NORTHROP GRUMMAN

Phase 2A Remedial Investigation Work Plan Addendum No. 6

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

November 2006

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

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ENVIRONMENT

Subject:
Town of Oyster Bay
Bethpage Community Park
Remedial Investigation Program

Date:
November 30, 2006

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Our ref:
NY001348.0896.00003

Dear Mr. Scharf:

As requested by Northrop Grumman Corporation, ARCADIS is forwarding the enclosed document entitled:

"Phase 2A Remedial Investigation Work Plan Addendum No. 6

Former Grumman Settling Ponds

(Operable Unit 3 – Bethpage Community Park)

Bethpage, New York

NYSDEC Site #1-30-003A".

As specified in the Remedial Investigation/Feasibility Study Work Plan for this project, Northrop Grumman Corporation committed to prepare a Work Plan Addendum to present the proposed locations and procedures for excavating test pits within the Bethpage Community Park.

Your prompt review of this document is greatly appreciated as Northrop Grumman Corporation would like to keep this project moving forward. If you have any questions and/or comments regarding the enclosed, please do not hesitate to contact us.

ARCADIS

Sincerely,

ARCADIS G&M, Inc.

Carlo San Giovanni

Carlo San Giovanni
Project Manager

Michael F. Wolfert
Project Director

Enclosures

Copies:
John Cofman, Northrop Grumman Corporation
Larry Leskovjan, Northrop Grumman Corporation

PHASE 2A REMEDIAL INVESTIGATION
WORK PLAN ADDENDUM NO. 6

FORMER GRUMMAN SETTLING PONDS
(OPERABLE UNIT 3 – BETHPAGE COMMUNITY PARK)
BETHPAGE, NEW YORK
NYSDEC SITE # 1-30-003A

Prepared for:

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

Prepared by:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NEW YORK

NOVEMBER 2006

PHASE 2A REMEDIAL INVESTIGATION
WORK PLAN ADDENDUM NO. 6
FORMER GRUMMAN SETTLING PONDS
(OPERABLE UNIT 3 – BETHPAGE COMMUNITY PARK)
BETHPAGE, NEW YORK
NYSDEC SITE # 1-30-003A

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1.0 INTRODUCTION

This document serves as Work Plan Addendum No. 6 for Phase 2A - Soil Remedial Investigation of the "Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Former Grumman Settling Ponds (Operable Unit 3 – Bethpage Community Park), Bethpage, New York," dated March 8, 2006.

The RI/FS Work Plan (Section 6.2.1.1.1 - Proposed Phase 2A Soil Remedial Investigation) specified that a work plan addendum would be prepared to incorporate information obtained from the geophysical survey conducted in the vicinity of the baseball field. The objectives of the geophysical survey were to identify potential source areas, evaluate the presence of low permeability units and to delineate the surface of the low permeability zone previously encountered approximately 40 to 50 feet below grade during installation of well and soil borings in the baseball field area. The information obtained as a result of conducting the geophysical survey was used to optimize the locations of the proposed test pits presented in this Work Plan Addendum. It should be emphasized that the test pit program described in this work plan addendum is intended to further investigate soil within the park, specifically addressing anomalies detected during the geophysical survey; these activities are not intended as remediation or for the removal of any material.

The remainder of this Work Plan Addendum is organized as follows:

- Section 2.0 presents the findings and interpretation of the geophysical survey;
- Section 3.0 presents the approach of the proposed test pit program based on the geophysical survey findings as well as the volatile organic compound screening results; and
- Section 4.0 describes the procedures to be utilized during the construction of the test pits.

2.0 GEOPHYSICAL SURVEY FINDINGS AND INTERPRETATION

2.1 Background

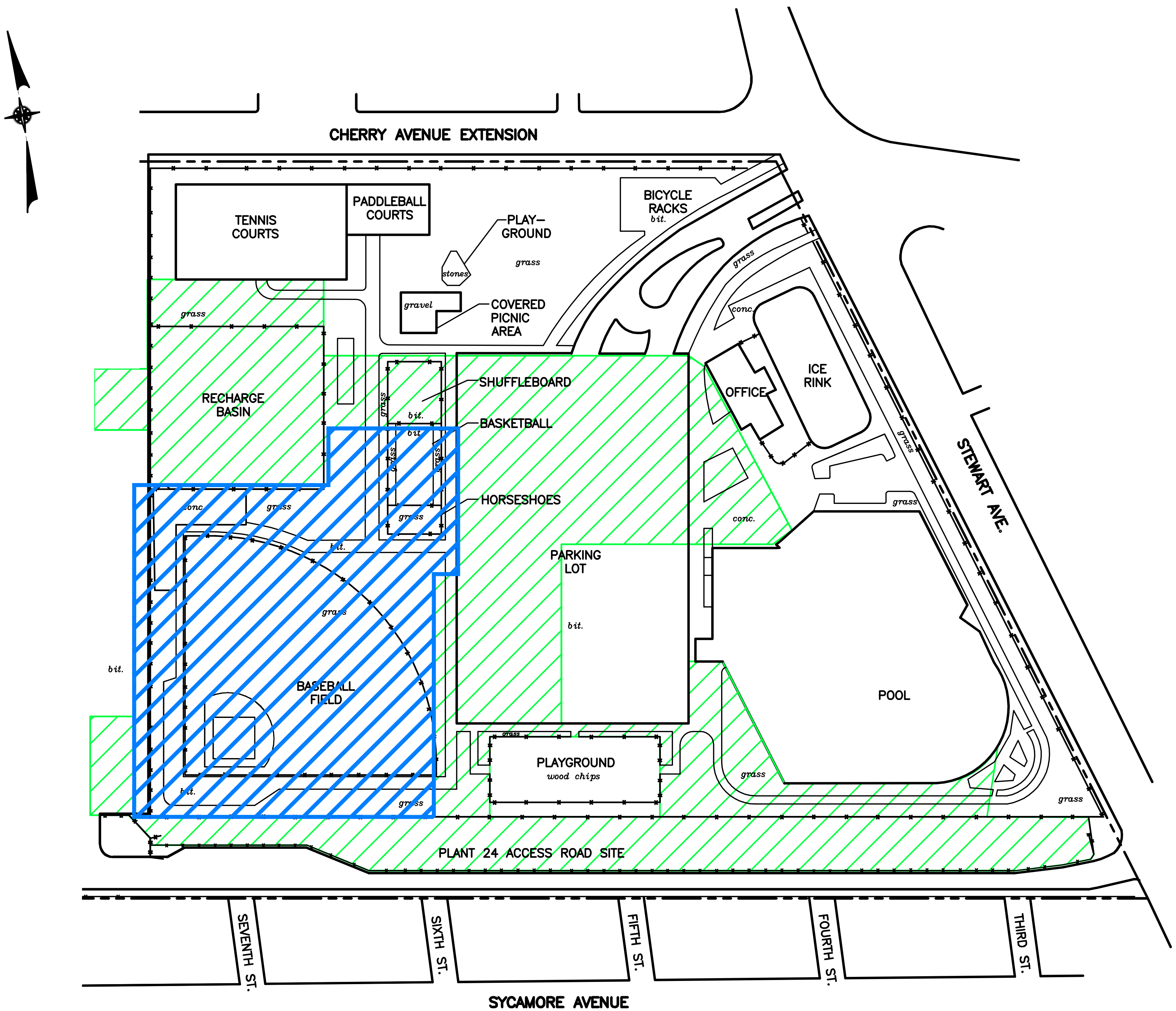
The objectives of the geophysical survey conducted within the Bethpage Community Park were to identify potential contaminant sources, potential low permeability subsurface zones and the surface of the low permeability zone (LPZ) previously encountered approximately 40 to 50 feet below grade in the area of the baseball field. Low permeability units in the subsurface may have provided preferential contaminant migration pathways and contaminant accumulation locations within the vadose zone, i.e., the area above the water table. The water table is located approximately 60 feet below grade in the park.

2.2 Scope of the Geophysical Survey

The area targeted by the geophysical survey covers approximately 4 acres and comprises a generally rectangular-shaped area measuring approximately 400 feet east-west by 500 feet north-south. This area includes the entire baseball field and the area immediately north of the baseball field, up to the recharge basin extending east through the basketball court to the western extent of the parking lot. The limits of the geophysical survey are shown on Figure 2-1. The figure also shows the limits of the magnetometry survey conducted to locate underground utilities.

The geophysical survey was conducted between April 24 and April 27, 2006 by Hager-Richter Geoscience, Incorporated (Hager-Richter), of Salem, New Hampshire. Personnel from Dvirka and Bartilucci Consulting Engineers (D&B) provided oversight of the survey. Prior to conducting the survey, interior chain link fences within the survey area were removed and the fence poles were cut flush to grade to minimize magnetic interference.

Prior to initiating the survey, a 50-foot grid was established across the survey area. Three-foot long wooden stakes were installed in the ground at the grid nodes, starting at the southwest corner of the park.



NOTES:

1. PARK FEATURES AND STRUCTURES DIGITIZED FROM A MARCH 14, 1974 AERIAL PHOTOGRAPH.

2. THE APPROXIMATE LOCATIONS AND DIMENSIONS OF THE PARK FEATURES AND STRUCTURES HAVE BEEN FIELD VERIFIED.

LEGEND:

- PROPERTY LINE
- FENCE
- TEMPORARY FENCE
- APPROXIMATE LIMITS OF GEOPHYSICAL SURVEY
- AREA OF GEOPHYSICAL SURVEY (APPROXIMATE) TO IDENTIFY SUBSURFACE UTILITIES

0 75' 150'

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A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

TOWN OF OYSTER BAY
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

LIMITS OF GEOPHYSICAL SURVEY

FIGURE 2-1

In order to accomplish the survey objectives, the following geophysical methods, instrumentation and transects were utilized:

- In-phase and apparent conductivity using frequency domain electromagnetic induction (Geonics Model EM-31) in a grid of 20-foot transects;
- Ground penetrating radar (GPR) (Sensors and Software Smart Cart Noggin) in a grid of 10-foot and 20-foot transects; and
- Dipole-dipole resistivity (Super Sting R IP 8 Channel Memory Earth Resistivity and IP Meter) in two east-west transects, two north-south transects and one southwest-northeast transect.

The details of the methodologies utilized for the geophysical survey are provided in Hager-Richter's report provided in Appendix A.

2.3 Findings and Interpretation

The detailed findings of the geophysical survey are provided in Hager-Richter's report presented in Appendix A. In order to maximize interpretation of the geophysical survey results, Hager-Richter was provided with and utilized geologic and geophysical logs of previous borings advanced within the study area. The effective depths of the geophysical methods utilized varied depending on several factors such as the depth of the target unit, variation in soil conductivity, and interferences from buried utilities and surface features, among others. General maximum penetrating depths for the survey methods were approximately 20 feet below grade for the GPR and conductivity methods, and approximately 90 feet below grade for the resistivity survey. The specific depths of anomalies detected by the GPR and conductivity methods are not definitive due to factors such as the size of the anomaly, variations in soil conductivity, and surface and subsurface interferences.

Figures (plates) presenting a graphic representation of the output associated with each of the three various survey methods are included in Appendix A. A summary of the findings and interpretations of the survey are provided below:

- The GPR survey identified areas of interest within Areas A, B and D (see Plate 4 in Appendix A).

- The presence of potential shallow anomalies was identified at approximately ten areas across the study area (see Plates 3 and 4 in Appendix A).

- Areas of relatively shallow, highly conductive soil were identified across the baseball infield and extending outward toward left-center field (see Plate 2 in Appendix A).

- Resistivity results indicated areas of interest, other than those identified in the GPR and conductivity surveys, in the vicinity of the roadway near the southwestern corner of Area B, in the area just southwest of Area D and in Area G.

- The resistivity survey provided the following additional lithologic and stratigraphic inferences that may aid in targeting potential contaminant migration pathways and potential residual contaminant zones in the study area:

  - A shallow low permeable zone (LPZ), between approximately 5 and 20 feet below grade, present under the center of the baseball field and appearing to thicken to the west;

  - The LPZ appears to be ridge-like beneath Area D;

  - The LPZ dips to southward under the center of the baseball field; and

  - The LPZ does not appear to be present under the southern approximate 150 feet of the baseball field.

- No areas of interest were identified within Areas C or E.

