

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

July through September 2010

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

NYSDEC ID # 1-30-003A

November 2010



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Maintenance, and Monitoring
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Interim Remedial Measure**

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NYSDEC ID# 1-30-003A

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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) Groundwater Interim Remedial Measure (Groundwater 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, is referred to herein as the Site. A Site Location Map is provided on Figure 1.

Full-time operation (i.e., system start-up) of the Groundwater IRM began on July 21, 2009. This quarterly OM&M report summarizes the Groundwater IRM OM&M activities performed between July 1, 2010 and September 30, 2010 (i.e., the “reporting period”). During this reporting period, the Remedial System and Environmental Effectiveness Monitoring Programs were completed in accordance with the NYSDEC-approved OU3 Groundwater IRM System Start-up Workplan (NYSDEC 2009b).

As discussed in the OU3 Site Area Remedial Investigation Report (ARCADIS 2008a), Northrop Grumman does not take responsibility for Freon 12 and Freon 22 present at the Site. Throughout this report, a distinction is made between the “project” and “non-project” Volatile Organic Compounds (VOCs); which are defined as follows:

- “Project VOCs” are VOCs that may be related to former Grumman historical activities. For this report, Project VOCs are the VOCs listed in the Interim State Pollutant Elimination Discharge System (SPDES) permit equivalency (NYSDEC 2009a), plus Toluene and Benzene. A list of “Project VOCs” is provided in various tables throughout this report.
- “Non-project VOCs” are VOCs, such as Freon 12 and Freon 22 that are not related to former Grumman activities but have been detected at the Site.

2. Groundwater Interim Remedial Measure Objectives

The remedial action objectives (RAOs) for the Groundwater IRM are as follows:

- Mitigate the off-site migration of project-related, dissolved-phase VOCs. Specifically, the Groundwater IRM addresses:
 - Groundwater that has total volatile organic compound (TVOC) concentrations greater than 5 micrograms per liter (ug/L) in the upper 20 feet of the surficial aquifer across the 1,200-foot wide lateral extent of the southern Site boundary.
 - Groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations greater than 50 ug/L.
- Comply with applicable NYSDEC standards, criteria and guidance values (SCGs) for treated water and air emissions.

A secondary benefit of the Groundwater IRM is the creation of a clean-water front atop the downgradient groundwater, which minimizes the potential for vapor intrusion downgradient of the Site.

3. Groundwater Interim Remedial Measure Description

The Groundwater IRM consists of:

- A “pump-and-treat system” where groundwater is:
 - Extracted along the southern portion of the Northrop Grumman Former Plant 24 Access Road via four remedial wells.
 - Conveyed to a treatment plant at McKay Field via four underground pipelines.
 - Treated via air stripping to reduce concentrations of Project and Non-Project VOCs.
 - Filtered to remove oxidized metals.
 - Returned to the aquifer, via a discharge pipeline routed to a recharge basin located on the adjacent former Navy Weapons Industrial Reserve Plant (NWIRP) property.
- A vapor phase treatment system to reduce concentrations of Project VOCs in the air stripper off-gas prior to discharge to the atmosphere.

- A Groundwater Monitoring Network that is periodically monitored to assess the environmental effectiveness of the Groundwater IRM.

The major components of the Groundwater IRM are briefly described below; additional information is provided in the Draft Groundwater IRM OM&M Manual (OM&M Manual [ARCADIS 2009b]). The layout of the Groundwater IRM is shown on Figure 2 and a schematic drawing is provided on Figure 3. The location of the Groundwater Monitoring Network is shown on Figure 4.

Groundwater Extraction and Conveyance System

The GW IRM is designed to extract groundwater at a rate of approximately 210 gallons per minute (gpm) from four remedial wells (RW-1 through RW-4) located along the downgradient (i.e., southern) boundary of the Site (Figure 2). The individual design pumping rates for RW-1 through RW-4 are 30 gpm, 75gpm, 75 gpm, and 30 gpm, respectively. Each remedial well is equipped with a submersible pump; RW-1 and RW-4 have 3 horsepower (hp) pumps and RW-2 and RW-3 have 7.5 hp pumps. Remedial Well construction details are summarized in Table A-1 (Appendix A).

Extracted groundwater is conveyed to the treatment plant via four underground influent pipelines, one for each Remedial Well. RW-1 and RW-4 have 2-inch diameter high-density polyethylene (HDPE) pipelines and RW-2 and RW-4 have 3-inch diameter HDPE pipelines.

Groundwater Treatment

VOCs are removed from the extracted groundwater via a low-profile air stripper equipped with a 40 hp blower. Metals, such as iron, that oxidize during the air stripping process are removed from the air stripper effluent via bag filters. To eliminate the need to shut down the plant when the spent bag filters need replacement, two filter units are used so that when one unit is “on-line”, the other is in “stand by” mode. Each unit has eight bag filters.

Groundwater Discharge

Treated groundwater is pumped, using a 10 hp pump, from the air stripper to a stormwater manhole that discharges to a recharge basin on the adjacent, former Naval Weapons Industrial Reserve Plant (NWIRP) property, which is now owned by Nassau County. This discharge is permitted by Nassau County.

Air Stripper Off-gas Treatment

Project VOCs are removed from the air stripper off-gas using two 10,000 pound (lb), vapor phase granular activated carbon (VPGAC) emission control units (ECUs) and two 10,000 lb potassium permanganate-impregnated zeolite (PPZ) ECUs.

Groundwater Monitoring Network

The Groundwater Monitoring Network consists of 35 monitoring locations (i.e., 17 groundwater monitoring wells, 4 remedial wells, and 14 piezometers). Construction details for the monitoring wells and piezometers are provided in Appendix A. In accordance with the Groundwater IRM Environmental Effectiveness Monitoring Program, groundwater quality samples and depth-to-water measurements are periodically collected from the Groundwater Monitoring Network to assess the effectiveness of the Groundwater IRM.

4. Operation and Maintenance Activities

Groundwater IRM operation and maintenance (O&M) activities conducted during the reporting period are described below and summarized in Table 1:

- The system operated full-time 87 out of 92 days (95 percent uptime).
- The system was monitored during most business days, either via a site visit or remotely via the wireless computer link-up.
- The Supervisory Control and Data Acquisition (SCADA) system operated as designed, and when conditions warranted (see below), shut the system down automatically and instantaneously, and provided notification to plant operators of system advisories and alarms.
- The system shut down automatically for the alarm conditions listed below. Alarm conditions were responded to and the system restarted on the same day or early the following day (see Table 1 for details):
 - Blower Vacuum Alarm: A blower high-vacuum alarm shut the system down on July 5, 2010. After troubleshooting the alarm condition between July 5 and 7, 2010, the system was restarted without incident on July 7, 2010. The

blower alarm is believed to be due to fouling of the air stripper mist eliminator. The mist eliminator was replaced on August 12, 2010.

- High Effluent Water Pressure Alarm: A water effluent high-water pressure alarm shut the system down on July 11, 2010. The alarm was triggered when an automatic bag filter switch occurred before the spent bag filters in the off-line (stand by) filter were replaced. The spent bag filters were replaced with new ones and the system was restarted without incident on the same day.
- Building Sump High Water Level Alarms: Building sump high-water level alarms shut the system down on July 17 and August 15, 2010. The July 17, 2010 alarm condition was caused when an unusually large amount of condensation, generated by the hot and humid July weather, accumulated in the building sump. The sump was pumped down and the system restarted. The August 15, 2010 alarm condition occurred just after an automatic bag filter switch occurred. When the bag filters switched, treated water slowly leaked from a loose hose fitting. The water accumulated in the building sump, and ultimately created the alarm condition. The loose hose connection was repaired and the system restarted.
- Pump Low Pressure Alarm: A low-pressure alarm in the Remedial Well RW-3 pipeline shut the system down on September 8, 2010. The alarm was caused by iron fouling inside the well and by loss of pump effectiveness. The system was restarted the same day with Well RW-3 off-line. The RW-3 pump and motor were replaced and the well was brought back on-line on September 16, 2010.
- In addition to the unplanned shutdowns noted above, the system was shut down intentionally between August 12 and 13, 2010 to complete scheduled maintenance activities on the air stripper.

5. Treatment System Compliance and Performance Monitoring

5.1 System Monitoring Activities

The following compliance and performance monitoring events were performed in accordance with requirements of the OM&M Manual during this reporting period (see Appendix B, Table B-1 for a summary of the required compliance and performance monitoring program):

- Three monthly water sampling events and two air sampling events.
- Thirteen weekly site visits to monitor and record key system operational parameters.
- Continuous monitoring of key system operational parameters by the SCADA system.

One exception to the requirements in the OM&M Manual is that since February 8, 2010, as authorized by the NYSDEC, the pH monitoring frequency was reduced from weekly to monthly

In addition to the required monitoring, the following additional, non-routine monitoring activities were performed during this reporting period to assess system performance:

- The following additional water sampling was performed:
 - On July 20, 2010, RW-2 and RW-3 samples were analyzed for total iron (Fe).
 - On August 9, 2010, treatment system influent and effluent samples were analyzed for cadmium (Cd), chromium (Cr), and manganese (Mg).
- pH was measured at other locations besides the system effluent.
- The following additional vapor sampling was performed:
 - On August 10, 2010, system influent, VPGAC mid-train, VPGAC effluent/PPZ influent (system mid-train sample) and PPZ mid-train were sampled and analyzed for VOCs.
- System parameters were monitored and observed at numerous additional times during this reporting period.

Field and analytical data collected during these monitoring events were used to assess performance of the Groundwater IRM and to determine whether the system discharges were compliant with project objectives. System performance and compliance results are discussed in Sections 5.2 and 5.3, respectively, of this report.

5.2 System Monitoring Results

In accordance with the OM&M Manual, the following tables, graphs, and appendices were developed to summarize the system operation during the current reporting period:

- An Operational Summary, including monitoring events, system operational days, and noteworthy site activities (Table 1).
- Summary of Influent and Effluent Water Sample Analytical Results (Tables 2 and 3, respectively). Table 3 also provides the Groundwater IRM treatment system removal efficiency. Complete validated Water Sample Analytical Result Summaries, per sample event, are included in Appendix B.
- Summary of Influent and Effluent Vapor Sample Analytical Results (Tables 4 and 5, respectively). Table 5 also provides the Groundwater IRM treatment system removal efficiency. Complete, validated Vapor Sample Analytical Results, per sample event, are included in Appendix C.
- System Parameters, including flow rates, line pressures, and temperatures (Table 6).
- Summary of Groundwater Recovered and TVOC Mass Removed (Table 7).
- Air Discharge Quality Evaluation and Compliance Table (Appendix D and Table 8, respectively).
- Cumulative TVOC Mass Removed (Figure 5).
- Remedial Well and System Influent TVOC Concentrations (Figure 6).
- Influent Project, Non-Project, and Combined TVOC Concentrations (Figure 7).
- TVOC Mass Removal Rates (Figure 8).

