Northrop Grumman Systems Corporation

Groundwater Interim Remedial Measure Work Plan, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York Site #1-30-003A

November 14, 2007
Revised December 12, 2007

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Groundwater Interim Remedial Measure Work Plan, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York
Site #1-30-003A

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1. Introduction

This Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Work Plan (Plan) was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The present day Bethpage Community Park property (Park), NYSDEC has been termed the "Former Grumman Settling Ponds Area" and designated as OU3, by the NYSDEC. The Park has been owned and operated by the Town of Oyster Bay since 1962. The term Site refers to the Park and the former Grumman Plant 24 Access Road (which is located south and west of the Park).

The CO allows the implementation of Interim Remedial Measures (IRMs) for OU3. In response to NYSDEC's December 22, 2006 letter to Northrop Grumman, Northrop Grumman elected to implement a soil gas mitigation system as an IRM. Northrop Grumman also elected to implement a groundwater treatment system IRM. The soil gas IRM is currently being constructed.

This Work Plan is organized into the following sections:

- Section 2 provides a brief description of the Site, its history and environmental setting, as well as a summary of the groundwater data obtained, to date, from the on-going OU3 Remedial Investigation (RI).

- Section 3 presents the pertinent Preliminary Applicable or Relevant and Appropriate Requirements (ARARs)/New York State Standards, Criteria, and Guidelines (SCGs).

- Section 4 summarizes the groundwater IRM rationale and objectives.

- Section 5 provides a description of the groundwater IRM remedial technology and system description.

- Section 6 describes the pre-design work proposed, including implementing a groundwater pumping test.

- Section 7 describes the design and technical specifications that will be provided to the NYSDEC for the proposed groundwater IRM.

- Sections 8 thru 11 provide information regarding the Quality Assurance Project Plan (QAPP), Health & Safety Plan (HASP), Operation, Maintenance and Monitoring Manual (OM&M Manual), and Citizen Participation Plan (CPP), respectively.

- Section 12 provides the proposed groundwater IRM schedule.

- Sections 13 thru 15 summarize information regarding the groundwater IRM permit requirements, closure strategy, and engineering certification.

- Section 16 provides the list of references cited in this Plan.

The following appendix is also included in this Plan:

- Appendix A – Draft OM&M Manual Outline.

2. Site Description and Background

The following subsections of this Plan summarize details regarding the Site description, location, history, and environmental setting. Much of the information related to site description and background that is presented herein was originally presented in the December 2003 Field Report - Town of Oyster Bay, Bethpage Community Park, Investigation Sampling Report, prepared by Dvirka & Bartilucci Consulting Engineers (D&B) on behalf of Northrop Grumman.

2.1 Site Description

The Site is bordered by Cherry Avenue Extension and the Robert Plan Company Building to the north, Stewart Avenue and Bethpage High School to the east, residential areas to the south, and a second Robert Plan Company Building (the former Northrop Grumman Plant 24) to the west. Other properties owned by Northrop Grumman, including the McKay Field property, ball fields and former nursery area are located to the west. The Site location is shown on Figure 2-1. The adjoining streets and properties, as well as site features and structures prior to the Town of Oyster Bay Park redevelopment are shown on Figure 2-2.

The present-day Park is operated by the Town of Oyster Bay (TOB or Town) and is comprised of approximately 18 acres. The Park, up to about mid-2006, was open year-round and contained two swimming pools, an ice rink, offices, parking lot, picnic and playground areas, tennis courts, paddleball courts, basketball court, shuffleboard courts, horseshoe pits, baseball field, bicycle rack areas, and a stormwater recharge basin. Freon, which we believe is attributable to the Town's operation of the ice rink,

has been found in soil gas and groundwater samples collected at the Park. Currently the Park is closed to the public to allow the Town to implement a soil IRM and to redevelop the Park, including construction of a new ice rink. Adjoining the Park property to the south is the former Grumman Plant 24 Access Road Property, which is a partially asphalt-paved/partially grassed area that runs east-west along the Park southern boundary with the asphalt paved portion of the property continuing in a north-south direction west of the Park. The former Plant 24 Access Road Property is owned by Northrop Grumman.

2.2 Park History and Groundwater Quality

The December 2003 report prepared by D&B provides a detailed description of the Site and its history (D&B 2003). Groundwater data collected during the on-going OU-3 RI will be provided in the RI report (in preparation). As a summary for this Work Plan, Figures 2-2 and 2-3 present plan and cross-sectional views of total volatile organic compounds (TVOCs) in groundwater, respectively.

2.3 Environmental Setting

This section of the Plan provides a brief, physical description of the Site, the local geology, and the area hydrogeology.

The Site is approximately 120 feet above mean sea level and, topographically, is generally flat. In general, the geology at the Site, from land surface down to the basal Magothy Formation, consists primarily of sand with interbedded lenses of silt, clay, and gravel. The uppermost sequence of these sediments is part of the Upper Pleistocene glacial outwash deposits, while the lower geologic sequence comprises the Magothy Formation. The Upper Pleistocene deposits in this area of Long Island tend to be coarser than the underlying upper portion of the Magothy Formation. Within the Magothy Formation, the deposits tend to become finer with depth, except for the basal Magothy, where coarse sand and gravel deposits are more prevalent. Vertical profile borings drilled at the Site indicate the presence of a low permeability zone (LPZ) that consists of interbedded slit, clay, and sandy silts and clays. The upper surface of the LPZ was encountered from approximately 36 to 46 feet below land surface (ft bls) with the zone ranging in thickness from approximately 1 ft to greater than 20 ft. The LPZ underlies the recharge basin and the ball field, as well as the western portion of the parking lot. A more detailed description of the Site geology is provided in the March 2006 OU3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan prepared by ARCADIS.

The principal aquifers underlying the project area are the Upper Glacial aquifer and Magothy aquifer; these hydrogeologic units are in direct hydraulic connection with each

other. Shallow groundwater in the Upper Glacial and Magothy aquifers occurs under unconfined conditions at and near the Site (although the Magothy aquifer can exhibit semi-confined conditions; the degree of confinement increases with depth due to stratification caused by numerous silt and clay lenses). Within the general area of the Site, the average horizontal hydraulic conductivity of the Upper Glacial aquifer is approximately 270 feet per day (ft/d); with an anisotropy of approximately 10:1 (horizontal to vertical, respectively). The average horizontal hydraulic conductivity of the Magothy aquifer in the general area of the Site is approximately 50 ft/d, with an anisotropy ratio of approximately 100:1 (horizontal to vertical, respectively) (Geraghty & Miller, Inc. 1994).

Depth to groundwater at the Site is approximately 55 ft bls. Water-level elevation data collected in the area of the Site indicate a resultant direction of shallow groundwater flow that is horizontally south-southeasterly and vertically, slightly downward. The on-Site stormwater recharge basin may produce local, water-table mounding during intense storm events, however no data currently exist to verify this. Perched water is present, in some areas, above the LPZ described above.

3. Preliminary ARARs/SCGs

The selection of ARARs/SCGs for the groundwater IRM will be consistent with the requirements of the NCP (USEPA 1990) and USEPA Guidance (USEPA 1988). ARARs/SCGs can be characterized as chemical-specific, action-specific, or location-specific requirements. Chemical-specific ARARs/SCGs are health-based or risk-based numerical values that may define acceptable exposure levels and can be used in establishing remediation goals. Location-specific ARARs/SCGs are restrictions based on the concentrations of hazardous substances or the conduct of activities in a specific area. Action-specific ARARs/SCGs are technology- or activity-based requirements or limitations on actions to be taken with respect to the hazardous waste.

