance related monitoring points, with the exception of VMWC-18A, was greater than or equal to the design objective of -0.1 iwc. The annual time-weighted rolling average at VMWC-18A decreased to -0.09 iwc. As described in Section 5.1.1.1, the manifold flow rate at Depressurization Well DW-11S will be increased during the next reporting period, as necessary, to return the induced vacuum at VMWC-18A to greater than or equal to -0.1 iwc.

- Similarly, the average instantaneous induced vacuum for all compliance related monitoring points, with the exception of VMWC-18A, was greater than or equal to -0.1 iwc for each respective monitoring period in 2010. The average instantaneous induced vacuum for VMWC-18A was below -0.1 iwc during the September and December 2010 monitoring events. It should be noted that a constant vacuum was maintained at VMWC-18A during the July to September 2010 monitoring period (-0.093 iwc), and the October to December 2010 monitoring period (-0.054 iwc) and the data indicate the vacuum is sufficient to prevent soil gas from migrating off-site. Typical industry guidance recommends a negative pressure of 0.035 iwc for the control of soil vapor (USEPA 1993). As described in Section 5.1.1.1, the manifold flow rate at Depressurization Well DW-11S will be increased during the next reporting period, as necessary, to return the induced vacuum at VMWC-18A to greater than or equal to -0.1 iwc.

- Three environmentally "A" rated compounds (as defined in Division of Air Resources [DAR-1] Annual Guideline Concentration [AGC]/Short-Term Guideline Concentration [SGC] tables revised September 10, 2007), (i.e., benzene, carbon tetrachloride, and vinyl chloride), were detected in the effluent vapor sample during 2010. However, the mass emission rates for these compounds were below the NYSDEC recommended action level of 0.01 lb/hr during all monitoring events. Therefore, no treatment is required.

- The TVOC concentration of the effluent vapor stream remained relatively constant between January and December 2010. All emissions were below applicable discharge criteria during all monitoring events as discussed in Section 6 of this report.

- Several TICs were identified on an inconsistent basis during 2010. ARCADIS will continue to monitor TIC concentrations and will evaluate corrective actions as necessary.

6. Air Emissions Model

Effluent vapor laboratory analytical results were compared to the NYSDEC DAR-1 SGCs during each monitoring event in 2010 including the October to December 2010 monitoring period. 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 SCREEN 3 model in conjunction with the NYSDEC DAR-1 AGCs. A scaling factor was calculated using the SCREEN 3 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. An annual 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. An annual 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 during 2010 and for the October to December 2010 period, based on the following:

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

- The measured concentration of individual VOCs in the effluent did not exceed applicable instantaneous MASCs during all monitoring events, 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,

- Three environmentally "A" rated compounds (as defined in DAR-1 AGC/SGC tables revised September 10, 2007), i.e., benzene, carbon tetrachloride and vinyl chloride, were detected in the effluent vapor samples collected during 2010. However, the mass emission rates for benzene, carbon tetrachloride and vinyl chloride were well below the NYSDEC recommended action level of 0.01 lb/hr for 2010. Therefore, no treatment is required. As described previously, vinyl chloride was detected at 1.7 ug/m^3 during the December 2010 monitoring event. This concentration result in mass emission rate of 3.86 x 10^{-6} lbs/hr, which is well below the NYSDEC recommended action level of 0.01 lbs/hr.

7. Conclusions and Recommendations

7.1 Conclusions

Based on the information provided herein, ARCADIS concludes that the soil gas IRM met or exceeded all design objectives summarized in Section 3.0 of this report as follows:

- The soil gas IRM maintained 0.1 iwc of negative pressure within all induced vacuum monitoring points based on a twelve-month rolling average, with the exception of monitoring well VMWC-18A, which had a twelve-month rolling average of -0.09 iwc (the induced vacuum twelve-month rolling average at monitoring point VMWC-18A was greater than -0.1 iwc through September 2010). It should be noted that a constant vacuum was maintained at VMWC-18A during the October to December 2010 monitoring periods and the data (-0.054 iwc) indicate the vacuum is sufficient to prevent soil gas from migrating off-site. Typical industry guidance recommends a negative pressure of 0.035 iwc for the control of soil vapor (USEPA 1993).

- System emissions were maintained at or below all applicable regulatory discharge criteria for all monitoring events and the above results indicate that air treatment is not required.

7.2 Recommendations

Based on the information provided herein, ARCADIS makes the following recommendations for 2011:

- Continued operation of the soil gas IRM.

- Conduct future OM&M activities in accordance with the Final OM&M Manual dated January 23, 2009 (ARCADIS 2009), as updated in 2011 (ARCADIS 2011).

- Evaluate the induced vacuum at monitoring wells associated with Depressurization DW-11S (i.e., VMWC-18A) and consider rebalancing each depressurization well if the induced vacuum continues to deviate from the design criteria (i.e., -0.1 iwc).

8. Certification

Statement of Certification

On behalf of Northrop Grumman Systems Corporation, I hereby certify and attest that the Operable Unit 3 Soil Gas Interim Remedial Measure is operated in compliance with the remedial action objectives provided within the NYSDEC approved Soil Gas Interim Remedial Measure Work Plan dated February 16, 2007, which was prepared pursuant to NYSDEC Order on Consent Index # W1-0018-04-01 referencing the Former Grumman Settling Ponds Site and dated July 4, 2005.