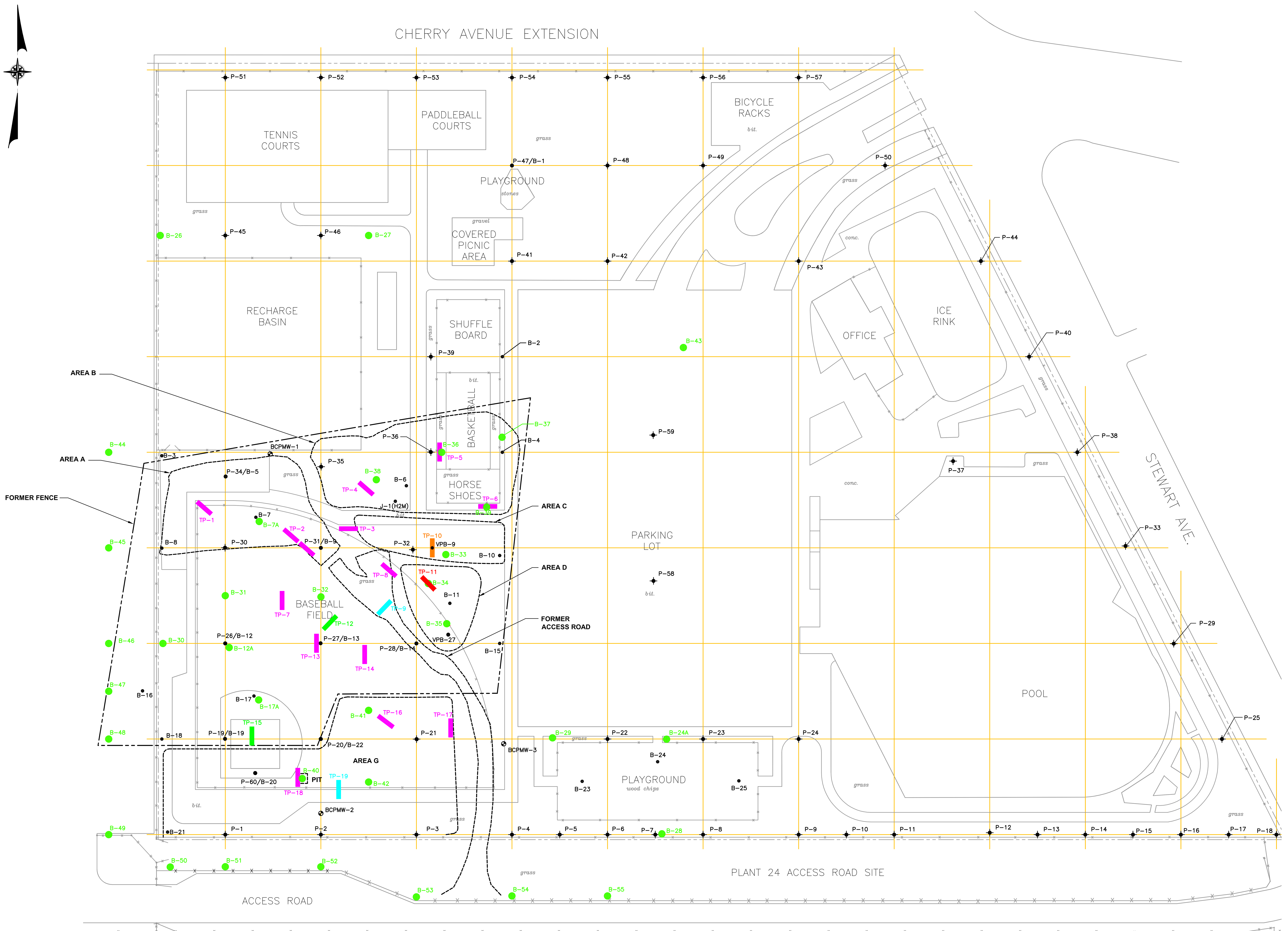
- Geophysical anomalies were identified in Area G that may be associated with the light pole.

3.0 PROPOSED INVESTIGATION APPROACH

In order to directly investigate and characterize the locations of the anomalies and potential low permeability zones, a field program involving excavating test pits will be conducted. The locations and depths of the test pits have been optimized by the findings of the geophysical survey, as well as the preliminary findings of the geophysical and volatile organic compound screening program conducted by Arcadis. Arcadis' screening program involved the use of Cone Penetrometer (CPT) and Membrane Interface Probe (MIP) technologies to indirectly characterize subsurface conditions, particularly the LPZ, in order to determine whether volatile organic compounds (VOCs) are present in the subsurface and whether a pathway exists for VOCs to impact groundwater quality. The results of these programs will be formally presented by Arcadis in the RI report. The approach and details of the proposed test pit program are provided below.

Nineteen test pits are proposed at the locations shown on Figure 3-1, "Proposed Test Pit Locations." The test pits are color coded on the figure to identify the specific geophysical method results that were used to support the need to further investigate the area. The geophysical method used to detect each anomaly is particularly helpful in anticipating the type of object/material that may be encountered during construction of each test pit. The test pit locations were selected based on the geophysical anomalies described in Section 2.0 of this plan. The proposed test pit locations overlain on the specific geophysical anomalies are provided on the following figures by geophysical method:

- Figure 3-2 - depicts the test pit locations in plan view based on in-phase conductivity anomalies.
- Figure 3-3 - depicts the test pit locations in plan view based on apparent conductivity anomalies.
- Figure 3-4 - depicts the test pit locations in sectional view based on apparent resistivity plots indicative of formation differences.



LEGEND:

- HISTORICAL FEATURES
- HISTORICAL FENCE LINE
- PROPERTY LINE
- FENCE
- TEMPORARY FENCE
- PREVIOUSLY-INSTALLED SOIL PROBE
- PREVIOUSLY-INSTALLED SOIL BORING
- EXISTING MONITORING WELL
- INSTALLED RI SOIL BORING LOCATION

TEST PITS:

- PROPOSED TEST PIT LOCATED BASED ON IN-PHASE CONDUCTIVITY RESULTS (INDICATIVE OF BURIED METAL OBJECTS)
- PROPOSED TEST PIT LOCATED BASED ON APPARENT CONDUCTIVITY AND GROUND PENETRATING RADAR RESULTS (INDICATIVE OF FORMATION DIFFERENCES SHALLOWER THAN APPROXIMATELY 20 FEET BELOW GRADE)
- PROPOSED TEST PIT LOCATED BASED ON RESISTIVITY DATA (INDICATIVE OF FORMATION DIFFERENCES UP TO APPROXIMATELY 80 FEET BELOW GRADE)
- PROPOSED TEST PIT LOCATED AT PREVIOUS SOIL BORING VPB-9 WHERE "SLUDGE-LIKE MATERIAL" WAS ENCOUNTERED
- PROPOSED TEST PIT TO INVESTIGATE AREA D

NOTES:

1. PARK FEATURES AND STRUCTURES DIGITIZED FROM A MARCH 14, 1974 AERIAL PHOTOGRAPH.
2. THE APPROXIMATE LOCATIONS AND DIMENSIONS OF THE PARK FEATURES AND STRUCTURES HAVE BEEN FIELD VERIFIED.

Dvirka and Bartilucci
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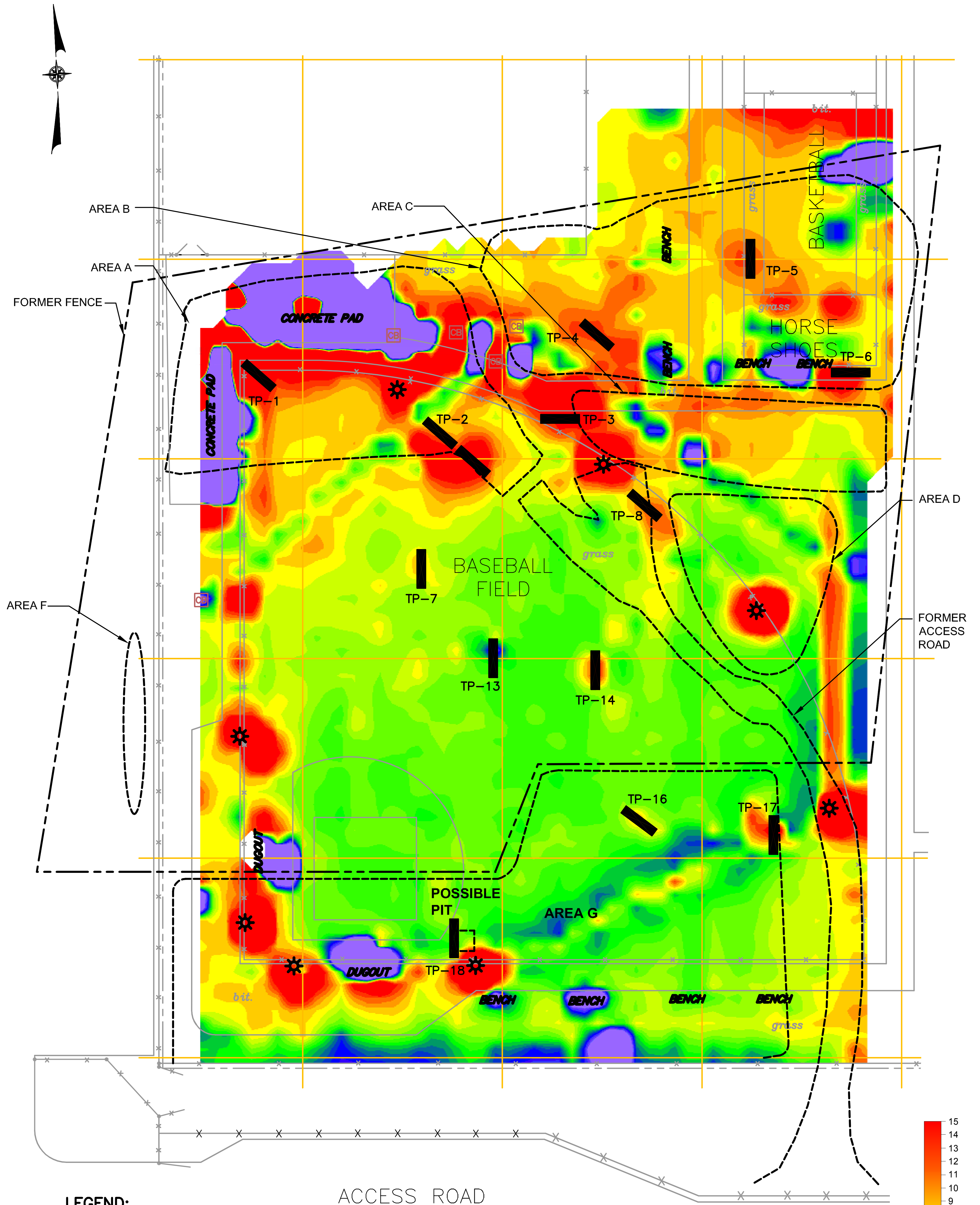
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

REMEDIAL INVESTIGATION PROGRAM - PHASE 2A ADDENDUM NO. 6
PROPOSED TEST PIT LOCATIONS

FIGURE 3-1

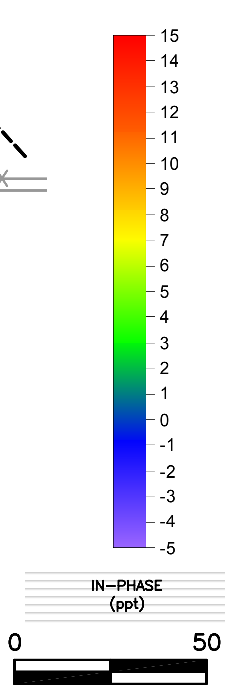


LEGEND:

- HISTORIC FEATURES
- HISTORIC FENCE LINE
- PROPERTY LINE
- FENCE
- TEMPORARY FENCE
- LIGHT POLE
- CATCH BASIN
- PROPOSED TEST PIT LOCATED BASED ON IN-PHASE CONDUCTIVITY RESULTS (INDICATIVE OF BURIED METAL OBJECTS)

NOTES:

1. PARK FEATURES AND STRUCTURES DIGITIZED FROM A MARCH 14, 1974 AERIAL PHOTOGRAPH.
2. THE APPROXIMATE LOCATIONS AND DIMENSIONS OF THE PARK FEATURES AND STRUCTURES HAVE BEEN FIELD VERIFIED.
3. IN-PHASE CONDUCTIVITY COLOR CONTOUR PLOT WAS DERIVED FROM HAGER-RICHTER GEOSCIENCE, INC. REPORT FILE 04SL22.



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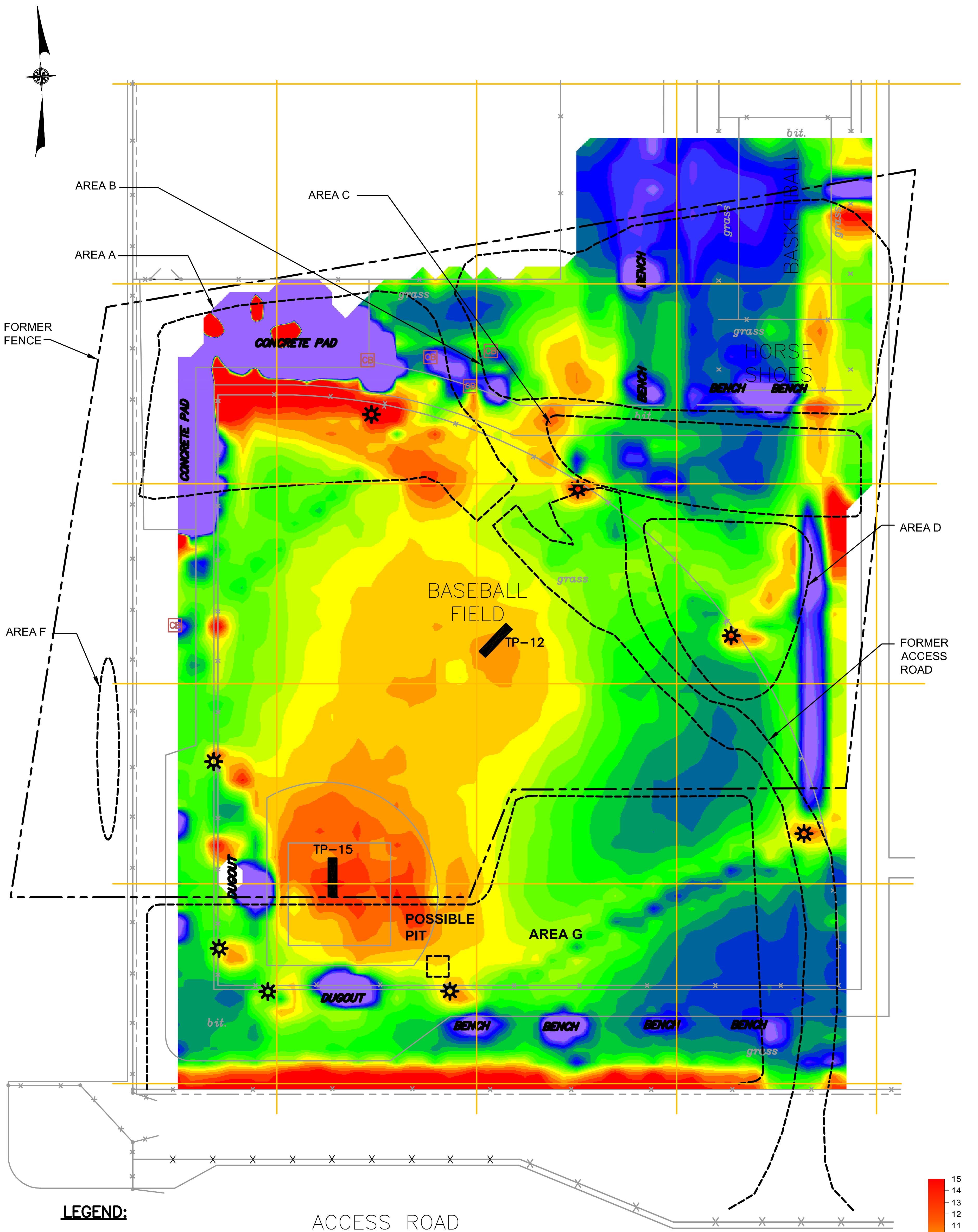
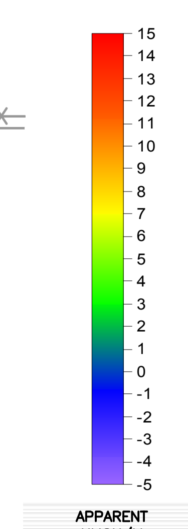
BETHPAGE, NEW YORK