The initial list of ARARs/SCGs developed for this groundwater IRM includes the following:

- Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, per Division of Water Technical and Operation Guidance Series (1.1.1), reissued June 1998 for ambient water classification "GA – Source of Drinking Water (groundwater)". (NYSDEC 1998)

- Annual Guidance Criteria (AGC) and Short-Term Guidance Criteria (SGC) per the NYSDEC Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991, and the AGC/SGC Tables dated December 22, 2003. (NYSDEC 1991/2003)

4. IRM Objectives

The specific objectives of the groundwater IRM are:

- To mitigate the off-Site migration of dissolved-phase VOCs through the implementation of a groundwater pump-and-treat system that will extract groundwater along the former Plant 24 Access Road property, south of the Park. Specifically the IRM will address: a) groundwater that has TVOC concentrations greater than 5 ug/L in the upper twenty feet of the surficial aquifer across the 1,200-foot wide lateral extent of the Site boundary and b) groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations above 50 ug/L.

- To comply with applicable NYSDEC SCGs for the various effluents.

A secondary benefit of the groundwater IRM will be to help mitigate possible vapor intrusion issues downgradient of the Site by creating a clean-water front atop the downgradient groundwater.

5. Process and System Description

The preliminary layout of the groundwater IRM is shown in Figure 5-1. This section provides a general description of the technologies that will be used in the IRM and a brief, general system description of the major components of the groundwater IRM. More details of the groundwater IRM will be provided in later phases of the design.

The groundwater IRM will consist of a groundwater pump-and-treat system to provide a hydraulic barrier across the downgradient Site boundary and to meet the other project objectives. Specifically, the groundwater IRM will be designed to:

- Prevent groundwater that has TVOC concentrations greater than 5 ug/L in the upper twenty feet of the surficial aquifer across the 1,200-foot wide lateral extent of the Site boundary and groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations above 50 ug/L from migrating off-site via a series of groundwater recovery wells installed in the former Plant 24 Access Road property located south of the Park. The IRM target treatment area is shown in Figure 2-3.

- Reduce concentrations of Volatile Organic Compounds (VOCs) in the extracted groundwater to concentrations less than the applicable ARARs/SCGs via air stripping.

- Discharge of treated water to the retention basin located on the northeast corner of the neighboring Naval Weapons Industrial Reserve Plant (NWIRP) site.

- Reduce concentrations of VOCs in the air stripper off-gas to concentrations less than the applicable ARARs/SCGs prior to discharge to the atmosphere using appropriate vapor phase emission control units (ECUs), which will likely consist of vapor phase granular activated carbon (VPGAC) followed by potassium-permanganate impregnated zeolite ($KMnO_4$).

5.1 Process Description

Groundwater pump-and-treat is a proven technology to address groundwater contamination at similar sites. Figure 5-2 is a schematic drawing of the proposed groundwater IRM process. As shown on Figures 5-1 and 5-2, impacted groundwater will be extracted from the subsurface via a series of recovery wells located along the Former Plant 24 Access Road via submersible pumps, one of which will be installed in each of the recovery wells. Extracted groundwater will be conveyed via a subsurface pipeline to the treatment area located on McKay Field. The treatment area will consist of an air stripper, treatment building, and ECUs. Treated water will gravity flow to the Northeast NWIRP basin and treated air stripper off-gas will be discharged to the atmosphere.

5.2 General System Description

Based on available data, the groundwater IRM will likely consist of the following major components at locations shown on Figure 5-1:

- Groundwater Extraction System – A series of groundwater extraction wells will be installed along the former Plant 24 Access Road property south of the Park to

extract VOC containing groundwater from the aquifer. The number of groundwater extraction wells, well spacing, well pumping rates, and well construction details will be estimated based on a site-specific model calibrated 3-dimensional groundwater flow. Data developed from the pumping test will be input to the model and the model will rerun to confirm or modify the number of wells, well spacing, well pumping rates, and well construction details. Preliminary design details will be confirmed or modified, as needed, based on the results of the groundwater pumping test and modeling (Section 6.0). Once these details have been confirmed, then the submersible pumps will be specified. Details of the groundwater extraction system will be fully-developed during later design phases.

- Pipelines – Pipelines between the extraction wells and the air stripper will be subsurface and installed using conventional trenching and backfilling methods. The effluent pipeline between the air stripper and the Northeastern NWIRP Basin will also be subsurface and installed using conventional trenching and backfilling methods. Pipelines will be sized to maintain design velocities and minimize headlosses. The majority of the underground pipelines will be installed during the construction of the Soil Gas IRM. Details of the pipelines will be fully-developed during later design phases.

- Air stripper – Air strippers use water-to-air mass transfer kinetics to transfer VOCs from their dissolved phase (in water) to their vapor phase (in air) by creating a counter-current flow system where ambient air is forced into contact with the VOC containing water. The air stripper will be sized to reduce the concentration of VOCs in the air stripper influent to below the ARARs/SCGs. Details of the air stripper will be fully-developed during later design phases.

- Duct Heater – a duct heater will be used to pre-treat the air stripper off-gas prior to treatment by the ECUs. Pre-treatment of the air stripper off-gas is needed to improve the treatment efficiency of the emission control system. The duct heater will be designed to reduce the relative humidity of the off-gas to less than 50% while keeping the temperature of the off-gas below 100 degrees Farenheit. Details of the duct heater will be fully-developed during later design phases.

- Emission Control System – Prior to atmospheric discharge, the air stripper off-gas will be treated to be compliant with applicable NYSDEC discharge requirements. Conceptually, the emission control system will likely consist of treatment using VPGAC and $KMnO_4$. ECU details will be fully-developed during later design phases. The ECUs will be located on Northrop Grumman property.

- Treatment Shed – The air stripper and the majority of the process equipment, system instrumentation and electrical controls will be housed in a treatment shed located on Northrop Grumman property.

6. Pre-Design Work

This section presents the Pre-design work that will be undertaken to assist with the design of the groundwater IRM.

6.1 Groundwater Pumping Test

To help determine site-specific design values for critical parameters, a groundwater pumping test will be performed. Information obtained from this testing program will be used to develop the following during later design phases:

- Number, location, and sizing of groundwater wells, and
- Proper sizing of piping, pumps, ECUs, and the air stripper.

The following is a brief description of the pumping test that will be performed:

- A six-inch diameter groundwater pumping test well (RW-2) will be installed at the approximate location shown on Figure 5-1. Additional one-and two-inch diameter, monitoring wells will be installed at varying distances, depths, and directions from GWPT-1.
- During the pumping test, water levels will be measured periodically, and in some cases nearly continuously using down-hole pressure transducers, in the monitoring wells while RW-2 is continuously pumped at a maximum rate of 200 gpm for a duration of 2 to 3 days.
- During the pumping test, extracted water will be discharge to the sanitary sewer via a nearby manhole. Water from RW-2 will be analyzed for compliance with Nassau County Department of Public Works (NCDPW) requirements for discharge to the sanitary sewer during the development of the well. If the pre-test analytical data indicates that water from RW-2 does not meet discharge standards, a temporary treatment system will be used to reduce VOC concentrations to acceptable concentrations.
- Samples will be collected and analyzed in accordance with NCDPW requirements.

