ARCADIS

Infrastructure, environment, facilities

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ENVIRONMENT

Steven M. Scharf, P.E.
Project Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, 11th Floor
625 Broadway
Albany, New York 12233-7015

Subject:
Results of Fourth Quarter 2008 Groundwater Monitoring, Operable Unit 2, Northrop Grumman Systems Corporation (Northrop Grumman) and Former Naval Weapons Industrial Reserve Plant (NWIRP) Sites, Bethpage, New York.
(NYSDEC Site #s 1-30-003A and B).

Date:
February 12, 2009

Contact:
David E. Stern

Phone:
(631) 391-5284

Email:
David.stern@arcadis-us.com

Our ref:
NY001464.0409.00004

Dear Mr. Scharf:

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), ARCADIS is providing the New York State Department of Environmental Conservation (NYSDEC) with the validated results of groundwater monitoring performed in accordance with the approved groundwater monitoring plan and the public water supply contingency plan (ARCADIS G&M, Inc. 2006 and 2003, respectively) for the Fourth Quarter of 2008 for Operable Unit 2 (OU2). Table 1 provides OU2 remedial systems performance and operational data and water balance for the current period. Tables 2 and 3 provide the results of monitoring for volatile organic compounds (VOCs) in monitoring wells and for VOCs in outpost wells, for this period, respectively. Figure 1 shows the site plan with well locations.

Please contact us if you have any questions or comments.

Sincerely,

ARCADIS

David E. Stern
Senior Hydrogeologist/Associate Project Manager

Enclosures

Copies:
See Attached Distribution List

Copies:
Walter Parish – NYSDEC Region 1
Bill Spitz, NYSDEC Region 1
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Table 1. Summary of Operational Data and Water Balance for the On-Site Portion of the OU2 Groundwater Remedy, Fourth Quarter 2008, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

Identification	Design Pumping/ Recharge Rate [a] (gpm)	Current Actual Average Pumping/Recharge Rate [b] (gpm)	Design Total Pumpage/Recharge (MG)	Current Actual Total Pumpage/ Recharge (MG)	Current Percent of Design Pumpage/ Recharge	Current TCE Concentration (ug/L)	Current TVOC Concentration [c] (ug/L)	4th Quarter 2008 Estimated VOC Mass Removed [d] (lbs)
Remedial Wells			**Groundwater Removed from Aquifer**					
Well 1	800	861	103.7	110.5	107%	400	500	460
Well 3	700	689	90.7	88.4	97%	2,900	3,080	2,267
Well 17	1,000	1,339	129.6	161.4	125%	240	264	355
Well 18	600	709	77.8	14.7	19%	100	121	15
Well 19	700	951	90.7	112.2	124%	200	226	211
Rounded Totals:	**3,800**	**4,549**	**493**	**487**	**99%**	--	--	**3,308**
Recharge Basins [a]			**Treated Water Recharged to Aquifer**					
West Recharge Basins	412	1,383	53	179.2	338%	--	--	--
South Recharge Basins	2,231	2,797	289.1	362.5	125%	--	--	--
Rounded Totals:	**2,643**	**4,180**	**342**	**541.7**	**158%**	--	--	--
Treated Water Sent to Calpine								
Calpine Demand	600-1000	167	78-130	21.4	--	--	--	--

Treatment Efficiencies	**Average SPDES Outfall TVOC Concentrations (ug/L) [f]**
Tower 96 System Efficiency [e] :	**>99.9%** **<0.5**
Tower 102 System Efficiency [e] :	**99.9%** **0.2**

see footnotes on last page

Table 1. Summary of Operational Data and Water Balance for the On-Site Portion of the OU2 Groundwater Remedy, Fourth Quarter 2008, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

(a) - Remedial well pumping rates based on computer modeling (ARCADIS G& M, Inc. 2003c). Acceptable minimum recharge rates based on computer modeling (ARCADIS G&M, Inc. 2004b). Design pumping and recharge rates were modified in April 2005. Recharge includes remedial well pumpage (minus Calpine demand, OCC/RUCO biosparge system demand, and pipe loss) and incidental runoff from precipitation. Current average recharge rates have been determined using the entire 90-day span of time as opposed to current average pumping rates, which account for varying amounts of downtime, as indicated below.

(b) - OU2 wells were operational during the Fourth Quarter 2008, at the following percentages: Well 1 (99%), Well 3 (99%); Well 17 (93%), Well-18 (16%), and Well 19 (91%). The Actual Average Pumping Rates and rate of treated water sent to Calpine are for when the wells are pumping.

(c) - The TVOC concentration for each well was calculated based on Fourth Quarter 2008 groundwater monitoring data (Table 2).