REMEDIAL INVESTIGATION PROGRAM - PHASE 2A ADDENDUM NO. 6
PROPOSED TEST PIT LOCATIONS BASED ON IN-PHASE CONDUCTIVITY RESULTS

FIGURE No. 3-2





LEGEND:

- HISTORIC FEATURES
- HISTORIC FENCE LINE
- PROPERTY LINE
- FENCE
- TEMPORARY FENCE
- LIGHT POLE
- CB CATCH BASIN
- PROPOSED TEST PIT LOCATED BASED ON APPARENT CONDUCTIVITY AND GROUND PENETRATING RADAR RESULTS (INDICATIVE OF FORMATION DIFFERENCES SHALLOWER THAN APPROXIMATELY 20 FEET BELOW GRADE)

NOTES:

1. PARK FEATURES AND STRUCTURES DIGITIZED FROM A MARCH 14, 1974 AERIAL PHOTOGRAPH.
2. THE APPROXIMATE LOCATIONS AND DIMENSIONS OF THE PARK FEATURES AND STRUCTURES HAVE BEEN FIELD VERIFIED.
3. APPARENT CONDUCTIVITY COLOR CONTOUR PLOT WAS DERIVED FROM HAGER-RICHTER GEOSCIENCE, INC. REPORT FILE 04SL22.

0 50
SCALE IN FEET

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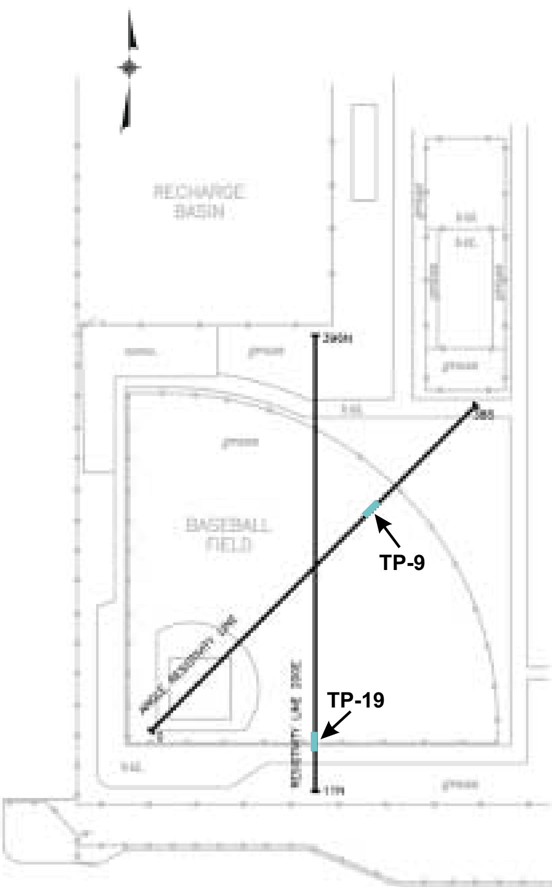
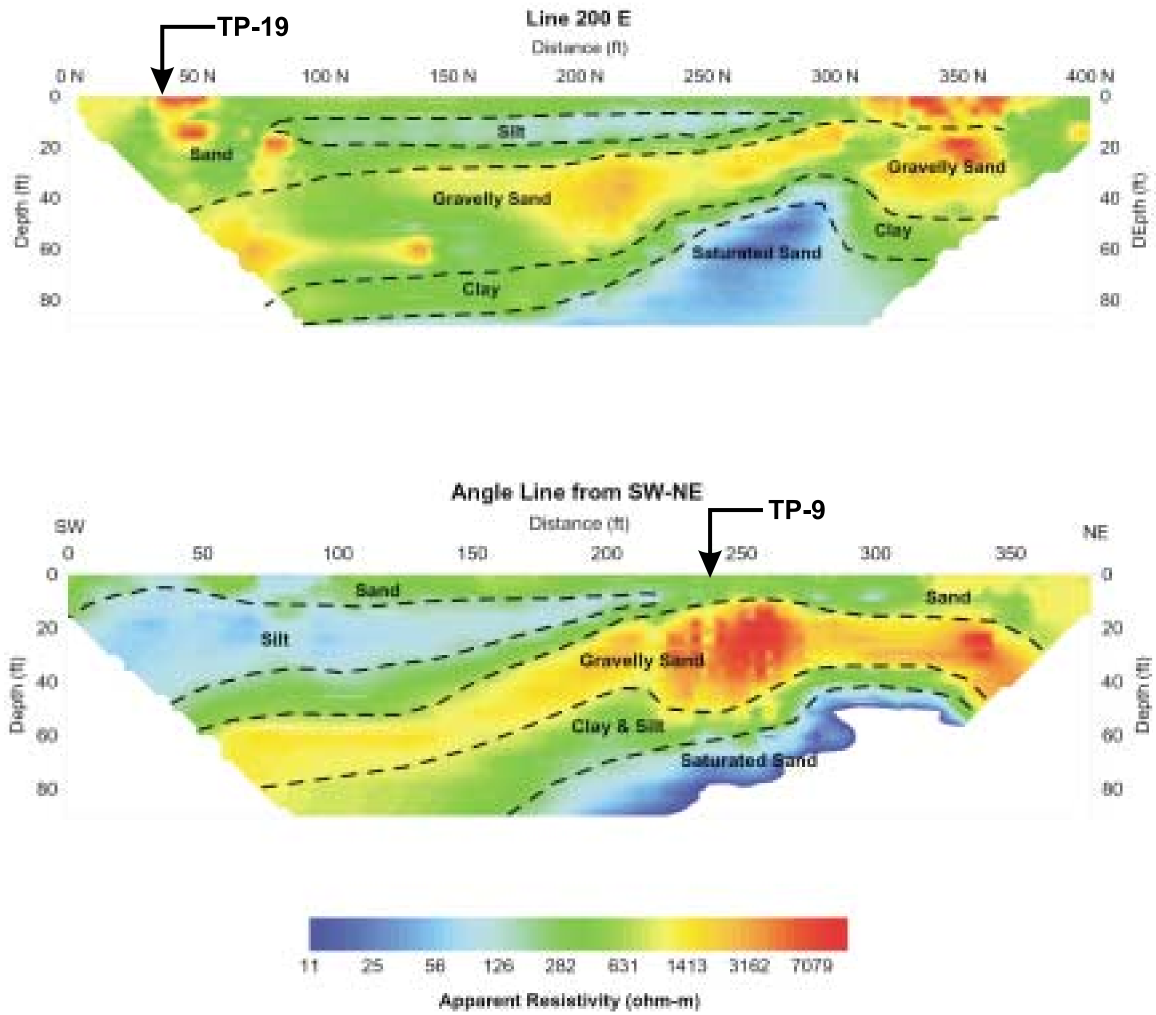
REMEDIAL INVESTIGATION PROGRAM - PHASE 2A ADDENDUM NO. 6
PROPOSED TEST PIT LOCATIONS BASED ON APPARENT CONDUCTIVITY RESULTS

FIGURE No. 3-3



Legend

- Proposed Test Pit Located Based on Apparent Resistivity Results (Indicative of Formation Differences)



Note:

1. Apparent resistivity color contour plots were derived from Hager-Richter Geoscience, Inc. report file 04SL22. Soil type classification presented on the plots was determined by Hager-Richter Geoscience, Inc. Soil type classification needs to be field verified.

RJM/IMAGES/1965-Bethpage Park(11/29/06)

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BETHPAGE, NEW YORK

REMEDIAL INVESTIGATION PROGRAM - PHASE 2A ADDENDUM NO. 6
PROPOSED TEST PIT LOCATIONS BASED ON APPARENT RESISTIVITY RESULTS

FIGURE No. 3-4

The specific locations and rationale for each test pit location are presented in Table 3-1. Test pits may be extended horizontally, utilizing the backhoe to construct an orthogonal transect approximately one backhoe bucket in width along the general line of excavation,

based on the field observations in order to delineate the areal extent of encountered features. The procedures utilized for test pit excavation are presented in Section 4.0 of this plan. However, the general investigation approach of the test pit program is presented below.

Each test pit will be located in the field relative to the geophysical survey grid and fixed site features, and marked with a stake designated with the test pit number. The test pit will be excavated with the intent of identifying the source of the geophysical anomaly up to a depth of approximately 10 feet below grade, under the direction of a D&B geologist. The backhoe used to conduct the test pits will have the ability to excavate to a depth of approximately 18 feet below grade. Test pits may continue based on field observations in order to encounter native material and/or determine the extent of low permeability zones or fill materials. Test pit excavation will cease at any point that field personnel determine that the test pit is unsafe, as described in Section 4.0 of this Work Plan Addendum.

Excavated material will be examined and logged for geologic character and indications of potential impact such as staining, anthropogenic materials, odor, etc., and screened for volatile organic vapors with a photoionization detector (PID). Based on the field observations and the vapor screening results, samples of potentially impacted materials, as well as samples from beneath any potentially impacted zones, will be collected for laboratory analysis. If impacts are observed in more than one zone, additional samples may be collected for analysis. For the purposes of this Work Plan Addendum, a minimum of one sample will be collected from the bottom of each test pit if the field observations (e.g., odors, PID readings, visual observations, anomalies, etc.) do not indicate any potentially impacted soil.

The soil samples collected during the test pit program will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals and hexavalent chromium.

Table 3-1

PHASE 2A REMEDIAL INVESTIGATION WORK PLAN ADDENDUM NO. 6
PROPOSED TEST PIT PROGRAM SUMMARY

Location	Proposed Test Pit	Rationale	Proposed Soil Sample Analyses
Area A	TP-1 and TP-2	Located at areas of in-phase conductivity anomalies.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Southern Area between Area A and Area C	TP-3	Located at area of in-phase conductivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Area B	TP-4, TP-5 and TP-6	Located at areas of in-phase conductivity anomalies.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Northwest of Area D	TP-8	Located at area of in-phase conductivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
West of Area D	TP-9	Located at area indicated by resistivity “angle line” section.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Area of Previously Identified Sludge-like Material	TP-10	Determine extent of “bluish sludge-like material” identified in soil boring VPB-9.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Area D	TP-11	Investigate potential materials apparent at depths of approximately 10 feet below grade in B-11 and 15 feet below grade in VPB-27.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Baseball Field Outfield	TP-7, TP-13, TP-14, TP-16 and TP-17	Located at areas of in-phase conductivity anomalies.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
	TP- 12	Located at area of apparent conductivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium

Table 3-1 (continued)

PHASE 2A REMEDIAL INVESTIGATION WORK PLAN ADDENDUM NO. 6
PROPOSED TEST PIT PROGRAM SUMMARY

Location	Proposed Test Pit	Rationale	Proposed Soil Sample Analyses
Baseball Field Infield	TP-15	Located at area of apparent conductivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
Area G	TP-18	Investigate area of apparent conductivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium
	TP-19	Located at area of resistivity anomaly.	VOCs, SVOCs, PCBs, TAL metals and hexavalent chromium

Abbreviations:

PCBs: Polychlorinated biphenyls
SVOCs: Semivolatile organic compounds
TAL: Target Analyte List
VOCs: Volatile organic compounds

The laboratory turnaround time for the test pit samples will be an accelerated time period of 1 week. These results will be evaluated to determine if further investigation and sampling of adjacent and/or deeper underlying materials is warranted.

The proposed test pit locations, identification, rationale and sample parameters are presented in Table 3-1. In summary, the nineteen test pits were located as follows:

- Twelve test pits are located in areas within the park where in-phase conductivity anomalies are present (test pits TP-1, TP-2, TP-3, TP-4, TP-5, TP-6, TP-7, TP-8, TP-13, TP-14, TP-16 and TP-17).

- Two test pits are located in areas within the park where conductivity anomalies were identified (test pits TP-12 and TP-15).

- Two test pits are located in areas within the park where resistivity anomalies were identified (test pits TP-9 and TP-19).

- One test pit is located within the park to investigate the extent of the "bluish sludge-like material" previously encountered at a boring located to the north of Area D (test pit TP-10).

- One test pit is located within Area D, based on field observations noted during the previous soil boring program (test pit TP-11).

- One test pit is located within Area G where geophysical anomalies were identified. The geophysical anomalies present in this area may be due to the light pole (test pit TP-18).

Based on the above, Table 3-2 presents a summary of the laboratory analyses proposed to be conducted on the soil samples collected as part of the test pit program.