6.2 Treatability Data Collection

To help define the expected influent water quality, specifically the concentration of regulated compounds, two additional sets of water samples will be collected during the pumping test. Both sets of samples will be analyzed for the following:

- VOCs per NYSDEC ASP 2000 Method OLM4.1
- Target Analyte List (TAL) Metals per NYSDEC ASP 2000 Method ILM 4.0
- Total and dissolved iron and manganese per NYSDEC ASP 2000 Method ILM 4.0
- Total dissolved solids (TDS) per USEPA Method 160.1
- Total suspended solids (TSS) per USEPA Method 160.2
- Total organic carbon (TOC) per USEPA Method 9060

Additionally, the following will be measured in the field: pH, temperature, and dissolved oxygen.

7. Design and Technical Specifications

The following design submittals for the groundwater IRM will be provided to the NYSDEC:

- A preliminary design submitted at the 50 to 75 percent completion level, and
- A 95 percent completion submittal of the design plans and specifications. These plans and specifications will be used to construct the IRM.

The schedule for submittals is addressed in Section 12 (Project Schedule) of this plan.

8. Quality Assurance Project Plan

A QAPP will be prepared and presented in the 95 percent design submittal.

9. Health and Safety Plan

HASP will be prepared and presented in the 95 percent design submittal.

10. Operation, Maintenance, and Monitoring (OM&M) Manual

A system OM&M Manual will be prepared and presented within 60 days of system start-up. An outline of the OM&M Manual is provided in Appendix A.

11. Citizens Participation Plan

A CPP for the OU3 project was prepared by ARCADIS as part of the March 2006 OU3 RI/FS Work Plan, Appendix D, and was approved by the NYSDEC. The referenced CPP summarizes the public participation objectives and activities to be conducted throughout the OU3 RI/FS process, including the conduct of an IRM. This OU3 CPP is included in this Plan by reference.

In general, the activities specified in the CPP for implementation of an IRM include the following:

- Preparation of an IRM Work Plan and submittal of the plan to NYSDEC for approval.
- Upon NYSDEC approval of the IRM Work Plan, a public availability session will be conducted prior to implementation of the IRM.
- The final IRM Work Plan will be placed in the document repositories, and a mailing will be sent out to the Contact List that announces the availability of the Work Plan, provides the date/time of the availability session, and includes a Fact Sheet that describes the IRM.

12. Project Schedule

A schedule of project milestones is provided as Figure 12-1.

The schedule was developed to meet the NYSDEC goal of having the groundwater IRM operational by the end of 2008. However, Northrop Grumman cannot commit to meeting this deadline due to the many circumstances beyond their control, but will target completion by the dates shown on the schedule. The attached schedule illustrates the task milestones associated with the project and how they are related. Deviations from the assumed task durations and potential impacts on other tasks along the critical path, may delay the start-up of the system.

A critical path method construction schedule will be provided in the 95 percent design report.

13. Permitting Requirements

Implementation of the groundwater IRM may require permits/permit equivalencies in accordance with applicable regulations. The need for these permits/permit equivalencies is also dependant on the activity being pursued. A brief discussion of the potential permits/permit equivalencies is provided herein.

To construct the groundwater IRM, the following permits/permit equivalencies may be required:

- Building Permit/permit equivalency (local authority).
- Electrical Permit/permit equivalency (local authority).

These permits/permit equivalencies will be obtained/applied for prior to system installation.

Prior to start-up of the groundwater IRM, the following permits/permit equivalencies will be obtained, if required:

- NYSDEC Air Discharge Permit/permit equivalency.
- NYSDEC State Pollutant Discharge Elimination System (SPDES) Permit/permit equivalency.

The proposed treatment facility is exempt from registration pursuant to 6 NYCRR Part 201-3.3(c)(29). However, a NYSDEC Air Facility Registration Form will be completed and attached to the 95 percent design submittal, as required. This permit equivalency will stipulate anticipated air discharge rates and the maximum concentrations of chemical constituents. It will also specify air sampling frequency and sample type.

A SPDES application will be completed, as required. There will be one outfall, 001, and the application will identify the location of the discharge, the allowable discharge limits, and the sampling frequency.

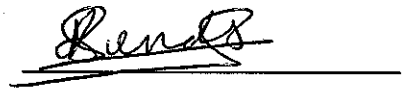
14. Closure Strategy

IRM closure criteria will be specified in the OM&M Manual.

15. Engineering Certification

This statement certifies that this Plan has been prepared for the Former Grumman Settling Ponds, Nassau County Site # 1-30-003A OU3 (Bethpage Community Park), pursuant to the Order on Consent (Index # WI-0018-04-01) entered into between Northrop Grumman Systems Corporation and the New State Department of Environmental Conservation (NYSDEC) in July 2005.

ARCADIS of New York, Inc.



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NY PE License Number 073670

16. References

ARCADIS G&M, Inc. 2006. Remedial Investigation/Feasibility Work Plan, Former Grumman Settling Ponds (Operable Unit 3), Bethpage Community Park, Bethpage, New York. March 8, 2006.

Dvirka and Bartilucci Consulting Engineers (D&B) 2003. Town of Oyster Bay Bethpage Community Park Investigation Sampling Program, Bethpage, New York, December 2003.

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New York State Department of Environmental Conservation (NYSDEC), 2005, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

Northrop Grumman Corporation (Northrop Grumman) Letter to New York State Department of Environmental Conservation (NYSDEC), RE: Former Settling Ponds, NYSDEC Nassau County Site No. 1-30-003A (Bethpage Community Park) dated, January 3, 2006.

New York State Department of Environmental Conservation (NYSDEC) Letter to Northrop Grumman, RE: Former Settling Ponds, NYSDEC Nassau County Site No. 1-30-003A (Bethpage Community Park) dated, December 22, 2006.

New York State Department of Environmental Conservation (NYSDEC) Letter to Northrop Grumman, RE: Northrop Grumman Site, Nassau County Site No. 1-30-003A Former Northrop Grumman Settling Ponds dated, January 12, 2007.