(d) - TVOC mass removed is based on the TVOC data given above and the following formula:

(TVOC concentration in ug/L) X (gallons pumped) X (3.785 L/gal) X (1 x 10^{-6} g/ug) X (2.2 x 10^{-3} lb/g)

(e) Air stripping efficiency calculated from values above and in Table 2 using the following formula:

$$1 - \left[\left(\frac{\text{Average SPDES TVOC Concentration at Outfall}}{\frac{[(\text{TVOC}_{\text{Well 1}} \times Q_{\text{Well 1}}) + (\text{TVOC}_{\text{Well 2}} \times Q_{\text{Well 2}})]}{(Q_{\text{Well 1}} + Q_{\text{Well 2}})}} \right) \right]$$

When non-detectable levels of VOCs are found in the effluent, a value of zero is used to estimate the efficiency of the air stripper.

(f) Towers 96 and 102 outfalls are identified as Outfalls 005 and 006, respectively (commonly known as the Plant 5 Recharge Basins and South Recharge Basins, respectively). Complete SPDES reporting provided to NYSDEC by Northrop Grumman under separate cover.

--	Not Available or Not Applicable	lb/g	pounds per gram
TVOC	Total Volatile Organic Compounds	lbs	pounds
g/ug	grams per microgram	MG	Million Gallons
gpm	gallons per minute	ug/L	micrograms per liter
L/gal	Liters per gallon	OU2	Operable Unit 2
SPDES	State Pollutant Discharge Elimination System	Q	Pumping Rate
Northrop Grumman	Northrop Grumman Systems Corporation	NYSDEC	New York State Department of Environmental Conservation

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Table 2. Concentrations of Volatile Organic Compounds Detected in Monitoring Wells and Groundwater Remedial Wells, Fourth Quarter 2008, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

CONSTITUENT (Units in ug/L)	Well: / Sample ID: / Date:	GM-20I / GM-20I / 12/30/2008	GM-20D / GM-20D / 12/30/2008	GM-21I / GM-21I / 12/30/2008	GM-21D / GM-21D / 12/15/2008	GM-33D2 / GM-33D-2 / 12/17/2008	GM-34D / GM-34D / 12/29/2008	GM-34D2 / GM-34D-2 / 12/29/2008	GM-35D2 / GM-35D-2 / 12/30/2008	GM-75D2 / GM-75D-2 / 12/17/2008
1,1,1-Trichloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,1,2,2-Tetrachloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,1,2-Trichloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,1-Dichloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,1-Dichloroethene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,2-Dichloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
1,2-Dichloropropane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
2-Butanone		< 50	< 50	< 50	< 50	< 50	< 250	< 100	< 100	< 50
2-Hexanone		< 50	< 50	< 50	< 50	< 50	< 250	< 100	< 100	< 50
4-methyl-2-pentanone		< 50	< 50	< 50	< 50	< 50	< 250	< 100	< 100	< 50
Acetone		< 50	< 50	< 50	< 50	< 50	< 250	< 100	< 100	< 50
Benzene		< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 3.5	< 1.4	< 1.4	< 0.7
Bromodichloromethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Bromoform		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Bromomethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Carbon Disulfide		< 50	< 50	< 50	< 50	< 50	< 250	< 100	< 100	< 50
Carbon tetrachloride		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Chlorobenzene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Chloroethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Chloroform		< 7	< 7	< 7	< 7	< 7	< 35	< 14	< 14	< 7
Chloromethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
cis-1,2-dichloroethene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
cis-1,3-dichloropropene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Dibromochloromethane		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Ethylbenzene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Methylene Chloride		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Styrene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Tetrachloroethene		< 5	< 5	< 5	< 5	**11**	< 25	**10**	< 10	< 5
Toluene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
trans-1,2-dichloroethene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
trans-1,3-dichloropropene		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Trichloroethylene		< 5	< 5	< 5	< 5	**57**	**790**	**290**	**210**	**190**
Trichlorotrifluoroethane (Freon 1		< 5	< 5	< 5	< 5	**23**	< 25	< 10	< 10	< 5
Vinyl Chloride		< 2	< 2	< 2	< 2	< 2	< 10	< 4	< 4	< 2
Xylene-o		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Xylenes - m,p		< 5	< 5	< 5	< 5	< 5	< 25	< 10	< 10	< 5
Total VOCs		0	0	0	0	**91**	**790**	**300**	**210**	**190**

ug/L Micrograms per liter
Bold Constituent detected
VOCs Volatile Organic Compounds

Table 2. Concentrations of Volatile Organic Compounds Detected in Monitoring Wells and Groundwater Remedial Wells, Fourth Quarter 2008, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

