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Steven Scharf, P.E.
New York State Department of Environmental Conservation
Bureau of Eastern Remedial Action
Division of Environmental Remediation
50 Wolf Road
Albany, NY 12233-7010

Subject:
Draft-Final Operable Unit 2 Groundwater Monitoring Plan, Northrop Grumman Corporation/Naval Weapons Industrial Reserve Plant (NWIRP) Sites, Bethpage, New York. (NYSDEC IDs: 1-30-003A & B).
ARCADIS Project No. NY001321.0001.00001

ENVIRONMENTAL

Date
11 May 2001

Contact:
Carlo San Giovanni

Extension:
(631) 391-5259

Dear Mr. Scharf:

Enclosed, please find three copies of above-referenced document, as requested. The Monitoring Plan has been revised incorporating NYSDEC and NYSDOH comments contained in the February 23, 2000 comment letter. From our telephone conversation on May 9, 2001, ARCADIS G&M understands that the interested parties (listed below) may offer additional comments on the Monitoring Plan and that such comments are to be directed to NYSDEC attention at the above address. Upon receipt of all comments, NYSDEC will compile and forward the complete set of comments to Northrop Grumman Corporation.

Please contact us if you have any questions.

Sincerely,

ARCADIS G&M, Inc.

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Project Hydrogeologist

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ARCADIS GERAGHTY & MILLER

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Operable Unit 2,
Groundwater Monitoring Plan
Northrop Grumman
Corporation, Bethpage,
New York

PREPARED FOR

Northrop Grumman Corporation

DRAFT

Operable Unit 2,
Groundwater Monitoring Plan
Northrop Grumman
Corporation, Bethpage,
New York

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Our Ref.:
NY001321.0001.00001

Date:
May 11, 2001

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1. Introduction

This groundwater monitoring plan (monitoring plan) was prepared as part of the operation, maintenance, and monitoring (OM&M) requirements of the Operable Unit 2 (OU2) groundwater remedy for the Northrop Grumman Corporation (NGC) and Naval Weapons Industrial Reserve Plant (NWIRP) sites in Bethpage, New York. The purpose of the monitoring plan is to establish a network of wells, define the analytical parameters, and establish a schedule to monitor the effectiveness of the groundwater remedy at achieving the remedial goals, described in the March 30, 2001 Record of Decision (ROD) for OU2 of preventing the off-site migration of volatile organic compound (VOC)-impacted groundwater and reducing VOC contaminant mass in groundwater in the GM-38 Area while also monitoring groundwater conditions in areas (including VCM subplume) on and downgradient of the NGC and NWIRP sites. This monitoring plan is a required component of the OM&M Plan, and was prepared consistent with New York State Department of Environmental Conservation (NYSDEC) guidance (NYSDEC 1990).

The following sections describe the monitoring plan objectives, a summary of remediation activities, the monitoring well network (both existing and proposed new wells), data collection methods, project quality assurance/quality control (QA/QC) requirements, the approach to evaluating the hydraulic and groundwater quality monitoring data, the contents of the groundwater monitoring reports, and the groundwater monitoring schedule. The monitoring plan will continue to be re-evaluated over time and revisions will be incorporated as appropriate into the OM&M Plan.

The original monitoring plan, prepared by ARCADIS G&M in May 1999, was commented on by the NYSDEC during a June 28, 1999 conference call and further comments from the NYSDEC and the New York State Department of Health (NYSDOH) were provided in a letter dated February 23, 2000. NGC responded to the February 23rd letter in a letter dated May 8, 2000. In a letter to NGC, dated June 16, 2000, the NYSDEC approved the monitoring plan, based on the changes proposed in the May 8, 2000 letter. This monitoring plan reflects the agreed upon changes to the May 1999 monitoring plan.

2. Monitoring Plan Objectives

The objectives of the monitoring plan are as follows:

- Determine, monitor, and document changes in local groundwater flow patterns in all four aquifer zones (shallow, intermediate, deep, and deep2 [D2]), as defined in the groundwater flow modeling report (ARCADIS Geraghty & Miller, Inc., 2000) resulting from the operation of the OU2 remedial extraction (remedial) wells, (i.e., Wells GP-1, ONCT-1, ONCT-2, and ONCT-3).

- Delineate, monitor, and document the vertical and horizontal extent of the cumulative capture zone created by the operation of the OU2 remedial wells.

- Determine, monitor, and document VOC concentrations and trends in the OU2 remedial wells and active Industrial Supply Well GP-3.

- Monitor and document groundwater quality changes (VOCs) at the leading edge of the plume upgradient of unimpacted pubic supply wells.

- Determine, monitor, and document groundwater quality concentration trends on- and off-site within the VOC plume, including the GM-38 Area.

- Determine, monitor, and document local groundwater quality and trends for cadmium (Cd) and chromium (Cr) in the area near former NGC Plant 2.

- Monitor and document the position of the vinyl chloride monomer (VCM) subplume.

- Monitor groundwater quality for VOCs and SVOCs downgradient of the NGC Plant 1 Fuel Depot in accordance with the Stipulation Agreement between NGC and NYSDEC dated March 1997.

- Determine and monitor groundwater quality trends for VOCs upgradient of the Bethpage Water District (BWD) Public Supply Wells N-3876 and N-8941 (Plant 6), N-8004 (Plant 5), and N-6915 and N-6916 (Plant 4).

3. Summary of Remediation Activities

Installation and development of the OU2 Groundwater Remedial (formerly called the IRM) Wells ONCT-1, ONCT-2, and ONCT-3 was completed in June 1997. The treatment facility serving the ONCT wells was completed in November 1997. Full remedial system operation began in September 1998. The baseline hydraulic measurement and groundwater quality sampling round was conducted in May and June

of 1997 (ARCADIS Geraghty & Miller, Inc., 1999). The OU2 remedial system consists of four extraction wells (ONCT-1, ONCT-2, ONCT-3, and GP-1), two treatment facilities consisting of air stripping towers (one facility [western treatment system] serves Well GP-1 and one facility [eastern treatment system] serves Wells ONCT-1, ONCT-2, and ONCT-3), and two sets of recharge basins (the Plant 5 Basins and the South Basins). The total design flow rate of the remedial wells is 3,375 gallons per minute (gpm). Currently, treated effluent from the two OU2 groundwater treatment plants is discharged to the groundwater system at the water table (shallow zone) via the two sets of recharge basins. Treated effluent from Remedial Well GP-1 (pumping at a rate of approximately 1,075 gpm) along with contribution from Industrial Supply Wells GP-3 and, as needed, GP-10 and GP-11 is discharged to the Plant 5 Recharge Basins (Wells GP-10 and GP-11 are not included in the well network, however as NGC pumps these wells through treatment systems that are monitored as part of the OU2 remedy, the contribution of these wells is considered as part of evaluating the effectiveness of the OU2 remedy). The combined effluent from Wells ONCT-1, ONCT-2, and ONCT-3 (pumping at a combined rate of approximately 2,300 gpm) is treated at the eastern treatment system and discharged to the South Recharge Basins.

4. Monitoring Network

Groundwater monitoring at the sites includes hydraulic (water-level) monitoring and groundwater quality monitoring. A total of 75 wells are included in the monitoring network (this includes five proposed wells yet to be installed). The locations of existing wells within the approximate domain of the groundwater flow model (approximately a 3½-mile radius from the NGC site) are shown on Figures 1A and 1B. The well number, depth, length of screen, and owner of wells shown on Figures 1A and 1B are included, as available, in Table A-1 (Appendix A). The locations and purposes of the proposed and existing wells in the groundwater monitoring network are shown on Figures 2 through 5. Table 1 summarizes the wells included in the OU2 groundwater monitoring network and their purposes; details on the wells in the OU2 groundwater monitoring network are provided in Table 2.

The components of the groundwater quality monitoring program are described below:

- Monitor groundwater flow patterns in all four aquifer zones (shallow, intermediate, deep, and D2), as defined in the groundwater flow modeling report (ARCADIS Geraghty & Miller, Inc. 2000).

- Determine the vertical and horizontal extent of the cumulative capture zone of Remedial Wells GP-1, ONCT-1, ONCT-2, and ONCT-3.

- Monitor VOC concentrations in active on-site industrial supply wells and remedial wells.

- Perform outpost groundwater monitoring at the leading edge of the VOC plume.

- Monitor groundwater quality concentration trends on- and off-site within the VOC plume, including the GM-38 Area.

- Monitor local groundwater quality for cadmium (Cd) and chromium (Cr) in the area of former NGC Plant 2. The current owner of the former NGC Plant 2 property, Steel Equities, has prepared a draft groundwater monitoring plan for additional monitoring of groundwater quality for total and dissolved Cd/Cr at the former NGC Plant 2 site (Appendix B). Currently, the NYSDEC is reviewing the draft plan. Upon NYSDEC approval of the Steel Equities plan, the well network will be incorporated into the groundwater monitoring program.

- Monitor local groundwater quality for semi-volatile organic compounds (SVOCs) and VOCs downgradient of the NGC Plant 1 Fuel Depot.

- Monitor the vinyl chloride monomer (VCM) subplume.

- Perform outpost groundwater quality monitoring for VOCs upgradient of Public Supply Wells N-3876, N-6915, N-6916, N-8004, and N-8941.

In addition to the well network described above and provided in the tables, additional wells are proposed for installation at the downgradient edge of the VOC plume and in the GM-38 area. The purpose of the additional wells will be to provide outpost monitoring upgradient of public supply wells and further define the extent of VOCs in the GM-38 Area. The locations and depths of these proposed wells will be selected based on groundwater and lithologic data obtained from an ongoing off-site, vertical profile boring (VPB) program, and will be provided at a later date. The US Navy has prepared work plans describing the scope of work related to drilling and sampling of VPBs in the GM-38 Area and in potential outpost monitoring well locations. These work plans are provided as Appendix C.

Figures 2 through 5 provide the locations and total depths of new and existing wells in the monitoring plan and locations of public supply wells according to depth (i.e., shallow wells are shown on Figure 2, intermediate wells are shown on Figure 3, deep wells are shown on Figure 4, and D2, and D3 wells are shown on Figure 5). These five zones are consistent with the hydrogeologic zones as defined for the groundwater flow model (ARCADIS Geraghty & Miller, Inc. 2000).

5. Hydraulic Measurement Methodology

To evaluate if hydraulic control (containment) of the on-site portion of the VOC plume has been created and maintained by the OU2 remedial system, water levels will be measured as follows: the depth to water in each well will be measured to the nearest one-hundredth of a foot with an electronic water-level indicator probe. At each well, the water level will be measured from the surveyed measuring point on the well casing.

6. Groundwater Sampling Methodology

The following subsections describe the methods used to sample groundwater from monitoring wells, the four remedial wells, and active on-site NGC industrial supply wells.

6.1 Monitoring Wells

Consistent with NYSDEC-approved procedures, intermediate, deep, and D2 monitoring wells will be purged using bladder pumps (currently some wells have dedicated pumps while others require use of a temporary pump) following United States Environmental Protection Agency (USEPA) Micropurge/low-flow protocols (USEPA 1998). Field parameters will be monitored in a flow-through cell for the Micropurge method and will include pH, specific conductance, dissolved oxygen, oxidation/reduction potential (redox), and temperature. Completion of purging and therefore, the actual volume of water purged from each well will be based on the stabilization protocols described in the Micropurge method. The purge rate will be reduced to 100 ml/min for sampling and samples will be collected directly from the pump discharge. Ten wells (FW-03, GM-20I, GM-21S, GM-21I, GM-36D2, GM-71D2, N-10627, HN-29I, HN-29D, and HN-42I) historically have exhibited high pH readings (i.e., greater than 8 standard units) during purging which decreased and subsequently stabilized prior to sampling. In these instances, three well volumes of water will be purged initially (using the packer, if previously installed) to evacuate stagnant, high pH water to the extent possible, prior to monitoring the parameters of

the formation water. Following stabilization of pH (three consecutive readings within +/- 10 percent) the Micropurge/lowflow purging and sampling method will be followed (including monitoring of all Micropurge field parameters – see above) prior to collection of the groundwater sample.

Shallow monitoring wells will be purged and sampled using a variable speed, 2-inch diameter submersible pump using the Micropurge/lowflow sampling methods described above.

6.2 Remedial Well, Treatment System, and Industrial Supply Well Monitoring

To monitor water quality of the remedial wells and the water quality in industrial supply wells, NGC personnel will collect raw water samples for analysis of trichloroethene (TCE) from Remedial Wells GP-1, ONCT-1, ONCT-2, and ONCT-3 and from Industrial Supply Wells GP-3, along with GP-10, and GP-11 (when operating). NGC will also monitor TCE concentrations in the total influent and effluent from the two groundwater treatment facilities (i.e., Plant 5 and Plant 5E). NGC will conduct this sampling on a voluntary basis weekly for their internal informational use and analyze the samples using the methods described in Section 6.3 (Analytical Parameters), and the data will be used for a qualitative evaluation of water quality trends (see below).

Water samples will also be collected on a quarterly basis from the Remedial Wells GP-1, ONCT-1, ONCT-2, and ONCT-3, Industrial Supply Well GP-3, and the GP-1 (Plant 5) and ONCT (Plant 5E) treatment systems influent and effluent (after the air stripper). Samples will be analyzed using the NYSDEC method described in Section 6.3 (Analytical Parameters).

NGC also maintains logs of the total volume of groundwater pumped from each remedial well on a biweekly basis and continually monitors and records the amount of time that the wells are operating and the reasons for any system shutdown.

6.3 Analytical Parameters

Samples collected from monitoring wells (and remedial systems as described above) will be placed on ice and shipped overnight under chain of custody protocols for laboratory analysis. Groundwater samples submitted for analysis of VOCs will be analyzed for the Target Compound List (TCL) VOCs using NYSDEC Analytical Services Protocol (ASP) Method 95-1. The laboratory will conduct a library search of

40 tentatively identified compounds (TICs) and include the TIC data with the VOC analytical results. Monitoring of VOCs and SVOCs downgradient of the Plant 1 Fuel Depot will utilize USEPA Methods 624 and 625, respectively. Groundwater samples submitted for analysis of Cd/Cr will be analyzed using USEPA Methods 3010/6010. The water samples collected by NGC for TCE analysis from the remedial wells, industrial supply wells, and OU2 treatment systems will be analyzed by NGC's internal laboratory using USEPA Method 601.

6.4 Waste Disposal

Samples collected by from the OU2 remedial wells and remedial system are obtained as direct grab samples; therefore no waste is generated. During sampling of groundwater from monitoring wells, purge water will be containerized in 55-gallon drums, transported, and discharged to the Nassau County Publicly Owned Treatment Works (POTW) intake, located on the NGC site; the Nassau County Department of Public Works granted approval to utilize the POTW intake on-site for disposal of purge water in a letter dated May 1998. Purge water from non-contaminated shallow wells will be discharged to land surface in accordance with NYSDEC-approved procedures for the remedial investigation.

6.5 Project Quality Assurance/Quality Control Procedures

Project QA/QC procedures for the monitoring program will be carried out consistent with the Quality Assurance Project Plan (QAPP) addendum, which is provided as Appendix D.

Validation of the quarterly groundwater quality data collected from all wells and treatment systems will be performed by following the QA/QC criteria set forth in the NYSDEC ASP (October 1995) and the USEPA National Functional Guidelines for Organic and Inorganic Data Review (October 1999) (USEPA 1999). Water samples collected by NGC as part of monitoring the remedial system are currently not subject to USEPA QC criteria; therefore, the resulting data will not be validated.

7. Data Evaluation and Reporting

The following subsections describe the contents of the quarterly groundwater monitoring reports and the approach to evaluating the hydraulic and groundwater quality data. The data evaluation described below will be included in the groundwater monitoring reports.

7.1 Remedial System Operational Monitoring

The groundwater monitoring reports will include a qualitative evaluation of the data collected by NGC to evaluate remedial system performance (time-concentration plots). The OU2 remedial system pumpage and water quality data (operational data) will be used to determine the percentage of time the wells are operating and the average pumping rates for the period of record; the water quality data will be used to estimate the total VOC mass removed. Collectively, the operational data will be used to assess the overall performance of the remedial system, monitor system influent concentration relative to NYSDEC Standards, Criteria, and Guidance Values (SCGs), and monitor well efficiency relative to design criteria.

7.2 Evaluation of Hydraulic Data

The hydraulic data (depth-to-groundwater measurements) will be tabulated and included in the monitoring reports. Groundwater-level elevations will be calculated by subtracting the depth to groundwater in each well from its respective surveyed measuring point elevation. Groundwater-level elevations will be plotted on a site plan and contoured to illustrate configuration of the potentiometric surface and the horizontal direction of groundwater flow in the shallow and D2 hydrogeologic zones. Vertical gradient data will be used to evaluate the effects of pumpage and recharge on the vertical movement of groundwater through the hydrogeologic zones of interest (i.e., from the shallow zone down to the D2 zone). On an annual basis, the hydraulic data may also be plotted on selected cross sections parallel and perpendicular to the long axis of the VOC plume to show the effects of pumpage (from the remedial wells) and recharge on the vertical movement of groundwater in the shallow, intermediate, deep, and D2 zones. These tables and figures collectively will illustrate if hydraulic containment has been created and maintained by the remedy, thereby preventing the off-site movement of on-site VOC impacted groundwater (see below).

Precipitation data (i.e., rainfall, snow, sleet, ice, and hail) recorded at a nearby National Oceanic and Atmospheric Administration (NOAA) recording station will be factored into the hydraulic data evaluation because NGC uses the on-site basins for the recharge of treated effluent (via the air stripping towers and/or the aeration basins) and stormwater. The precipitation will be totaled on a monthly basis, tabulated, and included in the respective quarterly reports. To place the monthly total precipitation data in perspective, it will be compared to the long-term average for that month.

7.3 Evaluation of Groundwater Quality Data

The groundwater quality data will be provided in tabular form with a comparison to the SCGs. Maps will be prepared by zone (shallow, intermediate, deep and deep2) to depict the extent of the VOC plume on an annual basis (see below). Time-concentration (TVOC) graphs will be prepared for selected wells through the period of record that will illustrate trends in the data. Using the cross sections described above, the TVOC concentrations may be plotted on the sections and provided in the annual report (see below). TVOC iso-concentration lines will be drawn to illustrate the effect of operation of the remedial wells and to monitor the position of the TVOC plume in the Upper Glacial and Magothy aquifers. All volatile TICs detected that quarter will be included in data tables and evaluated. These tables and figures collectively will illustrate the effect of the remedial system in preventing the off-site migration of VOC-impacted groundwater and ultimately the overall improvement of groundwater quality over time.