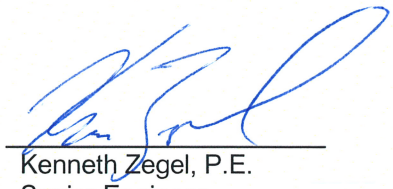

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Table 1. Annual Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Date	Extraction Well DW-7S Parameters					Extraction Well DW-7D Parameters				
	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	90	-21	44	NM	-1.5	7.0	-22	49	NM	-0.50
06/07/10	100	-19	63	NM	-1.7	9.0	-8.5	65	NM	-0.42
08/30/10	95	-19	69	NM	-1.7	15	-8.5	70	NM	-0.62
12/03/10	90	-20	51	NM	-1.6	12	-15	50	NM	-0.52

Date	Extraction Well DW-3S Parameters					Extraction Well DW-3D Parameters				
	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	6.5	-4.6	49	NM	-0.30	10	-7.0	47	NM	-0.40
06/07/10	5.0	-7.0	66	NM	-0.24	10	-7.0	64	NM	-0.37
08/30/10	6.0	-4.5	72	NM	-0.23	10	-6.0	70	NM	-0.35
12/03/10	7.0	-4.8	51	NM	-0.25	10	-6.5	51	NM	-0.37

Date	Extraction Well DW-5S Parameters					Extraction Well DW-5D Parameters				
	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	65	-24	45	NM	-1.6	14	-11	47	NM	-3.4
06/07/10	85	-17	62	NM	-1.4	16	-10	64	NM	-2.3
08/30/10	85	-16	69	NM	-1.4	14	-9.0	70	NM	-2.1
12/03/10	92	-19	51	NM	-1.5	14	-10	51	NM	-2.3

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. The system has been operating with Blower BL-300 online only since May 5, 2009.
2. Totalizers not recording flow due to fouling. There was no condensate collected in Storage Tank ST-510 between December 2, 2009 and March 11, 2010.
3. Readings shown were collected between March 11, and 12, 2010.
4. Totalizers were removed, cleaned and reinstalled on March 30, 2010.
5. 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. For the June 7, 2010 monitoring event, the total effluent flow rate was measured directly in standard cubic feet per minute using a hand-held anemometer.

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Table 1. Annual 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					Extraction Well DW-6D Parameters					Extraction Well DW-1S Parameters				
	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)
03/12/10[(3)]	90	-16	46	NM	-1.9	6.4	-5.0	48	NM	-1.7	87	-22	46	NM	-2.4
06/07/10	75	-17	63	NM	-1.5	5.8	-5.4	65	NM	-1.4	73	-21	63	NM	-1.8
08/30/10	75	-16	69	NM	-1.8	5.8	-5.0	72	NM	-1.2	75	-21	68	NM	-1.5
12/03/10	90	-19	51	NM	-1.7	6.3	-5.1	51	NM	-1.3	95	-24	53	NM	-2.0

Date	Extraction Well DW-1D Parameters					Extraction Well DW-4S Parameters					Extraction Well DW-4D Parameters				
	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)
03/12/10[(3)]	6.1	-3.4	50	NM	-1.5	85	-16	47	NM	-1.6	8.0	-6.0	49	NM	-0.86
06/07/10	5.7	-3.6	65	NM	-2.1	71	-16	63	NM	-1.5	6.0	-8.2	64	NM	-0.71
08/30/10	5.6	-3.2	72	NM	-1.6	70	-15	68	NM	-1.4	8.0	-5.5	71	NM	-0.61
12/03/10	6.3	-3.3	51	NM	-1.8	81	-16	52	NM	-1.6	6.8	-7.8	51	NM	-0.72

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.

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Table 1. Annual 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					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)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	80	-25	47	NM	-2.4	33	-14	49	NM	-1.4
06/07/10	85	-23	63	NM	-2.4	28	-14	64	NM	-1.2
08/30/10	82	-22	68	NM	-2.4	27	-13	68	NM	-1.1
12/03/10	70	-24	52	NM	-2.2	34	-14	53	NM	-1.3

	Extraction Well DW-2S Parameters					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)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	31	-23	49	NM	-1.9	38	-24	47	NM	-2.5
06/07/10	34	-18	63	NM	-1.5	35	-24	63	NM	-2.5
08/30/10	32	-20	68	NM	-1.6	35	-21	68	NM	-2.2
12/03/10	30	-21	53	NM	-1.8	35	-24	52	NM	-2.3

	Extraction Well DW-10S Parameters					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)	Flow Rate at Manifold (scfm)	Vacuum at Manifold (iwc)	Temperature at Manifold (°F)	PID Measured Concentration (ppmv)	Wellhead Vacuum (iwc)
03/12/10(3)	40	-18	47	NM	-1.8	36	-27	47	NM	-2.8
06/07/10	32	-15	64	NM	-1.9	33	-24	64	NM	-2.4
08/30/10	35	-14	68	NM	-1.9	32	-23	68	NM	-2.5
12/03/10	35	-18	52	NM	-0.69	15	-27	52	NM	-0.68

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.

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Table 1. Annual 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[5]	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)
03/12/10[3]	0	-30	0	132.67[2]	9,996,202.83[2]	36.94[2]	NM	NM	NM	NM	-32.5	2.0	NM	NM	NM	NM	NM	NM	606.28	0.00	85.0	2.2	76	NM	NM	NM	53.24	NM	49.20	38.12	18.50
06/07/10	0	-27	0	132.67[4]	9,996,213.94[4]	36.94[4]	NM	NM	NM	NM	-31.0	2.0	NM	NM	NM	NM	NM	NM	666.16	0.00	105	2.0	95	NM	NM	NM	51.20	46.72	51.31	38.14	18.43
08/30/10	0	-26	0	132.67	9,996,252.73	36.94	NM	NM	NM	NM	-31.0	2.0	NM	NM	NM	NM	NM	NM	587.45	0.00	110	2.1	102	NM	NM	NM	52.20	49.00	53.31	38.10	18.40
12/03/10	0	-29	0	132.67	9,996,253.84	36.94	NM	NM	NM	NM	-34.0	2.0	NM	NM	NM	NM	NM	NM	604.27	0.00	80.0	2.5	72	NM	NM	NM	53.50	49.30	52.30	38.12	18.32

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.