CONSTITUENT (Units in ug/L)	Well: / Sample ID: / Date:	GM-79I / GM-79I / 12/15/2008	GM-79D / GM-79D / 12/15/2008	GP-1 / WELL 1 / 12/17/2008	GP-1 / WELL 3 / 12/17/2008	T- 96 EFF / TOWER 96 EFF / 12/17/2008	WELL 17 / WELL 17 / 12/17/2008	WELL 18 / WELL 18 / 12/17/2008	WELL 19 / WELL 19 / 12/17/2008	T- 102 EFF / TOWER 102 EFF / 12/17/2008
1,1,1-Trichloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
1,1,2-Trichloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
1,1-Dichloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
1,1-Dichloroethene		< 5	< 5	< 13	< 100	< 5	< 10	**6.2**	< 5	< 5
1,2-Dichloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
1,2-Dichloropropane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
2-Btanone		< 50	< 50	< 130	< 1000	< 50	< 100	< 50	< 50	< 50
2-Hexanone		< 50	< 50	< 130	< 1000	< 50	< 100	< 50	< 50	< 50
4-methyl-2-pentanone		< 50	< 50	< 130	< 1000	< 50	< 100	< 50	< 50	< 50
Acetone		< 50	< 50	< 130	< 1000	< 50	< 100	< 50	< 50	< 50
Benzene		< 0.7	< 0.7	< 1.8	< 14	< 0.7	< 1.4	< 0.7	< 0.7	< 0.7
Bromodichloromethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Bromoform		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Bromomethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Carbon Dislfide		< 50	< 50	< 130	< 1000	< 50	< 100	< 50	< 50	< 50
Carbon tetrachloride		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Chlorobenzene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Chloroethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Chloroform		< 7	< 7	< 18	< 140	< 7	< 14	< 7	< 7	< 7
Chloromethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
cis-1,2-dichloroethene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	**18**	< 5
cis-1,3-dichloropropene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Dibromochloromethane		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Ethylbenzene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Methylene Chloride		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Styrene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Tetrachloroethene		< 5	< 5	**100**	< 100	< 5	**24**	**15**	**7.5**	< 5
Tolene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
trans-1,2-dichloroethene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
trans-1,3-dichloropropene		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Trichloroethylene		< 5	**48**	**400**	**2900**	< 5	**240**	**100**	**200 D**	< 5
Trichlorotrifloroethane (Freon 11		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Vinyl Chloride		< 2	< 2	< 5	**180**	< 2	< 4	< 2	< 2	< 2
Xylene-o		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Xylenes - m,p		< 5	< 5	< 13	< 100	< 5	< 10	< 5	< 5	< 5
Total VOCs		0	**48**	**500**	**3080**	0	**264**	**121.2**	**225.5**	0

ug/L Micrograms per liter
Bold Constituent detected
VOCs Volatile Organic Compounds

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Table 3. Concentrations of Site-Related Volatile Organic Compounds Detected in Outpost Wells, Fourth Quarter 2008, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

CONSTITUENT (Units in ug/L)	Well: / Sample ID: / Date:	BPOW 1-1 / BPOW 1-1 / 12/18/2008	BPOW 1-2 / BPOW 1-2 / 12/18/2008	BPOW 1-3 / BPOW 1-3 / 12/18/2008	BPOW 3-1 / BPOW 3-1 / 12/23/2008	BPOW 3-2 / BPOW 3-2 / 12/23/2008	BPOW 3-2 / BPOW 3-2 / 12/23/2008	BPOW 4-1 / BPOW 4-1 / 12/18/2008	BPOW 4-2 / BPOW 4-2 / 12/18/2008
1,1,1-Trichloroethane		**1.8**	< 0.5 U	**2**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane		**1.8**	< 0.5 U	**2**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene		**1.2**	< 0.5 U	**1.9**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon Tetrachloride		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichlorotrifluoroethane (Freon 113)		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene		< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene		**1.3**	< 0.5 U	**0.58**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Total Site-Related VOCs [1]:		**6.1**	0	**6.48**	0	0	0	0	0
TVOC Trigger Value [2]:		**0.6**	**0.6**	**0.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**

Note: Outpost wells OW2-1 and OW2-2 were not sampled by Northrop Grumman this round, due to ongoing NYSDEC investigation of non-site related VOCs (benzene and methyl tertiary butyl ether) detected in these wells.

(1) Site-related VOCs were established in the Public Water Supply Contingency Plan (PWSCP) (ARCADIS G&M, Inc. 2003).