5.3 Summary of OM&M Results

5.3.1 System Operation and Effectiveness

Groundwater IRM OM&M results for the current reporting period are summarized below:

- Total volume of groundwater recovered and treated (Table 7):
 - During this reporting period: Approximately 24 million gallons.
 - Project total (since July 2009, including groundwater pumped/treated during the system testing/troubleshooting phase): Approximately 121 million gallons.
- Total mass of VOCs recovered and estimated mass removal rates (Table 7):
 - During this reporting period: Approximately 155 pounds (lbs) of VOCs were recovered at an average rate of 1.9 lbs per day.
 - Project total (since July 2009, including groundwater pumped/treated during the system testing/troubleshooting phase): Approximately 880 lbs of VOCs were recovered.
- Total mass of VOCs recovered and estimated mass removal rates for each well during this reporting period (Table 7):
 - RW-1: Approximately 0.16 lbs of VOCs were recovered at an average rate of less than 0.01 lbs/day.
 - RW-2: Approximately 32 lbs of VOCs were recovered at an average rate of 0.39 lbs/day.
 - RW-3: Approximately 98 lbs of VOCs were recovered at an average rate of 1.2 lbs/day.
 - RW-4: Approximately 25 lbs of VOCs were recovered at an average rate of 0.30 lbs/day.
- During this reporting period:

- The concentration of Project VOCs in the system influent remains at an apparent constant concentration of approximately 133 ug/L, which is significantly lower (87% lower) than its peak concentration of 1,035 ug/L in July 2009 (Table 2 and Figure 7).
 - The concentration of Non-Project VOCs in the influent remains at an apparent constant concentration of approximately 450 ug/L, which is approximately 30 percent less than its apparent peak concentration of ~ 650 ug/L in May 2010 (Table 2 and Figure 7).
 - The amount of Non-Project VOCs in the system influent continued to be more than 3 times greater than the amount of Project VOCs in the system influent, a trend that started between December 2009 and January 2010 (Table 2 and Figure 7).
- The air stripper VOC removal efficiency was greater than 99.9 percent for Project and Non-Project VOCs during this reporting period (Table 3).
 - The air stripper off-gas emission control system's overall efficiency calculated using all VOCs (both Project and Non-Project VOCs) was 27 to 32 percent. The system efficiency improved to 94 to 95 percent when calculated using only Project VOCs (Table 5). Note: the vapor phase treatment system was designed to reduce only Project VOCs.
 - Iron, which is in the Site groundwater captured by Wells RW-2 and RW-3, continues to be problematic. Dissolved-phase iron enters these remedial wells and is oxidized and/or metabolized by iron-fixating bacteria, which produce iron precipitate and biological growth (e.g. slime). The iron precipitate and biological growth accumulate on the inside the well, including the well screens; on the pump and motor; inside the conveyance pipelines; and in the air stripper. During this reporting period alone, oxidized/metabolized iron resulted in two system shut-downs (the blower low-pressure alarm on July 5, 2010 and Well RW-3 low-pressure alarm on September 16, 2010) and an anomalous high total iron concentration in the September 7, 2010 influent sample. While the system effluent has been compliant with the NYSDEC requirement for total iron (600 ug/L), due to the post-air stripper bag filters removal of suspended iron prior to discharge, iron, this situation continues to be a reoccurring problem.

5.3.2 Regulatory Status of Discharges

5.3.2.1 Air Discharge

To determine the compliance status of air discharge from the Groundwater IRM treatment system, the system's effluent vapor concentrations were compared to NYSDEC Division of Air Resources Air Guide-1 (DAR-1) Model Short-term Guideline Concentrations (SGCs [NYSDEC 2007]) (Table 5) and the effluent vapor laboratory 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 the 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 information (e.g. building dimensions, stack height, terrain, etc.) and operating data (e.g. air 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 MASC. A summary of the instantaneous percent (i.e., not time-weighted) of the site-specific annual MASC for Project VOCs, Freon 12, and Freon 22 is provided in Table 8. A summary of the cumulative annual percent (i.e. time-weighted) of the site-specific MASC for detected compounds is also provided in Table 8. A summary of the model inputs, outputs, and backup calculations is provided in Appendix D.

The Groundwater IRM air effluent met NYSDEC requirements throughout the reporting period, as indicated by the following:

- The measured concentrations of individual VOCs in the vapor effluent did not exceed applicable SGCs (Table 5).
- The measured concentration of individual VOCs in the vapor effluent did not exceed their applicable, instantaneous MASCs, as calculated using the USEPA SCREEN 3 Model (Table 8). Similarly, the time-weighted rolling averages for the individual Project VOCs, Freon 12, and Freon 22 are below their respective MASCs.

5.3.2.2 Water Discharge

The Groundwater IRM water effluent met NYSDEC requirements during this reporting period (Table 3 and Appendix B).

5.4 Performance and Compliance Monitoring Conclusions

Based on the data collected during this reporting period, the following conclusions were made about the system operation:

- The system operated within its normal operational parameters during this reporting period; except for the five unanticipated alarms that shut the plant down (which are described in Section 4).
- The system controls and interlocks functioned correctly during this reporting period.
- The majority (84 percent) of the VOC mass removed came from Wells RW-2 and RW-3 (i.e. 130 lbs of the 155 total lbs) (Table 7).
- Project VOCs were not detected in Wells RW-1 or RW-4 above their respective SCGs. The majority (99% or greater) of VOCs detected in Well RW-4 are from non-project VOCs (i.e. Freon 22) (Appendix B).
- Concentrations of project-related VOCs appear to be leveling off at a concentration (~133 ug/L) that is 87% below its detected maximum concentration.
- Concentrations of non-project VOCs (Freon 22) also appear to be leveling off, but continue to remain elevated when compared with concentrations observed during system start-up. The percentage of Non-Project VOCs in the system influent is still approximately 3 times greater than the percentage of Project VOCs (Table 2 and Figure 7).
- Mercury does not appear to be present in the site groundwater, as indicated by its absence in project water samples.
- A preventive maintenance program is required to address the problems caused by problematic iron fouling of the remedial wells (Wells RW-2 and RW-3), remedial pumps, and conveyance pipelines. ARCADIS is working with Northrop Grumman to develop and implement a preventative maintenance program.
- The water discharge was compliant with project requirements.
- The air emissions were compliant with project requirements.

6. Environmental Effectiveness Monitoring

Groundwater IRM treatment system environmental effectiveness (i.e., hydraulic monitoring and groundwater quality monitoring) activities and results for this reporting period are discussed below. Environmental Effectiveness Monitoring was performed in accordance with OM&M Manual requirements and procedures.

6.1 Hydraulic Monitoring

6.1.1 Activities

In accordance with OM&M Manual requirements and methodologies, one quarterly round of hydraulic monitoring was performed during this reporting period. The depth-to-water was measured at 34 locations on August 26, 2010. The depth-to-water for Remedial Well RW-3 could not be measured on August 26 due to a blockage in the sampling port at the wellhead, the measurement was collected on September 9, 2010. The location of the 35 wells and piezometers are shown on Figure 4.

6.1.2 Results

The Groundwater IRM groundwater elevation measurements are provided in Table 9. The configuration of the potentiometric surface on August 26, 2010 is shown on Figure 4 and indicates that the groundwater containment system has established a capture zone that encompasses the southern portion of the site.

6.2 Groundwater Quality Monitoring

6.2.1 Activities

During the Third Quarter of 2010, no groundwater quality monitoring took place.

6.2.2 Results

Table 10 summarizes the results of laboratory analysis of VOCs in groundwater samples collected from monitoring wells associated with the Groundwater IRM to date. Table 11 summarizes the results of laboratory analysis of metals in groundwater samples collected from monitoring wells associated with the Groundwater IRM to date. When an appropriate amount of data has been collected, trend graphs will be developed for selected wells.

6.3 Environmental Effectiveness Monitoring Conclusions

As shown on Figure 4, ARCADIS has evaluated the operational hydraulic monitoring data and has concluded that the groundwater containment system is operating as expected and the associated capture zone has developed.

7. Groundwater IRM Recommendations

- Remove mercury from the SPDES equivalency monitoring program because mercury has never been detected in any system water sample.
- Continue operating, maintaining, and monitoring the system per the Groundwater OM&M Manual.

8. References

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Table 1. Operational Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

MONTH	DAY																																Days Operational (1)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Jul-09																						#/b	b	#/**b	b	b	b	b	#	b	b	11	
Aug-09	b	b	b	b	#/b	b	b			b	b	#/**b	b	b	b	b	b	b	#/b		b	b	b	b		b	b	b	b		b	30	
Sep-09	#/b	b		b	b	b	b		b	#/**b	b	b	b	b		b	b	b		b	b		b	b		b	b		b			30	
Oct-09	b			b	b			b	#/**	b			b		b			b			b	b	b	b		b	b		b			31	
Nov-09		b			b			b		#/**										C1,2						b		b			b		30
Dec-09		#/**			b					b					b						b/P1,2				b					b		28	
2009 Totals																																	160
Jan-10				b				b			#/*	b					b					b				b					b	31	
Feb-10		#/**b				b					b					b	C1				b					b						28	
Mar-10		b					b			#/*		b					b						b					b				29	
Apr-10	b				b					b		#/**	b				b			b	b		b										30
May-10				b						#/**				bb	b	b		b				b								b		30	
Jun-10									#/#/#/**	b						b										b							29
Jul-10	b				(2)		b				b(3)				b		(4)			#/**	b								b			29	
Aug-10				b					#/#/#	*	b	*(5)		(6)		b					b						b						29
Sep-10		b					#	(7)	b									b			b						b		b				29
Q3 2010																																	87
2010 Totals																																	264
TOTAL																																	424

Legend:


#

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*

b

Indicates system online for at least the majority of the day.

Indicates system operated with reduced flow rates.

Indicates system offline for at least the majority of the day.

Indicates water compliance samples were collected.

Indicates water performance samples were collected.

Indicates vapor compliance samples were collected.

Indicates vapor performance samples were collected.

Indicates filter bag unit changed over.

C1

C2

P1

P2

Indicates VPGAC ECU 501 media changeout.

Indicates VPGAC ECU 502 media changeout.

Indicates PPZ ECU 601 media changeout.

Indicates PPZ ECU 602 media changeout.

Notes on last page.

Table 1. Operational Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

- (1) Days in which the system was operational for the majority of the day are counted as one day.
- (2) The system shut down at 6:20 PM on July 5, 2010 due to a blower high-vacuum alarm condition. The alarm condition appeared to be due to restricted air flow through the air stripper demister caused by particulate fouling of the demister. The system was physically inspected and restarted. The system was off-line for a total of approximately 40.5 hours between July 5 and 7, 2010. A new demister was ordered and was installed on August 12, 2010.
- (3) The system shut down at 2:14 AM on July 11, 2010 due to a high-pressure alarm at the bag filters. The spent bag filters were changed out and the system restarted. The system was off-line for approximately 9 hours.
- (4) The system shut down at 7:23 AM on July 17, 2010 due to a building sump high-water level alarm. The alarm was caused by the large amount of condensate created from the air stripper and system piping during the unusually hot and humid July weather draining into the building sump. The sump was pumped down and the system was restarted.
- (5) The system was intentionally shut down at 9:03 AM on August 12, 2010 to perform scheduled maintenance on the system air stripper. The system was off-line for approximately 30 hours.
- (6) The system shut down at 2:46 AM on August 15, 2010 due to a high-water level alarm in the building sump. The alarm was caused by the release of treated water into the building sump via a leak at a hose connection recently installed during the maintenance work performed on August 12th and 13th. The connection was tightened and the system restarted. The system was off-line for approximately 9 hours.
- (7) The system shut down at 12:30 AM on September 8, 2010 due to a low-pressure alarm in the Remedial Well RW-3 pipeline. The alarm appeared to be from iron fouling on the inside of the well screen and declining pump performance. The system was restarted on September 8, 2010 with Remedial Well RW-3 offline; the system was off-line for approximately 15 hours. Remedial Well RW-3 was brought back on-line on September 16, 2010 after the pump and motor were replaced.

Acronyms/Key:

GW Groundwater.
IRM Interim Remedial Measure.
VPGAC Vapor phase granular activated carbon.
PPZ Potassium permanganate impregnated zeolite.
ECU Emission control unit.

Table 2. Summary of Influent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Compound ⁽²⁾	10/09/09 (µg/L)	11/10/09 (µg/L)	12/02/09 (µg/L)	01/11/10 (µg/L)	02/02/10 (µg/L)	03/10/10 (µg/L)	04/12/10 (µg/L)	05/10/10 (µg/L)	06/09/10 (µg/L)	07/20/10 (µg/L)	08/09/10 (µg/L)	09/07/10 (µg/L)
Project VOCs												
1,1,1 - Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethane	1.9	2	2	2	1	ND	ND	ND	1.1	0.90	ND	ND
1,2 - Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	ND	1	1	1	ND	ND	ND	ND	0.93	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	22	24	25	23	18	17	17	10	17	14	14	13
Vinyl Chloride	52	52	58	35	23	25	20	ND	22	15	14	11
cis 1,2-Dichloroethene	250	260	260	240	180	150	130	33	130	100	99	110
trans 1,2-Dichloroethene	17	1	3	ND	16	ND	2.6	ND	0.9	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	28	53	43	24	13	20	15	ND	9.9	9.4	ND	ND
Subtotal Project VOCs	371	393	391	325	251	212	185	43	182	139	127	134
Non-Project VOCs												
Dichlorodifluoromethane (Freon 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodifluoromethane (Freon 22)	100	220	210	440	480	590	610	650	450	440	480	430
Subtotal Non-Project VOCs	100	220	210	440	480	590	610	650	450	440	480	430
Total VOCs ⁽³⁾	471	613	601	765	731	802	795	693	632	579	607	564
Inorganics												
Total Iron	1,680	1,240	1,930	500	4,050	790	1,470	1,060	4,840	540	540	6,640
Total Mercury	NA	NA	NA	NA	NA	NA	ND	ND	ND	NA	ND	NA
pH ⁽⁴⁾	5.9	6.1	5.9	6.1 ⁽⁵⁾	5.8	6.5	6.7	6.8	6.0	5.8	6.4	6.3

See notes on last page.