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Table 2. Annual 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]
03/12/10 [5]	-0.097	-0.164	-0.161	NM	NM	NM	-0.200	NM	NM	-0.134	-0.166	-0.154	-0.122	NM	NM	NM	-0.153	NM	NM	-0.166	NM	NM	NM	-0.169
06/07/10	-0.119	-0.190	-0.190	NM	NM	NM	-0.130	NM	NM	-0.144	-0.133	-0.129	-0.140	NM	NM	NM	-0.127	NM	NM	-0.132	NM	NM	NM	-0.133
08/30/10	-0.103	-0.178	-0.178	NM	NM	NM	-0.105	NM	NM	-0.125	-0.130	-0.137	-0.140	NM	NM	NM	-0.115	NM	NM	-0.123	NM	NM	NM	-0.135
12/03/10	-0.106	-0.185	-0.190	NM	NM	NM	-0.126	NM	NM	-0.127	-0.141	-0.140	-0.144	NM	NM	NM	-0.142	NM	NM	-0.135	NM	NM	NM	-0.135
Time Weighted[4] Rolling Average:	-0.11	-0.18	-0.18	NA	NA	NA	-0.13	NA	NA	-0.13	-0.14	-0.14	-0.14	NA	NA	NA	-0.13	NA	NA	-0.13	NA	NA	NA	-0.14

Gross Average Compliance Points[6]

12/03/10	-0.13

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).
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 geometric mean of two consecutive quarterly induced vacuum readings and the number of days between the readings for a 12-month monitoring period, and dividing by the total time period between the first and last quarterly induced vacuum readings
5. Readings shown were collected between March 11, and 12, 2010.
6. Gross average compliance points calculated by summing the induced vacuum values for the noted monitoring event and dividing by the number of readings.

Table 2. Annual 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]
03/12/10 [5]	NM	NM	NM	-0.185	-0.303	-0.208	-0.221	NM	NM	NM	-0.121	NM	NM	NM	-0.136	NM	NM	NM	NM	-0.253	-0.313	-0.129	-0.154
06/07/10	NM	NM	NM	-0.199	-0.200	-0.175	-0.200	NM	NM	NM	-0.120	NM	NM	NM	-0.130	NM	NM	NM	NM	-0.230	-0.190	-0.100	-0.170
08/30/10	NM	NM	NM	-0.206	-0.185	-0.170	-0.184	NM	NM	NM	-0.095	NM	NM	NM	-0.117	NM	NM	NM	NM	-0.130	-0.154	-0.093	-0.117
12/03/10	NM	NM	NM	-0.155	-0.120	-0.125	-0.175	NM	NM	NM	-0.091	NM	NM	NM	-0.112	NM	NM	NM	NM	-0.140	-0.099	-0.054	-0.255
Time Weighted[4] Rolling Average:	NA	NA	NA	-0.19	-0.19	-0.17	-0.19	NA	NA	NA	-0.11	NA	NA	NA	-0.12	NA	NA	NA	NA	-0.18	-0.18	-0.09	-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).
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 geometric mean of two consecutive quarterly induced vacuum readings and the number of days between the readings for a 12-month monitoring period, and dividing by the total time period between the first and last quarterly induced vacuum readings
5. Readings shown were collected between March 11, and 12, 2010.
6. Gross average compliance points calculated by summing the induced vacuum values for the noted monitoring event and dividing by the number of readings.

Table 3. Annual 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)	CAS No.	SGC	Location ID: VSP-601 Sample Date: 3/12/2010	VSP-601 6/7/2010	VSP-601 8/30/2010	VSP-601 1/5/2011[6]
1,1,1-Trichloroethane	71-55-6	68,000	**18**	**12**	**22**	**17**
1,1-Dichloroethane	75-34-3	NS	**14**	**10**	**17**	**16**
1,1-Dichloroethene	75-35-4	380[4]	**5.2**	< 4.2	< 7.2	**5.5**
Benzene	71-43-2	1,300	**57**	**160**	< 7.2	< 1.5
Carbon Tetrachloride	56-23-5	1,900	**0.77**	< 4.2	< 7.2	< 1.5
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	**2.7**	< 4.2	< 7.2	**2.4**
Chloroform	67-66-3	150	**16**	**14**	**110**	**63**
cis-1,2-Dichloroethene	156-59-2	190,000[5]	**570 D**	**770**	**850**	**590 D**
Freon 113	76-13-1	960,000	**0.73**	< 4.2	< 7.2	< 1.5
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	**4.3**	< 4.2	< 7.2	**3.0**
Tetrachloroethene	127-18-4	1,000	**15**	**28**	**43**	**17**
Toluene	108-88-3	37,000	**1.3**	< 4.2	< 7.2	< 1.5
trans-1,2-Dichloroethene	156-60-5	190,000[5]	**8.0**	**5.0**	**10**	**5.5**
Trichloroethylene	79-01-6	14,000	**540 D**	**730**	**1,100**	**630 D**
Vinyl Chloride	75-01-4	180,000	**2.1**	< 4.2	< 7.2	**1.7**
Chlorodifluoromethane (Freon 22)	75-45-6	NS	**300 D**	**120**	**150**	**91**
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	NS	**340 D**	**690**	**670**	**170**
TVOC[3]			**1,895**	**2,539**	**2,972**	**1,612**

Notes and abbreviations on last page.

Table 3. Annual 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.
SGC Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
NS Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007. 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 September 10, 2007.
D Compound detected at a secondary dilution.
DAR-1 Division of Air Resources-1.
AGC Annual guideline concentration.