7.4 Report Preparation

Groundwater monitoring reports will be prepared approximately 60 days after receipt of analytical results of the groundwater sampling round (see Monitoring Schedule in Section 8 below). The reports will include a summary of the monitoring performed, the hydraulic and groundwater quality data, and an evaluation. The reports will reflect the hydraulic data collected from the current round, groundwater quality data collected from the preceding four rounds, and longer-term groundwater quality trends (changes in groundwater quality require significantly more time to be observed than changes in groundwater flow). The last report prepared for each year (i.e., the fourth quarter report) shall be prepared as an annual report which will include a synopsis of the monitoring conducted that year, along with an evaluation of the short-term changes in remedial system performance, groundwater flow and groundwater quality conditions observed over the previous year, and longer term changes observed through the period of record. Additional figures included in the annual report will include the plume maps and cross sections, as described above.

Each report will include conclusions made based on the data generated in that quarter and over the period of record. In addition, recommendations will be provided for changes to the monitoring program, as needed.

8. Monitoring Schedule

Four rounds of groundwater-level measurements are planned for 2001 to be conducted on a calendar-quarterly basis consistent with the OU2 ROD. Groundwater sampling for VOCs (both on-site and off-site) and for Cd/Cr is scheduled to be performed on a calendar-quarterly basis. VCM monitoring is scheduled to be conducted on a semi-annual basis (i.e., twice per year).

Monitoring frequency will be evaluated based on the data on an annual basis. If a reduction in frequency is recommended, NYSDEC approval will be obtained prior to implementation.

9. References

ARCADIS Geraghty & Miller, Inc. 2000. Final Groundwater Feasibility Study, Grumman Aerospace - Bethpage, New York Site (#130003A) and Naval Weapons Industrial Reserve Plant, Bethpage, New York Site (#130003B). October 16, 2000.

ARCADIS Geraghty & Miller, Inc. 1999. Baseline Monitoring Report, Groundwater IRM, Northrop Grumman Corporation, Bethpage, New York. May 1999.

New York State Department of Environmental Conservation (NYSDEC). 1998. Division of Water Technical and Operation Guidance Series (TOGS 1.1.1). Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Promulgated October 22, 1993. Re-issued June 1998.

New York State Department of Environmental Conservation (NYSDEC). 1995. Analytical Services Protocol. October 1995.

New York State Department of Environmental Conservation (NYSDEC). 1990. Operation, Maintenance, and Monitoring Manual for a Hazardous Waste Site. April 20, 1990.

U.S. Environmental Protection Agency (USEPA). 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. October 1999.

U.S. Environmental Protection Agency (USEPA). 1998. Groundwater Sampling Procedure, Low Stress (Low-Flow) Purging and Sampling, USEPA Region II, March 1998.

Table 1. Groundwater Monitoring Well Network and Purpose, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Existing Well	Proposed Well	MONITORING PURPOSE: Hydraulic Monitoring	TVOC Plume	Cd/Cr Monitoring	TVOC Outpost [a]	VCM Subplume	VCM Outpost
ON-SITE								
Shallow Wells								
MW-3R	X	--	X	X	X	--	--	--
GM-14 [b]	X	--	--	X	--	--	--	--
GM-15S	X	--	X	X	--	--	--	--
GM-16SR	X	--	X	X	X	--	--	--
GM-17SR	X	--	X	X	--	--	--	X
GM-18S	X	--	X	X	--	--	--	X
GM-19S	X	--	X	--	--	--	--	--
GM-23S	X	--	--	--	--	--	--	X
GM-72S	--	X	--	--	--	--	--	X
FW-03	X	--	--	X	--	--	--	--
Intermediate Wells								
GM-15I	X	--	X	X	--	--	--	--
GM-16I	X	--	--	X	--	--	--	--
GM-17I	X	--	X	X	--	--	--	X
GM-18I	X	--	X	X	--	--	--	X
GM-19I	X	--	X	--	--	--	--	X
GM-23I	X	--	--	--	--	--	--	X
GM-72I	--	X	--	--	--	--	--	X
GM-74I	X	--	X	X	--	--	--	--
HN-24I	X	--	--	X	--	--	--	--
HN-29I	X	--	--	X	--	--	--	--
MW-52S [c]	X	--	--	--	--	--	X	--
Deep Wells								
GM-13D	X	--	X	X	--	--	--	--
GM-15D	X	--	X	X	--	--	--	--
GM-17D	X	--	X	X	--	--	--	X
GM-18D	X	--	X	X	--	--	--	X
GM-23D	--	X	--	--	--	--	--	X
GM-72D	--	X	--	--	--	--	--	X
GM-74D	X	--	X	X	--	--	--	--
HN-29D	X	--	--	X	--	--	--	--
MW-52I [c]	X	--	--	--	--	--	X	--
MW-52D [c]	X	--	--	--	--	--	X	--

See notes on last page

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Table 1. Groundwater Monitoring Well Network and Purpose, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Existing Well	Proposed Well	MONITORING PURPOSE: Hydraulic Monitoring	TVOC Plume	Cd/Cr Monitoring	TVOC Outpost [a]	VCM Subplume	VCM Outpost
Deep2 Wells								
GM-15D2	X	--	X	X	--	--	--	--
GM-33D2	X	--	X	X	--	--	--	--
GM-73D2	X	--	X	X	--	--	--	--
GM-74D2	X	--	X	X	--	--	--	--
GP-1 [d]	X	--	X	X	--	--	--	--
GP-3 [d]	X	--	X	X	--	--	--	--
ONCT-1 [d]	X	--	X	X	--	--	--	--
ONCT-2 [d]	X	--	X	X	--	--	--	--
ONCT-3 [d]	X	--	X	X	--	--	--	--
OFF-SITE								
Shallow Wells								
N-9921	X	--	X	--	--	--	--	--
N-10597	X	--	X	--	--	--	--	--
N-10600	X	--	X	--	--	--	--	--
N-10631	X	--	X	X	X	--	--	--
N-10633	X	--	X	--	--	--	--	--
N-10634	X	--	X	X	--	--	--	--
N-10821	X	--	X	--	--	--	--	--
GM-21S	X	--	X	X	--	--	--	--
GM-78S	X	--	X	X	X	--	--	--
GM-79S	X	--	X	X	--	--	--	--
HN-40S	X	--	--	X	--	--	--	--
HN-42S	X	--	--	X	--	--	--	--
Intermediate Wells								
N-10624	X	--	X	X	--	--	--	--
GM-20I	X	--	X	X	--	--	--	--
GM-21I	X	--	X	X	--	--	--	--
GM-78I	X	--	X	X	X	--	--	--
GM-79I	X	--	X	X	--	--	--	--
HN-40I	X	--	--	X	--	--	--	--
HN-42I	X	--	--	X	--	--	--	--

see notes on last page

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Table 1. Groundwater Monitoring Well Network and Purpose, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Existing Well	Proposed Well	MONITORING PURPOSE: Hydraulic Monitoring	TVOC Plume	Cd/Cr Monitoring	TVOC Outpost [a]	VCM Subplume	VCM Outpost
Deep Wells								
N-10627	X	--	X	X	--	--	--	--
GM-20D	X	--	X	X	--	--	--	--
GM-21D	--	X	X	X	--	--	--	--
GM-34D	X	--	X	X	--	--	--	--
GM-36D	X	--	X	X	--	--	--	--
GM-37D	X	--	X	X	--	--	--	--
GM-38D	X	--	X	X	--	--	--	--
GM-79D	X	--	X	X	--	--	--	--
Deep2 Wells								
GM-34D2	X	--	X	X	--	--	--	--
GM-35D2	X	--	X	X	--	--	--	--
GM-36D2	X	--	X	X	--	--	--	--
GM-37D2	X	--	X	X	--	--	--	--
GM-38D2	X	--	X	X	--	--	--	--
GM-70D2	X	--	X	X	--	--	--	--
GM-71D2	X	--	X	X	--	--	--	--
GM-75D2	X	--	X	X	--	--	--	--

Cd/Cr	Total Cadmium/Chromium
TVOC	Total volatile organic compound
VCM	Vinyl chloride monomer
SVOC	Semivolatile Organic Compound
ft msl	feet relative to mean sea level
TCE	Trichloroethene

[a] Vertical profile borings are being drilled to determine locations for TVOC outpost wells.

[b] Well GM-14 is also sampled for SVOCs.

[c] Based on screen elevations, Well MW-52S is considered an intermediate well and Wells MW-52I and MW-52D are considered deep wells.

[d] NGC also collects water samples for analysis of TCE on a weekly basis.

Notes:
The shallow zone extends from the water table to +40 ft msl.
The intermediate zone extends from +40 to -50 ft msl.
The deep zone extends from -50 to -365 ft msl.
The deep2 zone extends from -365 to -530 ft msl.
The deep3 zone extends from -530 to the top of the Raritan Confining Unit (approximately -620 ft msl).

Table 2. Screened Intervals and Analytical and Sampling Specifications for Wells in the Groundwater Monitoring Well Network, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Well Screened Interval (ft bls)	Analytical Method	Detection Limit [a] (ug/L)	Monitoring Frequency
GM-13D	200 - 210	DEC ASP 95-1	10 (5)	Quarterly
GM-14	15 - 55	USEPA 624/625	1/1	Quarterly
				Quarterly
GM-15S	70 - 80	DEC ASP 95-1	10 (5)	Quarterly
GM-15I	95 - 105	DEC ASP 95-1	10 (5)	Quarterly
GM-15D	332 - 342	DEC ASP 95-1	10 (5)	Quarterly
GM-15D2	536 - 556	DEC ASP 95-1	10 (5)	Quarterly
GM-16SR	60 - 70	DEC ASP 95-1 / USEPA 6010	10 (5) / 5	Quarterly
GM-16I	135 - 145	DEC ASP 95-1	10 (5)	Quarterly
GM-17SR	60 - 70	DEC ASP 95-1	10 (5)	Quarterly
GM-17I	100 - 120	DEC ASP 95-1	10 (5)	Quarterly
GM-17D	278 - 298	DEC ASP 95-1	10 (5)	Quarterly
GM-18S	63 - 67	DEC ASP 95-1	10 (5)	Quarterly
GM-18I	95 - 105	DEC ASP 95-1	10 (5)	Quarterly
GM-18D	300 - 320	DEC ASP 95-1	10 (5)	Quarterly
GM-33D2	500 - 520	DEC ASP 95-1	10 (5)	Quarterly
GM-19S	48 - 53	water-levels only	--	Quarterly
GM-19I	130 - 140	water-levels only	--	Quarterly
GM-20I	95 - 105	DEC ASP 95-1	10 (5)	Quarterly
GM-20D	216 - 226	DEC ASP 95-1	10 (5)	Quarterly
GM-21S	63 - 67	DEC ASP 95-1	10 (5)	Quarterly
GM-21I	130 - 140	DEC ASP 95-1	10 (5)	Quarterly
GM-21D	***210 - 230***	***DEC ASP 95-1***	***10 (5)***	***Quarterly***
GM-23S	46 - 56	DEC ASP 95-1	2	Semiannually
GM-23I	110 - 120	DEC ASP 95-1	2	Semiannually
GM-23D	***310 - 330***	***DEC ASP 95-1***	***2***	***Semiannually***
GM-34D	309 - 319	DEC ASP 95-1	10 (5)	Quarterly
GM-34D2	510 - 520	DEC ASP 95-1	10 (5)	Quarterly
				Quarterly
GM-35D2	510 - 530	DEC ASP 95-1	10 (5)	Quarterly
GM-36D	204 - 214	DEC ASP 95-1	10 (5)	Quarterly
GM-36D2	520 - 540	DEC ASP 95-1	10 (5)	Quarterly
GM-37D	242 - 262	DEC ASP 95-1	10 (5)	Quarterly
GM-37D2	370 - 390	DEC ASP 95-1	10 (5)	Quarterly

See notes on last page

DRAFT

Table 2. Screened Intervals and Analytical and Sampling Specifications for Wells in the Groundwater Monitoring Well Network, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Well Screened Interval (ft bls)	Analytical Method	Detection Limit [a] (ug/L)	Monitoring Frequency
GM-38D	320 - 340	DEC ASP 95-1	10 (5)	Quarterly
GM-38D2	475 - 495	DEC ASP 95-1	10 (5)	Quarterly
GM-70D2	310 - 330	DEC ASP 95-1	10 (5)	Quarterly
GM-71D2	444 - 464	DEC ASP 95-1	10 (5)	Quarterly
GM-72S	***70 - 80***	***DEC ASP 95-1***	***2***	***Semiannually***
GM-72I	***105 - 125***	***DEC ASP 95-1***	***2***	***Semiannually***
GM-72D	***310 - 330***	***DEC ASP 95-1***	***2***	***Semiannually***
GM-73D2	532 - 552	DEC ASP 95-1	10 (5)	Quarterly
GM-74I	94 - 114	DEC ASP 95-1	10 (5)	Quarterly
GM-74D	295 - 305	DEC ASP 95-1	10 (5)	Quarterly
GM-74D2	542 - 562	DEC ASP 95-1	10 (5)	Quarterly
N-10624	190 - 194	DEC ASP 95-1	10 (5)	Quarterly
N-10627	290 - 295	DEC ASP 95-1	10 (5)	Quarterly
GM-75D2	525 - 545	DEC ASP 95-1	10 (5)	Quarterly
GM-78S	60 - 70	DEC ASP 95-1 / USEPA 6010	10 (5) / 5	Quarterly
GM-78I	90 - 110	DEC ASP 95-1 / USEPA 6010	10 (5) / 5	Quarterly
GM-79S	63 - 67	water levels only	--	Quarterly
GM-79I	175 - 195	DEC ASP 95-1	10 (5)	Quarterly
GM-79D	300 - 320	DEC ASP 95-1	10 (5)	Quarterly
HN-24I	148 - 158	DEC ASP 95-1	10 (5)	Quarterly
HN-40S	49 - 59	DEC ASP 95-1	10 (5)	Quarterly
HN-40I	108 - 118	DEC ASP 95-1	10 (5)	Quarterly
HN-42S	50 - 60	DEC ASP 95-1	10 (5)	Quarterly
HN-42I	100 - 110	DEC ASP 95-1	10 (5)	Quarterly
FW-03	49 - 64	DEC ASP 95-1	10 (5)	Quarterly
HN-29I	120 - 130	DEC ASP 95-1	10 (5)	Quarterly
HN-29D	210 - 220	DEC ASP 95-1	10 (5)	Quarterly
MW-3R	45 - 55	DEC ASP 95-1 / USEPA 6010	10 (5) / 5	Quarterly

See notes on last page

Table 2. Screened Intervals and Analytical and Sampling Specifications for Wells in the Groundwater Monitoring Well Network, Northrop Grumman Corporation, Bethpage, New York.

Well Designation	Well Screened Interval (ft bls)	Analytical Method	Detection Limit [a] (ug/L)	Monitoring Frequency
MW-52S	125 - 140	DEC ASP 95-1	2	Semiannually
MW-52I	220 - 235	DEC ASP 95-1	2	Semiannually
MW-52D	371 - 386	DEC ASP 95-1	2	Semiannually
N-9921	58 - 62	water levels only	--	Quarterly
N-10597	63 - 67	water levels only	--	Quarterly
N-10600	57 - 61	water levels only	--	Quarterly
N-10631	63 - 67	DEC ASP 95-1 / USEPA 6010	10 (5) / 5	Quarterly
N-10633	63 - 67	water levels only	--	Quarterly
N-10634	63 - 67	DEC ASP 95-1	10 (5)	Quarterly
N-10821	63 - 67	water levels only	--	Quarterly
ONCT-1	480 - 563	USEPA Method 601 (TCE only); DEC ASP 95-1	0.5	TCE Weekly/ TVOC Quarterly
ONCT-2	466 - 570	USEPA Method 601 (TCE only); DEC ASP 95-1	0.5	TCE Weekly/ TVOC Quarterly
ONCT-3	465 - 617	USEPA Method 601 (TCE only); DEC ASP 95-1	0.5	TCE Weekly/ TVOC Quarterly
GP-1	519 - 570	USEPA Method 601 (TCE only); DEC ASP 95-1	0.5	TCE Weekly/ TVOC Quarterly
GP-3	483 - 543	USEPA Method 601 (TCE only); DEC ASP 95-1	0.5	TCE Weekly/ TVOC Quarterly

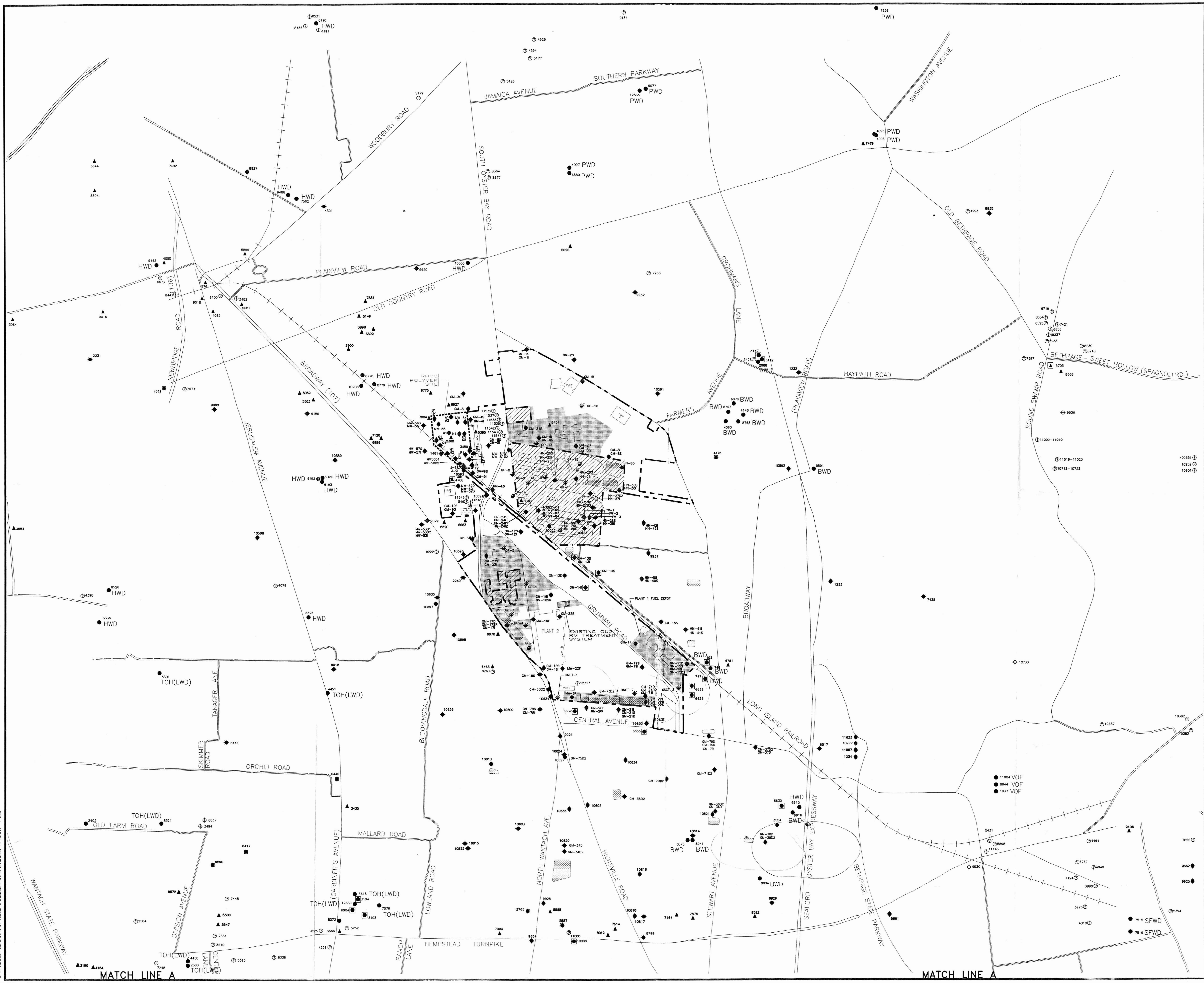
see notes on last page

Table 2. Screened Intervals and Analytical and Sampling Specifications for Wells in the Groundwater Monitoring Well Network, Northrop Grumman Corporation, Bethpage, New York.