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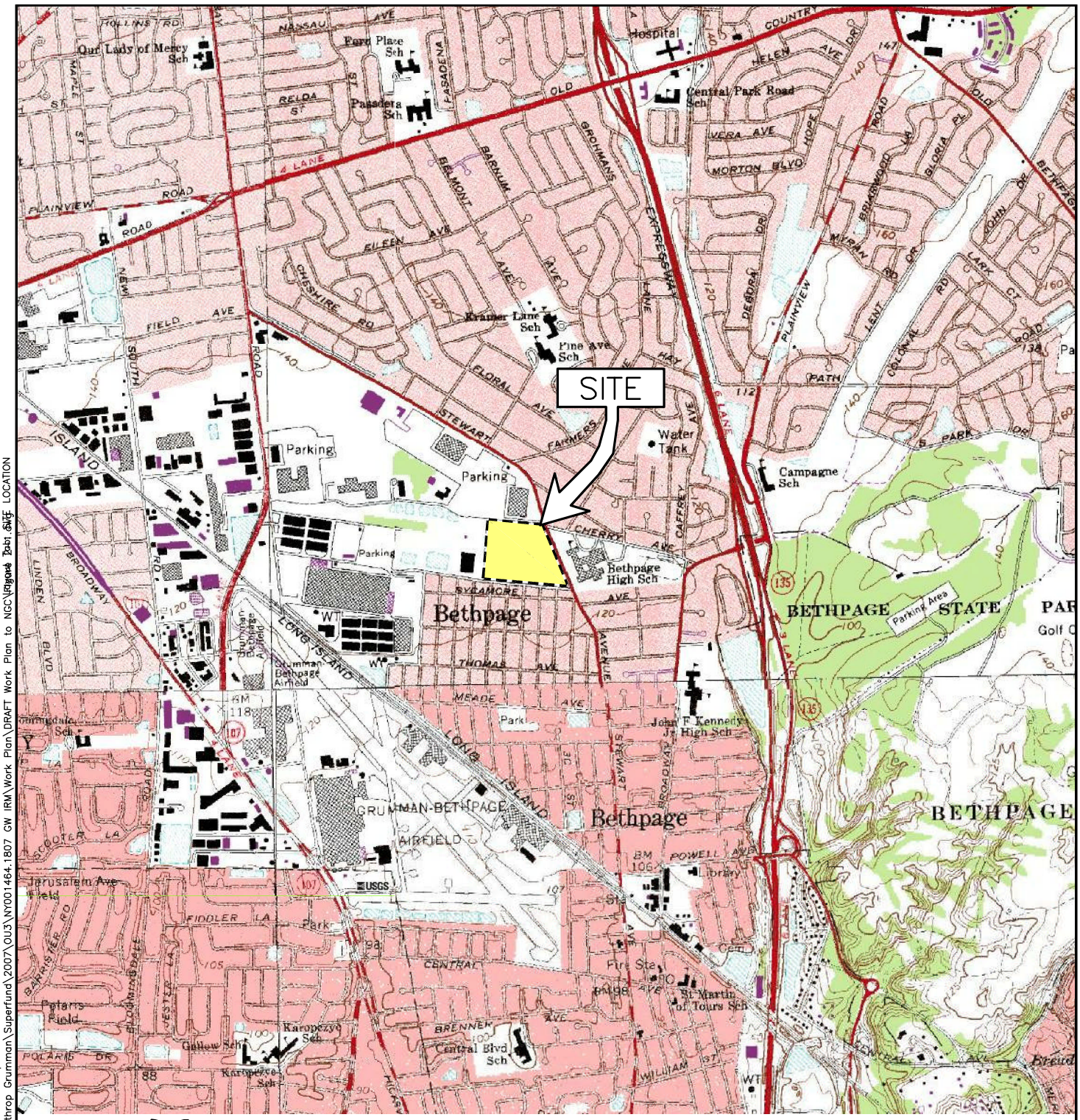

SITE LOCATION

EXPLANATION

PROPERTY BOUNDARY

SOURCE: USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, NY. 1994
USGS 7.5 MIN. FREEPORT QUADRANGLE, FREEPORT, NY., 1994
USGS 7.5 MIN. HICKSVILLE QUADRANGLE, HICKSVILLE, NY., 1967, PHOTOREVISED 1979
USGS 7.5 MIN. HUNTINGTON QUADRANGLE, HUNTINGTON, NY. 1967, PHOTOREVISED 1979

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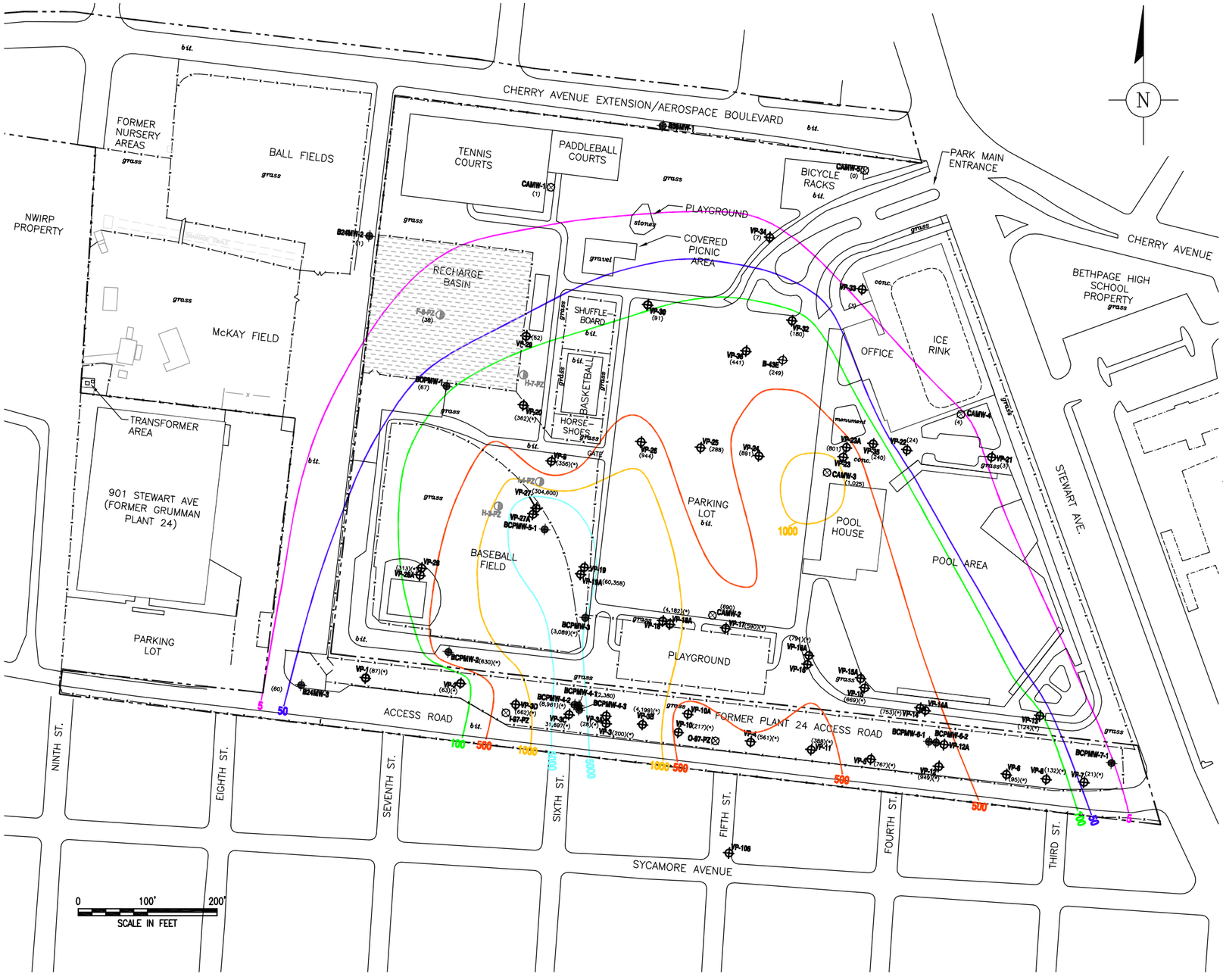
PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER: M. WOLFERT	LEAD DESIGN PROF.: W. WITTEK	CHECKED BY: D. STERN
SHEET TITLE: SITE LOCATION FORMER GRUMMAN SETTLING PONDS OPERABLE UNIT 3 BETHPAGE, NEW YORK		TASK/PHASE NUMBER: 00001	DRAWN BY: A. SANCHEZ
		PROJECT NUMBER: NY001464.1807	FIGURE: 2-1