Table 3-2

PHASE 2A REMEDIAL INVESTIGATION WORK PLAN ADDENDUM NO. 6
SUMMARY OF PROPOSED TEST PIT
ANALYTICAL SAMPLING

Program Element	Location/Depth	Additional Number of Samples*	Laboratory Analysis
Test Pits			
Subsurface Soil Sampling	Subsurface sampling to depth of 10 feet	22	VOCs
		22	SVOCs
		22	PCBs
		22	TAL Metals
		22	Hexavalent Chromium

**Represents the approximate number of samples.*

Abbreviations:

PCBs: Polychlorinated biphenyls
VOCs: Volatile organic compounds
SVOCs: Semivolatile organic compounds
TAL: Target Analyte List

4.0 METHODS OF INVESTIGATION

This section of the Phase 2A Work Plan Addendum No. 6 presents the methods of investigation to be utilized during the test pit program. The sampling methodology and analytical methods to be utilized will be consistent with those presented in the RI/FS Work Plan Quality Assurance Project Plan (QAPP). In addition, the logistical procedures outlined in the Phase 2 RI Site Operations Plan will be followed. It is important to reemphasize that the test pit program was developed to further investigate soil within the park; the program was not developed or intended as remediation or for the removal of any material.

Each test pit will be excavated utilizing a rubber-tired backhoe, with oversight by a geologist experienced in conducting similar programs. The overriding operating element of the test pit program will be to excavate the test pits in a safe manner. The following safety related procedures will be followed for each test pit:

- The area of the test pit will be restricted to authorized personnel (backhoe operator, geologist and support personnel) and identified by safety cones and caution tape. All of the proposed test pits are located within an area of the park that is already fenced off from the public.
- The backhoe will be properly positioned and balanced using its stabilizers prior to initiating any excavation.
- Each test pit will be excavated from the rear of the backhoe working the excavation toward the backhoe.
- Support equipment will not be staged and field personnel will not work adjacent to the test pit.
- Field personnel will not enter the area lateral to each test pit closer than its depth when the pit is less than 10 feet. The geologist may approach this line to visually observe the test pit or take photographs.
- Field personnel will not enter any test pit at any time.
- The Community Air Monitoring Program will be implemented during all test pit excavation activities. If dust becomes problematic, the test pit will be abandoned or the material will be wet with water, at the discretion of the field geologist.

- A combustible gas meter will be utilized during the test pitting activities to ensure safe excavation.

The following presents some general logistical procedures associated with excavating the test pits:

- Each test pit is initially planned to be excavated to the depth of each geophysical anomaly and, if possible, to native material. The depth of each test pit excavation will cease at approximately 10 feet below grade unless significant findings are observed and the field personnel determine that further excavation can continue in a safe manner. If, at any point, at any depth, the excavation is deemed unsafe, the test pit will immediately be backfilled.

- The dimensions of each test pit will generally be a few "bucket widths" wide (4 to 5 feet) and approximately 15 to 20 feet long, but will vary depending on the material encountered and the overall depth of test pit (e.g., sloping or benching).

- The dimensions of possible transects to a test pit constructed to determine the areal extent of any encountered feature will be approximately one backhoe bucket in width and as long as necessary to determine its lateral dimensions.

- Excavated material removed from each test pit will be staged on polyethylene sheeting adjacent to the test pit.

- Excavated material will be logged by a geologist using the Unified Soils Classification System and screened using a PID. Material encountered during each test pit will be appropriately examined and characterized by depth and location.

- The excavated material will be returned to the excavation in the reverse order of removal (i.e., last out, first in).

- When backfilled, the test pit will be compacted using the backhoe bucket, unless it is determined that the backhoe compaction may create a risk to a subsurface anomaly.

- The bucket will be steam cleaned prior to initial use on-site, between test pit locations and prior to removal from the site.

Additional logistical procedures to be conducted include the following:

- The top foot of soil/material removed from each test pit will be staged separately adjacent to the excavation on polyethylene sheeting. Subsequently, the underlying material will be excavated and placed on the other side of the test pit on polyethylene sheeting a minimum distance of 10 feet from the pit.

- A Test Pit Log Form will be completed for each test pit. A sample Test Pit Log Form is provided in Appendix B.
- Soil samples will be collected from the backhoe bucket immediately following retrieval utilizing a disposable polyethylene scoop or sterile tongue depressor.
- Once each test pit is completed, the center will be staked in the field and labeled denoting its identification and orientation. The location, if not included on an existing location map, will be measured to the existing grid or a fixed site feature, and plotted on the map. The test pit will be further surveyed as described in this section.

Air quality monitoring will be conducted continuously within the working area and downwind area for volatile organic vapor and dust concentrations. If the air monitoring results do not exceed action levels when non-native materials are encountered, solid materials will be characterized and delineated to the maximum extent feasible without endangering worker or the public's health. Once these activities are completed, the material will be returned to the test pit. Waste, with the exception of spent personal protective equipment and sampling equipment, will not be generated for off-site disposal during excavation of the test pits. Test pits conducted at areas of in-phase conductivity anomalies will be excavated to specifically search for metal objects. If significant metal is encountered and believed to be the cause of the anomaly, the material will be returned to the test pit if removed and safe to do so, the excavation terminated, and the test pit completed following the established procedures provided in this plan.

If at any time during test pit excavation, air monitoring data indicate readings above action levels, the excavation activities will be halted and care will be taken to cover the materials, as soon as possible, in a safe manner consistent with health and safety procedures as provided in the project health and safety plan. Less intrusive investigation activities (such as borings or installation of piezometers) may subsequently be used to characterize the nature and extent of the material, and/or additional test pits may be excavated to investigate the horizontal extent of the material.

In the event that drums, free liquids or perched water are encountered, the excavation activities will cease. If the air monitoring results indicate that air quality in the vicinity of or downwind of the test pit are above action levels, the excavation will immediately be backfilled with the excavated material. If the air monitoring results indicate that air quality in the vicinity of and downwind of the test pit are below action levels, excavation may continue in an attempt to determine the horizontal extent of the materials. However, since these are unknown materials, excavation through the material will not be performed and sampling of material contained in any intact drum will not be performed. Likewise, any intact drum that may be discovered will not be removed from the excavation. To the maximum extent possible, any intact drum will not be disturbed. Since these are unknown materials, the appropriate health and safety procedures to safeguard human health and the environment cannot be properly evaluated and implemented at this time. If possible, a sample of any free liquid or soil adjacent to the liquid will be collected for laboratory analysis. The location and extent of this material will be accurately noted in the field book and the material will be covered with the excavated material. Once the field program is complete and all analytical data have been evaluated, the best means of further investigating or removing any unknown materials in accordance with all applicable health and safety procedures will be developed.

It should be noted that the general approach for excavating the test pits is designed to minimize upsetting any potentially buried materials encountered. Soil will be slowly scraped from the excavation toward the backhoe and placed on polyethylene sheeting. The backhoe bucket will be toothless to avoid potentially puncturing or rupturing any container. As a result, if containers are uncovered during the excavation, this approach should minimize any potential damage to the container. Therefore, it is not expected that any liquids or other materials present in any potentially buried containers will be spilled or otherwise released to surrounding area during the test pitting activities. In the unlikely event that an intact drum is uncovered and its integrity compromised during the test pit program, the procedures outlined in the container release contingency plan provided as Appendix C will be followed.

Following completion of the test pit program, the test pit locations and extents will be surveyed by a licensed New York State surveyor.

APPENDIX A

GEOPHYSICAL SURVEY REPORT

HAGER-RICHTER
GEOSCIENCE, INC.

GEOPHYSICAL SURVEY
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

Prepared for:

Dvirka and Bartilucci
330 Crossways Park Drive
Woodbury, New York 11797

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 04SL22

0. EXECUTIVE SUMMARY

Hager-Richter Geoscience, Inc. conducted a geophysical survey at Bethpage Community Park located on Stewart Avenue in Bethpage, New York for Dvirka and Bartilucci (D&B) of Woodbury, New York in April, 2006. The geophysical survey was performed in support of a environmental investigation of the Site being conducted by D&B.

The Site is a partially active 18-acre community park. The area of interest for the geophysical survey is an approximately 400 ft by 500 ft area which includes a baseball field, a portion of a basketball court, and a horseshoe pit. Prior to its development as a community park, the Site was used by its former owner, Grumman Aerospace (now Northrup Grumman), for sludge-drying areas and wastewater lagoons.

According to information provided by D&B, some of the soils at the base of the lagoons have elevated levels of Chromium^{+3}. Soils at the site are also contaminated with PCBs, metals, and local pockets of VOCs and SVOCs. The native soils reportedly consist of well sorted medium sands. Fill materials reportedly vary in composition from poorly sorted silty fine to medium sand with sporadic pieces of wood, plastic, and brick fragments.

The objective of the geophysical survey was: (1) to detect buried drums, potential sludge pockets, and buried lagoons within the accessible portions of the area of interest, and if detected, to locate each, and (2) to determine the depth of a clay layer within the accessible portions of the area of interest.

Hager-Richter performed the field operations on site on April 24 - 27, 2006. The geophysical survey consisted of electromagnetic induction (EM), 2D resistivity profiling, and ground penetrating radar (GPR).

Based on the results of the geophysical survey conducted at the Bethpage Community Park Site located on Stewart Avenue in Bethpage, New York for Dvirka & Bartilucci , we conclude:

- In the areas investigated by the geophysical survey, one area of possible buried metal and five isolated possible buried metal objects were detected.

- A large high amplitude apparent conductivity anomaly indicating the presence of conductive soil was detected in the infield and left center field portions of the ball field.

- Four widespread filled areas were identified. These areas are consistent with the locations of sludge pits mapped by others from aerial photographs.

TABLE OF CONTENTS

1. INTRODUCTION

Hager-Richter Geoscience, Inc. conducted a geophysical survey at Bethpage Community Park located on Stewart Avenue in Bethpage, New York for Dvirka and Bartilucci (D&B) of Woodbury, New York in April, 2006. The geophysical survey was performed in support of a environmental investigation of the Site being conducted by D&B.

The Site is a partially active 18-acre community park that includes a swimming pool, an ice skating rink, a baseball field, tennis courts, basketball courts, playgrounds, picnic areas, and a parking lot. Figure 1 show the general location of the Site. The area of interest for the geophysical survey is an approximately 400 ft by 500 ft area which includes the baseball field, a portion of the basketball courts, and a horseshoe pit. Prior to its development as a community park, the Site was used by its former owner, Grumman Aerospace (now Northrup Grumman), for sludge-drying areas and wastewater lagoons. Depths of the former lagoons reportedly range from approximately 10 ft to 25 ft below grade.

According to information provided by D&B, some of the soils at the base of the lagoons have elevated levels of Chromium^{+3}. Soils at the site are also contaminated with PCBs, metals, and local pockets of VOCs and SVOCs. The native soils reportedly consist of well sorted medium sands. Fill materials reportedly vary in composition from poorly sorted silty fine to medium sand with sporadic pieces of wood, plastic, and brick fragments.

As part of an ongoing environmental study of the Site, D&B was interested in obtaining information about subsurface conditions, specifically the locations of the former lagoons, the locations of areas of buried metal, and if possible, the depth and continuity of a clay layer at a depth of 40-50 feet.

The objective of the geophysical survey was: (1) to detect buried drums, potential sludge pockets, and buried lagoons within the accessible portions of the area of interest, and if detected, to locate each, and (2) to determine the depth of a clay layer within the accessible portions of the area of interest.

The geophysical survey consisted of frequency domain electromagnetic induction terrain conductivity (EM) survey to detect areas of varying apparent conductivity and to locate areas of buried metal, a 2D resistivity profiling survey to determine subsurface stratigraphy including the depth and continuity of a clay layer at a depth of 40-50 feet, and a ground penetrating radar survey to determine the lateral extent of the former lagoons.

The EM survey was conducted across the accessible portions of the area of interest. The resistivity survey consisted of five profiles totaling approximately 1,900 feet. The GPR survey consisted of 63 traverses totaling about 24,500 feet. Plate 1 is a Site Plan showing the area of interest, the locations of the resistivity lines, and the locations of the GPR traverses.

Hager-Richter performed the field operations on April 24 - 27, 2006. Jeffrey Reid, P.G., Jonathan Gillan, and Michael Ryan conducted the geophysical survey. The project was coordinated with Mr. Al Jaroszewski of D&B. Mr. Jaroszewski specified the area of interest at the Site and was present for most of the field work. Data analysis and interpretation were performed at the Hager-Richter offices. Preliminary results of the geophysical survey were provided to D&B on May 9, 2006. Original data and field notes will be retained in the Hager-Richter files for a minimum of three years.

2. METHODS AND PROCEDURES

2.1 General

The geophysical survey at the Bethpage Community Park Site consisted of frequency domain electromagnetic induction terrain conductivity (EM), 2D resistivity profiling, and ground penetrating radar. The area of interest for the survey was specified by D&B. A survey grid was established and staked by Hager-Richter personnel. The survey grid origin is located at the fence corner located in the southwest corner of the area of interest and the grid was tied to permanent site features such the fences.

2.2 EM

2.2.1 General. The general equipment and procedures for EM surveys as conducted by Hager-Richter are described below. Details specific to this site are given in section 2.2.3.

The EM survey was conducted using a Geonics EM31 terrain conductivity meter in the vertical dipole mode. In this configuration, the nominal depth of earth sampled by the EM31 is about 18 feet. The EM31 is an induction type instrument and provides measurement of both the quadrature-phase and in-phase components of terrain conductivity without ground electrodes or contact. The data for both components are recorded on a digital data logger. The EM31 is calibrated to read ground conductivity directly in millimhos (mmho) per meter (m) with a resolution of 2% of full scale and an accuracy of 1 mmho/m.

2.2.2 Limitations of the Method. All electromagnetic geophysical methods, including the EM method proposed here, are affected by the presence of power lines and surface metal objects (steel sided buildings, dumpsters, vehicles, railroad tracks, reinforced concrete, etc.). Where such are present, the effects of materials in the subsurface may be masked, and firm conclusions about subsurface conditions cannot be made.