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 prior year up to and including the current quarter.
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 September 10, 2007. 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 µg/m^3 / 4.2 = approximately 380 µg/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 September 10, 2007.
5. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. 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 µg/m^3 / 4.2 = approximately 190,000 µg/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 September 10, 2007.
6. Analytical results from the total effluent vapor sample collected on December 3, 2010 indicated a sample collection or laboratory error; therefore, the December 3, 2010 total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent vapor sample was recollected on January 5, 2011.

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Table 4. Annual 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)	Location ID: Sample Date:	ST-510 Quarter 1 2010	ST-510 Quarter 2 2010	ST-510 Quarter 3 2010	ST-510 Quarter 4 2010
	CAS No.				
2-Butanone	78-93-3				
Acetone	67-64-1				
cis-1,2-Dichloroethene	156-59-2				
Isopropylbenzene	98-82-8	No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter
Trichloroethylene	79-01-6				
Benzene	71-43-2				
Chloroethane	75-00-3				
Chloromethane	74-87-3				
TVOC[3]		**NA**	**NA**	**NA**	**NA**

Notes and abbreviations:

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

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 the period from January to December 2010.
2. Table summarizes historically detected compounds only.
3. TVOC determined by summing individual detections and rounding to the nearest whole number.

Table 5. Annual 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]				Cumulative % MASC[4]
		3/12/2010	6/7/2010	8/30/2010	1/5/2011 [5]	
1,1,1-Trichloroethane	1,000	0.00%	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.63	0.07%	0.05%	0.08%	0.08%	0.07%
1,1-Dichloroethene	70	0.00%	0.00%	0.00%	0.00%	0.00%
Benzene	0.13	1.35%	4.10%	0.00%	0.00%	0.68%
Carbon Tetrachloride	0.067	0.04%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (CFC-11)	1,000	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	1.15%	1.08%	7.95%	4.48%	3.70%
cis-1,2-Dichloroethylene	63	0.03%	0.04%	0.04%	0.03%	0.04%
Freon 113	180,000	0.00%	0.00%	0.00%	0.00%	0.00%
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.00%
Tetrachloroethylene	1	0.05%	0.09%	0.13%	0.05%	0.08%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%
Trichloroethylene	0.5	3.32%	4.86%	6.84%	3.86%	4.99%
Vinyl chloride	0.11	0.06%	0.00%	0.00%	0.05%	0.00%
Chlorodifluoromethane (Freon 22)	50,000	0.00%	0.00%	0.00%	0.00%	0.00%
1-Chloro-1,1-difluoroethane (Freon 142b)	50,000	0.00%	0.00%	0.00%	0.00%	0.00%

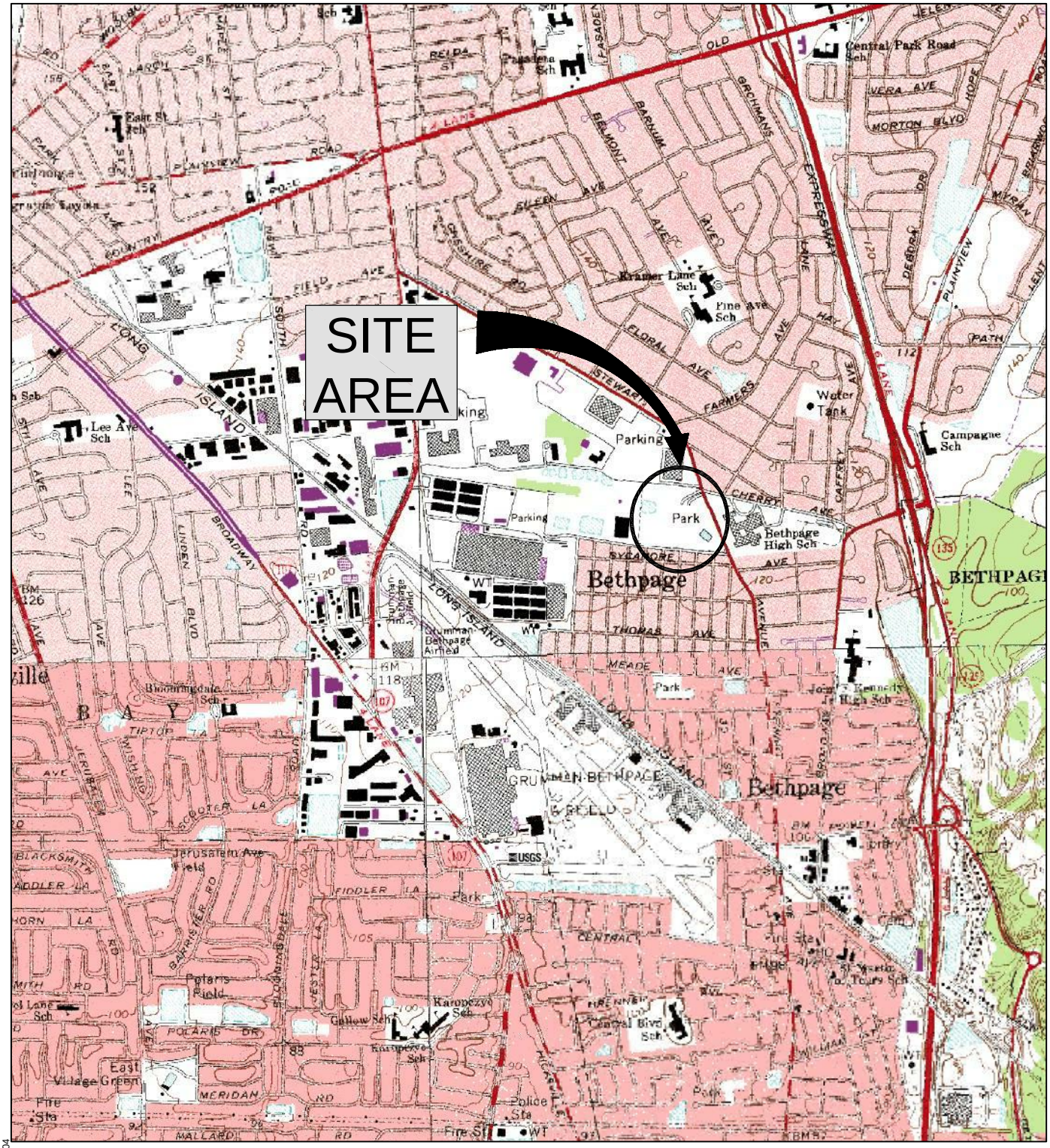
Notes and abbreviations on next page.