EXPLANATION

- NORTHROP GRUMMAN CORPORATION PROPERTY LINE
- FENCE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- BASIN
- bit. — BITUMINOUS PAVEMENT
- BCP-MW-3 — EXISTING MONITORING WELL
- VP-1 — COMPLETED VERTICAL PROFILE BORING (BY ARCADIS)
- F-8-PZ — COMPLETED PIEZOMETER (BY ARCADIS)
- (288) — SAMPLE CONCENTRATION
- VPB AND B-43E — VERTICAL PROFILE BORINGS

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. VPBs VP-1 TO VP-20 SURVEYED TO NAD 27. VPBs VP-21 TO VP-36 AND B-43E ARE APPROXIMATE.
3. MAXIMUM CONCENTRATION IS SHOWN FOR EACH VP LOCATION (INCLUDES COLOCATED VPBs); SAMPLE WAS COLLECTED AT THE WATER TABLE UNLESS OTHERWISE NOTED.
4. (*) SAMPLE NOT COLLECTED AT WATER TABLE.
5. MOST RECENT SAMPLE CONCENTRATION IS SHOWN FOR EACH MONITORING WELL.
6. APPROXIMATE LOCATIONS OF BETHPAGE PARK MONITORING WELLS INSTALLED BY THE TOWN OF OYSTER BAY ARE BASED ON THE 2005 REPORTS (H2M 2005a;b).

DEFINITION OF ISOCONCENTRATION CONTOURS

- 5 — 5 ug/L
- 50 — 50 ug/L
- 100 — 100 ug/L
- 500 — 500 ug/L
- 1000 — 1000 ug/L
- 5000 — 5000 ug/L

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
2	1-15-07	FINAL Q/C	DZ
1	1-11-07	UPDATED	JC
0	1-9-07	Q/C CONCENTRATIONS AS OF 12/06	DZ

SEAL

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PROJECT TITLE

WORKPLAN
GROUNDWATER INTERIM REMEDIAL MEASURES
OPERABLE UNIT 3-FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	M. WOLFERT	W. WITTEK	W. WITTEK
SHEET TITLE		TASK/PHASE NUMBER	DRAWN BY
SITE PLAN/TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN GROUNDWATER		00001	A. SANCHEZ
		PROJECT NUMBER	FIGURE NUMBER
		NY001464.1807	2-2

Acad Version : R17.0s (LMS Tech)
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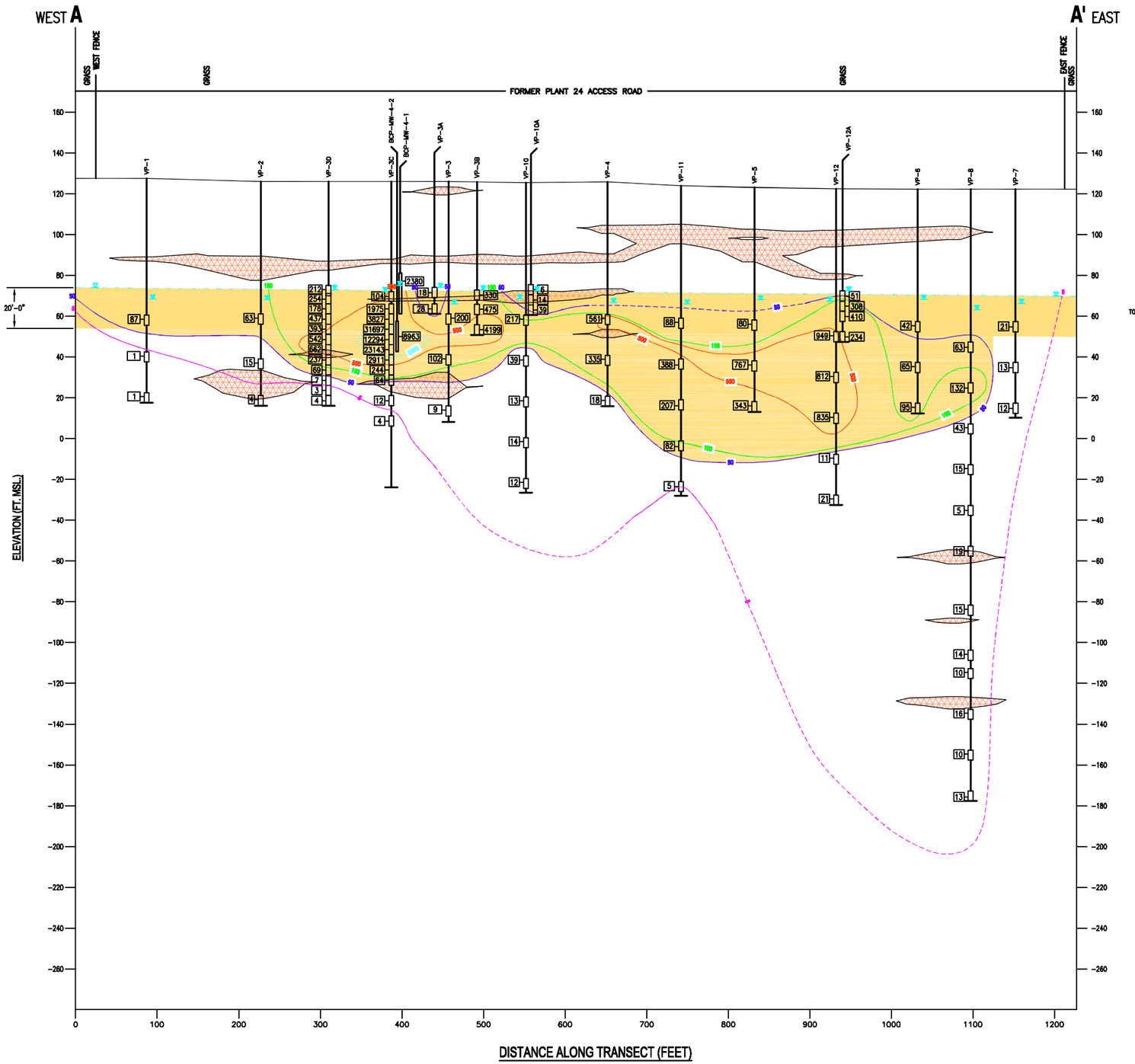

EXPLANATION

- VP DESIGNATION
- LAND SURFACE
- TYPICAL VP BOREHOLE
- AVERAGE WATER TABLE
- ACTUAL DEPTH TO WATER DURING BORING
- TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION (ug/L)
- LOCATION AND DEPTH OF VP GROUNDWATER SAMPLE INTERVAL
- END OF BORING
- LINE OF EQUAL TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION (ug/L)(DASHED WHERE INFERRED)
- AREAS OF LOW PERMEABILITY
- GROUNDWATER INTERIM REMEDIAL MEASURE TREATMENT AREA

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"= 20'
VERTICAL EXAGERATION = 2.5X

DEFINITIONS
VP VERTICAL PROFILE
ug/L MICROGRAMS PER LITER
FT. MSL. FEET RELATIVE TO MEAN SEA LEVEL

DEFINITION OF ISOCONCENTRATION CONTOURS

- 5 ug/L
- 50 ug/L
- 100 ug/L
- 500 ug/L
- 1000 ug/L
- 5000 ug/L

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD
1	1-16-07	Q/C CONTOURS	DZ
0	1-9-07	UPDATE	JC