Table 2. Summary of Influent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Notes:

- (1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per NYSDEC ASP 2000, Method OLM 4.3, for iron analyses per USEPA Method 6010 and for mercury analyses per USEPA Method 7470. The VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Influent water samples were collected from Water Sampling Port-5 (WSP-5); refer to Figure 3 of this OM&M Report for the schematic location of WSP-5. Data in this table corresponds to approximately the past year of system operation.
- (2) Only VOCs associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, plus Toluene, Benzene, non-project related Freon 12 and Freon 22, Mercury and Iron are included in this table. Complete VOC and inorganic data summary tables, including VOC TICs, are provided in Appendix B. Laboratory data qualifiers are included in the Appendix B tables.
- (3) "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have not been rounded.
- (4) pH samples collected and measured in the field by ARCADIS personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.
- (5) The January 2010 pH value was measured on December 7, 2009.

Acronyms\Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
µg/L	Micrograms per liter.
ND	Analyte not detected at, or above its laboratory quantification limit.
NA	Not analyzed.
NYSDEC	New York State Department of Environmental Conservation.
USEPA	United States Environmental Protection Agency.
TICs	Tentatively identified compounds.
VOC	Volatile organic compound.
IRM	Interim remedial measure.
OM&M	Operation, maintenance and monitoring.

Table 3. Summary of Effluent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

	Discharge												
	Limit ⁽³⁾	10/09/09	11/10/09	12/02/09	01/11/10	02/02/10	03/10/10	04/12/10	05/10/10	06/09/10	07/20/10	08/09/10	09/07/10
Compound ⁽²⁾	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Project VOCs													
1,1,1 - Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 - Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis 1,2 Dichloroethene	5	ND	ND	0.32	ND	0.23	ND	ND	ND	ND	ND	ND	ND
trans 1,2 Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal Project VOCs	--	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Project VOCs													
Dichlorodifluoromethane (Freon 12)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodifluoromethane (Freon 22)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal Non-Project VOCs	--	0	0	0	0	0	0	0	0	0	0	0	0
Total VOCs ⁽⁴⁾	--	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Treatment Efficiency ⁽⁵⁾	--	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%
Inorganics													
Total Iron	600	1,120	910	350	560	320	540	520	400	490	300	310	380
Total Mercury	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH ⁽⁶⁾	5.5 - 8.5	7.2	6.9	6.8	6.8 ⁽⁷⁾	6.4	6.9	7.0	7.0	6.4	6.2	6.9	6.5

See notes on last page.

Table 3. Summary of Effluent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Notes:

- (1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per NYSDEC ASP 2000, Method OLM 4.3, for iron analyses per USEPA Method 6010 and for mercury analyses per USEPA Method 7470. The VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Effluent water samples were collected from Water Sampling Port-7 (WSP-7); refer to Figure 3 of this OM&M Report for the location of WSP-7. Data in this tables corresponds to approximately the past year of system operation.
- (2) Only VOCs associated with the interim SPDES equivalency program, including Toluene, Benzene, non-project related Freon 12 and Freon 22, Mercury and Iron are included in this table. Complete VOC and inorganic data summary tables, including VOC TICs, are provided in Appendix B. Laboratory data qualifiers are included in the Appendix B tables.
- (3) Discharge limits per the interim SPDES equivalency program or Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Quality Standards and Guidance Values and Groundwater Effluent Limitations, if the compound is not part of the interim SPDES equivalency program.
- (4) "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have not been
- (5) Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration.
- (6) pH samples collected and measured in the field by ARCADIS personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.
- (7) The January 2010 pH value was measured on December 7, 2009.

Acronyms/Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
6	Bold box indicates value is greater than discharge criterion.
µg/L	Micrograms per liter.
ND	Analyte not detected at, or above its laboratory quantification limit.
NA	Not analyzed.
--	Not applicable.
NYSDEC	New York State Department of Environmental Conservation.
USEPA	United States Environmental Protection Agency.
TICs	Tentatively identified compounds.
VOC	Volatile organic compound.
IRM	Interim remedial measure.
OM&M	Operation, maintenance, and monitoring.
>	Greater than.
SPDES	State pollutant discharge elimination system.

Table 4. Summary of Influent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Compound ⁽²⁾	10/09/09 (µg/m ³)	11/10/09 (µg/m ³)	12/02/09 (µg/m ³)	02/02/10 (µg/m ³)	04/12/10 (µg/m ³)	06/09/10 (µg/m ³)	07/20/10 (µg/m ³)	08/10/10 (µg/m ³)
Project VOCs								
1,1,1, Trichloroethane	ND	5.2	ND	ND	ND	3.6	ND	3.6
1,1 - Dichloroethane	ND	36	29	26	20	15	14	17
1,2 - Dichloroethane	ND	ND	ND	ND	ND	ND	ND	0.77
1,1 - Dichloroethene	ND	18	17	16	14	12	9.0	11
Tetrachloroethene	ND	11	ND	6.1	ND	5.5	ND	6.4
Trichloroethene	330	400	420	370	280	230	190	190
Vinyl Chloride	1,200	1,200	800	410	330	220	180	150
cis 1,2-Dichloroethene	6,000	7,000	4,500	3,100	2,400	1,900	1,700	1,500
trans 1,2-Dichloroethene	ND	9	ND	4.6	ND	2.5	ND	4.6
Benzene	ND	5.5	ND	ND	ND	2	ND	1.2
Toluene	790	1200	770	370	340	150	150	150
Subtotal Project VOCs	8,320	9,885	6,536	4,303	3,384	2,541	2,243	2,035
Non-Project VOCs								
Dichlorodifluoromethane (Freon 12)	ND	ND	ND	ND	ND	3.5	ND	4.6
Chlorodifluoromethane (Freon 22)	7.1	2,800	2,500	3,700	4,700	5,200	6,100	5,800
Subtotal Non-Project VOCs	7.1	2,800	2,500	3,700	4,700	5,204	6,100	5,805
Total VOCs ⁽³⁾	8,327	12,685	9,036	8,003	8,153	7,745	8,343	7,840

See notes on last page.

Table 4. Summary of Influent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Notes:

- (1) Vapor samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method T0-15. A VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Influent samples were collected at Vapor Sampling Port-1 (VSP-1); refer to Figure 3 of this OM&M Report for the location of VSP-1. Data in this tables corresponds to approximately the past year of system operation.
- (2) Only VOCs that are associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, Toluene, Benzene, and non-project related Freon 12 and Freon 22 are included in this table. Complete VOC summary tables, including VOC TICs, are provided in Appendix C. Laboratory data qualifiers are included in the Appendix C tables.
- (3) "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have not been rounded.

Acronyms/Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
µg/m ³	Micrograms per cubic meter.
ND	Analyte not detected at or above its laboratory reporting limit.
USEPA	United States Environmental Protection Agency.
TICs	Tentatively identified compounds.
VOC	Volatile organic compound.
IRM	Interim remedial measure.
OM&M	Operation, maintenance, and monitoring.

Table 5. Summary of Effluent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Compound ⁽²⁾	Discharge											
	Limit ⁽³⁾ (µg/m ³)	10/9/09 ⁽⁹⁾ (µg/m ³)	11/12/09 (µg/m ³)	12/02/09 (µg/m ³)	01/11/10 (µg/m ³)	02/02/10 (µg/m ³)	03/10/10 (µg/m ³)	04/12/10 (µg/m ³)	05/10/10 (µg/m ³)	06/09/10 (µg/m ³)	07/20/10 (µg/m ³)	08/12/10 (µg/m ³)
Project VOCs												
1,1,1 - Trichloroethane	68,000	--	ND	ND	ND	ND	1	ND	ND	0.97	ND	ND
1,1 - Dichloroethane	NS	--	37	4	3	ND	6	ND	1.2	4.4	ND	3.3
1,2 - Dichloroethane	NS	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	380 ⁽⁴⁾	--	5.8	1	ND	ND	1	ND	ND	0.77	ND	2.0
Tetrachloroethene	1,000	--	ND	ND	ND	ND	1	ND	ND	1.1	ND	0.82
Trichloroethene	14,000	--	15	30	13	13	17	17	5.1	12	9.9	12
Vinyl Chloride	180,000	--	200	52	36	12	29	27	ND	5	17	15
cis 1,2 Dichloroethene	190,000 ⁽⁵⁾	--	1,700	230	52	34	77	65	9.2	21	40	49
trans 1,2 Dichloroethene	NS	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,300	--	13	12	8	17	5	29	7.8	13	17	11
Toluene	37,000	--	87	90	38	40	96	80	ND	44	31	25
Subtotal Project VOCs	NA	--	2,058	419	150	116	233	218	23	102	115	118
Non-Project VOCs												
Dichlorodifluoromethane (Freon 12)	NS	--	61	2	3	3	4	ND	3.5	3.5	ND	2.8
Chlorodifluoromethane (Freon 22)	NS	--	3,600	2,400	3,700	3,700	4,700	4,800	3,500	5,400	6,000	5,200
Subtotal Non-Project VOCs	NA	--	3,661	2,402	3,703	3,703	4,704	4,800	3,504	5,404	6,000	5,203
Total VOCs ⁽⁶⁾	NA	--	5,719	2,822	3,853	3,819	4,936	5,018	3,527	5,506	6,115	5,321
Treatment Efficiency w/Freons ⁽⁷⁾	NA	--	54.9%	68.8%	--	52.3%	--	38.5%	--	28.9%	26.7%	32.1%
Treatment Efficiency w/o Freons ⁽⁸⁾	NA	--	79.2%	93.6%	--	97.3%	--	93.6%	--	96.0%	94.9%	94.2%

See notes on last page.

Table 5. Summary of Effluent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. ⁽¹⁾

Notes:

- (1) Vapor samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method T0-15. A VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5. Data in this tables corresponds to approximately the past year of system operation.
- (2) Only VOCs that are associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, Toluene, Benzene, and non-project related Freon 12 and Freon 22 are included in this table. Complete VOC summary tables, including VOC TICs, are provided in Appendix C. Laboratory data qualifiers are included in the Appendix C tables.
- (3) Discharge limit is compound specific short-term guidance concentration (SGC) per the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
- (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 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 provided in Section IV.A.2.b.1 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/m³ / 4.2 = approximately 380 µg/m³. 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, 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 790,000 µg/m³ / 4.2 = approximately 190,000 µg/m³. 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.
- (6) "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have not been rounded.
- (7) Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration. Treatment efficiency is only calculated when there is a corresponding influent sample.
- (8) Treatment efficiency was calculated by dividing the difference between the influent and effluent total Project VOC concentrations by the influent total Project VOC concentration. Treatment efficiency is only calculated when there is a corresponding influent sample.
- (9) An effluent sample was not collected on date shown due to inadequate air pressure in sample container.

Acronyms/Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
µg/m ³	Micrograms per cubic meter.
ND	Analyte not detected at or above its laboratory reporting limit.
NA	Not applicable.
NYSDEC	New York State Department of Environmental Conservation.
USEPA	United States Environmental Protection Agency.
TICs	Tentatively identified compounds.
VOC	Volatile organic compound.
IRM	Interim remedial measure.
OM&M	Operation, maintenance, and monitoring.
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 in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
AGC	Annual guideline concentration.
--	Data not available or value could not be calculated.