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

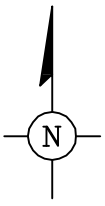
Notes and Abbreviations:

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

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 September 10, 2007. 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.
5. Analytical results from the total effluent vapor sample collected on December 3, 2010 indicated a sample collection or laboratory error; therefore, the December 3, 2010 total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent vapor sample was recollected on January 5, 2011.



QUADRANGLE LOCATION



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

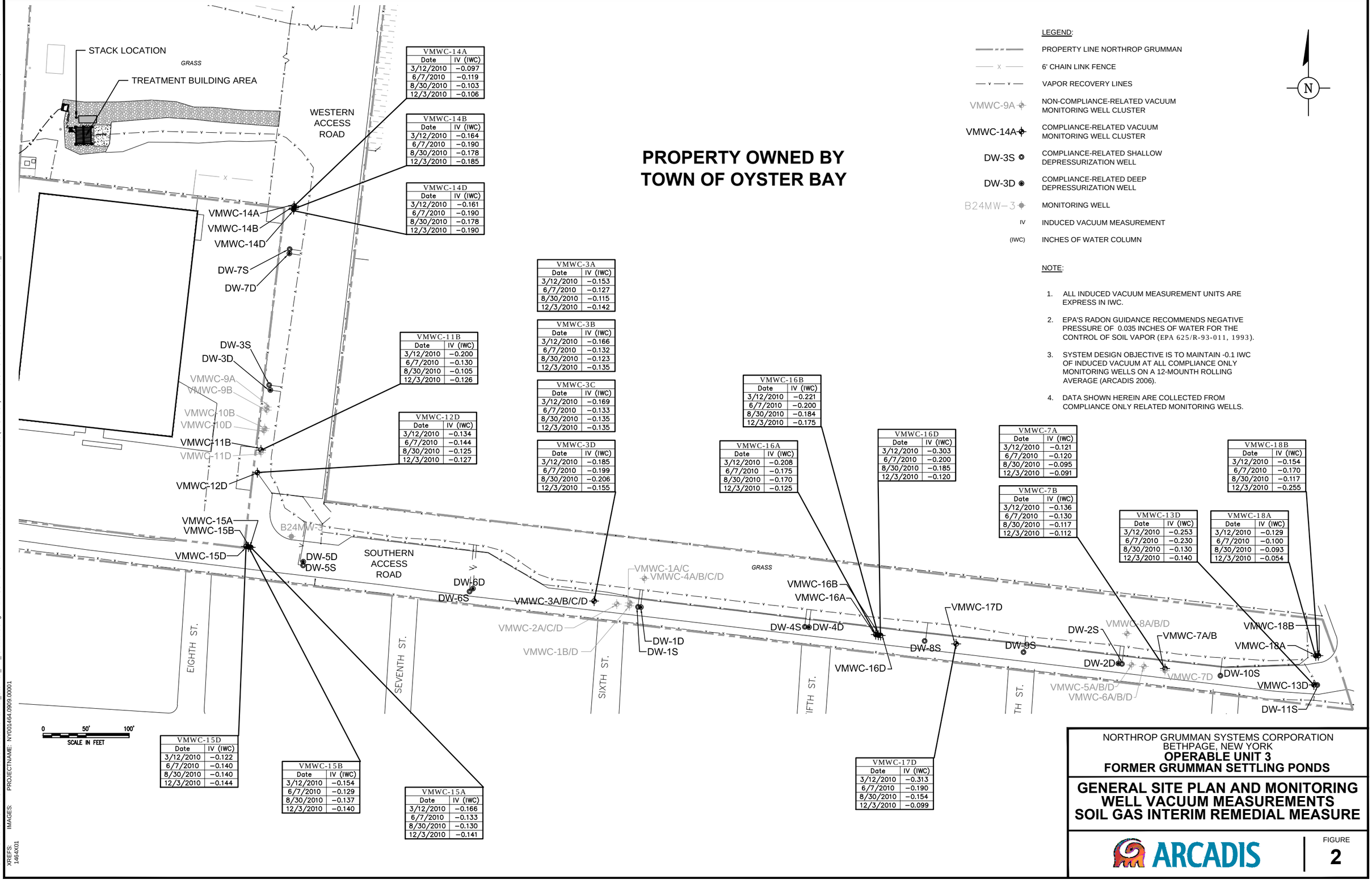
OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS

SITE LOCATION MAP
SOIL GAS INTERIM REMEDIAL MEASURE

ARCADIS

FIGURE
1

CITY:MELVILLE-NY DIV/GROUP:ENV cad DB:ALS LD: PIC: PM:CSG TM:KZ LYR:ON=*;OFF=*REF*
G:\ENVCAD\Melville-NY\NY001464\1407\0008\OM&M\01_Location Map.dwg LAYOUT: 1 SAVED: 2/6/2009 10:42 AM ACADVER: 17.1S (LMS TECH) PAGESETUP: ---PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 2/16/2009 3:00 PM BY: SANCHEZ, ADRIAN
XREFS:
PROJECTNAME: NY001464.0908.00004