KEYPLAN

PROJECT TITLE

WORK PLAN
GROUNDWATER INTERIM REMDIAL MEASURE
OPERABLE UNIT 3-FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

SHEET TITLE

CROSS-SECTION/TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN GROUNDWATER

ARCADIS OF NEW YORK, INC.
Two Huntington Quadrangle
Suite 1S10
Melville, NY 11747
Tel: 631-249-7600 Fax: 631-249-7610
www.arcadis-us.com

SEAL

SEAL

PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER: M. WOLFERT
LEAD DESIGN PROF.: W. WITTEK	CHECKED BY: W. WITTEK
TASK/PHASE NUMBER: 001GW	DRAWN BY: A. SANCHEZ
PROJECT NUMBER: NY001464.1807	FIGURE NUMBER: 2-3

Acad Version : R17.0s (LMS Tech) Date\Time : Wed, 14 Nov 2007 - 4:51pm
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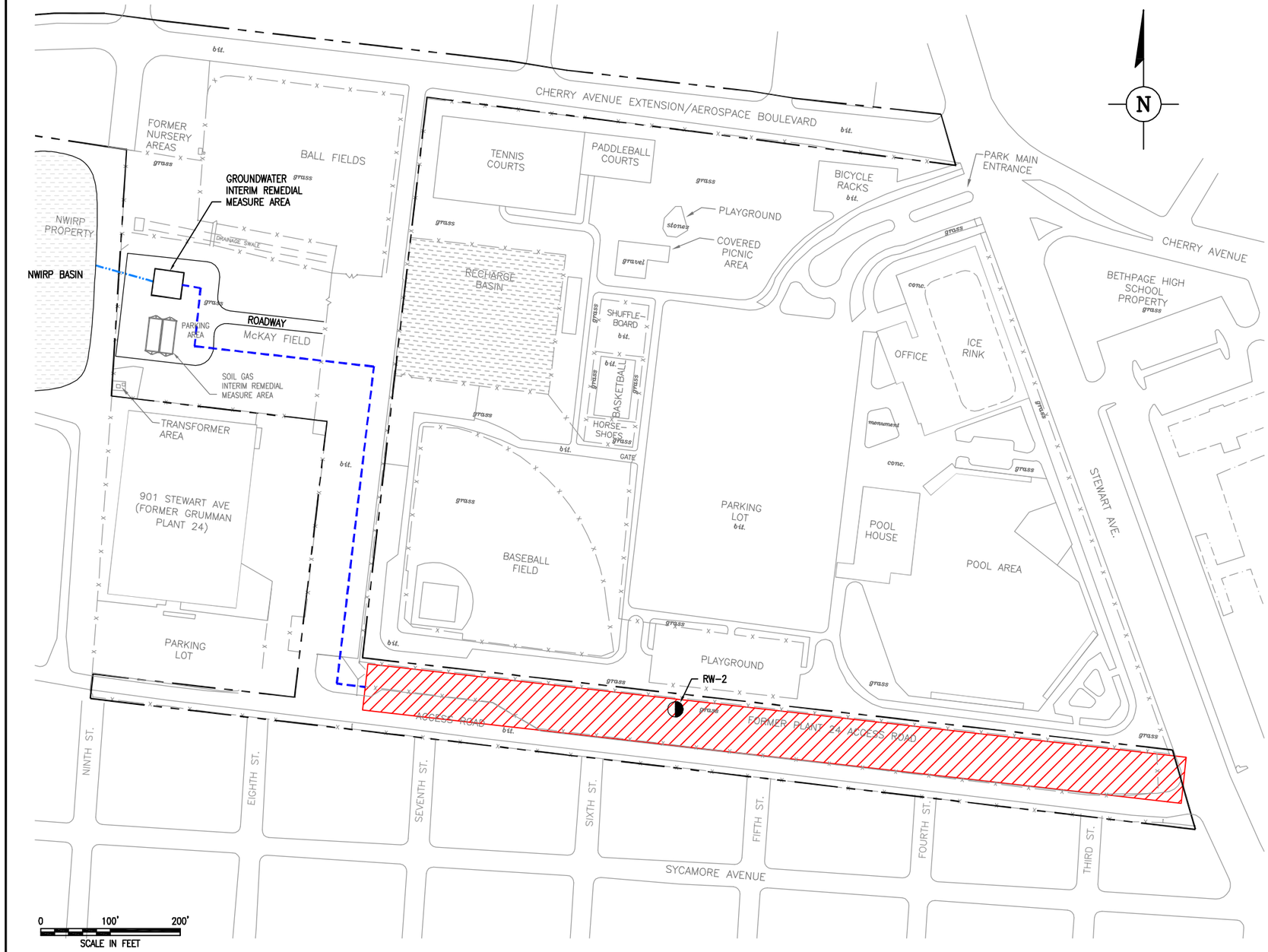

LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- bit. BITUMINOUS PAVEMENT
- GROUNDWATER IRM INFLUENT PIPELINE
- GROUNDWATER IRM EFFLUENT PIPELINE
- LOCATION OF GROUNDWATER EXTRACTION WELLS
- NWIRP NAVY BASIN
- RW-2 APPROXIMATE LOCATION OF GROUNDWATER PUMP TEST WELL
- IRM INTERIM REMEDIAL MEASURE
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD

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Melville, NY 11747
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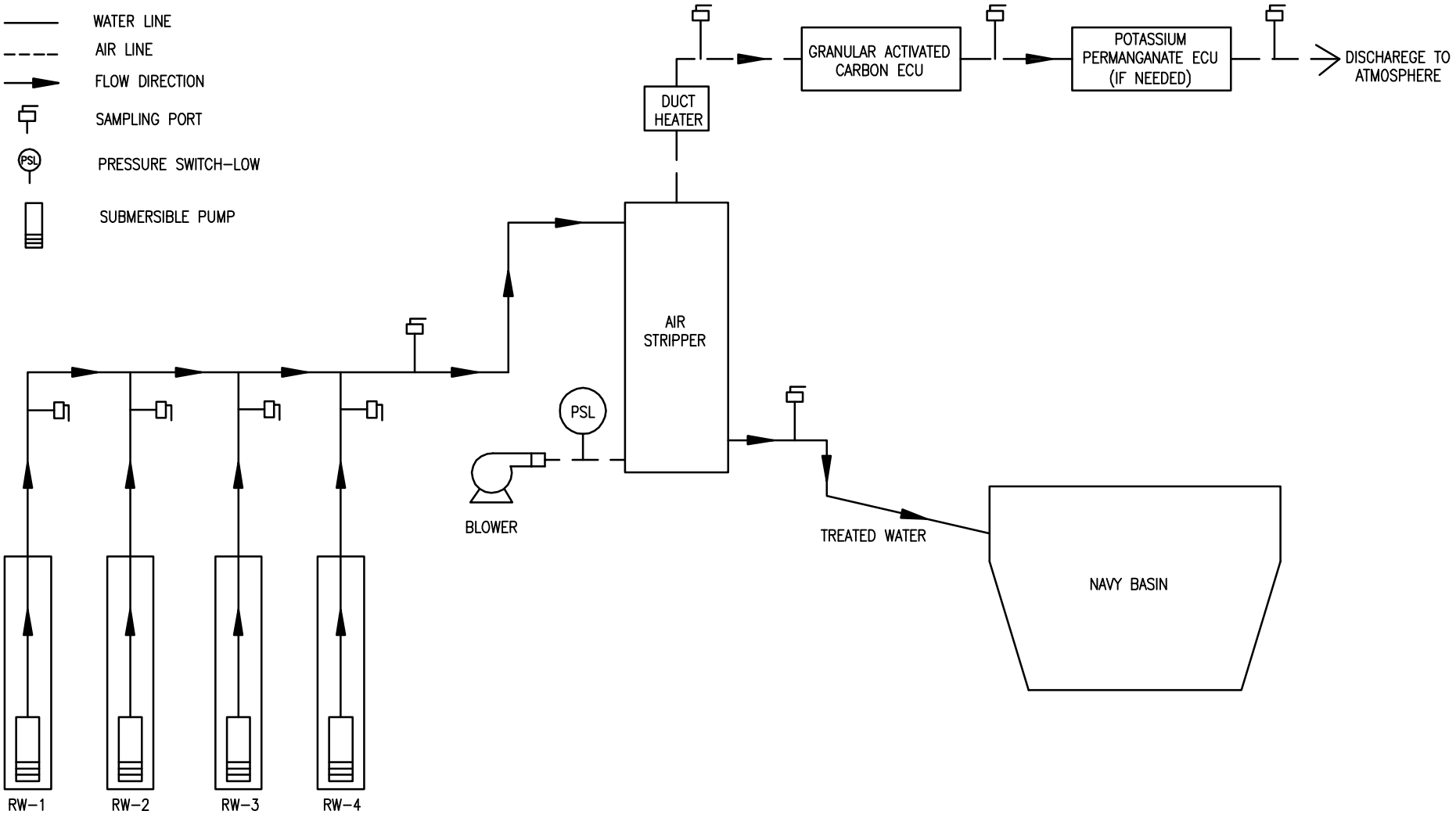
PROJECT TITLE