Table 6. Summary of System Parameters, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Date ⁽¹⁾	Water Flow Rates ⁽²⁾						Water Pressures ⁽²⁾					Air Flow Rate ⁽²⁾	Air Pressures ⁽²⁾					Air Temp. ⁽²⁾
	Remedial Well				Combined Influent	Effluent	Remedial Well Effluent ⁽³⁾				Effluent	Effluent	ECU Influent				Effluent	Stack Temp.
	RW-1	RW-2	RW-3	RW-4			RW-1	RW-2	RW-3	RW-4			GAC-501	GAC-502	PPZ-601	PPZ-602		
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(psi)	(psi)	(psi)	(psi)	(psi)	(scfm)	(inH ₂ O)	(inH ₂ O)	(inH ₂ O)	(inH ₂ O)	(inH ₂ O)	(°R)
10/09/09	30.5	75.3	75.3	30.7	219	223	57.0	42.3	63.6	55.9	9.0	2,065	8.5	6.5	5.0	2.1	0.0	540
11/10/09 ⁽⁴⁾	30.4	75.2	75.6	30.2	218	230	57.1	58.9	63.4	56.8	9.0	2,126	8.6	6.5	5.0	2.0	0.0	534 ⁽⁵⁾
12/02/09	30.4	75.3	75.2	30.2	216	228	57.1	56.3	65.2	56.8	9.0	1,935	9.0	6.0	4.5	2.0	0.0	538 ⁽⁵⁾
12/30/09	30.4	75.4	75.4	30.6	219	220	57.2	42.2	65.3	56.6	6.5	2,220	8.5	5.3	3.3	1.2	0.0	531 ⁽⁵⁾
01/11/10	30.5	75.7	75.7	30.4	219	218	57.5	40.6	65.6	57.0	7.0	2,184	8.7	5.3	3.5	1.1	0.0	531 ⁽⁵⁾
02/02/10	30.5	75.6	75.7	30.9	220	216	57.2	42.9	65.1	56.5	8.0	2,135	8.6	5.1	3.4	1.3	0.0	530 ⁽⁵⁾
03/10/10	30.8	75.2	75.2	30.6	218	229	57.5	34.3	65.9	56.9	6.5	2,099	6.0 ⁽⁶⁾	7.7 ⁽⁶⁾	3.4	1.2	0.0	537 ⁽⁵⁾
04/12/10	30.1	75.2	75.6	30.5	218	229	59.0	28.2	67.2	58.2	7.5	2,086	5.8	7.5	3.2	1.1	0.0	540
05/10/10	30.3	0.0 ⁽⁷⁾	75.6	30.6	139	137	59.3	-5.6 ⁽⁷⁾	68.8	59.0	6.0	2,076	6.0	7.7	3.3	1.1	0.0	540
06/09/10	30.3	75.4	75.6	30.4	216	218	59.4	58.7	68.0	59.0	8.0	2,003	7.8	9.5	5.2	3.5	0.0	537
07/20/10	30.4	75.8	75.8	30.6	219	216	58.5	54.9	66.2	58.0	7.0	2,114	5.6	6.8	3.9	1.6	0.0	550
08/09/10	30.7	75.4	75.5	30.8	219	218	58.1	54.5	67.8	57.7	7.0	2,097	5.5	6.5	3.5	1.5	0.0	551
09/07/10	30.4	75.4	75.4	30.5	218	212	58.0	52.4	56.4	57.6	6.0 ⁽⁸⁾	2,134	5.2	6.5	3.5	1.5	0.0	548

See notes on last page.

Table 6. Summary of System Parameters, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

- (1) Operational data collected by ARCADIS on days noted. Parameters listed were typically recorded during compliance monitoring events. Data in this table corresponds to approximately the past year of system operation.
- (2) Instantaneous values from field-mounted instruments, except for the combined influent water-flow rate, which is the sum of individual well flow rates via the Supervisory Control and Data Acquisition (SCADA) System.
- (3) Remedial Well effluent pressure readings measured at the influent manifold within the treatment system building.
- (4) Parameters shown were recorded during the November 2, 2009 site visit and represent the conditions for this monitoring period.
- (5) Total effluent air temperature gauge (TI-601) malfunctioned; the value shown was measured at the mid-train air temperature gauge (TI-501).
- (6) The emission control units were reconfigured after the February 17, 2010 VPGAC media replacement event. VPGAC ECU-502 was placed in the lead position and VPGAC ECU-501 was placed in the lag position.
- (7) Remedial Well RW-2 was off-line between April 24 and May 14, 2010 for rehabilitation activities and to replace the well pump and motor.
- (8) Value is from September 14, 2010, data was not collected during the September 7, 2010 event.

Acronyms/Key:

°R	Degrees Rankine.
gpm	Gallons per minute.
inH ₂ O	Inches of water column.
NM	Not measured.
psi	Pounds per square inch.
scfm	Standard cubic feet per minute.
Temp.	Temperature.
ECU	Emission control unit.
VPGAC	Vapor phase granular activated carbon.

Table 7. Summary of Groundwater Recovered and TVOC Mass Removed, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Operating Period ⁽¹⁾	Volume of Groundwater Recovered (x1,000 gal) ⁽²⁾					TVOC Mass Recovered (lbs) ⁽³⁾					TVOC Mass Recovery Rate (lbs/day) ⁽⁴⁾				
	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total
System Pilot Test, Shakedown and Start Up Totals ⁽⁵⁾															
	137	270	251	150	808	NA	NA	NA	NA	1.1	NA	NA	NA	NA	NA
2009 Totals ⁽⁶⁾															
7/21/09 - 12/30/09	6,592	13,838	16,445	6,574	43,449	0.41	280	54	13	350	<0.01	1.9	0.3	0.1	2.2
January 2010 through March 2010 Totals															
Subtotal Jan-Mar 10 ⁽⁷⁾	3,805	9,389	9,411	3,790	26,395	0.13	65	109	14	188	<0.01	0.75	1.3	0.16	2.2
April 2010 through June 2010 Totals															
Subtotal April-June 10 ⁽⁸⁾	4,195	8,324	10,409	4,196	27,124	0.15	48	121	20	189	<0.01	0.48	1.2	0.20	1.9
July 2010 through September 2010 Totals															
07/06/10 - 08/02/10	1,129	2,807	2,810	1,135	7,881	0.05	10	35	7.9	53	<0.01	0.37	1.3	0.29	2.0
08/02/10 - 09/07/10	1,552	3,853	3,846	1,556	10,807	0.07	14	48	10.9	73	<0.01	0.39	1.3	0.30	2.0
09/07/10 - 09/27/10	839	2,091	1,224	837	4,991	0.04	8	15	5.9	29	<0.01	0.40	0.75	0.30	1.5
Subtotal July-Sept 10 ⁽⁹⁾	3,520	8,751	7,880	3,528	23,679	0.16	32	98	25	155	<0.01	0.39	1.2	0.30	1.9
Subtotal 2010 ⁽¹⁰⁾	11,520	26,464	27,700	11,514	77,198	0.44	145	328	59	532	<0.01	0.50	1.2	0.20	2.0
Total ⁽¹¹⁾	18,250	40,570	44,400	18,240	121,460	0.85	430	380	72	880	NA	NA	NA	NA	NA

See notes on last page.

Table 7. Summary of Groundwater Recovered and TVOC Mass Removed, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

- (1) Represents operating period between consecutive monitoring events.
- (2) Volume of groundwater recovered is based on individual local well totalized flow readings. Listed value is the difference between totalized flow values recorded between consecutive monitoring events. The total groundwater recovered during a given operating period is the sum of the individual well flow totals. Values shown have been rounded to the nearest gallon.
- (3) Mass recovered per well was calculated by multiplying the TVOC concentration from the most recent sampling event by the number of gallons extracted between sampling events. The total amount recovered during a given operating period is the sum of masses recovered from each of the individual wells. Values shown have been rounded to include two significant figures to account for error associated with field measurements and analytical data.
- (4) Mass recovery rates were calculated by dividing the total mass recovered for each well and for the system by the number of days in the respective operating period. Values shown have been rounded to include two significant figures to account for error associated with field measurements and analytical data.
- (5) Values based on operational data recorded prior to system startup on July 21, 2009.
- (6) The volume of groundwater recovered and mass recovered calculations represent the operational period between system start-up on July 21, 2009 and December 30, 2009.
- (7) The volume of groundwater recovered and mass recovered calculations represent the operational period between December 30, 2009 and March 31, 2010.
- (8) The volume of groundwater recovered and mass recovered calculations represent the operational period between March 31, 2010 and June 30, 2010.
- (9) The volume of groundwater recovered and mass recovered calculations represent the operational period between June 30, 2010 and September 30, 2010.
- (10) "Subtotal 2010" refers to the amounts removed by the OU3 Groundwater IRM during 2010; mass recovery rates are averages and not totals.
- (11) "Total" refers to the amounts removed by the Operable Unit 3 Groundwater Interim Remedial Measure. Total volume of groundwater recovered reported is rounded to the nearest 10 gallons. Total mass recovered reported has been rounded to include two significant figures to account for error associated with field measurements and analytical data.

Acronyms/Key:

TVOC	Total volatile organic compounds.
gal	Gallons.
IRM	Interim Remedial Measure.
lbs	Pounds.
lbs/day	Pounds per day.
NA	Not applicable.
<	Less than.

Table 8. Air Emissions Model Output Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Compound ⁽¹⁾	AGC ⁽²⁾ (µg/m ³)	Percent of MASC Per Event ⁽³⁾											Percent AGC ⁽⁴⁾
		9/10/09	11/10/09	12/2/09	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10	
1,1,1 - Trichloroethane	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1 - Dichloroethane	0.63	0.13%	0.90%	0.09%	0.07%	0.00%	0.14%	0.00%	0.03%	0.11%	0.00%	0.08%	0.14%
1,2 - Dichloroethane	0.038	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1 - Dichloroethene	70	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Butanone	5,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	28,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	0.00%	10.72%	2.05%	1.51%	2.83%	2.82%	0.00%	1.25%	2.37%	0.00%	1.72%	2.25%
Ethylbenzene	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (o)	100	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (m,p)	100	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloromethane	90	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Methylene Chloride	2.1	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tetrachloroethene	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.02%	0.00%	0.01%	0.01%
Trichloroethene	0.5	0.27%	0.46%	0.93%	0.40%	0.40%	0.52%	0.52%	0.16%	0.36%	0.30%	0.37%	0.42%
Vinyl Chloride	0.11	22.18%	27.94%	7.30%	5.07%	1.68%	4.05%	3.76%	0.00%	0.69%	2.38%	2.10%	6.60%
cis 1,2 Dichloroethene	63	0.04%	0.41%	0.06%	0.01%	0.01%	0.02%	0.02%	0.00%	0.01%	0.01%	0.01%	0.05%
trans 1,2 Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Benzene	0.13	1.99%	1.54%	1.43%	0.93%	2.02%	0.54%	3.42%	0.92%	1.52%	2.01%	1.30%	1.58%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Hexanone	48	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorodifluoromethane (Freon 22)	50,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

See notes on last page.

Table 8. Air Emissions Model Output Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

- (1) Only VOCs that were detected in the effluent vapor sample (VSP-5) since system start up are included in this table.
- (2) AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual maximum allowable stack concentration (MASC) per monitoring event.
- (3) Percent of AGC (or Percent MASC) was calculated by dividing the actual effluent concentration by the site-specific annual MASC. Detailed calculations are included in Appendix D.
- (4) Percent AGC is the rolling twelve month average at the end of the reporting period. The Percent AGC was calculated by time-weighting the "Percent MASCs" for the individual sampling events over the past year. For this reporting period, the MASCs for September 2010 were assumed to be the same as for August 2010.

Acronyms\Key:

µg/m ³	Micrograms per cubic meter.
NYSDEC	New York State Department of Environmental Conservation.
USEPA	United States Environmental Protection Agency.
SGC	Short-term Guideline Concentration.
AGC	Annual Guideline Concentration.
DAR-1	Division of Air Resources-1.
VOCs	Volatile Organic Compounds.