VMWC-14A	
Date	IV (IWC)
3/12/2010	−0.097
6/7/2010	−0.119
8/30/2010	−0.103
12/3/2010	−0.106

VMWC-14B	
Date	IV (IWC)
3/12/2010	−0.164
6/7/2010	−0.190
8/30/2010	−0.178
12/3/2010	−0.185

VMWC-14D	
Date	IV (IWC)
3/12/2010	−0.161
6/7/2010	−0.190
8/30/2010	−0.178
12/3/2010	−0.190

VMWC-11B	
Date	IV (IWC)
3/12/2010	−0.200
6/7/2010	−0.130
8/30/2010	−0.105
12/3/2010	−0.126

VMWC-12D	
Date	IV (IWC)
3/12/2010	−0.134
6/7/2010	−0.144
8/30/2010	−0.125
12/3/2010	−0.127

VMWC-15D	
Date	IV (IWC)
3/12/2010	−0.122
6/7/2010	−0.140
8/30/2010	−0.140
12/3/2010	−0.144

VMWC-15B	
Date	IV (IWC)
3/12/2010	−0.154
6/7/2010	−0.129
8/30/2010	−0.137
12/3/2010	−0.140

VMWC-15A	
Date	IV (IWC)
3/12/2010	−0.166
6/7/2010	−0.133
8/30/2010	−0.130
12/3/2010	−0.141

VMWC-3A	
Date	IV (IWC)
3/12/2010	−0.153
6/7/2010	−0.127
8/30/2010	−0.115
12/3/2010	−0.142

VMWC-3B	
Date	IV (IWC)
3/12/2010	−0.166
6/7/2010	−0.132
8/30/2010	−0.123
12/3/2010	−0.135

VMWC-3C	
Date	IV (IWC)
3/12/2010	−0.169
6/7/2010	−0.133
8/30/2010	−0.135
12/3/2010	−0.135

VMWC-3D	
Date	IV (IWC)
3/12/2010	−0.185
6/7/2010	−0.199
8/30/2010	−0.206
12/3/2010	−0.155

VMWC-16B	
Date	IV (IWC)
3/12/2010	−0.221
6/7/2010	−0.200
8/30/2010	−0.184
12/3/2010	−0.175

VMWC-16A	
Date	IV (IWC)
3/12/2010	−0.208
6/7/2010	−0.175
8/30/2010	−0.170
12/3/2010	−0.125

VMWC-16D	
Date	IV (IWC)
3/12/2010	−0.303
6/7/2010	−0.200
8/30/2010	−0.185
12/3/2010	−0.120

VMWC-17D	
Date	IV (IWC)
3/12/2010	−0.313
6/7/2010	−0.190
8/30/2010	−0.154
12/3/2010	−0.099

VMWC-7A	
Date	IV (IWC)
3/12/2010	−0.121
6/7/2010	−0.120
8/30/2010	−0.095
12/3/2010	−0.091

VMWC-7B	
Date	IV (IWC)
3/12/2010	−0.136
6/7/2010	−0.130
8/30/2010	−0.117
12/3/2010	−0.112

VMWC-13D	
Date	IV (IWC)
3/12/2010	−0.253
6/7/2010	−0.230
8/30/2010	−0.130
12/3/2010	−0.140

VMWC-18B	
Date	IV (IWC)
3/12/2010	−0.154
6/7/2010	−0.170
8/30/2010	−0.117
12/3/2010	−0.255

VMWC-18A	
Date	IV (IWC)
3/12/2010	−0.129
6/7/2010	−0.100
8/30/2010	−0.093
12/3/2010	−0.054

PROPERTY OWNED BY TOWN OF OYSTER BAY

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

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 2006).
4. DATA SHOWN HEREIN ARE COLLECTED FROM COMPLIANCE ONLY RELATED MONITORING WELLS.

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:ENVcad DB:ALS LD: PIC: PM:CSG TM: LYR:ON=*;OFF=*REF* STATUS: IMAGES: PROJECTNAME: NY001464.0909.00001
G:\ENVCAD\Melville-NY\ACTIVITY\001496\09100\0001\IOM&M\02_Site Plan_IVR_rev122210.dwg LAYOUT: 2 SAVED: 12/23/2010 10:01 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 12/23/2010 10:05 AM BY: SANCHEZ, ADRIAN
XREFS: 1464X01

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

ARCADIS

Appendix **A**

Annual Summary of Vapor Sample Analytical Results Including Tentatively Identified Compounds