WORK PLAN
GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3–FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	M. WOLFERT	W. WITTEK	W. WITTEK
SHEET TITLE		TASK/PHASE NUMBER	DRAWN BY
PRELIMINARY LAYOUT OF GROUNDWATER INTERIM REMEDIAL MEASURE		00001	A. SANCHEZ
		PROJECT NUMBER	FIGURE NUMBER
		NY001464.1807	5-1

Acad Version : R17.0s (LMS Tech) Date\Time : Wed, 14 Nov 2007 - 6:04pm Current Plotstyle : ByColor
User Name : dsanchez Path\Name : G:\APROJECT\Northrop Grumman\Superfund\2007\OU3\NY001464.1807 GW IRM\Work Plan\DRAFT Work Plan to NGC\[Figure 5-1_Prelim IRM System Layout.dwg] FIG 3



RECOVERY WELLS

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD

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Melville, NY 11747
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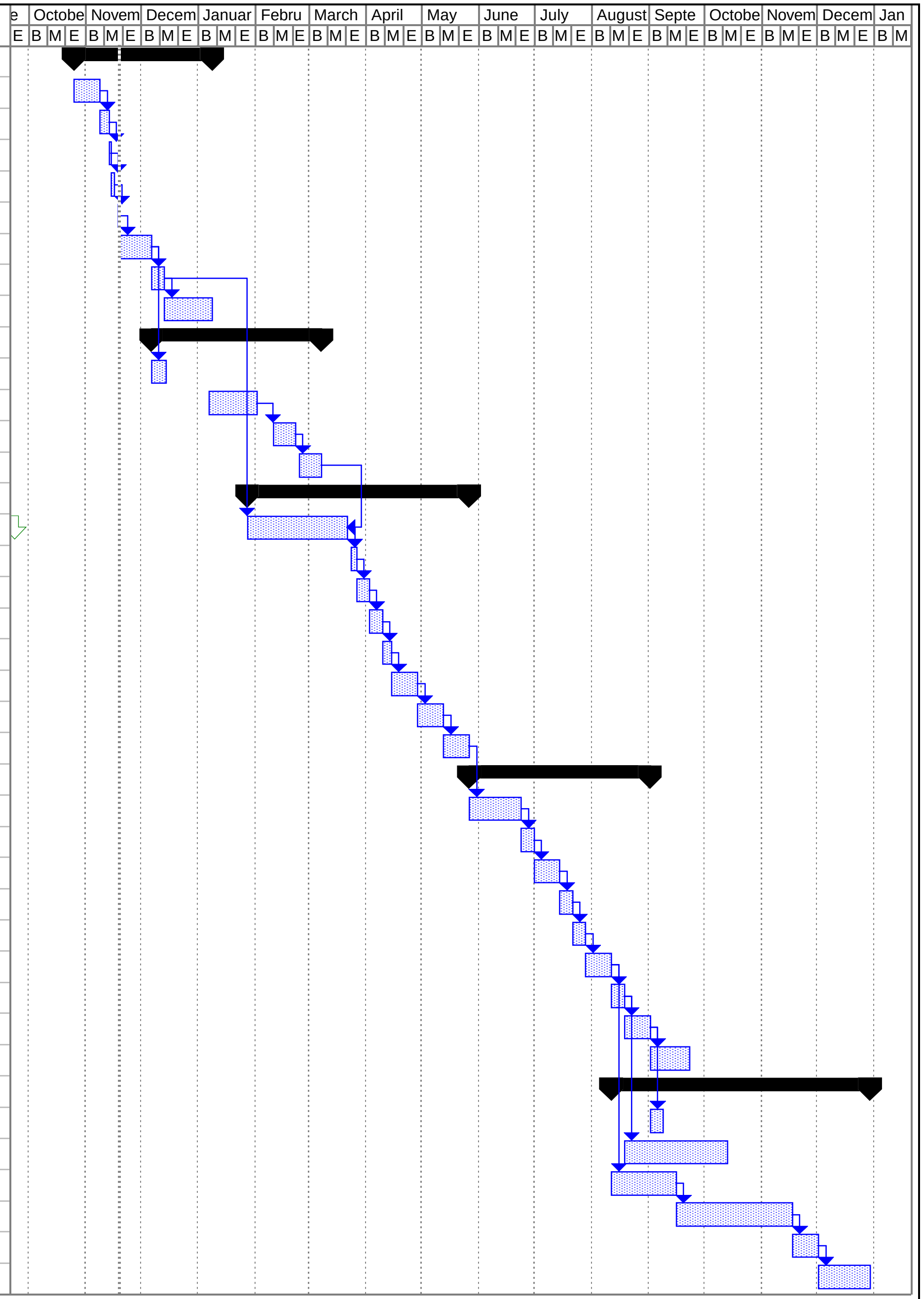
PROJECT TITLE

WORK PLAN
GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3-FORMER GRUMMAN SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	M. WOLFERT	W. WITTEK	W. WITTEK
SHEET TITLE		TASK/PHASE NUMBER	DRAWN BY
CONCEPTUAL PROCESS FLOW DIAGRAM		00001	A. SANCHEZ
		PROJECT NUMBER	FIGURE NUMBER
		NY001464.1807	5-2