Note: ***Bold/Italics*** denote a proposed monitoring well

[a]	VOCs will be reported under the New York State Contract Laboratory Protocols (NYSCLP) using site-specific revised Contract Required Quantitiation Limits (CRQLs). With the exception of benzene and vinyl chloride monomer (VCM), which will be reported to the method detection limit (MDL) of 0.7, and 2 ug/L, respectively, the revised CRQL will include reporting ketones at 10 ug/L and most other compounds to 5 ug/L (shown in parentheses). Samples analyzed using the revised CRQLs are listed above as 10 (5). The slash, where used, separates different analytical methods (e.g., USEPA 6010).
*	Samples collected by Northrop Grumman for internal informational use and analyzed by its internal laboratory.
DEC ASP 95-1	New York State Department of Environmental Conservation Analytical Services Protocol Method 95-1.
USEPA	United States Environmental Protection Agency
--	not applicable
ft bls	feet below land surface
ug/L	micrograms per liter, equivalent to parts per billion

DRAFT



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N

EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 ▲ INDUSTRIAL WELL
- GM-22I ABANDONED, DESTROYED, INACCESSIBLE WELL
- 747 BWD ● PUBLIC SUPPLY WELL AND OWNER
- 9918 ◆ OBSERVATION, MONITORING WELL
- 8799 ✱ IRRIGATION WELL
- 6635 ⑦ UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL

NOTES:

1. THIS FIGURE INCLUDES ALL THE MONITORING AND OBSERVATION WELLS INSTALLED BASED ON AVAILABLE RECORDS FROM NYSDEC, NORTHROP GRUMMAN, US NAVY, OCC/RUCO, AND STEEL LOS. ALL WELL LOCATIONS ARE APPROXIMATE.
2. THIS FIGURE INCLUDES ALL WELLS IDENTIFIED ON TABLE 1-1 OF THE OCTOBER 2000 FS REPORT, PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.
3. THIS FIGURE CONSISTS OF TWO PARTS (FIGURE 1-1A AND 1-1B). THE MATCH LINE FOR THESE FIGURES IS THE SOUTHERN (FIGURE 1-1A) AND THE NORTHERN (FIGURE 1-1B) BORDERS.
4. THIS FIGURE INCLUDES MONITORING WELLS INSTALLED BY NORTHROP GRUMMAN AND NAVY. NORTHROP GRUMMAN MONITORING WELLS INCLUDE NEW WELLS INSTALLED TO MONITOR THE EFFECTIVENESS OF THE GROUNDWATER OU2 REMEDIAL MEASURE.
5. LIST OF PUBLIC SUPPLY WELL OWNER ABBREVIATIONS:

BWD	BETHPAGE WATER DISTRICT
SFWD	SOUTH FARMINGDALE WATER DISTRICT
NYWS	NEW YORK WATER SERVICE
TOH	TOWN OF HEMPSTEAD WATER DISTRICT
LWD	LEVITTOWN WATER DISTRICT
HWD	HICKSVILLE WATER DISTRICT
PWD	PLAINVIEW WAER DISTRICT
VOF	VILLAGE OF FARMINGDALE WATER DISTRICT
EMWD	EAST MEADOW WATER DISTRICT

0' 800' 1600'

SCALE: 1" = 800'

NO.	DATE	REVISION DESCRIPTION	BY CKD

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF SUPPLY AND MONITORING WELLS WITHIN THE APPROXIMATE BOUNDARY OF THE NORTHROP GRUMMAN GROUNDWATER MODEL DOMAIN

NORTHROP GRUMMAN
BETHPAGE, NEW YORK

ARCADIS
GERAGHTY & MILLER

DRAFT

PROJECT MANAGER	DEPARTMENT MANAGER
LEAD DESIGN PROF.	CHECKED
DRAWN	DATE 1/22/99
PROJECT NUMBER NY000008.0151	DRAWING NUMBER 1A

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EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE

- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 INDUSTRIAL WELL
- GM-22 ABANDONED, DESTROYED, INACCESIBLE WELL
- 741 BWD PUBLIC SUPPLY WELL AND OWNER
- 9918 OBSERVATION, MONITORING WELL
- 8799 IRRIGATION WELL
- 6635 UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL

NOTES:

1. THIS FIGURE INCLUDES ALL THE MONITORING AND OBSERVATION WELLS INSTALLED BASED ON AVAILABLE RECORDS FROM NYSDEC, NORTHROP GRUMMAN, US NAVY, OCC/RUCO, AND STEEL LOS. ALL WELL LOCATIONS ARE APPROXIMATE.
2. THIS FIGURE INCLUDES ALL WELLS IDENTIFIED ON TABLE 1-1 OF THE OCTOBER 2000 FS REPORT, PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.
3. THIS FIGURE CONSISTS OF TWO PARTS (FIGURE 1-1A AND 1-1B). THE MATCH LINE FOR THESE FIGURES IS THE SOUTHERN (FIGURE 1-1A) AND THE NORTHERN (FIGURE 1-1B) BORDERS.
4. THIS FIGURE INCLUDES MONITORING WELLS INSTALLED BY NORTHROP GRUMMAN AND NAVY. NORTHROP GRUMMAN MONITORING WELLS INCLUDE NEW WELLS INSTALLED TO MONITOR THE EFFECTIVENESS OF THE GROUNDWATER OU2 REMEDIAL MEASURE.
5. LIST OF PUBLIC SUPPLY WELL OWNER ABBREVIATIONS:

BWD	BETHPAGE WATER DISTRICT
SFWD	SOUTH FARMINGDALE WATER DISTRICT
NYWS	NEW YORK WATER SERVICE
TOH	TOWN OF HEMPSTEAD WATER DISTRICT
LWD	LEVITTOWN WATER DISTRICT
HWD	HICKSVILLE WATER DISTRICT
PWD	PLAINVIEW WAER DISTRICT
VOF	VILLAGE OF FARMINGDALE WATER DISTRICT
EMWD	EAST MEADOW WATER DISTRICT
MWD	MASSAPEQUA WATER DISTRICT

0' 800' 1600'
SCALE: 1" = 800'

NO.	DATE	REVISION DESCRIPTION	BY / CKD

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF SUPPLY AND MONITORING WELLS WITHIN THE APPROXIMATE BOUNDARY OF THE NORTHROP GRUMMAN GROUNDWATER MODEL DOMAIN

NORTHROP GRUMMAN
BETHPAGE, NEW YORK

ARCADIS
GERAGHTY & MILLER

DRAFT

PROJECT MANAGER	DEPARTMENT MANAGER
LEAD DESIGN PROF.	CHECKED
DRAWN	DATE 1/22/99
PROJECT NUMBER NY000008.0151	DRAWING NUMBER 1B

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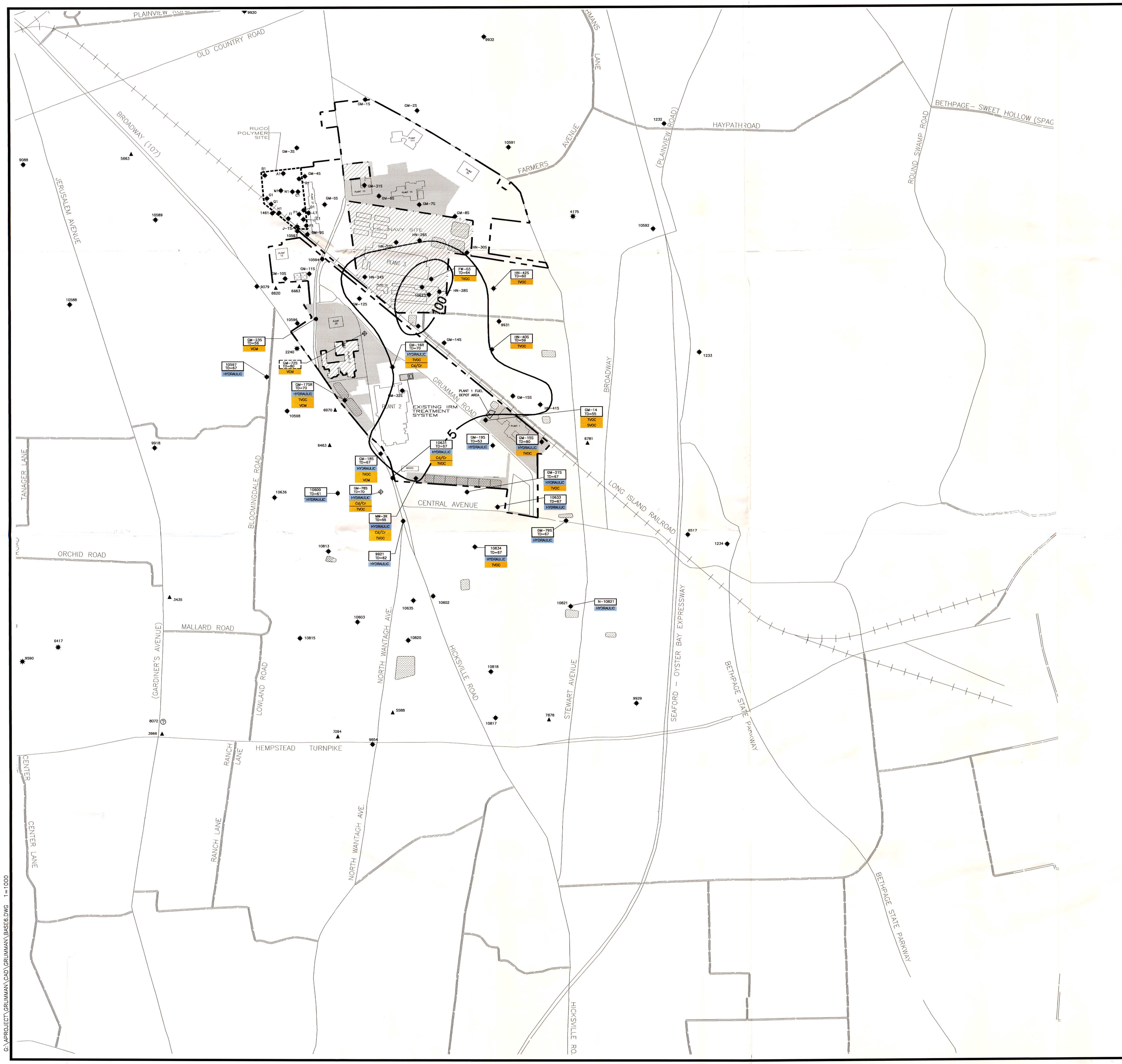

EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE
- –5– LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (in ppb). IN GROUNDWATER BASED ON FIRST QUARTER 2000 DATA. (ARCADIS GERAGHTY & MILLER, INC. 2000)
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 ▲ INDUSTRIAL WELL
- 747 ● PUBLIC SUPPLY WELL
- 9918 ◆ OBSERVATION, MONITORING WELL
- 8799 ✱ IRRIGATION WELL
- 6635 ⑦ UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL
- 10600 TD=61 LOCATION AND IDENTIFICATION OF EXISTING WELL INCLUDED IN OU2 RM MONITORING PLAN AND TOTAL DEPTH IN FT BLS.
- GM-72S TD=80 LOCATION AND IDENTIFICATION OF PROPOSED NEW WELL INCLUDED IN OU2 RM MONITORING PLAN AND PROPOSED TOTAL DEPTH IN FT BLS.
- HYDRAULIC WELL USED TO DETERMINE GROUNDWATER ELEVATION
- TVOC/VCM/Cd/Cr/SVOC WELL SAMPLED FOR WATER QUALITY

TVOC	TOTAL VOLATILE ORGANIC COMPOUNDS
VCM	VINYL CHLORIDE MONOMER
Cd/Cr	CADMIUM / CHROMIUM
SVOC	SEMIVOLATILE ORGANIC COMPOUNDS
FT BLS	FEET BELOW LAND SURFACE
OU2	OPERABLE UNIT 2
RM	REMEDIAL MEASURE

NOTES:

1. THIS FIGURE DOES NOT INCLUDE ALL ACTIVE MONITORING AND OBSERVATION WELLS INSTALLED SINCE 1992.
2. THIS FIGURE INCLUDES ALL SHALLOW WELLS IDENTIFIED ON TABLE 1-1 OF THE OCTOBER 2000 FS REPORT PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.

0' 1000' 2000'

SCALE: 1" = 1000'

N

NO.	DATE	REVISION DESCRIPTION	BY CKD

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF SHALLOW SUPPLY AND MONITORING WELLS AND POSITION OF TOTAL VOLATILE ORGANIC COMPOUND PLUME IN THE SHALLOW ZONE

ARCADIS GERAGHTY & MILLER
88 Duryea Road
Melville, New York 11747
Tel: 516/249-7600 Fax: 516/249-7610

DRAFT

PROJECT MANAGER C. SANGIOVANNI	DEPARTMENT MANAGER
LEAD DESIGN PROF.	CHECKED D. STERN
DRAWN AG	DATE 11/16/00
PROJECT NUMBER NY008.0153	DRAWING NUMBER 2

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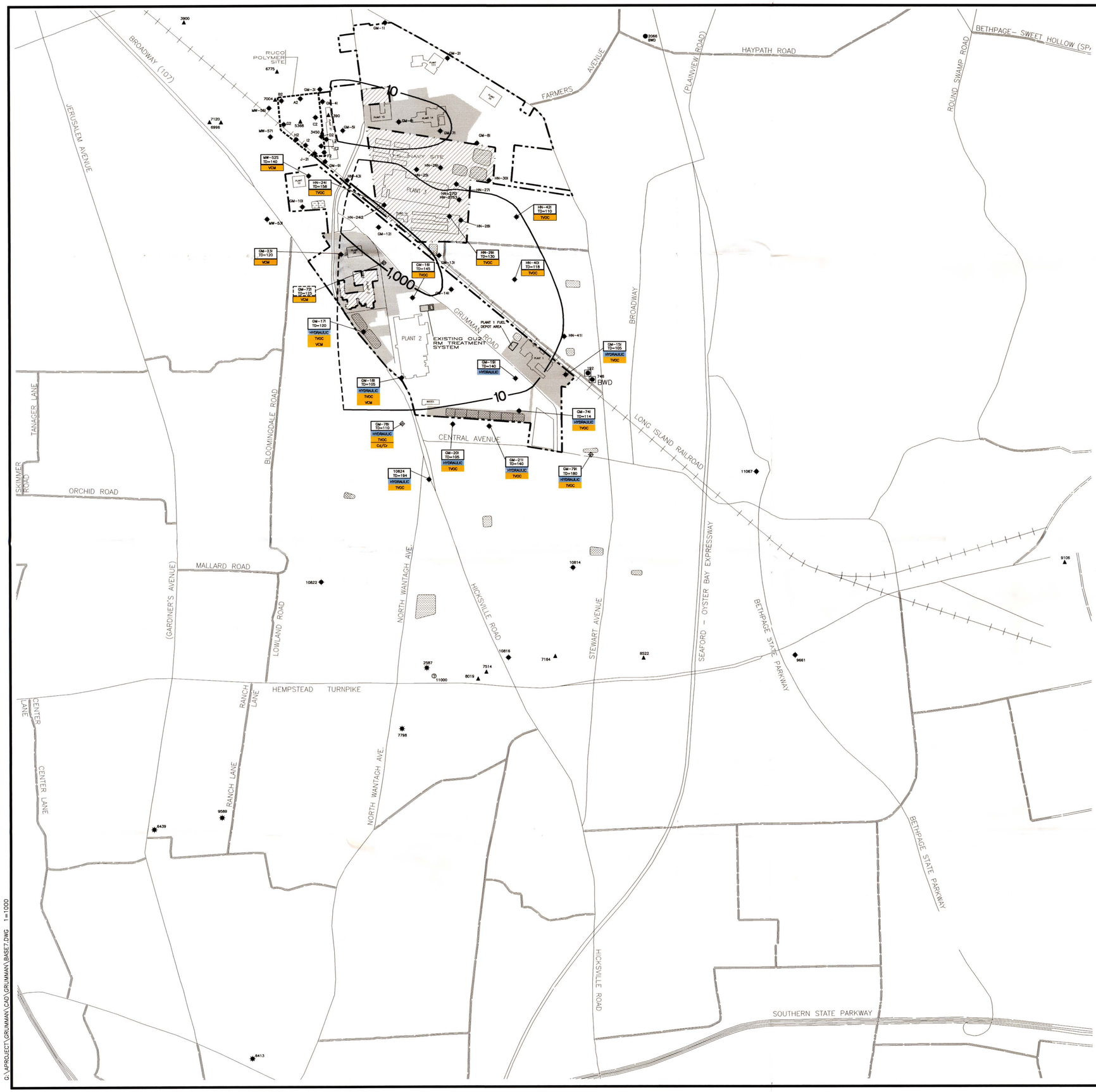

EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE
- –5– LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (in ppb), IN GROUNDWATER BASED ON FIRST QUARTER 2000 DATA. (ARCADIS GERAGHTY & MILLER, INC. 2000)
- APPROXIMATE WESTERN EXTENT OF TVOC PLUME ATTRIBUTABLE TO NORTHROP GRUMMAN AND NAVY.

- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 ▲ INDUSTRIAL WELL
- 747 ● PUBLIC SUPPLY WELL
- 746 ◉ ABANDONED WELL
- 9918 ◆ OBSERVATION, MONITORING WELL
- 8799 ✸ IRRIGATION WELL
- 5635 ⓘ UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL
- 10800 TD=105 LOCATION AND IDENTIFICATION OF EXISTING WELL INCLUDED IN OU2 RM MONITORING PLAN AND TOTAL DEPTH IN FT BLS.
- GM-74I TD=113 LOCATION AND IDENTIFICATION OF PROPOSED NEW WELL INCLUDED IN OU2 RM MONITORING PLAN AND PROPOSED TOTAL DEPTH IN FT BLS.
- HYDRAULIC WELL USED TO DETERMINE GROUNDWATER ELEVATION
- TVOC/VCM/Cd/Cr/FCR WELL SAMPLED FOR WATER QUALITY
- TVOC TOTAL VOLATILE ORGANIC COMPOUNDS
- VCM VINYL CHLORIDE MONOMER
- Cd/Cr CADMIUM / CHROMIUM
- FT BLS FEET BELOW LAND SURFACE
- BWD BETHPAGE WATER DISTRICT
- OU2 OPERABLE UNIT 2
- RM REMEDIAL MEASURE

NOTES:

1. THIS FIGURE DOES NOT INCLUDE ALL ACTIVE MONITORING AND OBSERVATION WELLS INSTALLED SINCE 1992.
2. THIS FIGURE INCLUDES ALL SHALLOW WELLS IDENTIFIED ON TABLE 1–1 OF THE OCTOBER 2000 FS REPORT PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.

0' 1000' 2000'
SCALE: 1" = 1000'

NO.	DATE	REVISION DESCRIPTION	BY CKD

NORTHROP GRUMMAN CORPORATION BETHPAGE, NEW YORK

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF INTERMEDIATE SUPPLY AND MONITORING WELLS AND POSITION OF TOTAL VOLATILE ORGANIC COMPOUND PLUME IN THE INTERMEDIATE ZONE

ARCADIS GERAGHTY & MILLER
88 Duryea Road
Melville, New York 11747
Tel: 516/249-7600 Fax: 516/249-7610

DRAFT

PROJECT MANAGER	DEPARTMENT MANAGER
C. SANGIOVANNI	
LEAD DESIGN PROF.	CHECKED
	D. STERN
DRAWN	DATE
AG	11/16/00
PROJECT NUMBER	DRAWING NUMBER
NY008.0153	3

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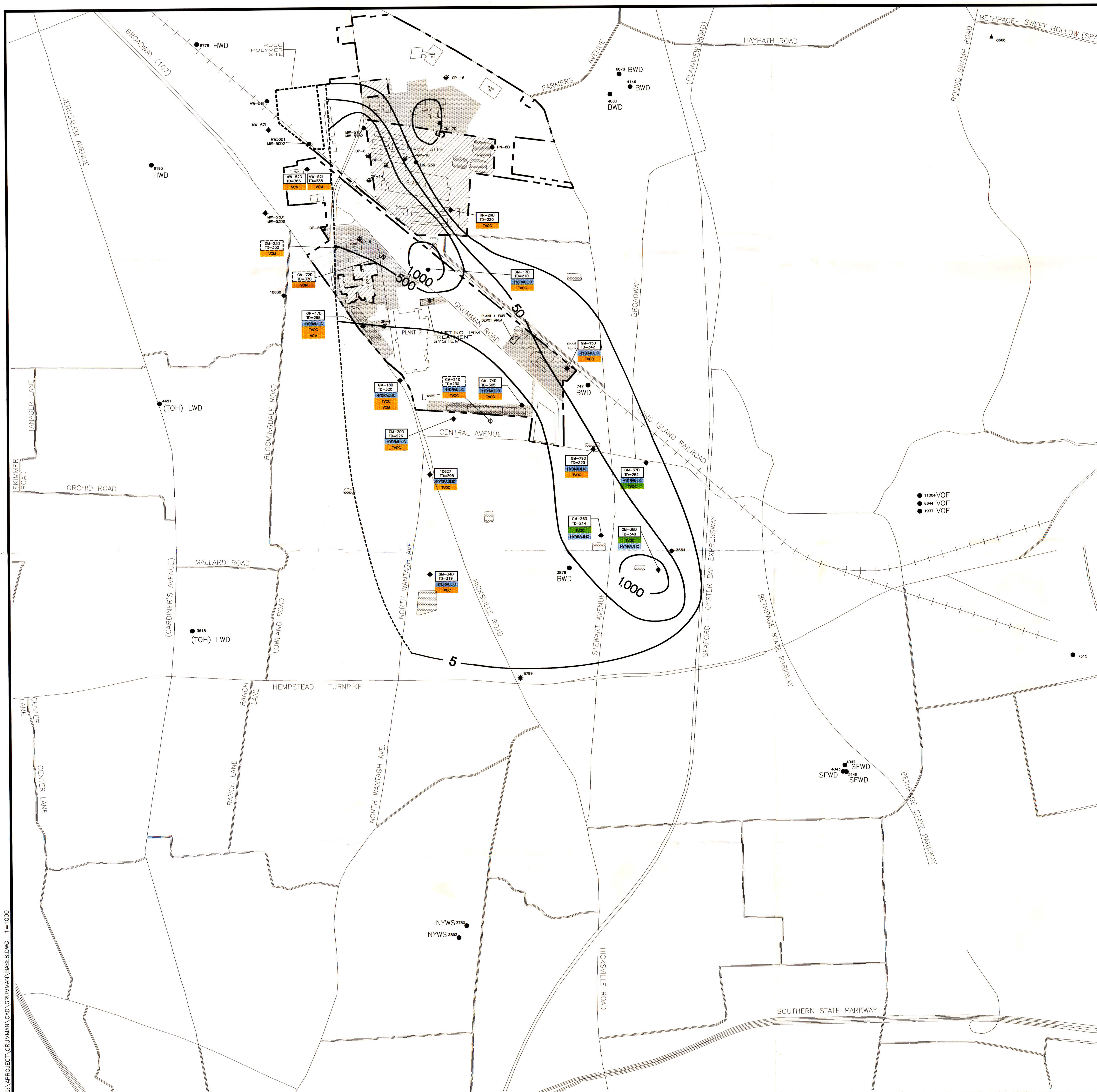

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EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE
- —5— LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (in ppb), IN GROUNDWATER BASED ON FIRST QUARTER 2000 DATA. (ARCADIS GERAGHTY & MILLER, INC. 2000)
- APPROXIMATE WESTERN EXTENT OF TVOC PLUME ATTRIBUTABLE TO NORTHROP GRUMMAN AND NAVY.
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 INDUSTRIAL WELL
- 3876 PUBLIC SUPPLY WELL
- 747 ABANDONED WELL
- 9918 OBSERVATION, MONITORING WELL
- 8799 IRRIGATION WELL
- 6635 UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL
- GM-13D TD=210 LOCATION AND IDENTIFICATION OF EXISTING WELL INCLUDED IN OU2 RM MONITORING PLAN AND TOTAL DEPTH IN FT BLS.
- GM-72D TD=330 LOCATION AND IDENTIFICATION OF PROPOSED NEW WELL INCLUDED IN OU2 RM MONITORING PLAN AND PROPOSED TOTAL DEPTH IN FT BLS.
- HYDRAULIC WELL USED TO DETERMINE GROUNDWATER ELEVATION
- TVOC/VCM/Cd/Cr WELL SAMPLED FOR WATER QUALITY
- TVOC WELL SAMPLED FOR WATER QUALITY FOR THE BETHPAGE WATER DISTRICT

TVOC	TOTAL VOLATILE ORGANIC COMPOUNDS
VCM	VINYL CHLORIDE MONOMER
Cd/Cr	CADMIUM / CHROMIUM
FT BLS	FEET BELOW LAND SURFACE
SFWD	SOUTH FARMINGDALE WATER DISTRICT
BWD	BETHPAGE WATER DISTRICT
TOH	TOWN OF HEMPSTEAD WATER DISTRICT
LWD	LEVITTOWN WATER DISTRICT
NYWS	NEW YORK WATER SERVICE
SFWD	SOUTH FARMINGDALE WATER DISTRICT
VOF	VILLAGE OF FARMINGDALE WATER DISTRICT
HWD	HICKSVILLE WATER DISTRICT
OU2	OPERABLE UNIT 2
RM	REMEDIAL MEASURE

NOTES:

1. THIS FIGURE DOES NOT INCLUDE ALL ACTIVE MONITORING AND OBSERVATION WELLS INSTALLED SINCE 1992.
2. THIS FIGURE INCLUDES ALL SHALLOW WELLS IDENTIFIED ON TABLE 1-1 OF THE OCTOBER 2000 FS REPORT PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.

0' 1000' 2000'
SCALE: 1" = 1000'

N

NO.	DATE	REVISION DESCRIPTION	BY / CKD

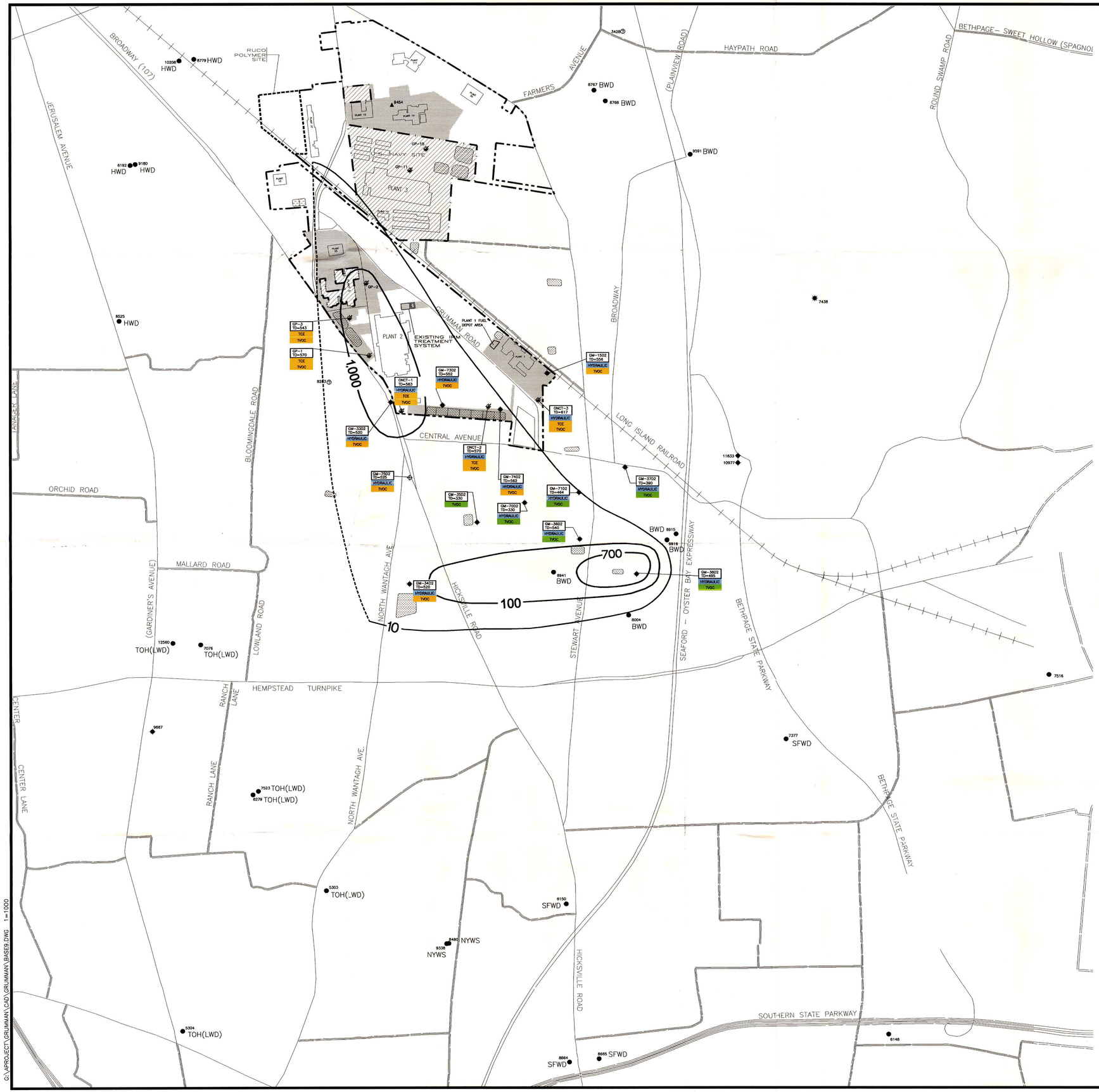
NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF DEEP SUPPLY AND MONITORING WELLS AND POSITION OF TOTAL VOLATILE ORGANIC COMPOUND PLUME IN THE DEEP ZONE

ARCADIS GERAGHTY & MILLER

DRAFT

PROJECT MANAGER: C. SANGIOVANNI	DEPARTMENT MANAGER:
LEAD DESIGN PROF.:	CHECKED: D. STERN
DRAWN: AG	DATE: 11/16/00
PROJECT NUMBER: NY008.0153	DRAWING NUMBER: 4



EXPLANATION

- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF U.S. NAVY SITE
- 5 — LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (in ppb), IN GROUNDWATER BASED ON FIRST QUARTER 2000 DATA. (ARCADIS GERAGHTY & MILLER, INC. 2000)
- APPROXIMATE WESTERN EXTENT OF TVOC PLUME ATTRIBUTABLE TO NORTHROP GRUMMAN AND NAVY.
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY
- DENOTES U.S. NAVY OWNED PROPERTY
- BASINS
- 6781 ▲ INDUSTRIAL WELL
- 747 ● PUBLIC SUPPLY WELL
- 9918 ◆ OBSERVATION, MONITORING WELL
- 8799 ✸ IRRIGATION WELL
- 6635 ⓟ UNKNOWN USE OF WELL
- GP-4 NORTHROP GRUMMAN OR NAVY PRODUCTION OR EXTRACTION WELL
- GM-3309 TD=520 ◆ LOCATION AND IDENTIFICATION OF EXISTING WELL INCLUDED IN OU2 RM MONITORING PLAN AND TOTAL DEPTH IN FT BLS.
- HYDRAULIC WELL USED TO DETERMINE GROUNDWATER ELEVATION
- TVOC/VCM/Cd/Cr WELL SAMPLED FOR WATER QUALITY
- TVOC WELL SAMPLED FOR WATER QUALITY FOR THE BETHPAGE WATER DISTRICT

TVOC	TOTAL VOLATILE ORGANIC COMPOUNDS
VCM	VINYL CHLORIDE MONOMER
Cd/Cr	CADMIUM / CHROMIUM
FT BLS	FEET BELOW LAND SURFACE
SFWD	SOUTH FARMINGDALE WATER DISTRICT
BWD	BETHPAGE WATER DISTRICT
NYWS	NEW YORK WATER DISTRICT
TOH	TOWN OF HEMPSTEAD WATER DISTRICT
LWD	LEVITTOWN WATER DISTRICT
HWD	HICKSVILLE WATER DISTRICT
OU2	OPERABLE UNIT 2
RM	REMEDIAL MEASURE
TCE	TRICHLOROETHENE

NOTES:

1. THIS FIGURE DOES NOT INCLUDE ALL ACTIVE MONITORING AND OBSERVATION WELLS INSTALLED SINCE 1992.
2. THIS FIGURE INCLUDES ALL SHALLOW WELLS IDENTIFIED ON TABLE 1-1 OF THE OCTOBER 2000 FS REPORT PLUS SELECT ADDITIONAL MONITORING AND OBSERVATION WELLS.

0' 1000' 2000'
SCALE: 1" = 1000'

NO.	DATE	REVISION DESCRIPTION	BY CKD

NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK

LOCATION OF NORTHROP GRUMMAN, U.S. NAVY, AND RUCO POLYMER SITES, AND LOCATIONS OF DEEP2 SUPPLY, DEEP2 AND DEEP3 MONITORING WELLS AND POSITION OF TOTAL VOLATILE ORGANIC COMPOUND PLUME IN THE DEEP2 ZONE

ARCADIS GERAGHTY & MILLER
88 Duryea Road
Melville, New York 11747
Tel: 516/249-7600 Fax: 516/249-7610

DRAFT

PROJECT MANAGER C. SANGIOVANNI	DEPARTMENT MANAGER
LEAD DESIGN PROF.	CHECKED D. STERN
DRAWN AG	DATE 11/16/00
PROJECT NUMBER NY008.0153	DRAWING NUMBER 5

G:\APROJECT\GRUMMAN\CAD\GRUMMAN\BASE8.DWG 1=1000

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Appendix A

Details for Wells Located Within a 3 ½-Mile Radius of the Northrop Grumman Site (Construction Logs to be Provided).