ARCADIS

Appendix A

Well Construction Information and
Environmental Effectiveness
Monitoring Program

Table A-1. Well Construction Information and Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. ^(1,2)

Well ID	Well Diameter (inches)	Depth to Screen		Screen Length (ft)	Well Depth (ft)	Well Materials	Water Levels ⁽³⁾	MONITORING ACTIVITY		
		Top (ft bls)	Bottom (ft bls)					WATER QUALITY ⁽⁴⁾		
								VOC	Cd/Cr	Fe/Mn
<u>Monitoring Wells</u>										
BCPMW-1	2	50	65	15	65	Sch. 40 PVC	Quarterly	Baseline	Baseline	--
BCPMW-2	2	60	75	15	75	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-3	2	59	74	15	74	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-4-1	4	45	65	20	70	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	Baseline
BCPMW-4-2	4	68.5	83.5	15	88.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	Baseline
BCPMW-4-3	4	115	125	10	130	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	Baseline
BCPMW-5-1	4	50	65	15	70	Sch. 80 PVC/ SS	Quarterly	Baseline	Baseline	Baseline
BCPMW-6-1	4	88.5	98.5	10	103.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
BCPMW-6-2	4	133	143	10	148	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
BCPMW-7-1	4	90	100	10	105	Sch. 40 PVC	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
B24MW-2	2	54	74	20	74	PVC	Quarterly	Baseline/Annual	Baseline	--
B24MW-3	2	55	70	15	70	PVC	Quarterly	Baseline/Annual	Baseline	--
B30MW-1	2	57	72	15	72	PVC	Quarterly	Baseline/Annual	Baseline	--
MW-200-1	4	85	95	10	100	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
MW-201-1	4	70	80	10	85	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
MW-202-1	4	125	135	10	140	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
MW-203-1	4	103	113	10	118	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual ⁽⁵⁾	Baseline/Annual	--
<u>Remedial Wells ⁽⁶⁾</u>										
RW-01	8	108	128	20	134	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-02	6	84	104	20	104	Steel/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-03	8	84	104	20	107	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-04	8	110	130	20	133	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--

See notes on last page.

Table A-1. Well Construction Information and Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. ^(1,2)

Well ID	Well Diameter (inches)	Depth to Screen		Screen Length (ft)	Well Depth (ft)	Well Materials	Water Levels ⁽³⁾	MONITORING ACTIVITY		
		Top (ft bls)	Bottom (ft bls)					WATER QUALITY ⁽⁴⁾		
								VOC	Cd/Cr	Fe/Mn
Piezometers										
PZ-01a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-01b	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-01c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-02a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-02b	1	80	85	5	85	Sch. 40 PVC	Quarterly	--	--	--
PZ-02c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-03	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-04	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-05a	2	65	70	5	74	Sch. 40 PVC	Quarterly	--	--	--
PZ-05b	1	110	115	5	117	Sch. 40 PVC	Quarterly	--	--	--
PZ-06a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-06b	1	90	95	5	97	Sch. 40 PVC	Quarterly	--	--	--
PZ-07a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-07b	1	113	118	5	120	Sch. 40 PVC	Quarterly	--	--	--

Notes:

- (1) Water samples will be collected and analyzed in accordance with the method and procedures described in this Sampling and Analysis Plan (SAP).
- (2) Approximate locations of the wells and piezometers in the OU-3 Groundwater Interim Remedial Measure Monitoring Program are shown in Figure 1.
- (3) Water levels will be measured in all wells/piezometers during the baseline monitoring event. Water levels will be measured in accordance with the procedures presented in this SAP.
- (4) VOC: VOCs, per Table D-3 in the Quality Assurance Project Plan (QAPP), using NYSDEC ASP 2000 Method OLM 4.3.
Cd/Cr: Cadmium and Chromium using USEPA Method 6010.
Fe/Mn: Iron and Manganese using USEPA Method 6010, both total and dissolved.
- (5) Semiannual wells will be monitored annually after Year 1.
- (6) Some of the analyses listed here are also covered in the Remedial System Sampling Program.

Acronyms\Key:

Sch. 80 PVC	Schedule 80 polyvinyl chloride.
Sch. 40 PVC	schedule 40 polyvinyl chloride.
SS	Stainless steel.
Steel	Low carbon steel.
ft	Feet.
ft ms	Feet relative to mean sea level.
ft bls	Feet below land surface.
--	Not applicable.
VOC	Volatile organic compound.

Appendix B

Compliance and Performance
Program and Water Sample
Analytical Results

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument ⁽¹⁾	Parameter (Method) ⁽²⁾	Frequency			SCADA Data Acquisition
		Short-Term ⁽³⁾ (first month)	(five month period following first month)	Long-Term ⁽⁴⁾	
<u>Water Samples</u> ⁽⁵⁾					
Remedial Well 1 (WSP-1)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 2 (WSP-2)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 3 (WSP-3)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 4 (WSP-4)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Air Stripper Influent (WSP-5)	VOCs (NYSDEC 2000 OLM 4.3)	1-hr ⁽⁶⁾ ; Days 1, 3, & Weekly	Monthly	Quarterly	NA
	Iron (USEPA 6010)	1-hr ⁽⁶⁾ ; Days 1, 3, & Weekly	Monthly	Quarterly	NA
Air Stripper Effluent (WSP-6)	Iron (USEPA 6010)	1-hr ⁽⁶⁾ ; As Needed	As Needed	As Needed	NA
Plant Effluent (WSP-7)	VOCs (NYSDEC 2000 OLM 4.3)	1-hr ⁽⁶⁾; Days 1, 3, & Weekly	Monthly	Monthly	NA
	Iron (USEPA 6010)	1-hr ⁽⁶⁾; Days 1, 3, & Weekly	Monthly	Monthly	NA
	Mercury (USEPA 7470) ⁽⁷⁾	1-hr ⁽⁶⁾; Days 1, 3, & Weekly	Monthly	Monthly	NA
	ph (field)	1-hr ⁽⁶⁾; Days 1, 3, & Weekly	Monthly	Monthly	NA
<u>Air Samples</u> ^{(8) (9)}					
Air Stripper Effluent/ECU-1 Influent (VSP-1)	VOCs (TO-15 Modified)	Monthly	Monthly	Quarterly	NA
ECU-1 Effluent/ECU-2 Influent (VSP-2)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-2 Effluent/ECU-3 Influent (VSP-3)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-3 Effluent/ECU-4 Influent (VSP-4)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
Total Effluent (VSP-5)	VOCs (TO-15 Modified)	Monthly	Monthly	Quarterly	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument ⁽¹⁾	Parameter (Method) ⁽²⁾	Frequency			
		Short-Term ⁽³⁾ (first month)	(five month period following first month)	Long-Term ⁽⁴⁾	SCADA Data Acquisition
<u>Water Flow Measurements</u>					
Remedial Well RW-1 (FT - 110)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (FT - 120)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (FT - 130)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (FT - 140)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Combined Influent (FR - 200)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
System Effluent (FT-700)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
<u>Air Flow Measurements</u>					
Air Stripper Effluent (FT-500)	Flow rate (SCFM)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
<u>Water Pressure Measurements</u>					
Remedial Well RW-1 (PT - 110)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (PT - 120)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (PT - 130)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (PT - 140)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Stripper Effluent (PT-700)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
<u>Air Temperature & Relatively Humidity Measurements</u>					
Air Stripper Effluent (TT-500)	Temperature	Weekly	Weekly	Weekly	Continuously
ECU Mid-Train (TI-503)	Temperature	Weekly	Weekly	Weekly	NA
Effluent (TI-603)	Temperature	Weekly	Weekly	Weekly	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument ⁽¹⁾	Parameter (Method) ⁽²⁾	Frequency			
		Short-Term ⁽³⁾		Long-Term ⁽⁴⁾	SCADA
		(first month)	(five month period following first month)		Data Acquisition
<u>Air Pressure Measurements</u>					
Air Stripper Effluent (PT-500)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	Continuously
ECU #1 Influent (PI-501)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #2 Influent (PI-502)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #3 Influent (PI-601)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #4 Influent (PI-602)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
System Effluent (PI-603)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Notes:

- (1) Refer to Figure 3 of this Operation, Maintenance, & Monitoring (OM&M) Report and Appendix E of the Groundwater IRM OM&M Manual (OM&M Manual (ARCADIS 2009c)) for a diagram showing referenced sample locations and measurement points.
- (2) Parameters/methods may be modified based on review of short-term and/or long-term testing results. Parameters shown in **Bold** indicate parameters that require NYSDEC notification/approval prior to change in monitoring schedule.
- (3) Short-term schedule is tentative. Modification may be required/recommended based on the results of start-up and performance testing.
- (4) Long-term schedule is tentative. Modification may be required/recommended based on the results of short-term testing or water quality trends.
- (5) Water samples will be collected in accordance with the methods described in the Sampling and Analysis Plan, which is included as Appendix A of the OM&M Manual (ARCADIS 2009c). Samples will be analyzed in accordance with the methods and procedures described in the Sampling and Analysis Plan.
- (6) Per NYSDEC request, a 1-hr pilot test was performed during system shake-down. 1-hr pilot test samples were also analyzed for mercury.
- (7) Per the interim treated effluent (water) discharge criteria provided in the NYSDEC letter dated March 19, 2009 (NYSDEC 2009a), select samples are being analyzed for Mercury (Hg). However, this analyte is not expected to be a long-term analyte since it is not a site contaminant of concern.
- (8) Air samples collected and analyzed in accordance with methods described in the Sampling and Analysis Plan, which is included as Appendix A of the OM&M Manual (ARCADIS 2009c).
- (9) Additional air samples will be collected to help calculate media usage rates and to help determine media changeout frequencies.

Acronyms\Key:

NA	Not applicable.
ECU	Emissions control unit.
VOCs	Volatile organic compounds (refer Tables D-3 and D-5 in the Quality Assurance Project Plan (QAPP) (Appendix D of the OM&M Manual (ARCADIS 2009c)) for the analyte lists for aqueous and air samples, respectively).
gal.	Gallons.
gpm	Gallons per minute.
i.w.g.	Inches water gauge.
NYSDEC	New York State Department of Environmental Conservation.
EPA	U.S. Environmental Protection Agency.
SCADA	Supervisory Control And Data Acquisition.
OM&M	Operation, maintenance and monitoring.

Table B-2. Water Sample Analytical Results - July 20, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-01 RW-1 7/20/2010	WSP-02 RW-2 7/20/2010	WSP-03 RW-3 7/20/2010	WSP-04 RW-4 7/20/2010	WSP-05 Influent 7/20/2010	WSP-07 Effluent 7/20/2010
<u>Volatile Organic Chemicals</u>							
1,1,1-Trichloroethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
1,1,2,2-Tetrachloroethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
1,1,2-Trichloroethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
1,1-Dichloroethane		< 5 U	2.3 J	< 50 U	< 25 U	0.90 J	< 5 U
1,1-Dichloroethene		< 5 U	2.1 J	< 50 U	< 25 U	< 13 U	< 5 U
1,2-Dichloroethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
1,2-Dichloropropane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
2-Butanone		< 50 U	< 130 U	< 500 U	< 250 U	< 130 U	< 50 U
2-Hexanone		< 50 U	< 130 U	< 500 U	< 250 U	< 130 U	< 50 U
4-methyl-2-pentanone		< 50 U	< 130 U	< 500 U	< 250 U	< 130 U	< 50 U
Acetone		< 50 U	< 130 U	< 500 U	< 250 U	2.4 J	1.2 J
Benzene		< 0.7 U	< 1.8 U	< 7 U	< 3.5 U	< 1.8 U	< 0.7 U
Bromodichloromethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Bromoform		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Bromomethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Carbon Disulfide		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Carbon tetrachloride		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Chlorobenzene		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Chlorodifluoromethane (Freon 22)		< 5 U	1.1 J	1,400	840	440	< 5 U
Chloroethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Chloroform		0.36 J	1.4 J	< 50 U	< 25 U	1.4 J	< 5 U
Chloromethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
cis-1,2-dichloroethene		2.0 J	310	64	< 25 U	100	< 5 U
cis-1,3-dichloropropene		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Dibromochloromethane		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Dichlorodifluoromethane (Freon 12)		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Ethylbenzene		< 5 U	1.7 J	< 50 U	< 25 U	< 13 U	< 5 U
Methyl tert-Butyl Ether		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Methylene Chloride		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Styrene		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Tetrachloroethene		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Toluene		< 5 U	35	< 50 U	< 25 U	9.4 J	< 5 U
trans-1,2-dichloroethene		< 5 U	0.95 J	4.8 J	< 25 U	< 13 U	< 5 U
trans-1,3-dichloropropene		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Trichloroethylene		3.4 J	35	14 J	< 25 U	14	< 5 U
Trichlorofluoromethane (CFC-11)		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		< 5 U	< 13 U	< 50 U	< 25 U	< 13 U	< 5 U
Vinyl Chloride		< 2 U	54	< 20 U	< 10 U	15	< 2 U
Xylene-o		< 5 U	1.3 J	< 50 U	< 25 U	< 13 U	< 5 U
Xylenes - m,p		< 5 U	2.4 J	< 50 U	< 25 U	< 13 U	< 5 U
Subtotal VOCs ⁽⁴⁾		5.8	447	1,483	840	583	1.2
Tentatively Identified Compounds		ND	ND	ND	ND	ND	ND
Subtotal TICs ⁽⁵⁾							
Total VOCs ⁽⁶⁾		5.8	447	1,483	840	583	1.2

See notes on last page.