Appendix A-1. Annual 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)	Location ID: / Sample Date:	VSP-601 3/12/2010	VSP-601 6/7/2010	VSP-601 8/30/2010	VSP-601 1/5/2011[3]
	CAS No.				
1,1,1-Trichloroethane	71-55-6	**18**	**12**	**22**	**17**
1,1,2,2-Tetrachloroethane	79-34-5	< 0.73	< 4.2	< 7.2	< 1.5
1,1,2-Trichloroethane	79-00-5	< 0.73	< 4.2	< 7.2	< 1.5
1,1-Dichloroethane	75-34-3	**14**	**10**	**17**	**16**
1,1-Dichloroethene	75-35-4	**5.2**	< 4.2	< 7.2	**5.5**
1,2-Dichloroethane	107-06-2	< 0.73	< 4.2	< 7.2	< 1.5
1,2-Dichloropropane	78-87-5	< 0.73	< 4.2	< 7.2	< 1.5
1,3-Butadiene	106-99-0	< 0.73	< 4.2	< 7.2	< 1.5
2-Butanone	78-93-3	< 7.3	< 42	< 72	< 15
2-Hexanone	591-78-6	< 0.73	< 4.2	< 7.2	< 1.5
4-Methyl-2-Pentanone	108-10-1	< 0.73	< 4.2	< 7.2	< 1.5
Acetone	67-64-1	< 7.3	< 42	< 72	< 15
Benzene	71-43-2	**57**	**160**	< 7.2	< 1.5
Bromodichloromethane	75-27-4	< 0.73	< 4.2	< 7.2	< 1.5
Bromoform	75-25-2	< 0.73	< 4.2	< 7.2	< 1.5
Bromomethane	74-83-9	< 0.73	< 4.2	< 7.2	< 1.5
Carbon Disulfide	75-15-0	< 7.3	< 42	< 72	< 15
Carbon Tetrachloride	56-23-5	**0.77**	< 4.2	< 7.2	< 1.5
Trichlorofluoromethane (CFC-11)	75-69-4	**2.7**	< 4.2	< 7.2	**2.4**
Chlorobenzene	108-90-7	< 0.73	< 4.2	< 7.2	< 1.5
Chlorodibromomethane	124-48-1	< 0.73	< 4.2	< 7.2	< 1.5
Chloroethane	75-00-3	< 0.73	< 4.2	< 7.2	< 1.5
Chloroform	67-66-3	**16**	**14**	**110**	**63**
Chloromethane	74-87-3	< 0.73	< 4.2	< 7.2	< 1.5
cis-1,2-Dichloroethene	156-59-2	**570 D**	**770**	**850**	**590 D**
cis-1,3-Dichloropropene	10061-01-5	< 0.73	< 4.2	< 7.2	< 1.5
Ethylbenzene	100-41-4	< 0.73	< 4.2	< 7.2	< 1.5
Trichlorotrifluoroethane (Freon 113)	76-13-1	**0.73**	< 4.2	< 7.2	< 1.5
Dichlorodifluoromethane (Freon 12)	75-71-8	**4.3**	< 4.2	< 7.2	**3.0**
Methyl Tert-Butyl Ether	1634-04-4	< 0.73	< 4.2	< 7.2	< 1.5
Methylene Chloride	75-09-2	< 0.73	< 4.2	< 7.2	< 1.5
Styrene	100-42-5	< 0.73	< 4.2	< 7.2	< 1.5
Tetrachloroethene	127-18-4	**15**	**28**	**43**	**17**
Toluene	108-88-3	**1.3**	< 4.2	< 7.2	< 1.5
trans-1,2-Dichloroethene	156-60-5	**8.0**	**5.0**	**10**	**5.5**
trans-1,3-Dichloropropene	10061-02-6	< 0.73	< 4.2	< 7.2	< 1.5
Trichloroethylene	79-01-6	**540 D**	**730**	**1,100**	**630 D**
Vinyl Chloride	75-01-4	**2.1**	< 4.2	< 7.2	**1.7**
Xylene-o	95-47-6	< 0.73	< 4.2	< 7.2	< 1.5
Xylenes - m,p	179601-23-1	< 1.5	< 8.4	< 14	< 2.9
Chlorodifluoromethane (Freon 22)	75-45-6	**300 D**	**120**	**150**	**91**
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	**340 D**	**690**	**670**	**170**
TVOC[2]		**1,895**	**2,539**	**2,972**	**1,612**

Notes and abbreviations on last page.

Appendix A-1. Annual 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.
D	Compound detected at a secondary dilution.

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 the period from January to December 2010.
2. TVOC determined by summing individual detections and rounding to the nearest whole number.
3. Analytical results from the total effluent vapor sample collected on December 3, 2010 indicated a sample collection or laboratory error; therefore, the December 3, 2010total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent vapor sample was recollected on January 5, 2011.

ARCADIS

Appendix A-2. Annual 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]

Location ID:	VSP-601	VSP-601	VSP-601	VSP-601
Sample Date:	3/12/2010	6/7/2010	8/30/2010	1/5/2011[4]
Units:	ppbv	ppbv	ppbv	ppbv
2-Butoxyethanol	**1.1**	--	No Tentatively Identified Compounds Detected	No Tentatively Identified Compounds Detected
alpha-Cumyl Alcohol	**1.4**	**10 JN**		
Acetophenone	**2.2**	**9.2 JN**		
Benzaldehyde	**0.90**	--		
alpha-Methylstyrene	**1.5**	**6.4 JN**		
Hexamethyl Cyclotrisloxane	**0.65**	**69 JN**		
Isobutane	**2.5**	--		
C_7H_{10} Compound	--	NA		
C_8H_{18} Compound	--	NA		
Unidentified Siloxane	--	NA		
Unidentified Siloxane	--	NA		

Notes and Abbreviations:

Bold	Detected.
ppbv	Parts per billion by volume.
--	Not detected.
JN	Compound tentatively identified, concentration is estimated.
NA	Unidentified compound detected but estimated concentration cannot be calculated.

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 the period from January to December 2010.
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. Analytical results from the total effluent vapor sample collected on December 3, 2010 indicated a sample collection or laboratory error; therefore, the December 3, 2010total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent vapor sample was recollected on January 5, 2011.

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Appendix **B**

Annual Summary of Condensate Sample Analytical Results Including Tentatively Identified Compounds

Appendix B-1. Annual 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 (units in µg/L)	Location ID: Sample Date:	ST-510 Quarter 1 2010	ST-510 Quarter 2 2010	ST-510 Quarter 3 2010	ST-510 Quarter 4 2010
	CAS No.				
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				
Trichlorofluoromethane (CFC-11)	75-69-4				
Chlorobenzene	108-90-7	No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter
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[2]		**NA**	**NA**	**NA**	**NA**

Notes and abbreviations on last page.

Appendix B-1. Annual 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:

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

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 the period from January to December 2010.
2. TVOC determined by summing individual detections and rounding to the nearest whole number.