Detection and identification should be clearly defined. Detection is the recognition of the presence of a metal object, and the electromagnetic method is excellent for such purposes. Identification, on the other hand, is determination of the nature of the causative body (i.e., what is the body -- a cache of drums, UST, automobile, white goods, etc.?). Although the EM data cannot be used to *identify* all buried metal objects, they provide excellent guides to the identification of some objects. For example, buried metal utilities produce anomalies with lengths many times their widths.

2.2.3 Site Specific. The EM survey was conducted across the accessible portions of the specified area of interest. The EM data were acquired at approximately 1-foot intervals along a series of N-S oriented parallel lines spaced 10 feet apart. The 12-foot boom of the instrument was oriented perpendicular to the lines of traverse where possible to provide overlapping coverage.

2.3 2D Resistivity Profiling

2.3.1 General. The general equipment and procedures for 2D resistivity profiling surveys as conducted by Hager-Richter are described below. Details specific to this site are given in section 2.3.3.

We used an AGI Super Sting R8 earth resistivity instrument with an automatic multi-electrode system for electrical imaging surveys produced by Advanced Geosciences, Inc. (AGI). The Sting R8 is a weatherproof instrument that records data digitally and is powered by a clip-on battery. The stored data are transferred to the hard disk of a laptop computer at the end of each field day for subsequent processing.

Electrical imaging incorporates both vertical electrical sounding and lateral profiling to produce a data set suitable to create a two-dimensional resistivity model. Modern digital technology has improved the resistivity technique significantly by providing the capability (1) to acquire many redundant data in a short time, and (2) to invert the data in a reasonable time to obtain resistivity as a function of depth and horizontal distance. The Super Sting allows automatic measurement of any type of array, i.e. any combination of current and voltage electrode connections can be controlled by the Super Sting system. Twenty-eight or multiples of 28 electrodes (with a maximum of 254 electrodes) are used with the Super Sting system.

The electrodes are "smart electrodes," a term meaning that they are addressable. The electronics component of the system contains a small computer that is programmable to select the various electrode sets (2 current and 2 potential), which command the system to inject current for a specified time and record the data in digital format. After acquisition of the raw data, the data are transferred to a PC and are inverted using commercial software (AGI EarthImager 2D) that produces the best model of the subsurface distribution of electrical resistivity.

Inversions are carried out with AGI EarthImager 2D, commercially available software, to create two-dimensional resistivity models. Apparent resistivity values are calculated with a forward modeling subroutine, and a smoothness-constrained least-squares optimization routine is used to invert the data. Both finite-difference and finite-element forward modeling techniques are available in the software.

There are many ways to display the results of the resistivity inversions, and the choice depends on what needs to be emphasized for a particular project. The display options for the data are either resistivity, conductivity or both resistivity and conductivity (resistivity is the reciprocal of conductivity). The choice of scales affects the appearance of the plots, and further emphasizes particular parts of the results, and the choice is most commonly between linear and logarithmic scales, although many others could be made. Furthermore, an image can be made to highlight either local detail or regional information.

2.3.2 Limitations of the Method. As with any of the electrical geophysical methods, resistivity data are subject to certain limitations, including site surface and subsurface conditions and structures, electrical and "geological" noise, and target depth and size. Interference from such cultural features as buildings, fencing, and underground and overhead power lines is common at many sites, particularly at active industrial sites. Thus, for certain applications, the use of the resistivity method in urban settings might be inappropriate.

The subsurface is three dimensional in character, and although the resistivity data are acquired along a line, the data are affected by resistivity changes off-line. Therefore, unless there are parallel survey lines that are spaced appropriately, resistivity changes off-line may be interpreted as changes below the survey line where the data are acquired. This limitation is particularly significant for single survey lines. A further limitation of the resistivity method arises from lack of data at the edges of a survey line where it becomes more difficult to image the subsurface and anomalies appear shallower than their true depth.

The target depth, size, and of course, resistivity contrast may pose limitations. These three parameters, generally characterized as large or small[1], are important in the survey design, and extreme values and some combinations of values can limit the usefulness of the resistivity method. For example: a small target, a granite boulder 2 ft in diameter at a large depth of 20 ft or more, even with very high resistivity contrast, 10^5 Ohm-m in a medium of 0.2 Ohm-m, cannot be detected. A target of reasonable size, a granite boulder 2 ft in diameter at a shallow depth of 6 ft or less, may not be detectable where the resistivity contrast is low, 10^5 Ohm-m in a medium of 10^4 Ohm-m.

2.3.3 Site Specific. The locations of the resistivity survey lines are shown in Plate 1. The resistivity survey lines were located in areas where adequate room was available for the line length required to achieve the required depth of exploration without interference from cultural features such as fences or underground utilities. We used a dipole-dipole array with 56 electrodes and an electrode spacing of 7 ft. The electrode spacing was chosen to maximize the area available for the resistivity lines. The Super Sting R8 system was set to acquire data until the standard deviation of the apparent resistivity was no larger than 2.0% or until 5 cycles had been acquired, whichever was reached first.

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[1] The parameters depth and size scale to the electrode spacing. A "large depth" is any depth greater than 10 times the electrode spacing. A "small depth" is any depth less than 3 times the electrode spacing. Depths less than 10 but greater than 3 times the electrode spacing are termed "intermediate depths." A "large size" is any size greater than 2½ times the electrode spacing. A "small size" is any size less than 1 times the electrode spacing. Sizes less than 2½ but greater than 1 times the electrode spacing are termed "intermediate sizes." Resistivity contrast refers to the ratio of the resistivity of one material to that of the second material. A large resistivity contrast is any such ratio of at least 100. A small resistivity contrast is any such ratio no greater than 0.5. Ratios less than 100 but greater than 0.5 are termed "intermediate ratios."

The data were processed in the office using AGI EarthImager 2D to produce resistivity models. The output of was a two dimensional plot of resistivity as a function of distance along the array and depth.

2.4 GPR

2.4.1 General. The general equipment and procedures for GPR surveys as conducted by Hager-Richter are described below. Details specific to this site are given in section 2.4.3.

The GPR survey was conducted using a Sensors and Software Noggin Plus digital GPR system. The system includes a survey wheel to trigger recording of the data at equal intervals. The transmit/receive antenna is housed in a box that is moved across the surface. The antenna transmits electromagnetic signals into the subsurface and then detects, amplifies, and displays reflections of the signals in real-time on the monitor and stores the data in digital form. The result is a digital radar record of the subsurface.

The maximum depth of penetration of the GPR signal and the resolution of the reflections are controlled in part by the frequency of the antenna used and in part by the electrical properties of the subsurface. Hager-Richter owns antennas with the following center frequencies: 120 MHz, 250 MHz, 300 MHz, 500 MHz, and 1000 MHz. The total time during which radar signals are recorded can be varied from a few to 1,000 nanoseconds (ns). However, there is a trade-off between total time, corresponding to depth range, and resolution. As the total time of recording is increased, the resolution of the GPR records decreases. For a given site, the total time window is set to detect features located somewhat below the maximum expected target depth.

The horizontal axis of a GPR record represents distance across the surface and the vertical axis represents round-trip travel time of the radar signal. For those sites where the subsurface is electrically heterogeneous, the travel times of the radar signal may be different in the various materials, and the vertical scale for the radar records is not necessarily uniform with depth.

The reflections in a GPR record are produced by spatial changes in the physical properties (e.g., type of material, subsurface fluids, porosity, etc.) and related changes in the electrical properties (dielectric constant) of the subsurface materials in the path of the signals. The greater the difference in electrical properties between two materials in the subsurface, the stronger the reflection observed in the GPR record.

The size, shape, and amplitude of the GPR reflections are the characteristics that are considered in the interpretation of the data from any site. Because the electrical properties of metal objects, utilities, and conduits differ significantly from those of the soils in which they are buried, such objects produce GPR reflections with high amplitude and distinctive shapes that permit identification with a high degree of reliability. Most other objects, although readily detectable, require "ground truth" for identification. Only excavations provide positive identification for most objects detected in GPR surveys.

2.4.2 Limitations of the Method. The maximum depth to which GPR signals can penetrate depends on the electrical properties of the subsurface materials. The higher the electrical conductivity of the subsurface materials, the lower the radar signal penetration. Clay minerals and/or brackish water in the subsurface, for example, attenuate the GPR signal, so reflections are not received from materials at greater depths.

There are limitations of the GPR technique as used to detect and/or locate particular targets: (1) surface conditions, (2) electrical conductivity of the ground, (3) contrast of the electrical conductivities of the targets and the ground, and (4) spacing between lines. Of these limitations, only the fourth, line spacing, is controlled by the operator.

The condition of the ground surface can affect the quality of the GPR data and the depth of penetration of the GPR signal. Sites covered with high grass, bushes, landscape structures, debris, obstacles, soil mounds, etc. limit the survey access and the coupling of the GPR antenna with the ground. In many cases, the GPR signal will not penetrate below concrete pavement, and a target may not be detectable.

The electrical conductivity of the ground determines the attenuation of the GPR signals, and thereby limits the maximum depth of exploration. The GPR signal does not penetrate clay-rich soils, and targets buried in clay can be missed.

A contrast in the electrical conductivities of the ground and the target is required to obtain a reflection of the GPR signal. If the contrast is too small, possibly due to extremely corroded conditions of a metal target, then the reflection may be too weak to recognize, and the target can be missed.

The spacing between lines is under control of the GPR operator, and the design of the survey is based on the dimensions of the smallest target of interest. Targets with dimensions smaller than the spacing between GPR survey lines can be missed.

Interpretation of GPR data is subjective. As noted above, "ground truth" through correlation with borings and excavations is required for positive identification of most objects detected on the basis of GPR data.

2.4.3 Site Specific. GPR data were acquired along two sets of orthogonal traverses spaced 10-feet apart in the north-south direction and 20-feet apart in the east-west direction in the accessible portions of the area of interest. The locations of the GPR traverses are shown in Plate 1. GPR traverses were oriented along the local geophysical survey grid. GPR data were acquired with a 250 MHz antenna and a 150 nsec time window. GPR signal penetration was generally good at the site with the exception of the baseball infield area where the GPR signal penetration was limited. Based on handbook values of time-to-depth conversions for the GPR signal in average soils, the GPR signal penetration is estimated to have varied from approximately 2 feet in the infield area to 15-20 feet for the rest of the Site.

3. RESULTS AND DISCUSSION

3.1 General

The geophysical survey at the Bethpage Community Park Site consisted of EM, 2D resistivity profiling, and GPR. The area of interest for the survey was specified by D&B. The surveys were conducted across the accessible portions of the specified area of interest. Plate 1 is a Site Plan showing the area of interest. Plates 2 & 3 show the results of the EM survey. Figures 2-4 show the results of the 2D resistivity profiling survey. Plate 4 shows the integrated interpretation of the EM and GPR surveys. The locations of subsurface utilities detected by the EM and GPR surveys are not shown on Plate 4. The detection of subsurface utilities was not an objective of the survey. The interpretation shown relates solely to the objectives of this survey.

3.2 EM Survey

The EM data are presented as color contour plots of the apparent conductivity and in-phase data in Plates 2 and 3, respectively. The results of the EM survey are shown in Plate 4.

Apparent conductivity data are useful for detecting the presence of anomalously conductive ground, which might be caused by the presence of objects with properties unlike those of the natural materials on site, such as fill. The in-phase component data, on the other hand, are *only* used to interpret the presence of metal objects. Where the metal objects are relatively small, the instrument must be located within a few feet of the objects in order to detect them.

Metal objects, whether buried or above ground, produce anomalously high or low apparent conductivity and in-phase component values in EM surveys. Most of the high amplitude EM anomalies evident in Plates 2 and 3 are associated with surface features and known subsurface features such as light poles, fences, concrete pads, structures, and known utilities. The locations of such objects are marked on Plate 4. In such areas, the presence or absence of buried metal cannot be determined on the basis of the EM data, due to the effects of the surface metal. Linear anomalies on Plates 2 and 3 are attributed to subsurface utilities; the detection of which was not an objective of this survey.

Background apparent conductivity values range from 1 to 3 mmho/m and in-phase component values range from 3 to 5 ppt across the entire Site. As can be seen on Plates 2 and 3, most of the area exhibits apparent conductivity and in-phase component values that are generally within the background range.

As can be seen on Plate 2, the apparent conductivity values in the area of interest are elevated in the central portion of the area of interest (on the infield portion of the ballfield extending to the north into the left-center field portion of the ballfield). The locations of elevated apparent conductivity are shown on Plate 4 as purple hatched areas.

As can be seen on Plate 3, in-phase component anomalies are present at the locations of the above ground structures. One area of elevated in-phase component values and several isolated small in-phase anomalies are present outside areas effected by surface features. Such anomalies are shown as green hatched areas and as green x's, respectively, on Plate 4. Note that the areas of anomalous apparent conductivity have no corresponding in-phase anomalies, indicating that there is not a significant amount of buried metal in such areas.

3.3 2D Resistivity Profiling

The locations of the five 2D resistivity profiles are shown in Plate 1. The resistivity profiles are identified as 200E, 285E, 150N, 283N, and Angle. The profiles are named for the grid northing or easting along which they are oriented except for Angle which is oriented SW-NE. The resistivity models of the subsurface obtained with EarthImager 2D with interpreted stratigraphy are shown in Figures 2-4.

Based on information provided by D&B, the stratigraphy at the Site consists of interbedded sands and silts over clay. The depth of the water table is estimated at about 45 to 50 feet. Based on the resistivity models, the sedimentary sequence dips to the southwest. The clay layer of interest at a depth of about 40 to 50 feet appears to be present continuously beneath all of the resistivity lines except for a small section of Line 283 N at about 140 E where the gravelly sand apparently cuts the clay layer. The clay layer appears to dip from a depth of about 40 feet in the northeast corner of the Site to about 80 feet in the southwest corner of the Site. The deepest layer is a lower resistivity, higher conductivity material that is interpreted as a saturated sand. The change in resistivity for this layer is likely due to the composition of the material rather than the saturation level and the interface likely does not represent the water table.