Table B-2. Water Sample Analytical Results - July 20, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-01 RW-1 7/20/2010	WSP-02 RW-2 7/20/2010	WSP-03 RW-3 7/20/2010	WSP-04 RW-4 7/20/2010	WSP-05 Influent 7/20/2010	WSP-07 Effluent 7/20/2010
Metals							
Cadmium (Dissolved)		--	--	--	--	--	--
Cadmium (Total)		--	--	--	--	--	--
Chromium (Dissolved)		--	--	--	--	--	--
Chromium (Total)		--	--	--	--	--	--
Iron (Dissolved)		--	--	--	--	140	140
Iron (Total)		--	1,180	890	--	540	300
Manganese (Dissolved)		--	--	--	--	--	--
Manganese (Total)		--	--	--	--	--	--
Mercury (Dissolved)		--	--	--	--	--	--
Mercury (Total)		--	--	--	--	--	< 0.30 U

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
- (2). Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3). Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms/Key:

Bold value indicates a detection.

VOC	Volatile organic compound.
USEPA	United States Environmental Protection Agency.
ug/L	Micrograms per liter.
OM&M	Operation, maintenance and monitoring.
--	Not sampled.
ND	TIC not detected.
< 5 U	Not detected above its laboratory quantification limit.
TICs	Tentatively identified compounds.
J	Estimated value.

Table B-3. Water Sample Analytical Results - August 9, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-05 Influent 8/9/2010	WSP-05 dup. Influent 8/9/2010	WSP-07 Effluent 8/9/2010
<u>Volatile Organic Chemicals</u>				
1,1,1-Trichloroethane		< 13 U	< 13 U	< 5 U
1,1,2,2-Tetrachloroethane		< 13 U	< 13 U	< 5 U
1,1,2-Trichloroethane		< 13 U	< 13 U	< 5 U
1,1-Dichloroethane		< 13 U	< 13 U	< 5 U
1,1-Dichloroethene		< 13 U	< 13 U	< 5 U
1,2-Dichloroethane		< 13 U	< 13 U	< 5 U
1,2-Dichloropropane		< 13 U	< 13 U	< 5 U
2-Butanone		< 130 U	< 130 U	< 50 U
2-Hexanone		< 130 U	< 130 U	< 50 U
4-methyl-2-pentanone		< 130 U	< 130 U	< 50 U
Acetone		< 130 U	< 130 U	< 50 U
Benzene		< 1.8 U	< 1.8 U	< 0.7 U
Bromodichloromethane		< 13 U	< 13 U	< 5 U
Bromoform		< 13 U	< 13 U	< 5 U
Bromomethane		< 13 U	< 13 U	< 5 U
Carbon Disulfide		< 13 U	< 13 U	< 5 U
Carbon tetrachloride		< 13 U	< 13 U	< 5 U
Chlorobenzene		< 13 U	< 13 U	< 5 U
Chlorodifluoromethane (Freon 22)		480	480	< 5 U
Chloroethane		< 13 U	< 13 U	< 5 U
Chloroform		< 13 U	< 13 U	< 5 U
Chloromethane		< 13 U	< 13 U	< 5 U
cis-1,2-dichloroethene		99	100	< 5 U
cis-1,3-dichloropropene		< 13 U	< 13 U	< 5 U
Dibromochloromethane		< 13 U	< 13 U	< 5 U
Dichlorodifluoromethane (Freon 12)		< 13 U	< 13 U	< 5 U
Ethylbenzene		< 13 U	< 13 U	< 5 U
Methyl tert-Butyl Ether		< 13 U	< 13 U	< 5 U
Methylene Chloride		< 13 U	< 13 U	< 5 U
Styrene		< 13 U	< 13 U	< 5 U
Tetrachloroethene		< 13 U	< 13 U	< 5 U
Toluene		< 13 U	< 13 U	< 5 U
trans-1,2-dichloroethene		< 13 U	< 13 U	< 5 U
trans-1,3-dichloropropene		< 13 U	< 13 U	< 5 U
Trichloroethylene		14	14	< 5 U
Trichlorofluoromethane (CFC-11)		< 13 U	< 13 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		< 13 U	< 13 U	< 5 U
Vinyl Chloride		14	14	< 2 U
Xylene-o		< 13 U	< 13 U	< 5 U
Xylenes - m,p		< 13 U	< 13 U	< 5 U
Subtotal VOCs ⁽⁴⁾		607	608	0
Tentatively Identified Compounds		ND	ND	ND
Subtotal TICs ⁽⁵⁾		ND	ND	ND
Total VOCs ⁽⁶⁾		607	608	0

See notes on last page.

Table B-3. Water Sample Analytical Results - August 9, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-05 Influent 8/9/2010	WSP-05 dup. Influent 8/9/2010	WSP-07 Effluent 8/9/2010
Metals				
Cadmium (Dissolved)		< 5.0 U	--	< 5.0 U
Cadmium (Total)		< 5.0 U	--	< 5.0 U
Chromium (Dissolved)		10	--	< 10 U
Chromium (Total)		11	--	< 10 U
Iron (Dissolved)		110	--	130
Iron (Total)		540	--	310
Manganese (Dissolved)		63	--	77
Manganese (Total)		65	--	78
Mercury (Dissolved)		--	--	--
Mercury (Total)		< 0.30 U	--	< 0.30 U

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
- (2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms\Key:

Bold value indicates a detection.

VOC	Volatile organic compound.
USEPA	United States Environmental Protection Agency.
ug/L	Micrograms per liter.
OM&M	Operation, maintenance and monitoring.
ND	TIC not detected.
< 5 U	Not detected above its laboratory quantification limit.
TICs	Tentatively identified compounds.

Table B-4. Water Sample Analytical Results - September 7, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-05 Influent 9/7/2010	WSP-07 Effluent 9/7/2010
<u>Volatile Organic Chemicals</u>			
1,1,1-Trichloroethane		< 13 U	< 5.0 U
1,1,2,2-Tetrachloroethane		< 13 U	< 5 U
1,1,2-Trichloroethane		< 13 U	< 5 U
1,1-Dichloroethane		< 13 U	< 5 U
1,1-Dichloroethene		< 13 U	< 5 U
1,2-Dichloroethane		< 13 U	< 5 U
1,2-Dichloropropane		< 13 U	< 5 U
2-Butanone		< 130 U	< 50 U
2-Hexanone		< 130 U	< 50 U
4-methyl-2-pentanone		< 130 U	< 50 U
Acetone		< 130 U	< 50 U
Benzene		< 1.8 U	< 0.7 U
Bromodichloromethane		< 13 U	< 5 U
Bromoform		< 13 U	< 5 U
Bromomethane		< 13 U	< 5 U
Carbon Disulfide		< 13 U	< 5 U
Carbon tetrachloride		< 13 U	< 5 U
Chlorobenzene		< 13 U	< 5 U
Chlorodifluoromethane (Freon 22)		430	< 5 U
Chloroethane		< 13 U	< 5 U
Chloroform		< 13 U	< 5 U
Chloromethane		< 13 U	< 5 U
cis-1,2-dichloroethene		110	< 5 U
cis-1,3-dichloropropene		< 13 U	< 5 U
Dibromochloromethane		< 13 U	< 5 U
Dichlorodifluoromethane (Freon 12)		< 13 U	< 5 U
Ethylbenzene		< 13 U	< 5 U
Methyl tert-Butyl Ether		< 13 U	< 5 U
Methylene Chloride		< 13 U	< 5 U
Styrene		< 13 U	< 5 U
Tetrachloroethene		< 13 U	< 5 U
Toluene		< 13 U	< 5 U
trans-1,2-dichloroethene		< 13 U	< 5 U
trans-1,3-dichloropropene		< 13 U	< 5 U
Trichloroethylene		13	< 5 U
Trichlorofluoromethane (CFC-11)		< 13 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		< 13 U	< 5 U
Vinyl Chloride		11	< 2 U
Xylene-o		< 13 U	< 5 U
Xylenes - m,p		< 13 U	< 5 U
Subtotal VOCs ⁽⁴⁾		564	0
Tentatively Identified Compounds			
Subtotal TICs ⁽⁵⁾		ND	ND
Total VOCs ⁽⁶⁾		564	0

See notes on last page.

Table B-4. Water Sample Analytical Results - September 7, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/L)	Sample ID: Sample Location: Sample Date:	WSP-05 Influent 9/7/2010	WSP-07 Effluent 9/7/2010
Metals			
Cadmium (Dissolved)		--	--
Cadmium (Total)		--	--
Chromium (Dissolved)		--	--
Chromium (Total)		--	--
Iron (Dissolved)		120	100
Iron (Total)		6,640	380
Manganese (Dissolved)		--	--
Manganese (Total)		--	--
Mercury (Dissolved)		--	--
Mercury (Total)		--	< 0.30 U

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
- (2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms\Key:

Bold value indicates a detection.

VOC	Volatile organic compound.
USEPA	United States Environmental Protection Agency.
ug/L	Micrograms per liter.
OM&M	Operation, maintenance and monitoring.
ND	TIC not detected.
< 5 U	Not detected above its laboratory quantification limit.
TICs	Tentatively identified compounds.

Appendix C

Vapor Sample Analytical Results

Table C-1. Vapor Sample Analytical Results - July 20, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/m ³)	Location ID: Sample Location: Sample Date:	VSP-1 Influent 7/20/2010	VSP-5 Effluent 7/20/2010
<u>Volatile Organic Chemicals</u>			
1,1,1-Trichloroethane		< 8.1 U	< 7.8 U
1,1,2,2-Tetrachloroethane		< 8.1 U	< 7.8 U
1,1,2-Trichloroethane		< 8.1 U	< 7.8 U
1,1-Dichloroethane		14	< 7.8 U
1,1-Dichloroethene		9.0	< 7.8 U
1,2-Dichloroethane		< 8.1 U	< 7.8 U
1,2-Dichloropropane		< 8.1 U	< 7.8 U
1,3-butadiene		< 8.1 U	< 7.8 U
1-Chloro-1,1-difluoroethane (CFC 142b)		< 8.1 U	< 7.8 U
2-Butanone		< 81 U	< 78 U
2-Hexanone		< 8.1 U	< 7.8 U
4-methyl-2-pentanone		< 8.1 U	< 7.8 U
Acetone		< 81 U	930
Benzene		< 8.1 U	17
Bromodichloromethane		< 8.1 U	< 7.8 U
Bromoform		< 8.1 U	< 7.8 U
Bromomethane		< 8.1 U	< 7.8 U
Carbon Disulfide		< 81 U	< 78 U
Carbon tetrachloride		< 8.1 U	< 7.8 U
Chlorobenzene		< 8.1 U	< 7.8 U
Chlorodifluoromethane (Freon 22)		6,100 D	6,000 D
Chloroethane		< 8.1 U	< 7.8 U
Chloroform		20	< 7.8 U
Chloromethane		< 8.1 U	< 7.8 U
cis-1,2-dichloroethene		1,700	40
cis-1,3-dichloropropene		< 8.1 U	< 7.8 U
Dibromochloromethane		< 8.1 U	< 7.8 U
Dichlorodifluoromethane (Freon 12)		< 8.1 U	< 7.8 U
Ethylbenzene		< 8.1 U	< 7.8 U
Methyl tert-Butyl Ether		< 8.1 U	< 7.8 U
Methylene Chloride		< 8.1 U	< 7.8 U
Styrene		< 8.1 U	< 7.8 U
Tetrachloroethene		< 8.1 U	< 7.8 U
Toluene		150	31
trans-1,2-dichloroethene		< 8.1 U	< 7.8 U
trans-1,3-dichloropropene		< 8.1 U	< 7.8 U
Trichloroethylene		190	9.9
Trichlorofluoromethane (CFC-11)		< 8.1 U	< 7.8 U
Trichlorotrifluoroethane (Freon 113)		< 8.1 U	< 7.8 U
Vinyl Chloride		180	17
Xylene-o		< 8.1 U	< 7.8 U
Xylenes - m,p		< 16 U	< 16 U
Subtotal VOCs ⁽⁴⁾		8,363	7,045

See notes on last page.