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
192	Bethpage Water District	176	112-173
576	LIRR	409	399-409
706	Village of Farmingdale	70	55-70
746	Bethpage Water District	120	81.5-120
747	Bethpage Water District	242	192-232
1232	NCDPW	57	--
1233	NCDPW	40	--
1234	NCDPW	65	--
1236	--	--	--
1461	NCDPW	18	--
1658	Grumman	112	87-112
1665	Grumman	101	67-100
1666	Grumman	108	74-98.5
1797	U.S. Navy	96	74-94
1798	U.S. Navy	105	80-105
1859	Grumman	165	140-170
1911	U.S. Navy	178	133-163
1912	U.S. Navy	159	119-149
1922	Grumman	187	130-160
1923	Grumman (GP-4)	359	293-348
1937	Village of Farmingdale	151	120-151
1960	U.S. Navy	200	130-160
1961	U.S. Navy	274	213-263
1963	U.S. Navy	186	97-127
2066	Bethpage Water District	158	121-153
2231	John Storyl Fannew-Farma	129	114-129
2240	M. Catapano (Nursery)	89	73-89
2402	Levitt & Sons, Inc.	85	64-85
2580	Levitt & Sons, Inc. (Levittown WD)	357	321-357
2587	--	61	26-61
3142	Bethpage Water District	163	122-163
3147	Bethpage Water District	233	192-233
3190	H.C. Bohack Company, Inc.	67	49-60
3193	Levittown Water District	316	274-316
3194	Levittown Water District	259	219-256
3312	Levittown Water District	304	252-304
3428	Bethpage Water District	611	--
3435	County Comm. Corp.	111.3	33-111.3
3450	Hooker Chemical	147	122-147

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
3463	NY Water Service	303	247-299
3488	Hicksville Water District	169	114-167
3547	The Grand Union Corp.	54	44-54
3552	Hicksville Water District	169	116-169
3554	NCDPW	288	264.5-268.5
3618	Levittown Water District	420	377-418
3666	--	68.5	29.2-68.5
3780	NY Water Service	142	89-142
3876	Bethpage Water District	386	328-381
3893	New York Water Service	150	98-151
3898	LILCO	138	107.5-129
3899	LILCO	134	113.5-124.5
3900	LILCO	156	136.5-147.5
3964	Metalab Equipment Corp.	103	93-103
4042	S. Farmingdale Water District	154	96-154
4043	S. Farmingdale Water District	374	312-372
4050	C. Bohack Company, Inc.	77	66-77
4063	Bethpage Water District	233	139-233
4078	--	79	75-79
4085	--	91	86-91
4095	Plainview Water District	490	425-485
4096	Plainview Water District	494	429-489
4097	Plainview Water District	465	420-460
4146	Bethpage Water District	235	153-235
4164	Caruso's Italian Cuisine & Bar	70	64-69
4175	--	69	54-69
4176	--	310	44-310
4301	Robert Bogart	87	82-87
4450	Levittown Water District	472	414-171
4451	Levittown Water District	403	231-281
4708	Grumman-formerly Pitts. Plate Corp.	169	149-169
5026	--	109	72-109
5148	S. Farmingdale Water District	369	309-369
5149	LILCO	193	121.5-175.5
5300	Mays Department Store	128	65-128
5301	Levittown Water District	377	324-377
5302	Levittown Water District	489	431-484
5303	Levittown Water District	714	620-736
5304	Levittown Water District	647	415-472
5305	Grumman	167	115.5-167

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
5306	Grumman	256	173-206 233-255
5321	East Meadow Water District	514	449-509
5322	East Meadow Water District	551	470-510
5336	Hicksville Water District	523^	472-523
5368	Hooker Chemical	150	110.5-141.5
5390	Hooker Chemical	145	82-137
5588	American Cleaners	45	22-45
5594	Mid-Island Shopping (Gertz)	255	130-255
5644	Mid-Island Shopping (J.J. Newberry)	270	245-270
5663	HIP of Greater NY	99^	89-99
5681	Eisoman, Inc.	96	91-96
5705	Town of Oyster Bay Incinerator	492^	450-492
5899	Drago Barcly Street Carwash, Inc.	91	76-91
6069	Hicksville Public Library	89	79-89
6077	Plainview Water District	460	395-455
6078	Bethpage Water District	275	225-275
6148	S. Farmingdale Water District	566	462-561
6150	S. Farmingdale Water District	612	545-607
6190	Hicksville Water District	610	550-600
6192	Hicksville Water District	637	574-624
6193	Hicksville Water District	467	396-456
6413	Salk Jr. HS (Levittown)	52	41-51
6417	Levittown Public School	60	49-60
6439	Abbey Lane School (Levittown)	59^	54-59
6440	Laurel Avenue School (Levittown)	60	55-60
6441	Northside School (Levittown)	66	57-62
6442	--	--	--
6443	--	--	--
6463	--	27	16-27
6517	NCDPW	58.5	10.4-58.5
6521	Plainedge High School	35^	29-35
6580	Plainview Water District	596	531-591
6620	Nat. Metal Process	87	82-87
6630	Bethpage Water District	586	--
6632	NCDPW	210	36-210
6633	NCDPW	216	37-216
6634	NCDPW	226	--
6635	NCDPW	219	--
6644	Village of Farmingdale	227	128-227
6775	Plastic Materials	105	87-105

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
6683	Westinghouse	135	60-135
6781	H. Bergonino	74	37-74
6867	--	--	--
6868	--	--	--
6904	Levittown Water District	693	--
6915	Bethpage Water District	608	540-603
6916	Bethpage Water District	611	556-606
6927	Dorrie Process Co.	140	120-140
6970	National Par 3 Golf	82	69.5-81.5
6996	Sonic Recording	120	103-119
7004	GWM Assoc.	150	124-150
7076	Levittown Water District	678	616-632
7094	--	57	25-57
7120	Sonic Recording	120	104-120
7164	--	83	28-83
7377	S. Farmingdale Water District	758	607-758
7438	Bethpage State Park	555	486-555
7479	Plainview-Old Bethpage Public Library	257	232-257
7492	Sears Roebuck Co.	305	260-305
7514	--	65	30-65
7515	S. Farmingdale Water District	352	289-352
7516	S. Farmingdale Water District	589	493-589
7518	Grumman (GP-16)	375	314-375
7523	Levittown Water District	684	589-614
7526	Plainview Water District	688	623-683
7531	LILCO	187	145-187
7534	Grumman (GP-6)	366	288-318 335-366
7535	U.S. Navy (GP-8)	357	280-290 308-357
7536	Grumman (GP-9)	436	375-436
7562	Hicksville Water District	545	455-470 490-540
7635	Grumman (GP-5)	394	314-344 364-394
7636	U.S. Navy (GP-10)	373	312-373
7637	U.S. Navy (GP-11)	490	429-489
7798	Island Trees Public School	64	49-64
7876	--	60	30-60

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
8004	Bethpage Water District	745	679-740
8019	--	72	36-72
8072	--	41	--
8124	Grumman (GP-3)	543	483-543
8154	Grumman (GP-2)	520	424-520
8263	--	530	52-530
8279	Levittown Water District	547	471-847
8321	Levittown Water District	675	574-612
8454	U.S. Navy	560	499-560
8480	New York Water Service	655	570-655
8487	Wantagh Jr/Sr High School	52	39-49
8522	Mid Island Hospital	125	105-125
8525	Hicksville Water District	503	432-482 493-503
8526	Hicksville Water District	601	520-601
8572	North Village Green Drugs	68	63-68
8643	U.S. Navy (GP-14)	467	416-467
8664	S. Farmingdale Water District	581	506-576
8665	S. Farmingdale Water District	611	529-606
8668	Town for Oyster Bay Incinerator	485^	434-485
8669	--	--	--
8767	Bethpage Water District	640	579-640
8768	Bethpage Water District	678	605-678
8767	Bethpage Water District	640	579-640
8768	Bethpage Water District	678	605-678
8778	Hicksville Water District	500	529-590
8779	Hicksville Water District	585	524-585
8799	Wheatley Hills G & C	221	190-221
8807	Certified Industries	140	110-140
8816	U.S. Navy (GP-15)	500	450-500
8842	Grumman (GP-1)	570	519-570
8941	Bethpage Water District	775	710-770
9016	West End Tavern	32	NA
9018	Nat Westminster Bank	405^	380-405
9079	NCDPW	70	--
9088	NCDPW	68	--
9106	McLellen Stores	60	53-60
9150	North Hicksville	81	76-81
9180	Hicksville Water District	635	545-567 598-630
9338	New York Water Service	646	585-646
9463	Hicksville Water District	638^	560-638

Footnots on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
9469	--	--	--
9471	--	--	--
9488	Hicksville Water District	583	518-568
9514	NY Water Service	660	569-660
9589	Levittown Mem. High School	63^	53-63
9590	Levittown Div. High School	51^	41-51
9591	Bethpage Water District	682	616-682
9654	NCDPW	53	--
9658	--	--	--
9660	--	--	--
9661	NCDPW	57	--
9662	--	--	--
9667	NCDPW	546	--
9878	NY Water Service	664	--
9918	NCDPW	77	--
9920	NCDPW	89	--
9921	NCDPW	62	--
9923	--	--	--
9927	NCDPW	94	--
9928	NCDPW	--	--
9929	NCDPW	40	--
9930	--	--	--
9931	NCDPW	73	64.35-69.35
9932	NCDPW	105	--
9935	NCDPW	135	--
9936	--	--	--
10195	New York Water Service	580^	512-580
10208	Hicksville Water District	649	572-649
10555	Hicksville Water District	620	608-693
10588	USGS	76	70.5-74.5
10589	USGS	76	73-76
10590	USGS (GM-2S)	76	73-76
10591	USGS	78	72-76
10592	USGS	73	67-71
10593	USGS	77	73-77
10594	USGS	76	73-76
10595	USGS (GM-13S)	67	63-67
10596	USGS	71	68-71
10597	USGS	66	63-66
10598	USGS	77	73-77

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
10599	USGS (GM-18S)	67	63-67
10600	USGS	61	57-61
10601	USGS (GM-21S)	67	63-67
10602	USGS	56	52-56
10603	USGS	61	57-61
10623	USGS	72	68-72
10624	USGS	194	190-194
10625	USGS (GM-14S)	67	63-67
10626	USGS (GM-15S)	67	63-67
10627	USGS	310^	290-295
10628	USGS	67	63-67
10629	USGS (GM-13I)	109	105-109
10630	USGS	300	280-285
10631	USGS	67	63-67
10632	USGS (GM-20S)	67	63-67
10633	USGS	67	63-67
10634	USGS	67	63-67
10635	USGS	49	45-49
10636	USGS	56	52-56
10733	--	--	--
10812	USGS (GM-3S)	93	89-93
10813	USGS	67	63-67
10814	USGS	72	68-72
10815	USGS	61	57-61
10816	USGS	130	126-130
10817	USGS	51	47-51
10818	USGS	56	52-56
10820	USGS	72	68-72
10821	USGS	56	52-56
10822	USGS	130	126-130
10977	NCDPW	693.5	668-693.5
10997	USGS (GM-34D2)	525.3	510-525
10998	USGS (GM-34D)	324	309-324
10999	USGS	335	320-335
11000	USGS	131	121-131
11004	Village of Farmingdale	347	260-347
11067	NCDPW	99	--
11145	--	--	--
11633	NCDPW	1075	949-969

Footnots on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
11643	--	--	--
11644	--	--	--
12535	Plainview Water District	618	553-613
12560	Levittown Water District	655	530-550 605-630
12765	Island Trees UFSD	108	88-108
12852	--	55.2	40.2-55.2
A-1	Hooker/Ruco	67	54-67
A-2	Hooker/Ruco	112	105-112
B-1	Hooker/Ruco	69	49-69
B-2	Hooker/Ruco	104	86-104
C-1	Hooker/Ruco	70	50-70
C-2	Hooker/Ruco	124	114-124
D-1	Hooker/Ruco	65	45-65
D-2	Hooker/Ruco	91	86-91
E-1	Hooker/Ruco	66	46-66
E-2	Hooker/Ruco	90	75-90
F-1	Hooker/Ruco	68	47.5-67.5
F-2	Hooker/Ruco	110	90-110
G-1	Hooker/Ruco	70	55-70
G-2	Hooker/Ruco	130.2	120.2-130.2
H-1	Hooker/Ruco	69.4	54.4-69.5
H-2	Hooker/Ruco	130.2	120.2-130.2
I-1	Hooker/Ruco	70	55-70
I-2	Hooker/Ruco	129.5	119.5-129.5
J-1	Hooker/Ruco	68	53-68
J-2	Hooker/Ruco	139	129-139
L-1	Hooker/Ruco	68.3	53.3-68.3
L-2	Hooker/Ruco	130.2	120.2-130.2
M-1	Hooker/Ruco	70	55-70
N-1	Hooker/Ruco	68	53-68
P-1	Hooker/Ruco	68	53-68
Q-1	Hooker/Ruco	68	53-68
R-1	Hooker/Ruco	68	53-68
GM-1S	Grumman	73	63-73
GM-1I	Grumman	125	115-125
GM-2I	Grumman	115	105- 115
GM-3I	Grumman	120	110-120
GM-4S (S-1)	Grumman	70	55-70

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
GM-4I (S-2)	Grumman	130	120-130
GM-5S (T-1)	Grumman	68	53-68
GM-5I (T-2)	Grumman	129.1	119.1-129.1
GM-6S (P-3)	Grumman	77.7	--
GM-6I	Grumman	143	133-143
GM-7S	Grumman	59	49-59
GM-7I	Grumman	105	105-115
GM-7D	Grumman	220	210-220
GM-8S	Grumman	58	48-58
GM-8I	Grumman	115	105-115
GM-9S (K-1)	Grumman	68	53-68
GM-9I (K-2)	Grumman	130	120-130
GM-10S (P-5)	Grumman	67.7	--
GM-10I	Grumman	120	110-120
GM-11S (3)	Grumman	47	37-47
GM-12S	Grumman	55	45-55
GM-12I	Grumman	116	106-116
GM-13D	Grumman	210	200-210
GM-14	Grumman	--	--
GM-14I	Grumman	110	100-110
GM-15I	Grumman	105	95-105
GM-15D	Grumman	--	--
GM-15D2	Grumman	--	--
GM-16S (3)	Grumman	53	43-53
GM-16SR	Grumman	53	43-53
GM-16I	Grumman	145	135-145
GM-17S (3)	Grumman	48	38-48
GM-17SR	Grumman	48	38-48
GM-17I	Grumman	--	--
GM-17D	Grumman	--	--
GM-18I	Grumman	105	95-105
GM-19S	Grumman	53	38-43 48-53
GM-19I	Grumman	140	130-140

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
GM-20I	Grumman	105	95-105
GM-20D	Grumman	226	216-226
GM-21I	Grumman	140	130-140
GM-21D	Grumman	--	--
GM-22S	Grumman	46	36-46
GM-22I	Grumman	100	90-100
GM-22D (3)	Grumman	200	190-200
GM-23S	Grumman	56	46-56
GM-23I	Grumman	120	110-120
GM-31S	Grumman	76	66-76
GM-32S	Grumman	51	41-51
GM-33D2	Grumman	520	500-520
GM-34D	Grumman	324	309-319
GM-34D2	Grumman	525	510-520
GM-35D2	Grumman	530	510-530
GM-36D	Grumman	214	204-214
GM-36D2	Grumman	540	520-540
GM-37D	Grumman	262	242-262
GM-37D2	Grumman	390	370-390
GM-38D	Grumman	340	320-340
GM-38D2	Grumman	495	475-495
GM-70D2	Grumman	--	--
GM-71D2	Grumman	--	--
GM-73D2	Grumman	--	--
GM-74D	Grumman	--	--
GM-74D2	Grumman	--	--
GM-74I	Grumman	--	--
GM-75D2	Grumman	--	--
GM-78S	Grumman	--	--
GM-78I	Grumman	--	--
GM-79S	Grumman	--	--
GM-79D	Grumman	--	--
GM-79I	Grumman	--	--
HN-8D	U.S. Navy	198.4	188-198
HN-24S	U.S. Navy	59	48.6-58.6
HN-24I	U.S. Navy	158	148-158
HN-24I1	U.S. Navy	159	149-150
HN-24I2	U.S. Navy	160	150-160

Footnotes on last page

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Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
HN-25S	U.S. Navy	59.3	49-59
HN-25I	U.S. Navy	130.4	120-130
HN-25D	U.S. Navy	210	200-210
HN-26S	U.S. Navy	55	44-54
HN-26I	U.S. Navy	155	115.3-125.3
HN-27S1	U.S. Navy	54.3	44-54
HN-27S2	U.S. Navy	61	51-61
HN-27S3	U.S. Navy	61	51-61
HN-27I1	U.S. Navy	155	100-110
HN-27I2	U.S. Navy	135	110-135
HN-28S	U.S. Navy	54.3	44-54
HN-28I	U.S. Navy	155	131-141
HN-29S	U.S. Navy	49.3	39-49
HN-29I	U.S. Navy	130.4	120-130
HN-29D	U.S. Navy	220	210-220
HN-30S	U.S. Navy	57.3	47-57
HN-30I	U.S. Navy	155	110-120
HN-40S	U.S. Navy	59	49-59
HN-40I	U.S. Navy	118	108-118
HN-41S	U.S. Navy	55	45-55
HN-41I	U.S. Navy	113	103-113
HN-42S	U.S. Navy	60	50-60
HN-42I	U.S. Navy	110	100-110
HN-43I	U.S. Navy	151.31	141-151
MW-1GF	--	--	--
MW-2GF	--	--	--
MW-3R	--	--	--
MW-50D1	Hooker/Ruco	310	285-305
MW-50D2	Hooker/Ruco	598	415-435
MW-51D1	Hooker/Ruco	260	235-255
MW-51D2	Hooker/Ruco	370	350-365
MW-52S	Hooker/Ruco	142	125-140
MW-52I	Hooker/Ruco	237	220-235
MW-52D	Hooker/Ruco	402	371-386
MW-53I	Hooker/Ruco	173	150-170
MW-53D1	Hooker/Ruco	338	300-330
MW-53D2	Hooker/Ruco	600	430-460
MW-54	--	--	--
MW-55	--	--	--
MW-56S	Hooker/Ruco	123	105-120

Footnotes on last page

Table 1-1. Details for Wells Located within a 3 1/2-mile Radius of the Northrop Grumman Site, Bethpage, New York.(1) **

NYSDEC Well ID #	Owner/ User	Total Depth of Well (feet)	Screened Interval (feet)
MW-56I	Hooker/Ruco	392	260-275
MW-57S	Hooker/Ruco	155.5	137-152
MW-57I	Hooker/Ruco	392	191-206
FW-1	--	--	--
FW-2	--	--	--
FW-3	--	64	49-64
GP-17	Northrop/Grumman	563	480-563
GP-18	Northrop/Grumman	570	466-570
GP-19	Northrop/Grumman	617	465-617
AOC22-01	--	--	--
AOC22-02	--	--	--
AOC22-03	--	--	--
AOC22-04	--	--	--
AOC22-05	--	--	--
BRMW-01	--	64	49-64

** 2001 Well inventory update includes only: public, private, industrial, irrigation, commercial, monitoring and supply wells, through May 2001.

-- The information was either not available or not applicable.

(1) Inventory complied from NYSDEC, USGS, NCDPW, and NCDOH data, as of December 2000. (Note: Well depths and screened intervals may vary slightly between data sources.)

Sources:

USGS (1982, 1987, 1988, 1992, 1998, 2001).
NYSDEC (1984, 1987, 1988, 1998, 2001).
LBG (1984).
Kilburn (1982).
Northrop Grumman (2001).
US Navy (2001).