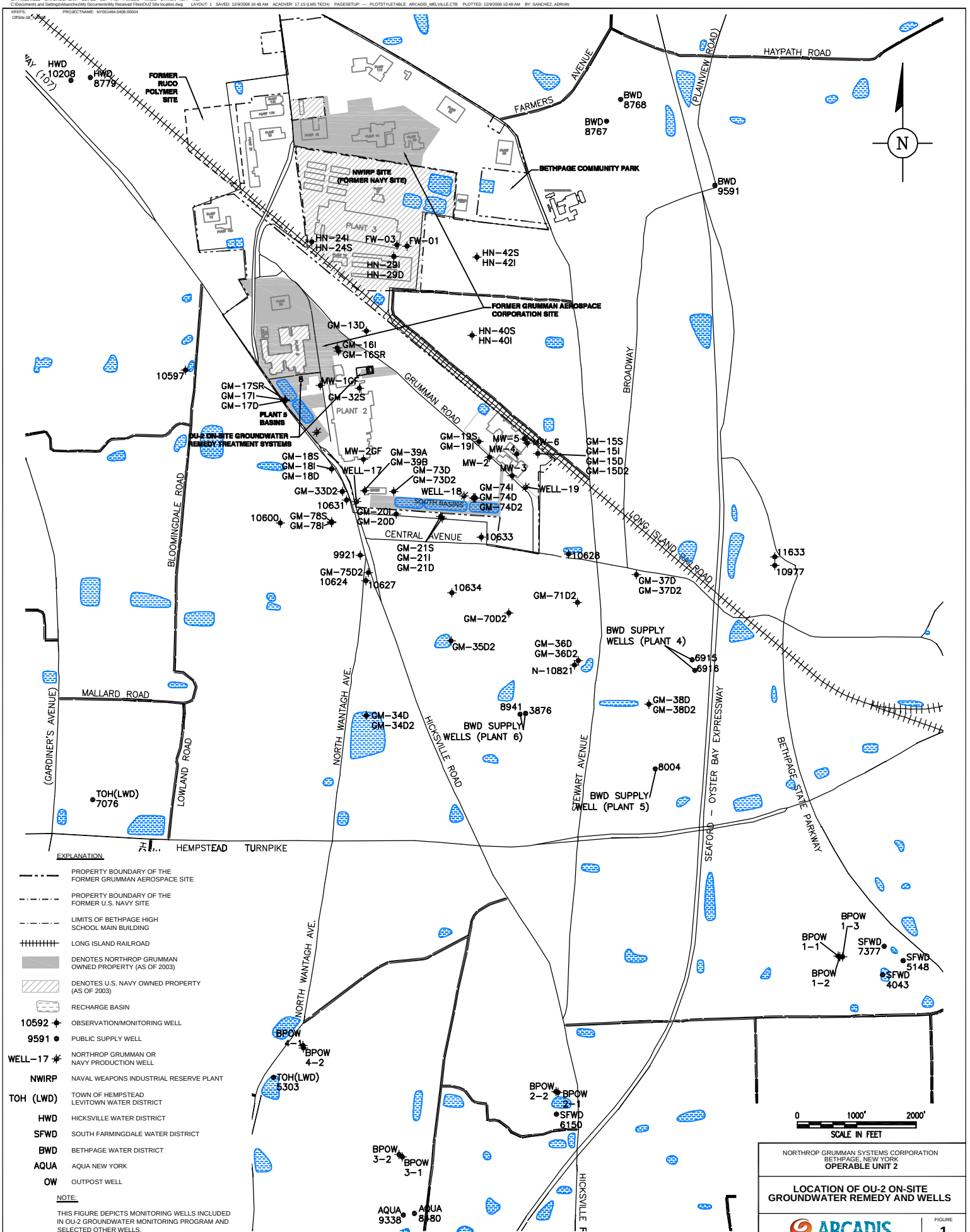
(2) TVOC Trigger Values were established in the PWSCP (ARCADIS G&M, Inc. 2003).

(3) The TVOC Trigger Value for Cluster 1 was initially exceeded on April 23, 2004; confirmatory sampling and reporting was conducted as per the PWSCP (ARCADIS G&M, Inc. 2003).

ug/L Micrograms per liter

Bold Constituent detected

TVOC Total Volatile Organic Compounds



EXPLANATION

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER U.S. NAVY SITE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2003)
- DENOTES U.S. NAVY OWNED PROPERTY (AS OF 2003)
- RECHARGE BASIN
- 10592 — OBSERVATION/MONITORING WELL
- 9591 — PUBLIC SUPPLY WELL
- WELL-17 — NORTHROP GRUMMAN OR NAVY PRODUCTION WELL
- NWIRP — NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- TOH (LWD) — TOWN OF HEMPSTEAD LEVITOWN WATER DISTRICT
- HWD — HICKSVILLE WATER DISTRICT
- SFWD — SOUTH FARMINGDALE WATER DISTRICT
- BWD — BETHPAGE WATER DISTRICT
- AQUA — AQUA NEW YORK
- OW — OUTPOST WELL

NOTE:

THIS FIGURE DEPICTS MONITORING WELLS INCLUDED IN OU-2 GROUNDWATER MONITORING PROGRAM AND SELECTED OTHER WELLS.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

LOCATION OF OU-2 ON-SITE GROUNDWATER REMEDY AND WELLS

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FIGURE 1