Table C-1. Vapor Sample Analytical Results - July 20, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/m ³)	Location ID:	VSP-1	VSP-5
	Sample Location:	Influent	Effluent
	Sample Date:	7/20/2010	7/20/2010
<u>Tentatively Identified Compounds</u>			
Propylene Glycol		--	110 JN
1-Butanol		--	48 JN
2,5-Hexanedione		--	72 JN
2-Phenyl-2-Propanol		63 JN	1,200 JN
Acetaldehyde		--	100 JN
Acetophenone		--	270 JN
Hexamethyl Cyclotrisiloxane		--	100 JN
Silanol, trimethyl-		--	41 JN
Subtotal TICs ⁽⁵⁾		63	1,941
Total VOCs ⁽⁶⁾		8,426	8,986

See notes on last page.

Table C-1. Vapor Sample Analytical Results - July 20, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
- (2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms\Key:

Bold value indicates a detection.

ug/m ³	Micrograms per cubic meter.
USEPA	United States Environmental Protection Agency.
VPGAC	Vapor phase granular activated carbon.
PPZ	Potassium permanganate impregnated zeolite.
VOC	Volatile organic compound.
OM&M	Operation, maintenance and monitoring.
TIC	Tentatively identified compound.
--	TIC not detected.
< 9.2 U	Undetected above its laboratory quantification limit.
D	Concentration is based on a diluted sample analysis.
JN	Compound tentatively identified, concentration is estimated.

Table C-2. Vapor Sample Analytical Results - August 10 and August 12, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/m ³)	Location ID: Sample Location: Sample Date:	VSP-1 Influent 8/10/2010	VSP-2 VPGAC Mid-Train 8/10/2010	VSP-3 VPGAC Effluent 8/10/2010	VSP-4 PPZ Mid-Train 8/10/2010	VSP-5 Effluent 8/12/2010
<u>Volatile Organic Chemicals</u>						
1,1,1-Trichloroethane		3.6	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1,1,2,2-Tetrachloroethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1,1,2-Trichloroethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1,1-Dichloroethane		17	< 0.82	1.7	3.5	3.3
1,1-Dichloroethene		11	< 0.82	7.3	4.0	2.0
1,2-Dichloroethane		0.77	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1,2-Dichloropropane		1.2	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1,3-butadiene		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
1-Chloro-1,1-difluoroethane (CFC 142b)		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
2-Butanone		< 7.7 U	31	15	21	8.1
2-Hexanone		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
4-methyl-2-pentanone		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Acetone		16	520	480	360	230
Benzene		1.2	3.6	12	5.6	11
Bromodichloromethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Bromoform		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Bromomethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Carbon Disulfide		< 7.7 U	< 8.2	< 8 U	< 7.9 U	< 7.6 U
Carbon tetrachloride		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Chlorobenzene		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Chlorodifluoromethane (Freon 22)		5,800	5,700	5,800	5,800	5,200 D
Chloroethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Chloroform		27	< 0.82	< 0.8 U	5.3	4.8
Chloromethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
cis-1,2-dichloroethene		1,500	< 0.82	68	160	49
cis-1,3-dichloropropene		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Dibromochloromethane		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Dichlorodifluoromethane (Freon 12)		4.6	2.6	3.5	3.0	2.8
Ethylbenzene		8.5	< 0.82	< 0.8 U	1.1	< 0.76 U
Methyl tert-Butyl Ether		2.4	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Methylene Chloride		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Styrene		< 0.77 U	< 0.82	< 0.8 U	4.2	< 0.76 U
Tetrachloroethene		6.4	< 0.82	< 0.8 U	1.0	0.82
Toluene		150	< 0.82	0.88	29	25
trans-1,2-dichloroethene		4.6	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
trans-1,3-dichloropropene		< 0.77 U	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Trichloroethylene		190	< 0.82	< 0.8 U	26	12
Trichlorofluoromethane (CFC-11)		2.6	< 0.82	2.3	1.3	1.2
Trichlorotrifluoroethane (Freon 113)		1.8	< 0.82	< 0.8 U	< 0.79 U	< 0.76 U
Vinyl Chloride		150	160	160	54	15
Xylene-o		6.0	< 0.82	< 0.8 U	0.84	< 0.76 U
Xylenes - m,p		13	< 1.6	< 1.6 U	1.9	< 1.5 U
Subtotal VOCs ⁽⁴⁾		7,918	6,417	6,551	6,482	5,565

See notes on last page.

Table C-2. Vapor Sample Analytical Results - August 10 and August 12, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/m ³)	Location ID: Sample Location: Sample Date:	VSP-1 Influent 8/10/2010	VSP-2 VPGAC Mid-Train 8/10/2010	VSP-3 VPGAC Effluent 8/10/2010	VSP-4 PPZ Mid-Train 8/10/2010	VSP-5 Effluent 8/12/2010
<u>Tentatively Identified Compounds</u>						
Propylene Glycol		29 JN	85 JN	270 JN	-	170 JN
(E)-3-Penten-2-one		-	-	21 JN	-	-
1-Butanol		-	5.2 JN	-	-	4.9 JN
1-Chloro-2-propanol		-	-	29 JN	-	-
2,5-Dimethylfuran		-	6.1 JN	-	-	17 JN
2,5-Hexanedione		14 JN	-	-	-	150 JN
2-Butoxyethanol + 2,5-Hexanedione		-	290 JN	800 JN	-	-
2-Ethylhexylacetate		-	5 JN	-	-	-
2-Hydroxypropyl methacrylate		34 JN	-	-	-	-
2-Phenyl-2-Propanol		140 JN	610 JN	1,000 JN	1,900 JN	150 JN
4-Hydroxy-2-butanone		-	--	15 JN	-	-
Acetaldehyde		-	26 JN	38 JN	-	17 JN
Acetophenone		38 JN	190 JN	330 JN	-	110 JN
Benzaldehyde		-	-	9.1 JN	-	4.5 JN
Benzene, 1-methylethyl-		4.6 JN	12 JN	19 JN	-	5.6 JN
C11H24 Branched Alkane WITH HIGHEST CONC.		-	-	-	680 JN	-
C12H26 Branched Alkane WITH HIGHEST CONC.		-	-	-	2,900 JN	-
C12H26 Branched Alkane WITH 2ND HIGHEST CONC.		-	-	-	2,500 JN	-
C12H26 Branched Alkane WITH 3RD HIGHEST CONC.		-	-	-	2,100 JN	-
C12H26 Branched Alkane WITH 4TH HIGHEST CONC.		-	-	-	2,100 JN	-
C12H26 Branched Alkane WITH 5TH HIGHEST CONC.		-	-	-	1,800 JN	-
C12H26 Branched Alkane WITH 6TH HIGHEST CONC.		-	-	-	1,300 JN	-
C12H26 Branched Alkane WITH 7TH HIGHEST CONC.		-	-	-	1,300 JN	-
C12H26 Branched Alkane WITH 8TH HIGHEST CONC.		-	-	-	1,100 JN	-
C13H28 Branched Alkane WITH HIGHEST CONC.		-	-	-	3,000 JN	-
C13H28 Branched Alkane WITH 2ND HIGHEST CONC.		-	-	-	1,300 JN	-
Dodecane		-	-	-	1,200 JN	-
Hexamethyl Cyclotrisiloxane		-	250 JN	210 JN	-	120 JN
Hexanal		-	4.2 JN	-	-	--
Isoprene		11 JN	-	-	-	--
Isopropyl Alcohol (manufacturing-strong Acid)		-	5.4 JN	19 JN	-	--
Isopropylbenzene (Cumene)		-	-	-	-	21 JN
Methyl Vinyl Ketone		-	10 JN	27 JN	-	14 JN
Methylcyclohexane		4.8 JN	-	-	-	-
Nonanal		5.2 JN	5.2 JN	-	-	-
Pentylcyclohexane		-	-	-	1,800 JN	-
Phenol + Unidentified Siloxane		-	-	21 JN	-	-
Propylene Carbonate		3.9 JN	-	-	-	-
Silanol, trimethyl-		-	56 JN	29 JN	-	9.4 JN
Undecane		-	-	-	1,300 JN	-
Unidentified Compound with highest Conc.		-	76 JN	32 JN	2,300 JN	55 JN
Unidentified Oxygenated Compound with highest Conc.		18 JN	14 JN	33 JN	-	5.7 JN
Unidentified Siloxane with highest Conc.		9 JN	21 JN	13 JN	-	5.6 JN
UNKNOWN WITH 2ND HIGHEST CONC.		-	12 JN	28 JN	1,400 JN	-
UNKNOWN WITH 3RD HIGHEST CONC.		-	5.2 JN	19 JN	1,100 JN	-
UNKNOWN WITH 4TH HIGHEST CONC.		-	-	-	1,000 JN	-
UNKNOWN WITH 5TH HIGHEST CONC.		-	-	-	670 JN	-
Subtotal TICs ⁽⁵⁾		312	1,688	2,962	32,750	860
Total VOCs ⁽⁶⁾		8,229	8,106	9,513	39,232	6,425

See notes on last page.

Table C-2. Vapor Sample Analytical Results - August 10 and August 12, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
- (2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms\Key:

Bold value indicates a detection.

ug/m ³	Micrograms per cubic meter.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
OM&M	Operation, maintenance and monitoring.
TIC	Tentatively identified compound.
< 9.2 U	Undetected above its laboratory quantification limit.
D	Concentration is based on a diluted sample analysis.
JN	Compound tentatively identified, concentration is estimated.

Table C-3. Vapor Sample Analytical Results - September 7, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

COMPOUND (ug/m ³)	Location ID: Sample Location: Sample Date:
<u>Volatile Organic Chemicals</u>	
1,1,1-Trichloroethane	
1,1,2,2-Tetrachloroethane	
1,1,2-Trichloroethane	
1,1-Dichloroethane	
1,1-Dichloroethene	
1,2-Dichloroethane	
1,2-Dichloropropane	
1,3-butadiene	
1-Chloro-1,1-difluoroethane (CFC 142b)	
2-Butanone	
2-Hexanone	
4-methyl-2-pentanone	
Acetone	
Benzene	
Bromodichloromethane	
Bromoform	
Bromomethane	
Carbon Disulfide	
Carbon tetrachloride	
Chlorobenzene	
Chlorodifluoromethane (Freon 22)	
Chloroethane	
Chloroform	
Chloromethane	
cis-1,2-dichloroethene	
cis-1,3-dichloropropene	
Dibromochloromethane	
Dichlorodifluoromethane (Freon 12)	
Ethylbenzene	
Methyl tert-Butyl Ether	
Methylene Chloride	
Styrene	
Tetrachloroethene	
Toluene	
trans-1,2-dichloroethene	
trans-1,3-dichloropropene	
Trichloroethylene	
Trichlorofluoromethane (CFC-11)	
Trichlorotrifluoroethane (Freon 113)	
Vinyl Chloride	
Xylene-o	
Xylenes - m,p	
Subtotal VOCs ⁽⁴⁾	

No Vapor Samples September 2010

See notes on last page.

Table C-3. Vapor Sample Analytical Results - September 7, 2010, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. ^(1,2,3)

	Location ID:
COMPOUND	Sample Location:
(ug/m ³)	Sample Date:

Tentatively Identified Compounds

No Vapor Samples
September 2010

Subtotal TICs ⁽⁵⁾

Total VOCs ⁽⁶⁾

Notes:

- (1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
- (2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
- (3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
- (4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. These values are not rounded.
- (5) "Subtotal TICs" represents the sum of individual TICs detected. These values are not rounded.
- (6) "Total VOCs" represent the sum of VOCs and TICs detected. These values are not rounded.

Acronyms\Key:

Bold value indicates a detection.

ug/m ³	Micrograms per cubic meter.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
OM&M	Operation, maintenance and monitoring.
TIC	Tentatively identified compound.