DRAFT

Appendix B

Draft Steel Equities Groundwater Monitoring Plan

Gannett Fleming

GANNETT FLEMING ENGINEERS AND ARCHITECTS, P.C.
480 Forest Avenue
P.O. Box 707
Locust Valley, NY 11560-0707
Office: (516) 671-8440
Toll Free: (800) 249-3337
Fax: (516) 671-3349
www.gannettfleming.com

copy – File – Carlo – Lesk... – JC
@ Acth

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7099 3400 0001 4745 5299

August 7, 2000
File #34413

Steven Scharf, P.E.
New York State Department of
Environmental Conservation
Division of Environmental Remediation
50 Wolf Road, Room 242
Albany, New York 12233-7010

AUG 2000
ENVIRONMENTAL TECHNOLOGY & COMPLIANCE

Re: Groundwater Monitoring Plan
Delisting Request-Plant 2
(Site No. 130003C)
Former Northrop Grumman Site

Dear Mr. Scharf:

On behalf of Steel Los III, Gannett Fleming submits this plan to respond to the Department's June 16, 2000 request for a groundwater monitoring plan to supplement Arcadis Geraghty & Miller's (G&M) July 21, 1999 Draft Hydraulic and Groundwater Quality Monitoring Plan which was recently forwarded.

Site History and Prior Remediation Efforts

The former Plant 2 property was acquired by Steel Los III from Northrop Grumman Corp. in December 1996 to be redeveloped for commercial uses. The property was successfully subdivided and is currently occupied by over 10 tenants. As part of the property transaction, Steel Los III assumed responsibility for delisting the property by completing the investigation and remediation of hazardous soil and concrete which was previously started by Northrop Grumman, with groundwater investigation and remediation remaining Northrop Grumman's responsibility. Steel Los III completed the investigation of Areas of Concern which identified hazardous soil and concrete in the building. Subsequently, Steel Los II retained Brookside Environmental to remove the hazardous waste (188 tons total) which was transported and disposed of at a licensed facility in October 1997. Post excavation sampling confirmed that the hazardous waste was removed but that residual contamination exceeded NYSDEC TAGM values. Based on the December 1997 Delisting Petition submitted to NYSDEC which summarizes the investigation and remediation efforts and the

Continued . . .

deed restrictions developed for the property, NYSDEC reclassified the property from Class 2 to Class 4.

Deed Restriction

The attached deed restriction on the property obligates Steel Los III to maintain the cap over the former Plant 2 property. The cap consists of the concrete floor and the roof.

Groundwater Monitoring Plan

In August 1999, at the request of NYSDEC, Steel Los III proposed specific groundwater monitoring wells to be added to the sitewide network proposed by G&M. These wells are to be monitored for cadmium and chromium and include the following: GM16SR, 10631, MW3R, GM17S, and GM18S. G&M indicated that GM78S has not yet been installed and GM20S was inadvertantly destroyed. MW-1 and MW-2 located downgradient of Plant 2 were inadvertently destroyed during repaving and were replaced in April 2000 by MW-1GF and MW-2GF, which are at locations agreed upon with NYSDEC. These wells are also proposed as part of the monitoring network for cadmium and chromium. Copies of the boring logs and well construction logs are attached. In addition, Steel Los wishes to include MW-32S in the monitoring network as an upgradient well. Table 1 summarizes the analyses required toward the delisting effort. Table 1 also shows the relative locations of the wells proposed to be added to the network in addition to the screened intervals provided by Arcadis Geraghty & Miller.

As discussed in the G&M Groundwater Monitoring Plan, groundwater sampling for cadmium and chromium would take place on a quarterly basis for two years or less with NYSDEC's concurrence. Analyses would be in accordance with USEPA method 6010 to be performed by an ELAP-certified laboratory. Data would be summarized in a quarterly report.

Recent Sampling Data

In order to get an initial indication of the concentrations of cadmium and chromium in groundwater, Gannett Fleming sampled wells MW-1GF, MW-2GF, MW-32S and MW-16SR. Results for filtered and unfiltered samples are summarized on Table 2 and copies of the lab reports are attached. Table 3 shows the water table elevation measurements collected on August 2, 2000.

Continued . . .

Steven Scharf, P.E.
New York State Department of
Environmental Conservation
August 7, 2000

We trust that this information is responsive to your request.

Please call us if you have any questions or require additional information.

Very truly yours,

GANNETT FLEMING ENGINEERS AND ARCHITECTS, P.C.

DEAN E. DEVOE, P.E.
Project Manager

LEONARD EDER, P.E.
Senior Consultant

DD:LE/sh

cc: S. McCormick, P.E.
W. Gilday, P.E.
J. Cofman
J. Lostritto
K. Lumpe
P. Casowitz, Esq.

M:\CLERICAL\PROJECTS\34400\34413\UBW1067.WPD

STEEL LOS III
BETHPAGE, NEW YORK

TABLE 1

WELLS PROPOSED FOR SITE WIDE MONITORING NETWORK

Well ID	Relative Location	Proposed Analyses (1)	Sampling Frequency	Screened Interval Ft. (2)
MW-1GF	NW	Total & Filtered Cadmium & Chromium	Quarterly	48-58
MW-2GF	SE	Total & Filtered Cadmium & Chromium	Quarterly	49-59
MW3R	S	Total & Filtered Cadmium & Chromium	Quarterly	N/A
MW-32S	NE	Total & Filtered Cadmium & Chromium	Quarterly	41-51
GM16SR	N	Total & Filtered Cadmium & Chromium	Quarterly	55-65
GM17S	W	Total & Filtered Cadmium & Chromium	Quarterly	38-48
GM18S	SW	Total & Filtered Cadmium & Chromium	Quarterly	63-67
10631	S	Total & Filtered Cadmium & Chromium	Quarterly	63-67

Notes:

(1) USEPA method 6010.
(2) Based on information provided by Geraghty & Miller
NA indicates not available

STEEL LOS III
BETHPAGE, NEW YORK

TABLE 2

SUMMARY OF GROUNDWATER MONITORING RESULTS
FORMER PLANT 2, 700 HICKSVILLE ROAD, BETHPAGE

Well ID	Date Sampled	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium
MW-1GF	4/21/00 5/02/00	<5 <5	<5 <5	92 100	<5 <5
MW-2GF	4/21/00 5/02/00	<5 6	<5 <5	300 370	310 340
GM16SR	6/23/00	<5	<5	<5	<5
GM32S	6/23/00	<5	<5	100	97

Notes:

(1) Results in ppb.

STEEL LOS III
BETHPAGE, NEW YORK

TABLE 3

GROUNDWATER LEVEL MONITORING AT 700 HICKSVILLE ROAD, BETHPAGE

Well ID	Top of Casing	Depth to Water	Water Table Elevation
MW-1GF	112.86	46.07	66.79
MW-2GF	111.41	46.92	64.49
MW-16S	115.77	49.93	65.84
MW-32S	109.10	43.50	65.60

Notes:

Measurements are surveyed as feet above mean sea level on August 2, 2000.

BORING REPORT	GANNETT FLEMING 480 FOREST AVENUE LOCUST VALLEY, NEW YORK 11560	SHEET 1 OF 2

DATE STARTED: 4/4/00	DATE FINISHED: 4/4/00				BORING NO.: MW-1 GF		
CLIENT: Steel Equities					PROJECT NO.: 34413		
PROJECT NAME & LOCATION: Plant 2- Bethpage, NY					PREPARED BY: Dawn Sharvin		
DRILLING CONTRACTOR: Land, Air, Water Environmental Services					LOGGED BY: John Gavras		DRILLER: K. McGourthy
		SOIL	CORE		MON. WELL (MW)		DRILL RIG
EQUIPMENT:	CASING:	SAMPLER:	BARREL	AUGER	PIPE	CAP	AND METHOD
TYPE:		Split Spoon		6 5/8"			Mobile B-61 HD
SIZE:		2" x 24"					Hollow Stem Auger
HAMMER WT/FALL		140lbs 30"	BIT:				

SURFACE ELEVATION: SURFACE CONDITIONS: Asphalt parking lot

WATER LEVEL AT HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	PID READINGS (ppm)	SAMPLE DEPTH (FROM-TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
0		0-4					Asphalt, tan c-m sands, some gravel.
		4-6		0.9'	12-16-24-30		0-0.9': Poorly sorted tan sand & gravel, little silt.
5							
		9-11		0.9'	12-13-13-15		0-0.9': Poorly sorted tan sand & gravel, little silt.
10							
		14-16		1.45'	7-9-11-14		0-0.55': Poorly sorted tan sand & m-f gravel, little silt.
15							0.55-0.70': Well sorted m-f sand, trace silt.
							0.70-1.0': Poorly sorted tan sand & gravel, little silt.
							1.0-1.45': Tan well sorted f sand.
		19-21	Damp	0.8'	10-10-12-14		0-0.8': Poorly sorted tan sand & gravel, trace silt.
20							
		24-26	Damp	1.1'	9-11-12-13		0-1.1': Poorly sorted tan sand & gravel, little silt.
25							

PROJECT NAME: Steel Equities **BORING NO. MW-1 GF** **PROJECT NO. 34413**

BELOW GRADE	PID READINGS	DEPTH (FROM-TO)	MOISTURE CONTENT	RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=0-30% AND=35-50%
		29-31	Damp	1.3'	8-11-15-19		0-0.9': Poorly sorted tan sand & gravel, trace silt.
30							0.9-1.3': Well sorted f-m sand, trace f-m gravel; little silt
		34-36	Damp	1.15'	7-9-12-15		0-1.15': Poorly sorted tan sand & gravel, trace silt.
35							
		39-41	Damp	0.65'	7-8-11-15		0-0.2': Poorly sorted tan sand & gravel, trace silt.
40							
		44-46	Damp	1.15'	14-17-19-22		0-1.15': Poorly sorted tan sand & gravel, little silt.
45							
		49-51	Saturated	0.7'	14-19-25-33		0-0.7': Poorly sorted tan sand & gravel, some silt, little clay.
50							
		54-56	Saturated	1.6'	19-20-33-37		0-1.1': Poorly sorted lt. brn sand & gravel, trace silt.
55							1.1-1.6': Well sorted lt brn f-m sand & gravel, trace silt
		59-61	Saturated	1.1'	7-9-9-11		0-0.35': Well sorted lt brn f-m sand & gravel, little silt, trace c gravel
60							0.35-1.1': Poorly sorted lt brn sand & m-f gravel, trace silt
							End of boring @ 63'.

BORING REPORT	GANNETT FLEMING 480 FOREST AVENUE LOCUST VALLEY, NEW YORK 11560	SHEET 1 OF 2

DATE STARTED: 4/5/00	DATE FINISHED: 4/5/00				BORING NO.: MW-1A GF		
CLIENT: Steel Equities					PROJECT NO.: 34413		
PROJECT NAME & LOCATION: Plant 2- Bethpage, NY					PREPARED BY: Dawn Sharvin		
DRILLING CONTRACTOR: Land, Air, Water Environmental Services					LOGGED BY: John Gavras		DRILLER: C. Pedersen
		SOIL	CORE		MON. WELL (MW)		DRILL RIG
EQUIPMENT:	CASING:	SAMPLER:	BARREL	AUGER	PIPE	CAP	AND METHOD
TYPE:		Split Spoon		6 5/8"			Mobile B-61 HD
SIZE:		2" x 24"					Hollow Stem Auger
HAMMER WT/FALL		140lbs 30"	BIT.				
SURFACE ELEVATION:					SURFACE CONDITIONS: Asphalt parking lot		
WATER LEVEL AT		HRS.			FT. AFTER		HRS.

DEPTH BELOW GRADE	PID READINGS (ppm)	SAMPLE DEPTH (FROM-TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
0		0-5					Brn/ tan c-m sands, little c gravel.
5							
10							
15							
20							
25							

PROJECT NAME: Steel Equities **BORING NO. MW-1 GF** **PROJECT NO. 34413** **SHEET 2 OF 2**

BELOW GRADE	PID READINGS	DEPTH (FROM-TO)	MOISTURE CONTENT	RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=0-30% AND=35-50%
30							
35							
40							
45		45-47	Damp	0.9'	12-33-100/6"		Poorly sorted tan sand & gravel.
50		48-50		0'	15-17-28-35		
55							
60							End of boring @59'.

BORING REPORT	GANNETT FLEMING 480 FOREST AVENUE LOCUST VALLEY, NEW YORK 11560	SHEET 1 OF 2

DATE STARTED: 4/5/00	DATE FINISHED: 4/5/00				BORING NO.: MW-2 GF		
CLIENT: Steel Equities					PROJECT NO.: 34413		
PROJECT NAME & LOCATION: Plant 2- Bethpage, NY					PREPARED BY: Dawn Sharvin		
DRILLING CONTRACTOR: Land, Air, Water Environmental Services					LOGGED BY: John Gavras		DRILLER: C. Pedersen
		SOIL	CORE		MON. WELL (MW)		DRILL RIG
EQUIPMENT:	CASING:	SAMPLER:	BARREL	AUGER	PIPE	CAP	AND METHOD
TYPE:		Split Spoon		6 5/8"			Mobile B-61 HD
SIZE:		2" x 24"					Hollow Stem Auger
HAMMER WT/FALL		140lbs 30"	BIT:				

SURFACE ELEVATION: SURFACE CONDITIONS: Asphalt parking lot

WATER LEVEL AT HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	PID READINGS (ppm)	SAMPLE DEPTH (FROM-TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
0		0-3					1" asphalt
							8" concrete
		3-5	Damp	0.35'	4-7-8-11		0-0.35': Poorly sorted lt grey/ lt tan sand, little silt, little concrete fragments (fill material)
5							
		8-10	Damp	1.3'	4-5-4-8		0-0.2': Poorly sorted lt grey/ lt tan sand, little silt, little concrete fragments (fill material) 0.2-0.6': Poorly sorted tan sand & m-f gravel, little silt. 0.6-0.8': Dk. grey organic rich sandy silt, little f gravel.
			Moist				
10			V. Moist				0.8-1.1': Brn sandy silt. 1.1-1.3': M-c rounded gravel & brn sandy silt
		13-15	Damp	0.65'	8-11-17-25		0-0.65': Poorly sorted lt tan sand, some f gravel, little silt.
15							
		18-20	Damp	1.0'	14-18-21-29		0-1.0': Poorly sorted tan sand, some f-c gravel, little silt
20							
		23-25	Damp		12-15-19-22		Poorly sorted tan sand & gravel, trace silt.
25							

BELOW GRADE	PID READINGS	DEPTH (FROM-TO)	MOISTURE CONTENT	RECOVERY	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION & REMARKS TRACE=0-10% LITTLE=10-20% SOME=0-30% AND=35-50%
		28-30			7-10-14-17		Poorly sorted tan sand, some f-m gravel, little silt
30							
		33-35	Damp	1.1'	9-14-18-21		0-0.15': Poorly sorted tan sand, some f-m gravel, little silt
							0.15-1.1': Alternating layers (0.2-0.25' thick) of well sorted v. lt tan sand, trace silt & orange tan sandy silt
35							
		38-40	Damp	1.0'	7-12-13-16		0-1.0': Well sorted v. lt tan f sand, trace silt.
40							
		43-45	Damp	1.0'			0-1.0': Well sorted v. lt tan f sand, trace silt.
			V. Damp				0.75-0.8': Thin layer of orange tan sandy silt.
45							
		48-50	Moist	1.05'	7-14-19-22		0-0.25': Well sorted v. lt tan f sand, trace silt. 0.25-0.30': Orange tan sandy silt
			Moist				0.3-1.05': Well sorted v. lt tan f sand grading into poorly sorted v. lt tan m-f sand.
50		50-52	Saturated	1.0'	6-10-11-13		0-1.0': Poorly sorted v. lt m-f tan sand, trace f gravel.
55		55-57	Saturated	1.0'	5-7-8-10		0-1.0': Poorly sorted v. lt m-f tan sand, trace f gravel.
							End of boring @ 60'.
60							

Gannett Fleming

MONITORING WELL CONSTRUCTION INFORMATION

JOB No. : 34413 CLIENT : Steel Equities

LOCATION : Plant 2- Bethpage, NY

DATE : 4/5/00 WELL No.: MW-1 GF

HYDROGEOLOGIST : John Gavras

DRILLING CONTRACTOR : Land, Air, Water Environmental Services

1). SCREEN TYPE : PVC

SLOTTED LENGTH : 10 Feet

SLOT SIZE : 0.10 inches

2). SOLID PIPE TYPE : PVC

SOLID PIPE LENGTH : 48 Feet

PIPE & SCREEN DIA. : 4 inches

JOINT TYPE-SLIP / GLUED : ____ THREADED _

3). TYPE OF BACKFILL AROUND SCREEN :

1 Silica Sand

4). TYPE OF SEAL (IF INSTALLED) :

Medium Bentonite Chips

5). TYPE OF BACKFILL: Bentonite/ Cement Grout

HOW INSTALLED: Tremied

6). TYPE OF SURFACE SEAL (IF INSTALLED):

7). PROTECTIVE CASING: YES _____ NO _____

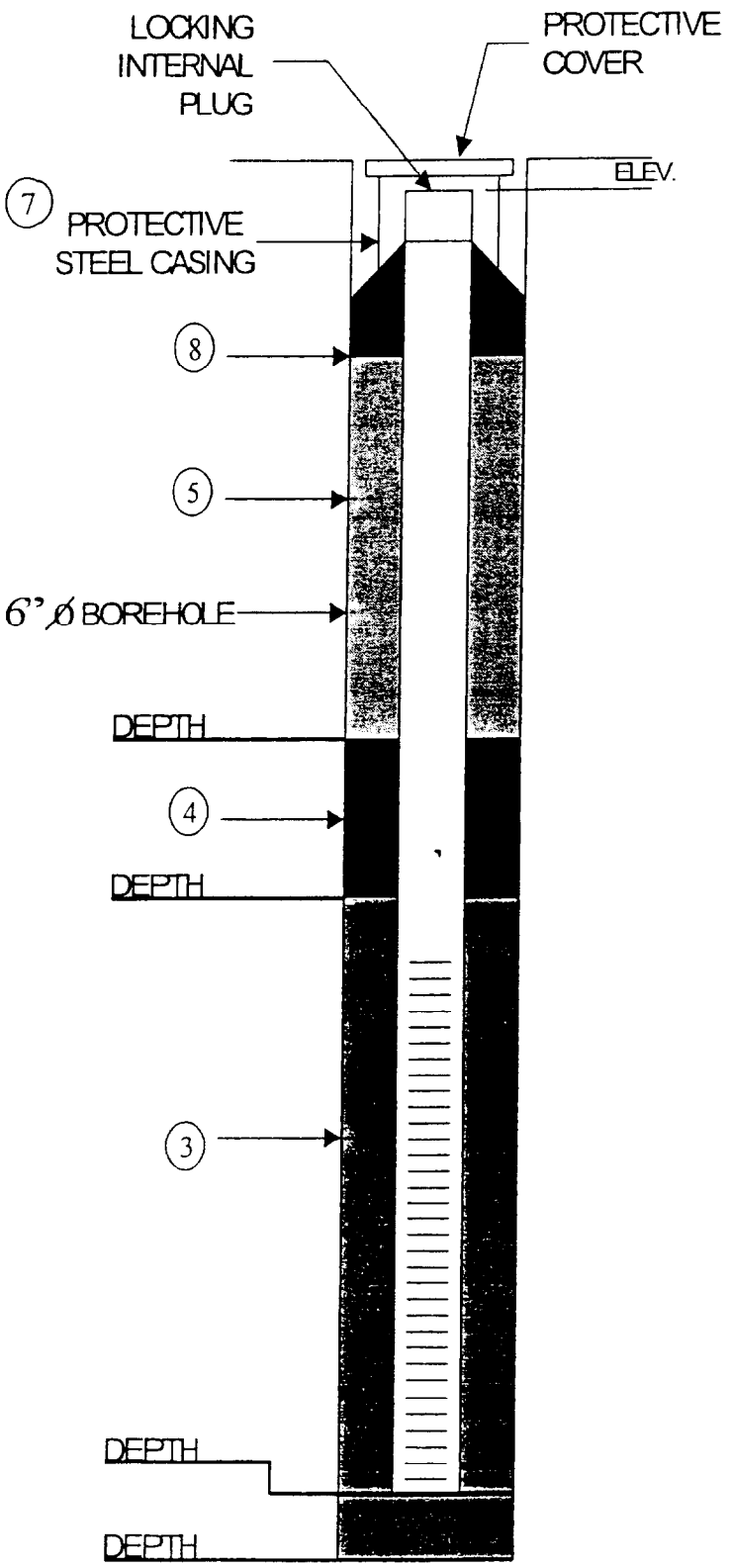
LOCKING CAP: YES _____ NO _____

8). CONCRETE SEAL: YES _____ NO _____

9). DRILLING METHOD:

Hollow Stem Auger

10). ADDITIVES USED (IF ANY):



WATER LEVELCHECKS*

DATE	TIME	DEPTH TO WATER	REMARKS

* FROM TOP OF WELL

Gannett Fleming

MONITORING WELL CONSTRUCTION INFORMATION

JOB No. : 34413 CLIENT : Steel Equities

LOCATION : Plant 2- Bethpage, NY

DATE : 4/5/00 WELL No.: MW-2 GF

HYDROGEOLOGIST : John Gavras

DRILLING CONTRACTOR : Land, Air, Water Environmental Services

1). SCREEN TYPE : PVC

SLOTTED LENGTH : 10 Feet

SLOT SIZE : 0.10 inches

2). SOLID PIPE TYPE : PVC

SOLID PIPE LENGTH : 49 Feet

PIPE & SCREEN DIA. : 4 inches

JOINT TYPE-SLIP / GLUED : ____ THREADED _

3). TYPE OF BACKFILL AROUND SCREEN :

1 Silica Sand

4). TYPE OF SEAL (IF INSTALLED) :

Medium Bentonite Chips

5). TYPE OF BACKFILL: Bentonite/ Cement Grout

HOW INSTALLED: Tremied

6). TYPE OF SURFACE SEAL (IF INSTALLED):

7). PROTECTIVE CASING: YES _____ NO _____

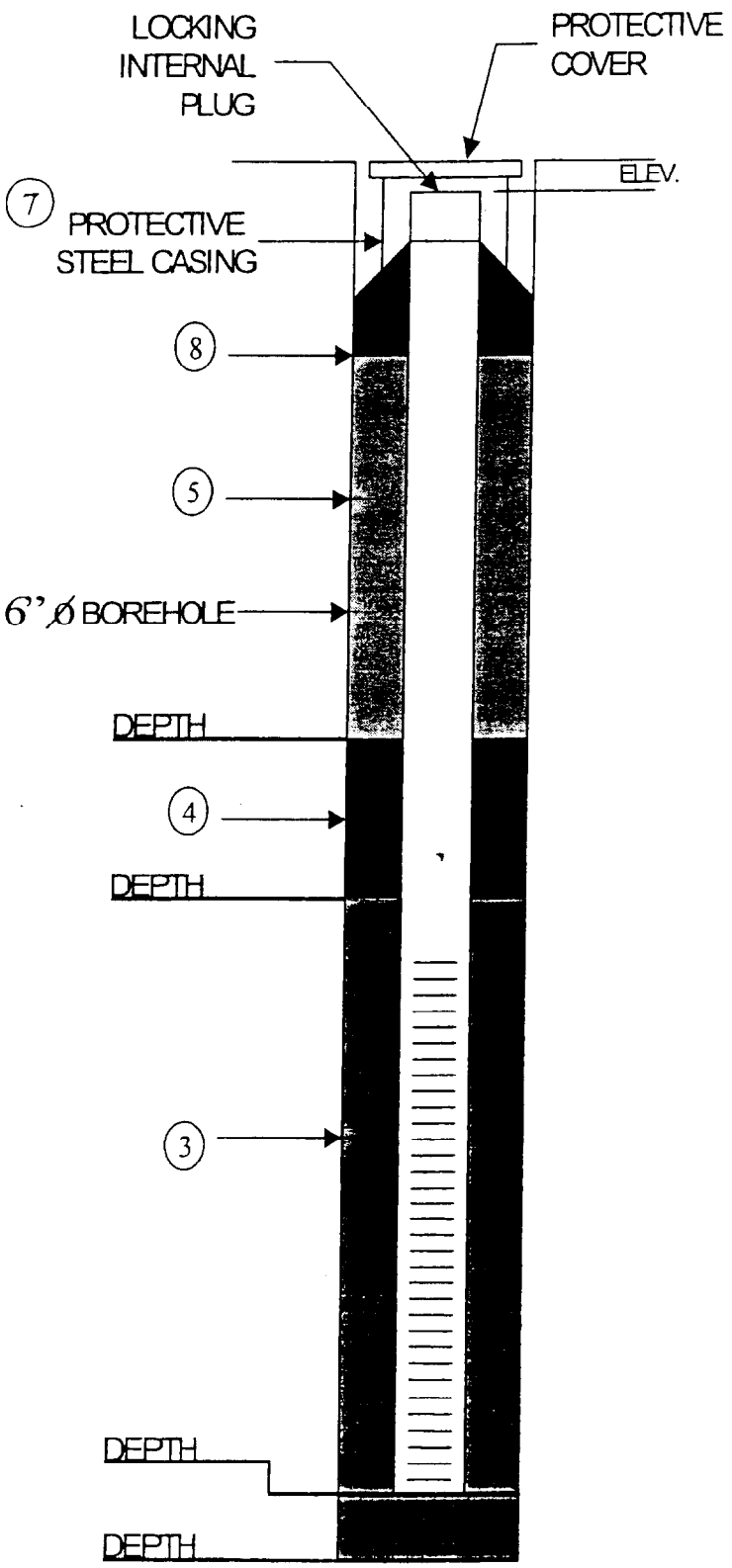
LOCKING CAP: YES _____ NO _____

8). CONCRETE SEAL: YES _____ NO _____

9). DRILLING METHOD:

Hollow Stem Auger

10). ADDITIVES USED (IF ANY):



WATER LEVELCHECKS*

DATE	TIME	DEPTH TO WATER	REMARKS

* FROM TOP OF WELL

BY AND BETWEEN

GRUMMAN AEROSPACE CORPORATION, a New York corporation having an address at Building I South Oyster Bay Road, Bethpage, New York 11714 ("Grantor")

party of the first part, and

STEEL-LOS III, a New York limited partnership, having a ninety (90%) tenant in common interes JOSEPH LOSTRITTO, individually, having a ten percent (10%) tenant-in-common interest, both havi address at 4 Pound Hollow Court Rd., Old Brookville, New York 11545 (collectively, "Grantee")

party of the second part.

WITNESSETH:

1. Conveyance.

Grantor, in consideration of TEN and 00/100 ($10.00) DOLLARS paid by Grantee, does hereby gran release unto Grantee and Grantee's successors and assigns forever, subject to the matters hereinafte set forth:

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situ lying and being at Bethpage, Town of Oyster Bay and Town of Hempstead, County of Nassau and Sta New York, being more particularly bounded and described on Schedule "A", annexed hereto and made hereof (the "Premises"), consisting of, amongst other things, a building of approximately 904,600 square ("Building No. 2").

Grantor is same as grantee in deeds set forth in Schedule "B", annexed hereto and made part hereof

TOGETHER with all right, title and interest, if any, of Grantor in and to any publicly dedicated streets roads abutting the Premises to the center lines thereof; TOGETHER with the appurtenances and a estate and rights of Grantor in and to the Premises; TO HAVE AND TO HOLD the Premises herein gra unto Grantee, and Grantee's successors and assigns forever.

2. General Covenants.

(a) Grantor covenants that it has not done or suffered anything whereby the Premises have encumbered in any way whatever, except as aforesaid.

(b) Grantor, in compliance with Section 13 of the Lien Law, covenants that it will receive consideration for this conveyance and will hold the right to receive such consideration as a trust to be applied first for the purpose of paying the cost of the improvement and will apply the same to the payment of the cost of the improvement before using any part of the total of the same fo other purpose.

3. Conveyance Subject to Maintenance of a Containment System or Cap

A. Definitions

For the purpose of this paragraph "3", the following definitions shall apply:

1. "Environmental Laws" means the Comprehensive Environmental Response Compens and Liability Act ("CERCLA"), 42 U.S.C. 9601 et seq., as amended; the Resource Conservation Recovery Act ("RCRA"), 42 U.S.C. 6901 et seq., as amended; the Clean Air Act ("CAA"), 42 U.S.C. et seq., as amended; the Clean Water Act ("CWA"), 33 U.S.C. 1251 et seq., as amended; and any federal, state, local or municipal laws, statutes, regulations, rules or ordinances imposing liabi establishing standards for protection of the environment.

2. "Hazardous Materials" means any element, compound or chemical, that is defined, list otherwise classified as a pollutant, toxic pollutant, toxic or hazardous waste, special waste, or hazar substance under Environmental Laws.

3. "Release" means any spilling, leaking, pumping, emitting, emptying, discharging, inje escaping, leaching, dumping, or disposing (including the abandonment or discarding of barrels, cont or other closed receptacles containing Hazardous Materials) of Hazardous Materials.

B. Obligation to Maintain Cap

Grantor and Grantee acknowledge that Hazardous Materials, particularly chromium cadmium, are present in the soil under Building No. 2 at concentrations that exceed New York Department of Environmental Conservation ("DEC") recommendations for protection of human health the environment. Therefore, Grantee and each successor owner or occupant of the Premises shall ma a containment system (hereinafter referred to as the "Cap") to prevent the Release, spreading or lea of these Hazardous Materials.

...m, did depose and say that he r...es at [redacted]
...g No. 5, South Oyster Bay Road, Bethpage, N...w
that he is the Chief Executive Officer and Director
...umman Aerospace Corporation, the corporation
...cribed in and which executed the foregoing instrument;
...d that he signed his name thereto by order of the Board
said Corporation.

RICHARD EMIL MUGNO
NOTARY PUBLIC,STATE OF NEW YORK
NO. 41-4663707
QUALIFIED IN NASSAU COUNTY
COMM. EXPIRES APRIL 30, 1998

ARGAIN AND SALE DEED

WITH COVENANT AGAINST GRANTOR'S ACTS

Title No. GC960879N

...UMMAN AEROSPACE CORPORATION

TO

EEL-LOS III, Limited Partnership and
...OSEPH LOSTRITTO, as tenants-in-common

me duly sworn, did d...se and say that ...
Pound Hollow Court, Old Brookville, New Yo...545, that he is the President of STEEL-LOS III, INC. the general partner of STEEL-LOS III LIMITED PARTNERSHIP, the limited partnership described in and which executed the foregoing instrument, and that he had authority to sign the same and acknowledged that he executed the same as the act and deed of said limited partnership.

RICHARD EMIL MUGNO
NOTARY PUBLIC,STATE OF NEW YORK
NO. 41-4663707
QUALIFIED IN NASSAU COUNTY
COMM. EXPIRES APRIL 30, 1998

STATE OF NEW YORK, COUNTY OF NASSAU ss:

On the 23rd day of December, 1996, before me personally came JOSEPH LOSTRITTO, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged that he executed the same.

RICHARD EMIL MUGNO
NOTARY PUBLIC,STATE OF NEW YORK
NO. 41-4663707
QUALIFIED IN NASSAU COUNTY
COMM. EXPIRES APRIL 30, 1998

SECTION 46
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Appendix C

Work Plans for Vertical Profile Borings Prepared by US Navy (To Be Provided)

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Appendix D

Quality Assurance Project Plan
Addendum

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Operable Unit 2, Quality Assurance Project Plan Addendum

Northrop Grumman Corporation and Naval Weapons Industrial Reserve Plant

PREPARED FOR

Northrop Grumman Corporation

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Project Director

Operable Unit 2, Quality Assurance Project Plan Addendum

Northrop Grumman Corporation and Naval Weapons Industrial Reserve Plant

Prepared for:
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Our Ref.:
NY001321.0001.00001

Date:
11 May 2001

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Appendices

1. Introduction

ARCADIS G&M, Inc. has been retained by Northrop Grumman Corporation to conduct monitoring of the Operable Unit-2 (OU2) Groundwater Remedy at their Bethpage, New York facility. ARCADIS G&M, Inc. has prepared this Addendum to the Quality Assurance Project Plan (QAPP) prepared as part of the Remedial Investigation Work Plan (Geraghty & Miller, Inc. 1990) as a component of this project to address specific quality control (QC) checks and quality assurance (QA) auditing processes.

The overall QAPP objective is to produce data at the highest quality level to provide direct support for the monitoring of the groundwater remedial extraction and treatment (remedial) system. This QAPP addresses the field sampling and analysis components of the long-term monitoring program. Project organization and responsibilities, and QA/QC protocols related to field sampling and analysis activities are presented in this QAPP. The procedures in this QAPP will be implemented to ensure that precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) of the data can be documented, as applicable.

2. Site Description

The Northrop Grumman site was a former manufacturing facility of components for military and commercial applications. The 500-acre site consisted of several large manufacturing buildings (plants). The majority of the site has been subdivided into parcels and sold. The portion of the site retained by Northrop Grumman is listed by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2, Inactive Hazardous Waste site (Site No.130031A). The Naval Weapons Industrial Reserve Plant (NWIRP) is located adjacent to the Northrop Grumman Corporation to the north and is a government-owned, contractor-operated (GOCO) facility (Site No. 130031B). The sites are located in Bethpage, Nassau County, New York. The sites are bounded by Stewart Avenue to the north and east, Central Avenue to the south, and Broadway to the west. A site location map is presented in Figure A-1.

The OU2 groundwater remedy (formerly called IRM [Interim Remedial Measure]) has been operating since September 1998 to hydraulically contain on-site groundwater contaminated with volatile organic compounds (VOCs) thereby preventing it from migrating off-site while also removing VOC mass from the groundwater. Monitoring of outpost monitoring wells near public supply wells owned and operated by the Bethpage Water District (BWD) has been conducted since 1995. Additionally, monitoring is also being conducted to determine the extent of the vinyl chloride

monomer (VCM) subplume, the position of the VOC plume, the extent of VOCs and SVOCs downgradient of NGS Plant 1 Fuel Depot, and the extent of Cadmium (Cd) and Chromium (Cr) near former Northrop Grumman Plant 2. Following completion of the vertical profile boring (VPB) program, monitoring wells will be installed beyond the downgradient (southern) edge of the VOC plume to serve as outpost wells upgradient of public supply wells further downgradient.

3. Project Organization and Responsibilities

The responsibilities of the key project personnel are detailed below.

- The Project Director is responsible for overseeing the implementation of the project tasks. The Project Director will review all documents and other correspondence concerning the activities performed pursuant to the successful completion of the project. The Project Director is also responsible for the overall QA including technical adequacy of the project activities and reports and conformance to the scope of work.

- The Project Manager is responsible for the following: sampling QC; overall project coordination; adherence to the project schedules; directing, reviewing, and assessing the adequacy of the performance of the technical staff and subcontractors assigned to the project; implementing corrective action, if warranted; interacting with the Project Director; preparing reports; and maintaining full and orderly project documentation.

- The project team members include the task managers, field hydrogeologists, sampling team/field technicians, support staff (e.g., data processors, secretaries, and in-house experts in engineering, etc.) who are responsible for work in their respective specialty areas which are or may be required to meet the project objectives.

- The Project QA/QC Officer is responsible for performing systems auditing and for providing independent data quality review of project documents and reports.

- The Project Health and Safety Coordinator is responsible for implementing the site-specific health and safety directives in the Health and Safety Plan (HASP) and for contingency response.

- The Data Validator is responsible for review of laboratory data for compliance with the QA objectives for the PARCC parameters, and notifications to the project manager of any QC deficiencies.

4. Quality Assurance/Quality Control – Field Sampling and Analysis Activities

The overall QA objective for this aspect of the project is to develop and implement procedures for field measurements, sampling, and analytical testing that will provide data of known quality that is consistent with the intended use of the information. Generally, the specific field sampling and analysis activities to be conducted during this project which require QA/QC protocols include: remedial system performance monitoring (water and effluent stack air quality) and groundwater sampling associated with evaluating the effectiveness of the on-site containment (ONCT) system in preventing the on-site VOC impacted plume from migrating off-site and reducing VOC mass in on-site groundwater; the efficiency of the proposed GM-38 Area extraction/treatment system in reducing elevated VOC concentrations in groundwater; the fate and movement of the portion of the VOC plume not actively remediated; monitoring the extent of VOCs and SVOCs downgradient of Northrop Grumman Plant 1 Fuel Depot; and monitoring the extent of Cd/Cr near former Northrop Grumman's Plant 2.

Quality assurance/quality control protocols will be used to ensure the PARCC parameters of data collected during these field activities meets the objectives of the overall project. Specifically, all data will be gathered or developed using procedures appropriate for the intended use of the data. The field measurements and laboratory analyses will be used to support one or more steps in the monitoring described above.

The QA/QC protocols for this aspect of the project will include laboratory analysis and validation procedures, field decontamination procedures, calibration and maintenance of field instruments, and QA/QC sampling procedures. The following sections outline the QA/QC protocols for each of these issues.

4.1 Field QA/QC

To ensure that data collected in the field is consistent, accurate and complete, forms will be utilized for repetitive data collection, such as depth to water in wells, groundwater sampling etc. These field forms include a Water-Level Measurement

form and a Water Sampling Log, as applicable to a specific field task; sample forms are provided in Appendix A.