3.4 GPR Survey

GPR data were acquired along two sets of orthogonal traverses with the north-south lines spaced 10-feet apart and the east-west lines spaced 20-feet apart in accessible portions of the area of interest. The locations of the GPR traverses are shown in Plate 1 and the integrated interpretation of the data are shown in Plate 4.

GPR records for the Site exhibit chaotic reflections typical of filled areas at four locations. Such areas are shown as cross hatched areas on Plate 4. These locations are roughly coincident with the locations of former lagoons and disposal areas identified by others on old air photos. GPR reflections typical of buried utilities are also present in the data for the Site. The locations of such utilities are not shown on the figures provided as they have been mapped by others.

3.5 Integrated Interpretation

The integrated interpretation of the geophysical data in terms of the objectives of the survey is given in Plate 4. The Site is generally free of very high amplitude apparent conductivity and in-phase anomalies that may be due to subsurface features such as buried drums. Several linear apparent conductivity and in-phase component anomalies are coincident with GPR reflections and subsurface utility markings made by others and are interpreted as possible utilities. The locations of subsurface utilities are not shown on Plate 4 because the detection of subsurface utilities was not an objective of this survey.

One area of elevated in-phase component values and several isolated small in-phase anomalies are present. We infer that buried metal may be present at such locations. The GPR data for these locations are similar to those for the filled areas.

The large high amplitude apparent conductivity anomaly located in the area of the infield and left-center field portion of the ball field, correlates well with the wedge of low resistivity material interpreted as silt on the 2D resistivity profiles, and has no GPR anomalies associated with it. These areas are shown as purple hatched areas on Plate 4 and are interpreted to be caused by possible conductive soils. Such areas may be related to higher silt and/or clay content in the soils or to electrically conductive fill materials such as sludge.

Four widespread possible filled lagoons were detected on the basis of the GPR data. The fill areas are shown as red crosshatched areas on Plate 4. The apparent conductivity response is generally not elevated at these locations indicating that the either the fill material is not more conductive than the native materials, or the material is more conductive but buried too deeply to be sensed by the EM survey.

4. CONCLUSIONS

Based on the results of the geophysical survey conducted at the Bethpage Community Park Site located on Stewart Avenue in Bethpage, New York for Dvirka & Bartilucci , we conclude:

- In the areas investigated by the geophysical survey, one area of possible buried metal and five isolated possible buried metal objects were detected.

- A large high amplitude apparent conductivity anomaly indicating the presence of conductive soil was detected in the infield and left center field portions of the ball field.

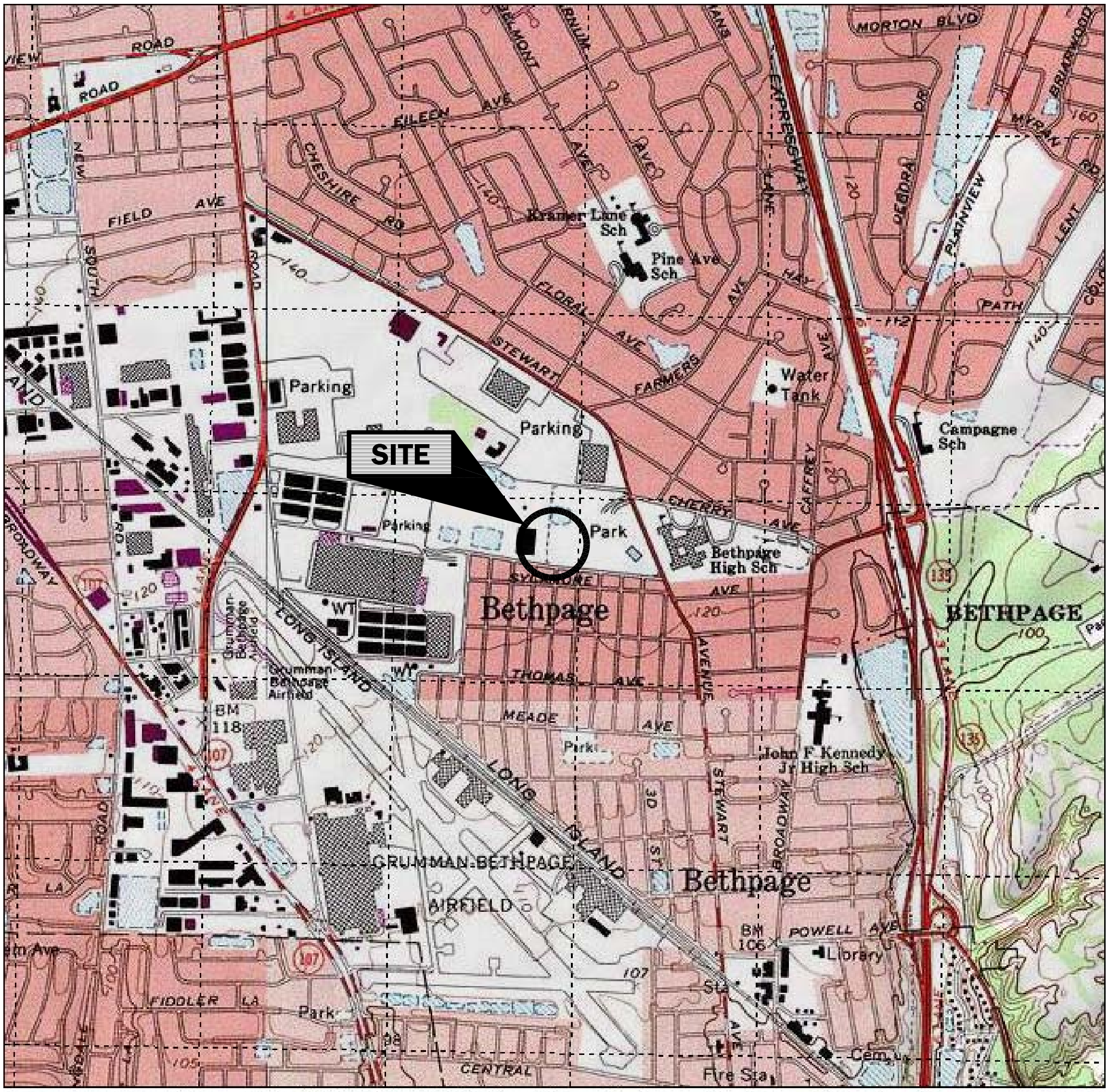
- Four widespread filled areas were identified. These areas are consistent with the locations of sludge pits mapped by others from aerial photographs.

5. LIMITATIONS

This report was prepared for the exclusive use of Dvirka and Bartilucci (Client). No other party shall be entitled to rely on this Report or any information, documents, records, data, interpretations, advice or opinions given to Client by Hager-Richter Geoscience, Inc. (H-R) in the performance of its work. The Report relates solely to the specific project for which H-R has been retained and shall not be used or relied upon by Client or any third party for any variation or extension of this project, any other project or any other purpose without the express written permission of H-R. Any unpermitted use by Client or any third party shall be at Client's or such third party's own risk and without any liability to H-R.

H-R has used reasonable care, skill, competence and judgment in the performance of its services for this project consistent with professional standards for those providing similar services at the same time, in the same locale, and under like circumstances. Unless otherwise stated, the work performed by H-R should be understood to be exploratory and interpretational in character and any results, findings or recommendations contained in this Report or resulting from the work proposed may include decisions which are judgmental in nature and not necessarily based solely on pure science or engineering. It should be noted that our conclusions might be modified if subsurface conditions were better delineated with additional subsurface exploration including, but not limited to, test pits, soil borings with collection of soil and water samples, and laboratory testing.

Except as expressly provided in this limitations section, H-R makes no other representation or warranty of any kind whatsoever, oral or written, expressed or implied; and all implied warranties of merchantability and fitness for a particular purpose, are hereby disclaimed.



Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

LOCATION

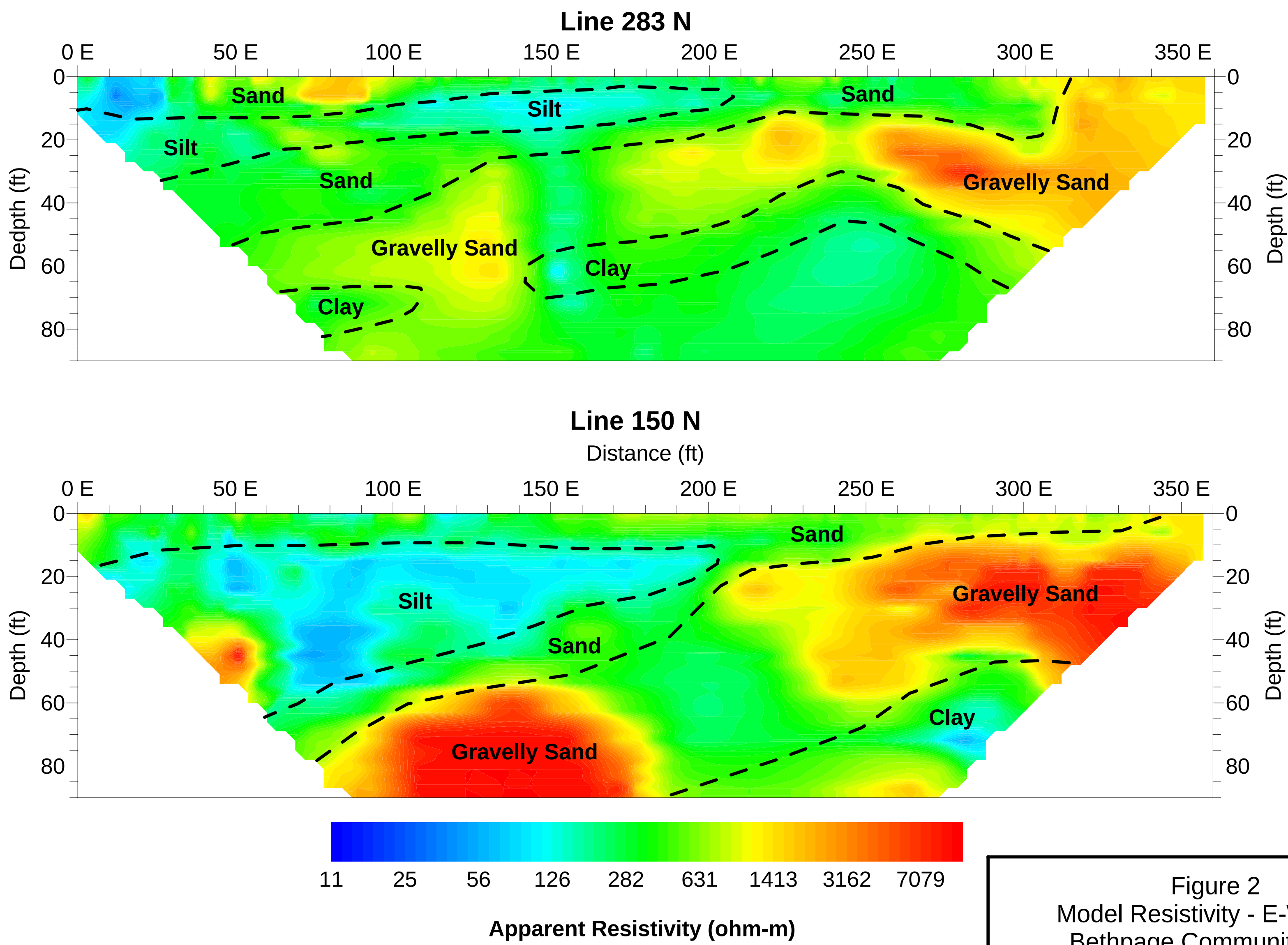
SCALE (feet)

0 2000 4000

Figure 1
General Site Location
Bethpage Community Park
Bethpage, New York

File 04SL22	May, 2006

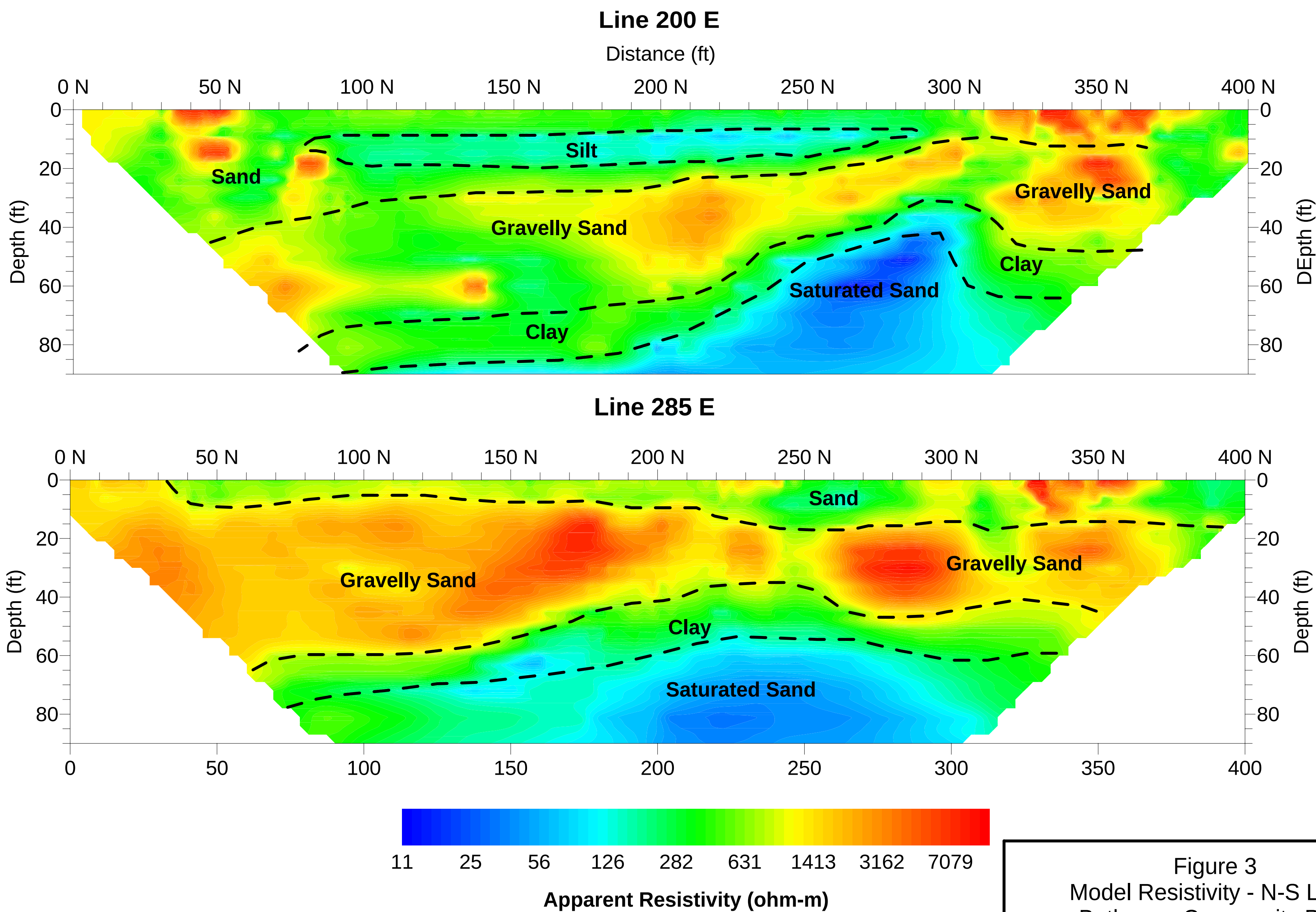
HAGER–RICHTER GEOSCIENCE, INC.
Salem, New Hampshire



Data acquired using an AGI Super Sting R8 with the Dipole-Dipole electrode configuration, 56 electrodes, and a 7-foot electrode spacing.