ARCADIS

Appendix D

Air Discharge Quality Evaluation

Table D-1. Summary of SCREEN3 Model Input and Outputs, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Parameters	Date Sampled:	09/10/09	11/10/09	12/02/09	01/11/10	02/02/10	03/10/10	04/12/10	05/10/10	06/09/10	07/20/10	08/12/10
SCREEN3 Model Input												
Source Type	Point	Point	Point	Point	Point	Point	Point	Point	Point	Point	Point	Point
Emission Rate (g/s)	1	1	1	1	1	1	1	1	1	1	1	1
Stack Height (ft)	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Stack Height (m)	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Stack Inside Diameter (m)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Air Flow Rate (scfm) ⁽¹⁾	2,077	2,126	1,935	2,184	2,135	2,099	2,086	2,076	2,003	2,114	2,097	
Air Flow Rate (acfm @ stack temp) ⁽²⁾	3,809	2,142	1,964	2,188	2,135	2,127	2,125	2,115	2,029	2,194	2,180	
Stack Gas Exit Temperature (K) ⁽¹⁾	540	297	299	295	294	298	300	300	298	306	306	
Ambient Air Temperature (K) ⁽³⁾	296	281	278	269	269	280	285	283	288	299	296	
Receptor Height (m) ⁽⁴⁾	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Urban/Rural	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	
Building Height (m)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
Min Horizontal Bldg Dim (m)	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	
Max Horizontal Bldg Dim (m)	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	
Consider Bldg Downwash?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Simple/Complex Terrain Above Stack	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	
Simple/Complex Terrain Above Stack Base	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	
Meteorology	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	
Automated Distances Array	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Terrain Height Above Stack Base	0	0	0	0	0	0	0	0	0	0	0	
SCREEN3 Model Output												
1-HR Max Concentration at Receptor Height ($\mu\text{g}/\text{m}^3$) ⁽⁵⁾	1,909	1,900	2,084	1,876	1,912	1,912	1,911	1,919	1,985	1,857	1,869	
Annualization Factor ⁽⁶⁾	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
Average Annual Concentration at Receptor Height ($\mu\text{g}/\text{m}^3$) ⁽⁷⁾	152.7	152	166.7	150.1	153	153	152.9	153.5	158.8	148.6	149.5	
Distance To Max Concentration (m) ⁽⁸⁾	8	8	8	8	8	8	8	8	8	8	8	

See notes on last page.

Table D-1. Summary of SCREEN3 Model Input and Outputs, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

- (1) The stack air flow rate (in scfm) and temperature were measured using inline instrumentation. Values were measured at the blower 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 USEPA time averaging conversion factor of 1/0.08 was used to convert the 1-hour maximum concentration output to an annual average.
- (7) Average annual constituent concentration at the receptor height was calculated by multiplying the one hour maximum concentration by the annualization factor.
- (8) SCREEN3 calculated distance to the 1-hour maximum concentration.

Acronyms/Key:

µg/m ³	Micrograms per cubic meter.
acfm	Actual cubic feet per minute.
ft	Feet.
g/s	Grams per second.
K	Kelvin.
m	Meters.
scfm	Standard cubic feet per minute.
USEPA	United States Environmental Protection Agency.

Table D-2. Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York.

Compound	Actual Effluent Concentrations ⁽¹⁾ (µg/m ³)										
	9/10/09	11/10/09	12/2/09	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10
1,1,1 - Trichloroethane	0	0	0	0	0	0.91	0	0	0.97	0	0
1,1 - Dichloroethane	5.3	37	3.7	2.8	0	5.9	0	1.2	4.4	0	3.3
1,2 - Dichloroethane	0	0	0	0	0	0	0	0	0	0	0
1,1 - Dichloroethene	0	5.8	1.4	0	0	0.97	0	0	0.77	0	2
2-Butanone	0	0	5.5	16	42	17	0	9.2	9.1	0	8.1
Acetone	0	310	13	61	550	98	200	95	170	930	230
Chloroform	0	30	5.7	4.2	7.9	7.9	0	3.5	6.7	0	4.8
Ethylbenzene	0	1.4	3	1.1	0	1.8	0	0	0.79	0	0
Xylenes (o)	0	1.6	3.4	1.4	0	3.1	0	0	1.4	0	0
Xylenes (m,p)	0	2.8	6.2	2.3	0	5.1	0	0	2.4	0	0
Chloromethane	0	18	0	0	8.8	0.82	0	0.97	2.8	0	0
Methylene Chloride	0	2.5	0	0	0	0	0	0	0	0	0
Tetrachloroethene	0	0	0	0	0	1.2	0	0	1.1	0	0.82
Trichloroethene	8.8	15	30	13	13	17	17	5.1	12	9.9	12
Vinyl Chloride	160	200	52	36	12	29	27	0	5.0	17	15
cis 1,2 Dichloroethene	150	1,700	230	52	34	77	65	9.2	21	40	49
trans 1,2 Dichloroethene	0	0	0	0	0	0	0	0	0	0	0
Benzene	17	13	12	7.8	17	4.6	29	7.8	13	17	11
Toluene	120	87	90	38	40	96	80	0	44	31	25
2-Hexanone	0	0	0	0	0	0.81	0	0	0	0	0
Trichlorofluoromethane (Freon 11)	0	2.2	0	0	0	0	0	0	0	0	1.2
Dichlorodifluoromethane (Freon 12)	10	61	2.4	2.9	3.3	3.8	0	3.5	3.5	0	2.8
Chlorodifluoromethane (Freon 22)	540	0	2,400	3,700	3,700	4,700	4,800	3,500	5,400	6,000	5,200

See notes on last page.

Table D-2. Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York.

Compound	AGC ⁽²⁾ (µg/m ³)	Maximum Allowable Stack Concentration ⁽³⁾ (µg/m ³)										
		09/10/09	11/10/09	12/2/09	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10
1,1,1 - Trichloroethane	1,000	3.64E+06	6.51E+06	6.47E+06	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06
1,1 - Dichloroethane	0.63	2.30E+03	4.10E+03	4.08E+03	4.06E+03	4.09E+03	4.10E+03	4.11E+03	4.11E+03	4.14E+03	4.09E+03	4.10E+03
1,2 - Dichloroethane	0.038	1.38E+02	2.47E+02	2.46E+02	2.45E+02	2.46E+02	2.47E+02	2.48E+02	2.48E+02	2.50E+02	2.47E+02	2.47E+02
1,1 - Dichloroethene	70	2.55E+05	4.56E+05	4.53E+05	4.52E+05	4.54E+05	4.56E+05	4.56E+05	4.57E+05	4.60E+05	4.55E+05	4.55E+05
2-Butanone	5,000	1.82E+07	3.25E+07	3.24E+07	3.23E+07	3.24E+07	3.26E+07	3.26E+07	3.26E+07	3.29E+07	3.25E+07	3.25E+07
Acetone	28,000	1.02E+08	1.82E+08	1.81E+08	1.81E+08	1.82E+08	1.82E+08	1.83E+08	1.83E+08	1.84E+08	1.82E+08	1.82E+08
Chloroform	0.043	1.57E+02	2.80E+02	2.78E+02	2.77E+02	2.79E+02	2.80E+02	2.80E+02	2.81E+02	2.83E+02	2.79E+02	2.80E+02
Ethylbenzene	1,000	3.64E+06	6.51E+06	6.47E+06	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06
Xylenes (o)	100	3.64E+05	6.51E+05	6.47E+05	6.45E+05	6.49E+05	6.51E+05	6.52E+05	6.53E+05	6.58E+05	6.50E+05	6.50E+05
Xylenes (m,p)	100	3.64E+05	6.51E+05	6.47E+05	6.45E+05	6.49E+05	6.51E+05	6.52E+05	6.53E+05	6.58E+05	6.50E+05	6.50E+05
Chloromethane	90	3.28E+05	5.86E+05	5.82E+05	5.81E+05	5.84E+05	5.86E+05	5.87E+05	5.87E+05	5.92E+05	5.85E+05	5.85E+05
Methylene Chloride	2.1	7.65E+03	1.37E+04	1.36E+04	1.35E+04	1.36E+04	1.37E+04	1.37E+04	1.37E+04	1.38E+04	1.36E+04	1.37E+04
Tetrachloroethene	1	3.64E+03	6.51E+03	6.47E+03	6.45E+03	6.49E+03	6.51E+03	6.52E+03	6.53E+03	6.58E+03	6.50E+03	6.50E+03
Trichloroethene	0.5	1.82E+03	3.25E+03	3.24E+03	3.23E+03	3.24E+03	3.26E+03	3.26E+03	3.26E+03	3.29E+03	3.25E+03	3.25E+03
Vinyl Chloride	0.11	4.01E+02	7.16E+02	7.12E+02	7.10E+02	7.14E+02	7.16E+02	7.17E+02	7.18E+02	7.23E+02	7.15E+02	7.15E+02
cis 1,2 Dichloroethene	63	2.30E+05	4.10E+05	4.08E+05	4.06E+05	4.09E+05	4.10E+05	4.11E+05	4.11E+05	4.14E+05	4.09E+05	4.10E+05
trans 1,2 Dichloroethene	63	2.30E+05	4.10E+05	4.08E+05	4.06E+05	4.09E+05	4.10E+05	4.11E+05	4.11E+05	4.14E+05	4.09E+05	4.10E+05
Benzene	0.13	4.74E+02	8.46E+02	8.41E+02	8.39E+02	8.43E+02	8.46E+02	8.48E+02	8.48E+02	8.55E+02	8.45E+02	8.45E+02
Toluene	5,000	1.82E+07	3.25E+07	3.24E+07	3.23E+07	3.24E+07	3.26E+07	3.26E+07	3.26E+07	3.29E+07	3.25E+07	3.25E+07
2-Hexanone	48	1.75E+05	3.12E+05	3.11E+05	3.10E+05	3.11E+05	3.13E+05	3.13E+05	3.13E+05	3.16E+05	3.12E+05	3.12E+05
Trichlorofluoromethane (Freon 11)	1,000	3.64E+06	6.51E+06	6.47E+06	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06
Dichlorodifluoromethane (Freon 12)	12,000	4.37E+07	7.81E+07	7.77E+07	7.74E+07	7.78E+07	7.81E+07	7.83E+07	7.83E+07	7.89E+07	7.80E+07	7.80E+07
Chlorodifluoromethane (Freon 22)	50,000	1.82E+08	3.25E+08	3.24E+08	3.23E+08	3.24E+08	3.26E+08	3.26E+08	3.26E+08	3.29E+08	3.25E+08	3.25E+08

See notes on last page.

Table D-2. Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York.

Compound	Percent of Maximum Allowable Stack Concentration ⁽⁴⁾										
	09/10/09	11/10/09	12/2/09	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10
1,1,1 - Trichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1 - Dichloroethane	0.23%	0.90%	0.09%	0.07%	0.00%	0.14%	0.00%	0.03%	0.11%	0.00%	0.08%
1,2 - Dichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1 - Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Butanone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.00%	10.72%	2.05%	1.51%	2.83%	2.82%	0.00%	1.25%	2.37%	0.00%	1.72%
Ethylbenzene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (o)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (m,p)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloromethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Methylene Chloride	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tetrachloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.02%	0.00%	0.01%
Trichloroethene	0.48%	0.46%	0.93%	0.40%	0.40%	0.52%	0.52%	0.16%	0.36%	0.30%	0.37%
Vinyl Chloride	39.93%	27.94%	7.30%	5.07%	1.68%	4.05%	3.76%	0.00%	0.69%	2.38%	2.10%
cis 1,2 Dichloroethene	0.07%	0.41%	0.06%	0.01%	0.01%	0.02%	0.02%	0.00%	0.01%	0.01%	0.01%
trans 1,2 Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Benzene	3.59%	1.54%	1.43%	0.93%	2.02%	0.54%	3.42%	0.92%	1.52%	2.01%	1.30%
Toluene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Hexanone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorodifluoromethane (Freon 22)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Notes:

- (1) Actual effluent concentrations are analytical results from air samples collected on the dates shown. Data in this table corresponds to approximately the first 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) Maximum allowable stack concentrations were calculated by dividing the product of the annual guideline concentration of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average 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.

Acronyms/Key:

$\mu\text{g}/\text{m}^3$ Micrograms per cubic meter.
 AGC Annual guideline concentration.
 MASC Maximum allowable stack concentration.