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Appendix B-2. Annual 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]

Tentatively Identified Compounds (units in µg/L)	Sample ID:	ST-510	ST-510	ST-510	ST-510
	Date:	Quarter 1 2010	Quarter 2 2010	Quarter 3 2010	Quarter 4 2010
Unknown Ethanol Furan, tetrahydro- Unknown alcohol Cyclohexanone Isoproply Alcohol Butanal Heptanal 1-Hexanol, 2-ethyl-		No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter	No Sampling During This Quarter

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 the period from January to December 2010.
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 **C**

Annual Summary of Air Modeling Calculations

Table C-1. Annual 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:	3/12/2010	6/7/2010	8/30/2010	12/3/2010
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)		606	666	587	604
Air Flow Rate (acfm @ stack temp)(2)		613	697	623	606
Stack Gas Exit Temperature (K)(1)		298	308	312	295
Ambient Air Temperature (K)(3)		279	287	299	277
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)		1,330	1,265	1,321	1,337
Annualization Factor(6)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(7)		106.4	101.2	105.7	107.0
Distance To Max Concentration (m)(8)		44	45	44	44

Notes and abbreviations on next page.

Table C-1. Annual 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:

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.

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. Annual 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)			
	3/12/2010	6/7/2010	8/30/2010	1/5/2011[5]
1,1,1-Trichloroethane	18	12	22	17
1,1-Dichloroethane	14	10	17	16
1,1-Dichloroethene	5.2	0	0	5.5
Benzene	57	160	0	0
Carbon tetrachloride	0.77	0	0	0
Trichlorofluoromethane (CFC-11)	2.7	0	0	2.4
Chloroform	16	14	110	63
cis-1,2-Dichloroethylene	570	770	850	590
Freon 113	0.73	0	0	0
Dichlorodifluoromethane (Freon 12)	4.3	0	0	3.0
Tetrachloroethylene	15	28	43	17
Toluene	1.3	0	0	0
trans-1,2-Dichloroethene	8.0	5.0	10	5.5
Trichloroethylene	540	730	1,100	630
Vinyl chloride	2.1	0	0	1.7
Chlorodifluoromethane (Freon 22)	300	120	150	91
1-Chloro-1,1-difluoroethane (Freon 142b)	340	690	670	170

Notes and abbreviations on last page.

Table C-2. Annual 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] ($\mu g/m^3$)			
		3/12/2010	6/7/2010	8/30/2010	1/5/2011[5]
1,1,1-Trichloroethane	1,000	3.25E+07	3.00E+07	3.22E+07	3.27E+07
1,1-Dichloroethane	0.63	2.05E+04	1.89E+04	2.03E+04	2.06E+04
1,1-Dichloroethene	70	2.27E+06	2.10E+06	2.25E+06	2.29E+06
Benzene	0.13	4.22E+03	3.91E+03	4.18E+03	4.25E+03
Carbon tetrachloride	0.067	2.18E+03	2.01E+03	2.16E+03	2.19E+03
Trichlorofluoromethane (CFC-11)	1,000	3.25E+07	3.00E+07	3.22E+07	3.27E+07
Chloroform	0.043	1.40E+03	1.29E+03	1.38E+03	1.41E+03
cis-1,2-Dichloroethylene	63	2.05E+06	1.89E+06	2.03E+06	2.06E+06
Freon 113	180,000	5.85E+09	5.41E+09	5.79E+09	5.88E+09
Dichlorodifluoromethane (Freon 12)	12,000	3.90E+08	3.60E+08	3.86E+08	3.92E+08
Tetrachloroethylene	1	3.25E+04	3.00E+04	3.22E+04	3.27E+04
Toluene	5,000	1.62E+08	1.50E+08	1.61E+08	1.63E+08
trans-1,2-Dichloroethene	63	2.05E+06	1.89E+06	2.03E+06	2.06E+06
Trichloroethylene	0.5	1.62E+04	1.50E+04	1.61E+04	1.63E+04
Vinyl chloride	0.11	3.57E+03	3.30E+03	3.54E+03	3.59E+03
Chlorodifluoromethane (Freon 22)	50,000	1.62E+09	1.50E+09	1.61E+09	1.63E+09
1-Chloro-1,1-difluoroethane (Freon 142b)	50,000	1.62E+09	1.50E+09	1.61E+09	1.63E+09

Notes and abbreviations on last page.

Table C-2. Annual 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]			
	3/12/2010	6/7/2010	8/30/2010	1/5/2011[5]
1,1,1-Trichloroethane	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.07%	0.05%	0.08%	0.08%
1,1-Dichloroethene	0.00%	0.00%	0.00%	0.00%
Benzene	1.35%	4.10%	0.00%	0.00%
Carbon tetrachloride	0.04%	0.00%	0.00%	0.00%
Trichlorofluoromethane (CFC-11)	0.00%	0.00%	0.00%	0.00%
Chloroform	1.15%	1.08%	7.95%	4.48%
cis-1,2-Dichloroethylene	0.03%	0.04%	0.04%	0.03%
Freon 113	0.00%	0.00%	0.00%	0.00%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%
Tetrachloroethylene	0.05%	0.09%	0.13%	0.05%
Toluene	0.00%	0.00%	0.00%	0.00%
trans-1,2-Dichloroethene	0.00%	0.00%	0.00%	0.00%
Trichloroethylene	3.32%	4.86%	6.84%	3.86%
Vinyl chloride	0.06%	0.00%	0.00%	0.05%
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. Annual 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:

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

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.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
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. Analytical results from the total effluent vapor sample collected on December 3, 2010 indicated a sample collection or laboratory error; therefore, the December 3, 2010 total effluent vapor sample results were qualified as unusable. Accordingly, the total effluent vapor sample was recollected on January 5, 2011.