Data processed and inverted using EarthImager2D Software by AGI.

Figure 2 Model Resistivity - E-W Lines Bethpage Community Park Bethpage, New York	
File 04SL22	May, 2006
HAGER-RICHTER GEOSCIENCE, INC. Salem, New Hampshire	



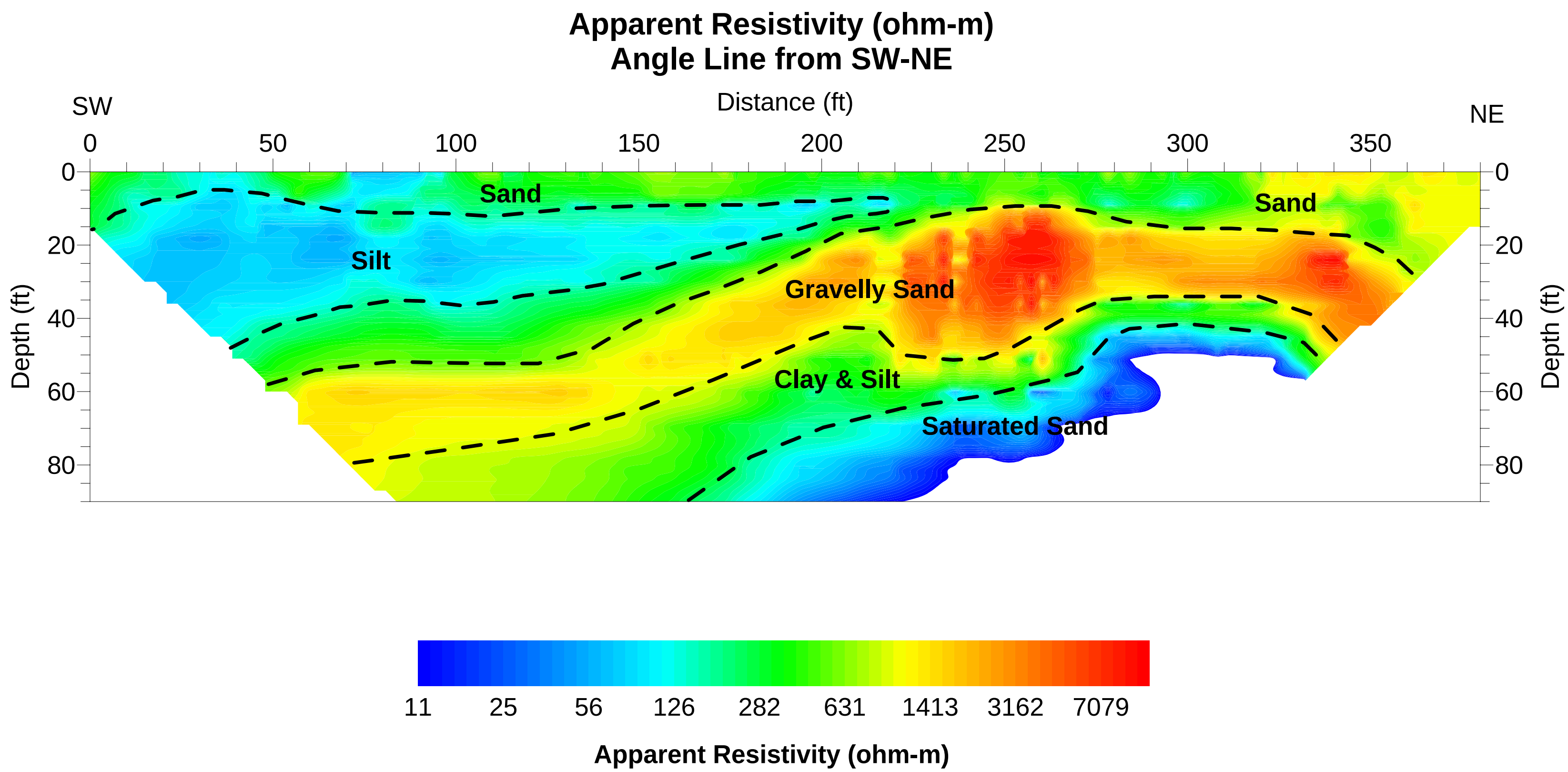
Data acquired using an AGI Super Sting with the Dipole-Dipole electrode configuration, 56 electrodes, and a 7-foot electrode spacing.

Data processed and inverted using EarthImager2D Software by AGI.

Figure 3
Model Resistivity - N-S Lines
Bethpage Community Park
Bethpage, New York

File 04SL22	May, 2006

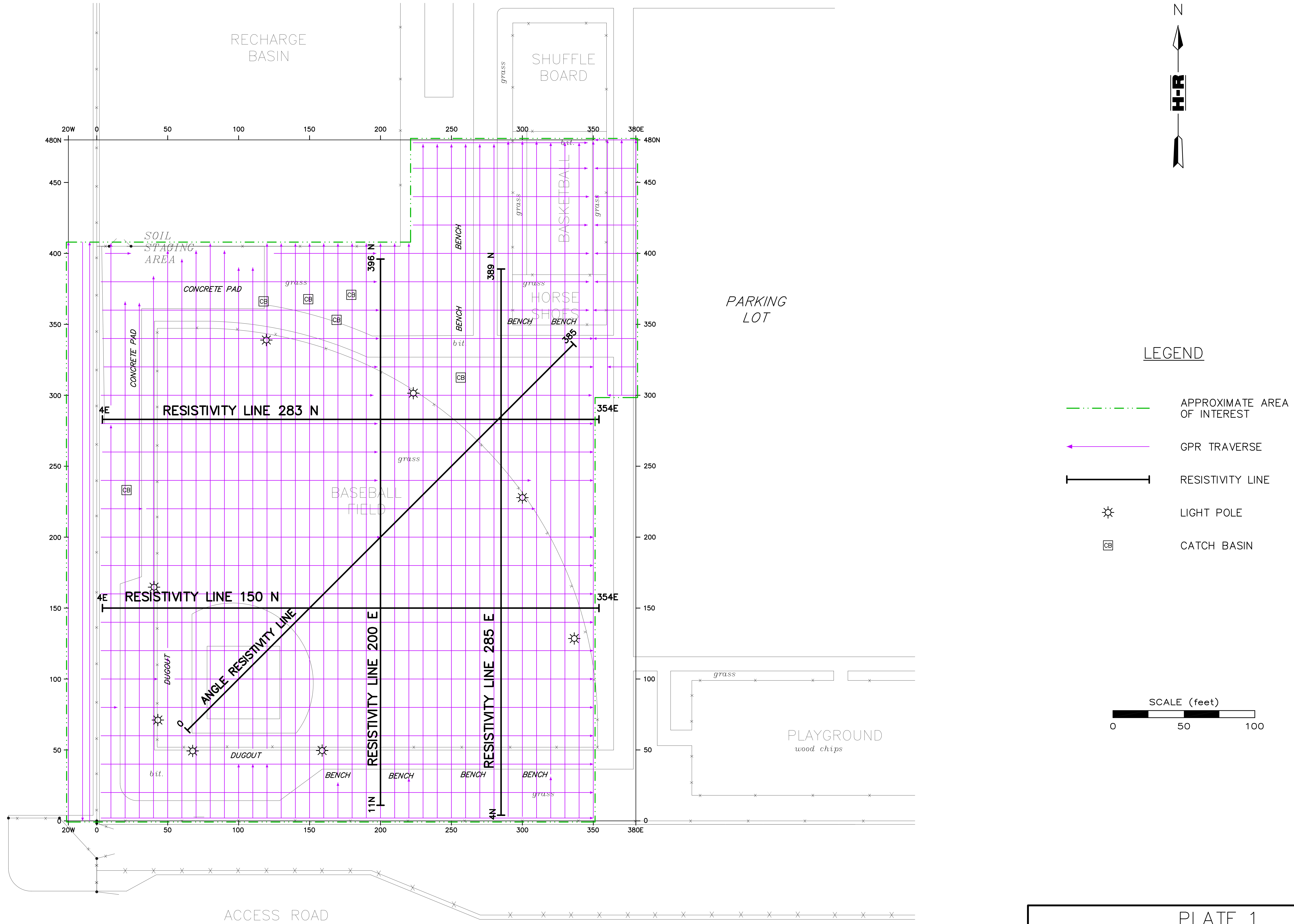
HAGER-RICHTER GEOSCIENCE, INC.
Salem, New Hampshire



Data acquired using an AGI Super Sting with the Dipole-Dipole electrode configuration, 56 electrodes, and a 7-foot electrode spacing.

Data processed and inverted using EarthImager2D Software by AGI.

Figure 4 Model Resistivity - Angle Line Bethpage Community Park Bethpage, New York	
File 04SL22	May, 2006
HAGER-RICHTER GEOSCIENCE, INC. Salem, New Hampshire	



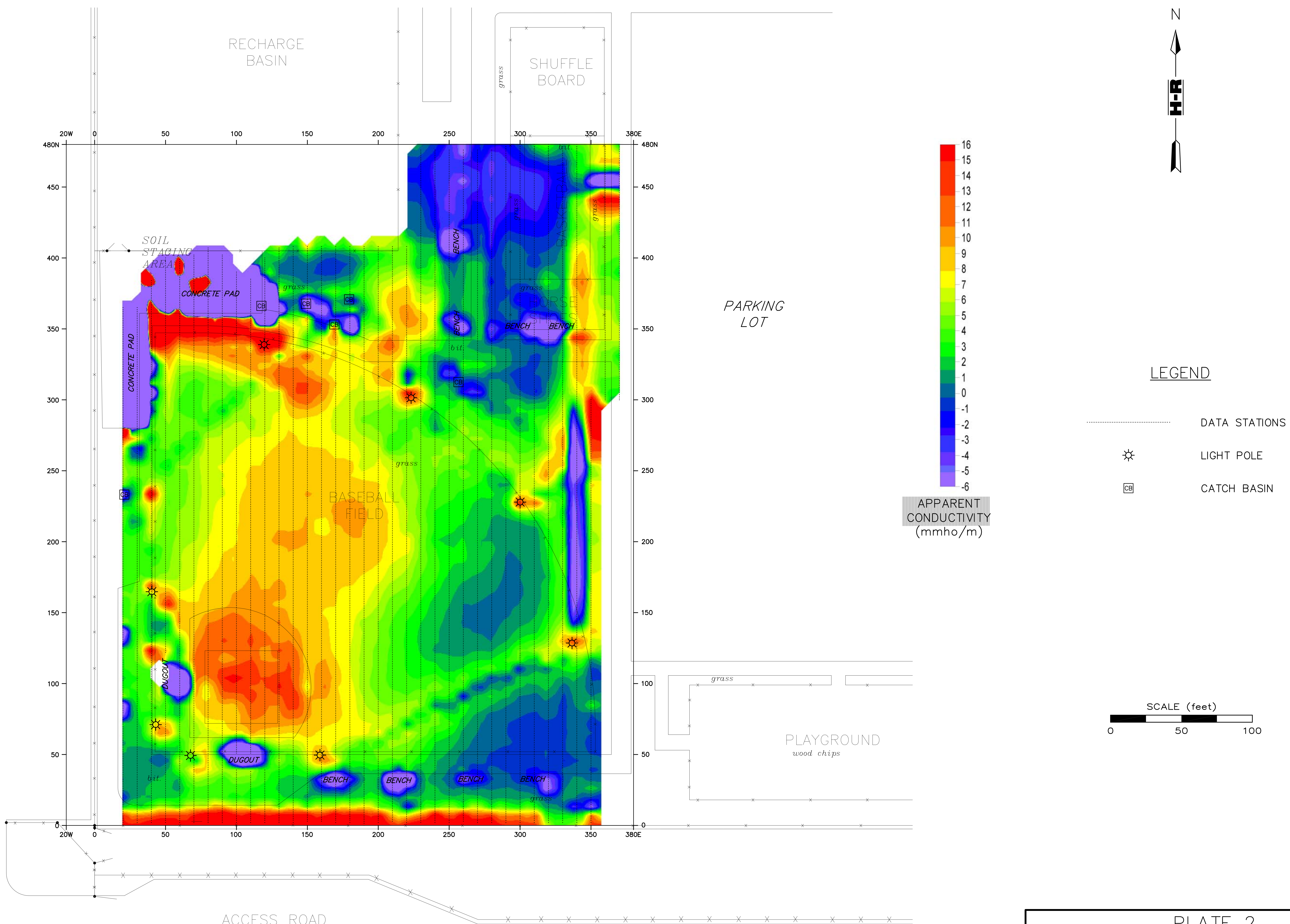
NOTE:

Modified from site plan provided by Dvirka and Bartilucci Consulting Engineers.