Quality assurance/quality control samples will be collected to assure quality control for the groundwater monitoring program. Analyses of QA/QC samples will enable data evaluation for accuracy and integrity. A quality assurance/quality control sample set includes a field (equipment) blank, a trip blank, a site-specific matrix spike/matrix spike duplicate (MSA/MSD), and a blind duplicate. A summary of the QA/QC samples is provided in Table A-1. Blanks and duplicate samples will be used to verify the quality of the sampling results. Demonstrated analyte-free water will be supplied by the laboratory for the preparation of QA/QC samples; documentation for the analysis of QA/QC blank water will be provided if contamination is detected in the blanks. A brief description of these samples follows.

4.1.1 Field (Equipment Rinsate) Blanks

A field (equipment rinsate) blank is a water sample that consists of laboratory supplied analyte-free water that is poured through or over a decontaminated piece of sampling or other down-hole equipment to assess or document the thoroughness of the decontamination process. A rinsate blank will be collected from the decontaminated down-hole equipment by pouring analyte-free water over the equipment and into sample containers before use in sampling. One field blank will be collected each day non-dedicated (disposable or reusable) equipment is used. These QA/QC samples will only be collected in connection with the collection of aqueous samples and submitted for the appropriate chemical analysis.

4.1.2 Trip Blanks

A trip blank will contain laboratory supplied analyte-free water and will be transported to the site and returned to the laboratory without opening. This will serve as a check for contamination originating from sample transport, shipping, and from site conditions. One trip blank per day per sampling team will be utilized during groundwater sampling activities. These QA/QC samples will only be collected in connection with the collection of aqueous samples for VOC analysis and submitted for the appropriate chemical analysis.

4.1.3 Blind (Field) Duplicates

The relative difference in analytical results between samples and their blind duplicates will be used to determine if the data reported by the laboratory are precise, accurate, representative, and comparable. The blind duplicate samples will be assigned fictitious identifications; the correct sample identification number will be recorded on the water sampling log. One blind duplicate sample per 20 groundwater samples will be collected during groundwater sampling activities. These QA/QC samples will be collected in connection with the collection of aqueous samples and submitted for the appropriate chemical analysis.

4.1.4 MS/MSD Samples

Site-specific MS and MSD samples will be collected and submitted to the laboratory as separate samples to provide site-specific matrix-interference data. Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed by the appropriate method. The purpose of spiking and analyzing the samples is to evaluate any site-specific matrix interference on the analytical results. One MS/MSD sample set will be collected for every 20 samples collected during groundwater sampling activities. These QA/QC samples will only be collected in connection with the collection of aqueous samples and submitted for the appropriate chemical analysis.

4.1.5 Field Records

Proper documentation will consist of all field personnel maintaining records of all work accomplished including the items listed below:

- Date and time of work events;
- Purpose of work;
- Description of methods;
- Description of samples;
- Number and size of samples;
- Description of sampling point;

- Date and time of collection of sample;
- Sample collector's name;
- Field observations; and
- Field measurements with portable instruments.

4.2 Preparation and Preservation of Sample Containers

Laboratory pre-cleaned sample containers will be provided by the laboratory. Each sample container will be provided with a label for sample identification purposes. The information on the label will include a sample identification number, time, date and initials of the sample collector. All sample containers will be accompanied by a full chain-of-custody (see Appendix B).

All sample containers will be thoroughly pre-cleaned at the laboratory prior to sampling and appropriate sample preservatives will be added to the bottles, prior to sample bottle shipment to the client. It is laboratory practice to pre-preserve sample containers in order to minimize potential contaminants in the field and to reduce unnecessary sample handling in the field (see laboratory QAPP in Appendix C for a summary description of sample analysis methods, holding times and preservation procedures).

4.3 Decontamination

Proper decontamination of all sampling equipment will help ensure that the data collected will meet the PARCC requirements.

4.3.1 Decontamination Procedures

Field equipment will be decontaminated by the following procedures.

4.3.1.1 Field Decontamination of Sampling Equipment

Field decontamination of non-dedicated equipment will consist of manual scrubbing with Micro-90 solution (or equivalent) to remove foreign material inside and out. The items will then be stored in such a manner as to preserve their decontaminated condition.

4.3.1.2 Personnel Protective Equipment Decontamination Procedures

The personnel protective equipment (PPE) decontamination procedure shall consist of the minimum decontamination stations outlined in the HASP (Geraghty & Miller, Inc. 1991) (incorporated here by reference).

4.4 Sample Custody

To maintain and document sample possession, chain-of-custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection in the field; a sample chain-of-custody form is provided in Appendix B.

A sample is under custody if it is:

1. In one's actual possession; or

2. In one's view, after being in your physical possession; or

3. Was in one's physical possession and then was locked up or sealed to prevent tampering; or

4. It is in a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain-of-custody procedures. A detailed discussion of the stages of possession (i.e., field collection, transfer, and laboratory custody) is presented below in the following sections.

4.4.1 Environmental Samples Chain-of-Custody

The laboratory begins the chain-of-custody procedure with the preparation of the sample bottles. The field sampler continues the chain-of-custody procedure in the field and is the first to sign the form upon collection of samples. The field sampler is personally responsible for the care and custody of the samples until they are transferred and properly dispatched. Sample labels shall be completed for each sample, using waterproof ink, subjected to proper preservation, and packaged to preclude breakage during shipment. Every sample shall be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form.

4.4.2 Transfer of Custody and Shipments

All samples will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time of transfer. This record documents transfer of custody of samples from the sampler to another person to the analytical laboratory.

Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. All chemical analytical samples will be delivered to the laboratory within 24 hours of collection.

Whenever samples are split with a facility or government agency, a separate chain-of-custody record will be prepared for those samples and marked to indicate with whom the samples were split.

4.4.3 Laboratory Sample Custody

The laboratory utilized will have standard operating procedures for documenting receipt, tracking and compilation of sample data. Sample custody related to sampling procedures and sample transfer are described below:

1) Shipping or Pickup of Cooler By Client (Sampler).

   (a) Cooler packed at the laboratory after contact with client.

   (b) Cooler wrapped with evidence tape.

   (c) Chain-of-Custody form filled out by field sampling personnel and client.

   (d) Client supplies evidence tape and seals cooler prior to shipment back to the laboratory.

2) Delivery of Cooler to the Analytical Laboratory

   (a) Samplers check for any external damage (such as leaking).

   (b) Samplers sign the waybill for cooler to the laboratory (to shipper).

(c) The laboratory receives cooler and complete chain of custody.

The samples will be stored at the proper temperature prior to analysis. It is the responsibility of the laboratory to properly dispose of samples beyond the holding period.

4.5 Laboratory Analyses

All groundwater and air samples will be analyzed by Severn Trent Laboratories, Inc. (STL). Groundwater samples will be analyzed for VOCs under NYSDEC Analytical Service Protocol (ASP) Method 95-1; selected samples will also be analyzed for SVOCs and Cd/Cr using United States Environmental Protection Agency (USEPA) Method 625 and USEPA Methods 3010/6010, respectively by the STL facility located in Shelton, Connecticut, a NYSDEC Contract Laboratory Program (CLP)-certified laboratory.

The internal laboratory SOPs and QA/QC procedures are described in the individual laboratory facility QAPP, an independent plan provided by the analytical laboratory. The STL Connecticut QAPP is provided in Appendix C.

4.6 Data Validation

Data validation is a process in which analytical data generated by the laboratory are evaluated against a specific set of requirements and specifications, and determinations of data usability and limitations are made. The data validator examines the criteria pertaining to analytical data generated in accordance with CLP protocols from four perspectives, as follows:

- Technical requirements.
- Contractual requirements.
- Determination of compliance.
- Determination and action of how to define the usability or qualify the data.

Validation of the organic data will be performed following the QA/QC criteria set forth in the New York State Department of Environmental Conservation (NYSDEC)

Analytical Services Protocol (ASP), October 1995 and the USEPA National Functional Guidelines for Organic Data Review, October 1999.

The data will be evaluated for compliance to method guidelines and the following items as appropriate:

- Adherence to specified holding times.
- Trip, field, and/or laboratory blank-detected constituents.
- Matrix spike/spike duplicate precision and accuracy.
- Field replicate precision.

Final validation of data obtained during the field sampling and analysis activities will be performed by ARCADIS G&M data validators. The laboratory deliverables will be reviewed for accuracy, precision, completeness, and overall quality of data. All laboratory data will be reviewed for adherence to method-specific QA/QC guidelines and to the data validation guidelines that are described above.

4.7 Data Usability

The data validator for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable. The review of the analytical results will include checking chain-of-custody forms, sample holding times, blank contamination, spike recoveries, surrogate recoveries, internal standards, precision of duplicate sample analysis, and laboratory control samples. This review will be used to classify the data as valid, usable, or unusable. Valid data will indicate that all QA/QC review parameters have been met and are acceptable (as per details outlined in the preceding section). Data will be characterized as usable when QA/QC parameters are marginally outside acceptable limits (example: sample holding times were slightly exceeded) where the data may be questionable, but still usable within limitation. Unusable data will be data that are observed to have gross errors or analytical interference that would render the data invalid for any purpose.

4.8 Performance and System Audits

Performance and system audits will be performed on a periodic basis, as appropriate, to ensure that the work is implemented in accordance with the approved project SOPs and in an overall satisfactory manner. Examples of audits that will be performed during the project activities are as follows:

- On a timely basis, the data packages submitted by the laboratory will be checked for the following information: that all requested analyses were performed; that sample holding times were met; that the data were generated through the approved methodology with the appropriate level of QC effort and reporting; and that the analytical results are in conformance with the prescribed acceptance criteria. The quality and limitations of the data will be evaluated based on these factors.

- The project manager will oversee the field personnel and check that the management of the acquired data proceeds in an organized and expeditious manner.

- Audits of the laboratory are performed on a regular basis by regulatory agencies. Audits are discussed in the laboratory QAPP.

4.9 Preventive Maintenance

ARCADIS G&M has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed, as indicated in the following examples:

- An inventory of equipment, including model and serial number, quantity, and condition will be maintained. Each item will be tagged and signed out when in use, and its operating condition and cleanliness will be checked upon return. Routine checks will be made on the status of equipment, and spare parts will be stocked. An equipment manual library will also be maintained.

- The field personnel are responsible for making sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the field.

The laboratory also follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventive maintenance program is described in the laboratory QAPP.

Table 1. Quality Assurance/Quality Control Sample Summary, Operable Unit 2, Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Bethpage, New York.

Matrix	Sampling Event	Sample Location/ Sample Point	Parameters (1)	Frequency	Estimated Sample Quantity per Event	Estimated Field Blanks per Event	Estimated Trip Blanks per Event	Estimated Field Duplicates per Event	Estimated MS/MSD (2) per Event
Water	Groundwater monitoring	Monitoring wells	VOCs	TVOCs, Cd/Cr, and SVOCs	59	8	16	3	3
			Cd/Cr	analyzed for quarterly;	5	2	0 (4)	1	0
			SVOCs	VCM Wells sampled	1	1	0 (4)	0	0
			VCM(3)	Semi-annually	5	1	1	0	0
Water	Remedial System Performance Monitoring	Four remedial wells; Remedial system influent/effluent; Well GP-3	VOCs	Analyzed Quarterly	9	0 (5)	1	1	1
Air	Compliance Monitoring	Remedial System Effluent Stacks (Plants 5 and 5E)	VOCs	Analyzed Quarterly	4	0	0	0	0

(1) All water analyses will be performed in accordance with NYSDEC Analytical Services Protocol (ASP), or USEPA methods by a CLP-certified laboratory.

(2) Matrix spike/matrix spike duplicate (MS/MSD) analysis is performed on a site sample and therefore is not counted as a separate sample. For MS/MSD's, triple sample volume will be provided.

(3) Wells monitored for VCM area analyzed for the full TCL VOCs - See Note (1).

(4) Trip Blanks will be provided by the analytical laboratory and will accompany specific VOC samples as they are collected and during shipment.

(5) Remedial well and system samples are collected as grab samples; no equipment used.

* One field blank collected per day every time non-dedicated (i.e., disposable or reusable) sampling equipment (i.e., pumps and/or bailers) is used.

MS/MSD Matrix spike/matrix spike duplicate
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
Cd/Cr Total cadimum/chromium
USEPA U.S. Environmental Protection Agency
NYSDEC New York State Department of Environmental Conservation
VCM Vinly Chloride Monomer

NWIRP SITE

RUCO POLYMER SITE

PLANT 12 AREA

NORTHROP GRUMMAN SITE

PLANT 5 BASINS

PLANT 1 FUEL DEPOT AREA

SOUTH BASINS

CADMIUM/CHROMIUM MONITORING AREA

BWD SUPPLY WELLS (PLANT 6)

BWD SUPPLY WELLS (PLANT 4)

BWD SUPPLY WELL (PLANT 5)

U.S. NAVY SITE

PLANT 111

PLANT 35

PLANT 12

PLANT 3

PLANT 10

PLANT 2

PLANT 1

PLANT 5

OU2 RM TREATMENT SYSTEMS

GRUMMAN ROAD

FARMERS AVENUE

(PLAINVIEW ROAD)

BROADWAY

BLOOMINGDALE ROAD

CENTRAL AVENUE

LONG ISLAND RAILROAD

NORTH WANTAGH AVE.

HICKSVILLE ROAD

STEWART AVENUE

SEAFORD - OYSTER BAY EXPRESSWAY

HEMPSTEAD TURNPIKE

MW-52D MW-52I MW-52S

GP-10

GP-11

HN-24I HN-24I2

FW-03

HN-29I HN-29O

HN-42I HN-42S

GM-23D GM-23S GM-23I

GM-72I GM-72D GM-72S

GM-13D

HN-40I HN-40S

GM-16SR GM-16I

10597

GP-3

GM-17D GM-17SR GM-17I

GP-1

GM-14

GM-19S GM-19I

GM-15D GM-15D2 GM-15S GM-15I

GM-18D GM-18S GM-18I

ONCT-1

GM-33D2

10631

10600

GM-78S GM-78I

GM-73D2

ONCT-2

GM-74D GM-74I GM-74D2

ONCT-3

GM-20D

GM-20I

GM-21D GM-21I GM-21S

10633

9921

10624 10627 GM-75D2

10634

GM-79D GM-79S GM-79I

GM-37D GM-37D2

GM-71D2

GM-70D2

GM-35D2

N-10821 GM-36D GM-36D2

6915

6916

3876

8941

GM-38D2 GM-38D

GM-34D GM-34D2

8004

EXPLANATION

- INDUSTRIAL SUPPLY WELL
- IRM WELL
- EXISTING WELL/CLUSTER
- PROPOSED WELL/CLUSTER
- PROPERTY BOUNDARY OF THE RUCO POLYMER SITE
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF NWIRP SITE

NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

OU2 RM OPERABLE UNIT 2 REMEDIAL MEASURE

BWD BETHPAGE WATER DISTRICT

0' 1000' 2000'

SCALE: 1" = 1000'

ARCADIS GERAGHTY & MILLER

NORTHROP GRUMMAN CORPORATION

BETHPAGE, NEW YORK

SITE PLAN

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
A.G.	2/27/01	CSG	
		LEAD DESIGN PROF.	CHECKED D.S.
		PROJECT NUMBER NY008.0210	DRAWING NUMBER A-1

G:\PROJECT\GRUMMAN\CAD\GRUMMAN_SITE_LOCATION.DWG

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Appendix A

Sample Field Forms

ARCADIS GERAGHTY & MILLER

Water Level/Pumping Test Record

Page _____ of _____

Project _____ Well _____ Site _____

Screen Setting _____ Measuring Point Description _____ Height Above Ground Surface _____

Static Water Level _____ Measured With _____ Date/Time _____

Drawdown ☐ Start of Test _____ Pumping Well _____

Recovery ☐ End of Test _____

Distance From Well Measured To Pumping Well® _____ Discharge Rate _____ Orifice _____

Date & Time	Well Or t (mins)	Held (ft)	Wet (ft)	Depth to Water (ft)	s (ft)	Dew. 1) Corr. (ft)	Art. 2) s' (ft)		Q (gpm)	Mano-meter (in)	Remarks 3)

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.

ARCADIS GERAGHTY & MILLER

Water Sampling Log

Project _____ Project No. _____ Page 1 of _____

Site Location _____ Date _____

Site/Well No. _____ Replicate No. _____ Code No. _____

Weather _____ Sampling Time: Begin _____ End _____

Evacuation Data

Measuring Point _____

MP Elevation (ft) _____

Land Surface Elevation (ft) _____

Sounded Well Depth (ft bmp) _____

Depth to Water (ft bmp) _____

Water-Level Elevation (ft) _____

Water Column in Well (ft) _____

Casing Diameter/Type _____

Gallons in Well _____

Gallons Pumped/Bailed Prior to Sampling _____

Sample Pump Intake Setting (ft bmp) _____

Purge Time begin _____ end _____

Pumping Rate (gpm) _____

Evacuation Method _____

Field Parameters

Color _____

Odor _____

Appearance _____

pH (s.u.) _____

Conductivity (mS/cm) _____

(µmhos/cm) _____

Turbidity (NTU) _____

Temperature (°C) _____

Dissolved Oxygen (mg/L) _____

Salinity (%) _____

Sampling Method _____

Remarks _____

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel _____

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page _____ of _____

Project/No. _____ Well _____ Date _____

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level _____ Measured Width _____ Well Materials _____ PVC ____ ST. Steel

Total depth _____ Pump On: _____ Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged** _____

Centrifugal _____ **Sample Time:** _____

Submersible _____

Other _____ Bailer Type: _____ Sampled By: _____

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)

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Appendix B

Sample Chain-of-Custody Form

ARCADIS GERAGHTY & MILLER

Laboratory Task Order No./P.O. No. _____

CHAIN-OF-CUSTODY RECORD

Page _____ of _____

Project Number/Name _____

Project Location _____

Laboratory _____

Project Manager _____

Sampler(s)/Affiliation _____

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	ANALYSIS / METHOD / SIZE						Remarks	Total

Sample Matrix: L = Liquid; S = Solid; A = Air

Total No. of Bottles/ Containers

Relinquished by: _____	Organization: _____	Date ___/___/___	Time _____	Seal Intact?
Received by: _____	Organization: _____	Date ___/___/___	Time _____	Yes No N/A
Relinquished by: _____	Organization: _____	Date ___/___/___	Time _____	Seal Intact?
Received by: _____	Organization: _____	Date ___/___/___	Time _____	Yes No N/A

Special Instructions/Remarks: _____

Delivery Method: ☐ In Person ☐ Common Carrier _____ ☐ Lab Courier ☐ Other _____

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Appendix C

Laboratory QAPP – STL Connecticut
(To Be Provided)