ID		Task Name	Duration	Start	Finish	Predecessors
1		**IRM Work Plan**	**42 days**	**Fri 10/26/07**	**Tue 1/8/08**	
2		Prepare Work Plan	10 days	Fri 10/26/07	Thu 11/8/07	
3		ARCADIS review	3 days	Fri 11/9/07	Tue 11/13/07	2
4		Revise and Submit to Client	1 day	Wed 11/14/07	Wed 11/14/07	3
5		Client Review and Comment	2 days	Thu 11/15/07	Fri 11/16/07	4
6		Revise and Submit to State	1 day	Mon 11/19/07	Mon 11/19/07	5
7		State & Town Review and Comment	10 days	Tue 11/20/07	Thu 12/6/07	6
8		Revise and Submit Final	5 days	Fri 12/7/07	Thu 12/13/07	7
9		State Approval	10 days	Fri 12/14/07	Tue 1/8/08	8
10		**Pilot Tests**	**58 days**	**Fri 12/7/07**	**Fri 3/7/08**	
11		Contact/Schedule Driller	6 days	Fri 12/7/07	Fri 12/14/07	7
12		Install Wells	20 days	Mon 1/7/08	Fri 2/1/08	
13		Perform Tests	10 days	Mon 2/11/08	Fri 2/22/08	12FS+5 days
14		Analyze Results	10 days	Mon 2/25/08	Fri 3/7/08	13
15		**50- 70 Percent Design**	**86 days**	**Mon 1/28/08**	**Mon 5/26/08**	
16		Prepare Design	40 days	Mon 1/28/08	Fri 3/21/08	8,14FF+10 days
17		ARCADIS review	3 days	Mon 3/24/08	Wed 3/26/08	16
18		Revise and Submit to Client	5 days	Thu 3/27/08	Wed 4/2/08	17
19		Client Review and Comment	5 days	Thu 4/3/08	Wed 4/9/08	18
20		Revise and Submit to State	3 days	Thu 4/10/08	Mon 4/14/08	19
21		State & Town Review and Comment	10 days	Tue 4/15/08	Mon 4/28/08	20
22		Revise and Submit Final	10 days	Tue 4/29/08	Mon 5/12/08	21
23		State Approval	10 days	Tue 5/13/08	Mon 5/26/08	22
24		**95 Percent Design**	**70 days**	**Tue 5/27/08**	**Mon 9/1/08**	
25		Prepare Design	20 days	Tue 5/27/08	Mon 6/23/08	23
26		ARCADIS review	5 days	Tue 6/24/08	Mon 6/30/08	25
27		Revise and Submit to Client	10 days	Tue 7/1/08	Mon 7/14/08	26
28		Client Review and Comment	5 days	Tue 7/15/08	Mon 7/21/08	27
29		Revise and Submit to State	5 days	Tue 7/22/08	Mon 7/28/08	28
30		State & Town Review and Comment	10 days	Tue 7/29/08	Mon 8/11/08	29
31		Revise and Submit Final	5 days	Tue 8/12/08	Mon 8/18/08	30
32		State Approval	10 days	Tue 8/19/08	Mon 9/1/08	31
33		Public Meeting/Review	15 days	Tue 9/2/08	Mon 9/22/08	32
34		**Construct/Start-up**	**100 days**	**Tue 8/12/08**	**Mon 12/29/08**	
35		Finalize Equipment List	5 days	Tue 9/2/08	Mon 9/8/08	32
36		Order/Procure Long Lead Items	40 days	Tue 8/19/08	Mon 10/13/08	31
37		Install wells	25 days	Tue 8/12/08	Mon 9/15/08	30
38		Construct System	45 days	Tue 9/16/08	Mon 11/17/08	37
39		System Start-up	10 days	Tue 11/18/08	Mon 12/1/08	38
40		OM&M Manual	20 days	Tue 12/2/08	Mon 12/29/08	39



Project: schedule 11_16_07
Date: Mon 11/19/07

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Figure 12-1: Project Schedule, Groundwater IRM Work Plan, OU-3, Former Grumman Settling Ponds, Bethpage, New York

Appendix A

Draft Outline Operation, Maintenance, and Monitoring (OM&M) Manual, Groundwater Interim Remedial Measure, Operable Unit 3 – Former Grumman Settling Ponds, Bethpage, New York.

APPENDIX A

DRAFT Outline, Operation, Maintenance, and Monitoring Manual, Groundwater Interim Remedial Measure, Operable Unit 3 – Former Grumman Settling Ponds, Bethpage, New York.

The DRAFT outline for the Operation, Maintenance, and Monitoring (OM&M) Manual is provided below.

1.0 Introduction
- 1.1 Project Description
- 1.2 Purpose of OM&M Manual
- 1.3 Special Site-Specifics Safety Warnings
- 1.4 Records Management
  - 1.4.1 OM&M Needs Summary
  - 1.4.2 OM&M Needs Summary List of Official Records and References

2.0 Site Description
- 2.1 Description of Sites
- 2.2 Site History
- 2.3 Physical Site Characterization

3.0 Site Remedial Action
- 3.1 Description of Groundwater Remedial Measure (GW IRM)
- 3.2 Goals of Remedial Action

4.0 Sampling Analysis
- 4.1 Monitoring Plan
  - 4.1.1 Elements of Monitoring Plan
  - 4.1.2 Basis of Design
- 4.2 Environmental Effectiveness Monitoring
  - 4.2.1 Groundwater Level Monitoring
  - 4.2.2 On-site Groundwater Quality Monitoring
- 4.3 Remedial System Performance and Compliance Monitoring
  - 4.3.1 Water Sampling Procedures
  - 4.3.2 Vapor Sampling Procedures
- 4.4 Analytical Program
- 4.5 Evaluation of Monitoring Results
- 4.6 Records

5.0 Site Maintenance
- 5.1 Maintenance Activities
  - 5.1.1 Site Fence
  - 5.1.2 Signs
  - 5.1.3 Treatment Plant Maintenance
  - 5.1.4 Maintenance Schedule
- 5.2 Inspections and Maintenance
  - 5.2.1 Daily Check List
  - 5.2.2 Monthly Check List
  - 5.2.3 Annual Check List
- 5.3 Preventative Maintenance Schedule
  - 5.3.1 Monthly Activities
  - 5.3.2 Annual Activities
- 5.4 Disposal of Used Materials and Wastes

6.0 Reports
- 6.1 Quarterly Reports
- 6.2 Yearly Reports
- 6.3 5-Year Review Reports

7.0 Citizen Participation
- 7.1 OM&M Citizen Participation Plan
- 7.2 Contact List
- 7.3 FOIL Packet

8.0 Personnel
- 8.1 Organization
  - 8.1.1 Chain of Command
- 8.2 Manpower Requirements
- 8.3 Responsibilities and Duties
- 8.4 Qualifications
- 8.5 Training
- 8.6 Material Safety Data Sheets

9.0 Health and Safety Plan

10.0 Records and Forms
- 10.1 Groundwater Monitoring Well System
  - 10.1.1 Inspection Forms
  - 10.1.2 Monitoring Forms
  - 10.1.3 Maintenance Forms
- 10.2 Treatment Plant
  - 10.2.1 Inspection Forms
  - 10.2.2 Monitoring Forms
  - 10.2.3 Maintenance Forms

11.0 Emergency Contingency Plan
- 11.1 Emergency Spill Response
- 11.2 Fire/Explosion
- 11.3 Personal Injury
- 11.4 Toxic Exposures
- 11.5 Emergency Telephone Numbers, Map and Directions to Nearest Health Facility
- 11.6 Public Water Contingency Plan

12.0 Record Drawings

13.0 RODs, Consent Orders, and/or any Explanation of Significant Differences (ESDs)

14.0 Electronic Copies of Official Records and References

APPENDIX A: Manufacture's Information

APPENDIX B: SOPs