PLATE 1
SITE PLAN
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

FILE 04SL22	MAY, 2006

HAGER–RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE



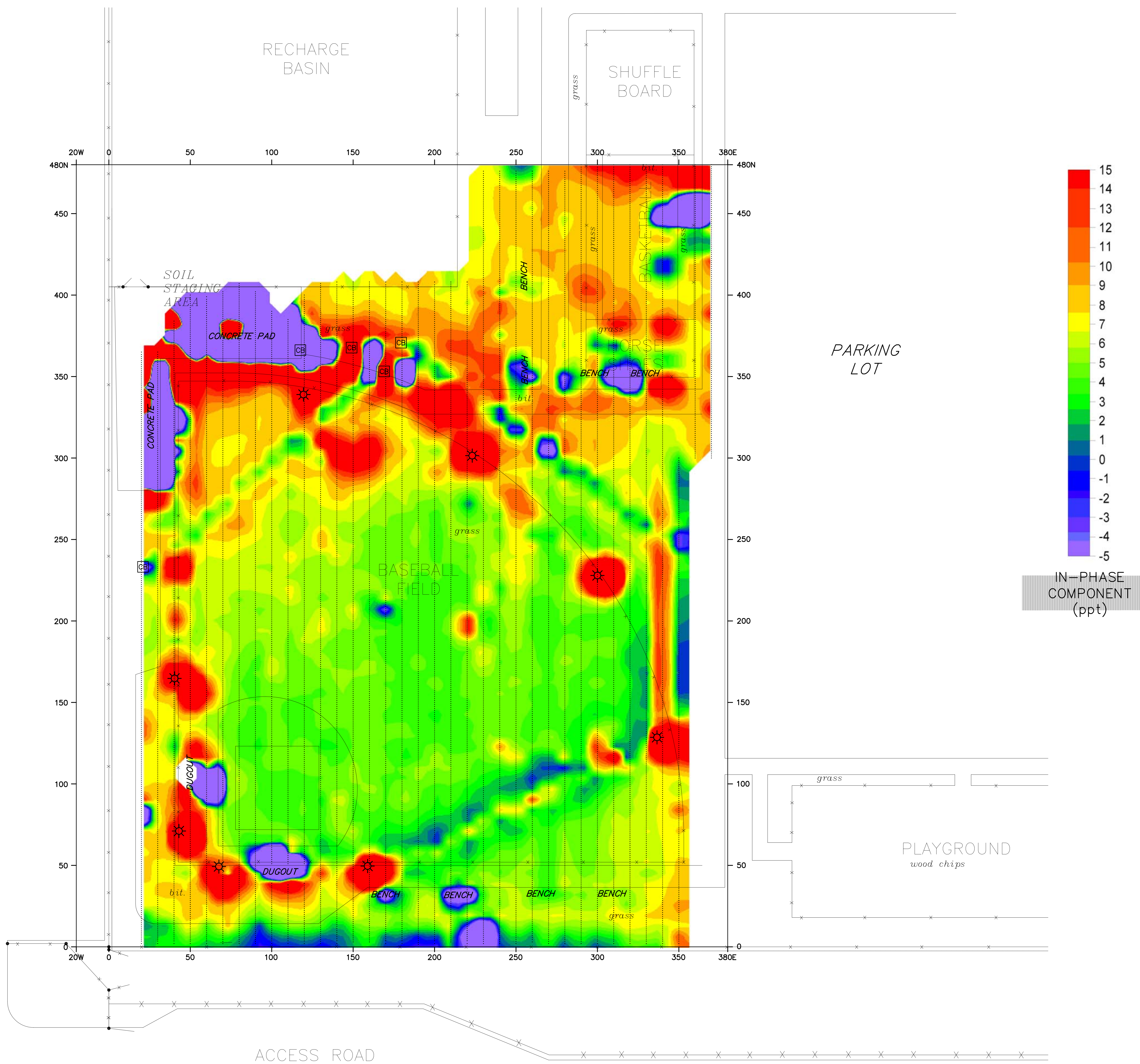
NOTES:

1. Modified from site plan provided by Dvirka and Bartilucci Consulting Engineers.
2. Data were recorded with Geonics EM31 in vertical dipole mode with boom perpendicular to traverse line where possible.

PLATE 2
APPARENT CONDUCTIVITY
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

FILE 04SL22	MAY, 2006

HAGER–RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE



NOTES:

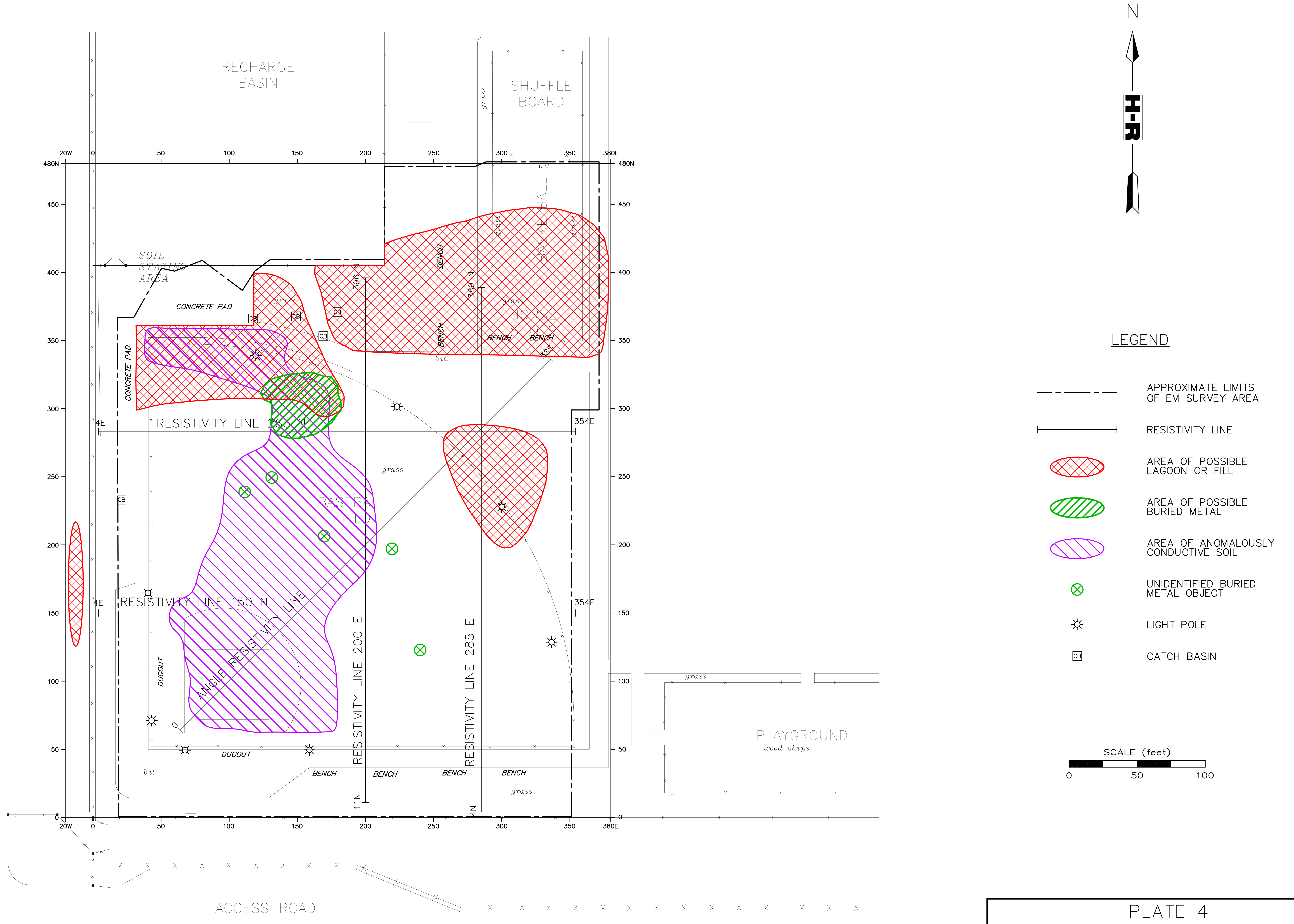
1. Modified from site plan provided by Dvirka and Bartilucci Consulting Engineers.

2. Data were recorded with Geonics EM31 in vertical dipole mode with boom perpendicular to traverse line where possible.

PLATE 3
IN-PHASE COMPONENT
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

FILE 04SL22	MAY, 2006

HAGER-RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE



NOTES:

1. Modified from site plan provided by Dvirka and Bartilucci Consulting Engineers.

2. The location of subsurface utilities detected by the geophysical survey are not shown on this plot. The detection of subsurface utilities was not an objective of this survey. The interpretation shown is relative solely to the objectives of the survey. (See text)

PLATE 4
INTEGRATED INTERPRETATION
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK

FILE 04SL22	MAY, 2006

HAGER–RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE

APPENDIX B

EXAMPLE TEST PIT LOG FORM

Dvirka and Bartilucci CONSULTING ENGINEERS A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.	**Project No.:** **Project Name:**	**Test Pit No.:** **Sheet of** **By**:
Contractor: **Operator:** **Equipment:**	**Geologist:** **Test Pit Method:** **Date Started:** **Date Completed:**	**Test Pit Completion Depth:** **Ground Surface Elevation:** **Test Pit Dimension(s):**

Weather Conditions:

Depth *(ft.)*	**OVA** *(ppm)*	**PID** *(ppm)*	**Description of Materials**	**Remarks**
-0-				
-1-				
-2-				
-3-				
-4-				
-5-				
-6-				
-7-				
-8-				
-9-				
-10-				

NOTES:

APPENDIX C

CONTAINER RELEASE CONTINGENCY PLAN

TOWN OF OYSTER BAY BETHPAGE COMMUNITY PARK
REMEDIAL INVESTIGATION PROGRAM
TEST PIT PROGRAM
CONTAINER RELEASE CONTINGENCY PLAN

The following is intended as a general procedure to be followed in the event that an intact container holding residual liquids is uncovered during the test pit program and is punctured, damaged or its integrity otherwise compromised such that the contents may be released to the environment. This scenario represents the only case where a removal action would be considered as part of the test pit program. It is important to note that any container uncovered during the test pit activities is considered an unknown material. Accordingly, all health and safety considerations outlined by the Occupational Safety and Health Administration (OSHA) for this scenario will be implemented and followed to safeguard workers, public health and the environment. This plan is not intended to be a site-specific health and safety document designed to identify the specific protocols for this unlikely event. This plan is intended to provide interim procedures to be undertaken until a qualified contractor is authorized to mobilize to the site to undertake the appropriate removal activities.

It is important to note that the likelihood of an intact container holding residual liquids being uncovered and punctured during the test pit activities is minimal due to the overall design of the test pit program which requires the removal of overburden material by slowly scraping the surface with the backhoe bucket to avoid damaging any potentially buried containers. As a result, all activities performed by on-site personnel will be limited to those that prevent the further spillage of any liquid from any compromised container and that mitigate impact to ambient air. Due to the manner in which the test pit activities will be undertaken, any potential damage will likely occur on the top surface of any container that may be discovered. As a result, it is unlikely that the container contents will empty unless the container is moved in place.

In the event that an intact container is uncovered and its integrity compromised during the test pit activities, the following general procedures will be undertaken:

1. Excavation activities will immediately halt and the backhoe turned off.

2. All unnecessary personnel will leave the immediate area.

3. A call will be placed to Northrop Grumman Corporation's standby remediation contractor who will mobilize a crew to the site. Until the removal contractor arrives on-site, on-site personnel will continue to follow this procedure.

4. If necessary, based on air monitoring equipment readings, on-site personnel will don respiratory protection.

5. The uncovered container and affected area will be photographed.

6. An attempt will be made to place absorbent pads over the damaged portion of the container. ***At no time will personnel enter the excavation for any reason.***

7. An attempt will be made to place a stake next to the drum in the general location of the damage. ***At no time will personnel enter the excavation for any reason.***

8. The absorbent pads will be covered with approximately one inch of excavated soil with a shovel to minimize any potential vapor release.

9. Following these activities, if the air monitoring results indicate that it is safe to turn on the backhoe, the backhoe will be moved from the immediate area.

Upon arrival, Northrop Grumman Corporation personnel and representatives will meet with the removal contractor to describe the situation and determine the best means for removal. To prevent any further release of any liquid, the removal contractor will likely pump the container contents into an intact container that will be staged in the Northrop Grumman Corporation's waste staging area located adjacent to the park. Once the uncovered container is empty, the container will be removed, over-packed and staged in the staging area. Once the container has been removed, any visibly impacted soil will be removed (if safe to do so), containerized and staged in the staging area. The quantity of soil removed will be limited to that which appears to have been impacted based on visible staining and the use of field instrumentation. All materials placed in the staging area will be properly sampled and characterized for proper off-site transportation and disposal in accordance with all applicable federal, state and local regulations.

During the removal contractor's activities, on-site personnel will assist with air monitoring. If at any time, the air monitoring results exceed the limits specified in the Community Air Monitoring Program, the excavation will be covered with excavated soil and the team will determine the best means for removal while safeguarding public health.