Remedial Design Work Plan for VOC Source Area

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

NYSDEC Site # 1-30-003A

Prepared for:

NORTHROP GRUMMAN

June 30, 2016

Prepared by:

ENVIRON
Environ Engineers of North Carolina, PC

and

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Certification

I, Russell S. Kemp, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Design Work Plan for VOC Source Area Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

By: ENVIRON Engineers of North Carolina, PC
Certificate of Authorization # 0012568

Russell S. Kemp, P.E.
New York State PE # 079272-1
Date: 30 June 2016

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1 INTRODUCTION

Environ Engineers of North Carolina, PC and EMAGIN, Inc. have prepared this Remedial Design Work Plan (Work Plan) for the Volatile Organic Compound (VOC) Source Area within the Lower Permeability Zone (LPZ) at the Bethpage Community Park (Park) in Bethpage, New York on behalf of Northrop Grumman Systems Corporation (Northrop Grumman). This Work Plan satisfies a requirement of the Operable Unit 3 Record of Decision (OU3 ROD; NYSDEC, 2013) and was prepared in accordance with the "Pre-Design Sampling and Remedial Technology Evaluation Report for VOC Source Area" (Pre-Design Report; Arcadis, 2015); and Section 5.2(b) of "DER-10 / Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2010). **Figure 1** provides the location of the Park.

1.1 Background

As described in the Pre-Design Report, deep vadose zone soil in the western portion of the Park is impacted with total VOCs (TVOCs) in concentrations greater than 10 milligrams per kilogram (mg/kg). Those impacts are found in two separate areas (see **Figure 2**), the Former Rag Pit (Area 1) and a VOC-impacted area northwest of the Former Rag Pit (Area 2). TVOCs in concentrations greater than 10 mg/kg are described in the Pre-Design Report as indicative of a potential VOC source to groundwater. As described in 6 NYCRR Part 375-1.2, a source is a discrete area where contaminants exist in an environmental medium (e.g., soil) in sufficient concentrations to migrate in that medium or to release significant levels of contaminants to another environmental medium (e.g., groundwater).

The areal extent of TVOCs greater than 10 mg/kg in Areas 1 and 2 is presented on **Figure 2.** The vertical extent of TVOCs greater than 10 mg/kg in Areas 1 and 2 is shown on **Figures 3** and **4**, respectively. Vadose zone deposits within Areas 1 and 2 consist primarily of fill material underlain by glacial sand deposits and the silts and clays that comprise the LPZ, where the VOC impacts (predominantly toluene and trichloroethene (TCE)) in the vadose zone are primarily found. The LPZ is present within Areas 1 and 2 at an approximate depth of 40-55 feet below land surface (ft bls) and varies within these areas in its vertical and lateral distribution as well as the consistency of its lithology.

Two remedial systems are actively controlling off-site migration of VOCs from the Park. Since 2008, Northrop Grumman has operated the Bethpage Park Soil Gas Containment System (BPSGCS; previously referred to as the Soil Gas Interim Remedial Measure) along the southern and western boundaries of the Park to prevent VOCs in soil gas from migrating beyond the Park boundary. Since 2009, Northrop Grumman has operated the Bethpage Park Groundwater Containment System (BPGWCS; previously referred to as the Groundwater Interim Remedial

Measure) along the southern boundary of the Park to prevent VOCs in groundwater from migrating beyond the Park boundary.

1.2 Remedial Action Objectives

The NYSDEC-selected remedy for the VOC Source Area in the OU3 ROD states:

> "The approximately one acre VOC rag pit area source area(s) in a low permeability zone present approximately 40 feet bgs in the Former Grumman Settling Pond Area, will be remediated using an in-situ thermal desorption and soil vapor extraction technology, or an alternate in-situ treatment technology capable of achieving comparable removals may be proposed for approval by the Department."

In accordance with the OU3 ROD, the VOC Source Area remedy will consist of in-situ thermal remediation (ISTR) to transfer VOCs in soil into the vapor phase for recovery utilizing soil vapor extraction (SVE). The remedial action objective (RAO) for the VOC Source Area remedy is to reduce the TVOCs in the LPZ to an average concentration of less than 10 mg/kg. Standards, criteria, and guidance (SCGs) potentially applicable to the remedial design are summarized in **Table 1**.

The VOC Source Area remedial system will be shut down based on the following protocol:

- The remedial design will provide an estimated operation time to achieve the RAO based on physical and chemical properties of the constituents, heating profile, and numerical modelling. During the treatment period, interim milestones and associated metrics toward achieving the RAO will be monitored (e.g., initial contaminant mass, contaminant mass recovery rates, cumulative mass recovered).
- Real time data collection (e.g., soil temperature, VOC concentrations in SVE effluent) and data analysis will be used to determine when the system has tentatively reached its design objectives.
- A hot soil sampling method will be used to collect representative soil samples at multiple depths throughout the treatment area to confirm attainment of the RAO.
- If attainment of the RAO is not confirmed, operation of the ISTR/SVE remedy will be continued until either the RAO is attained or it is shown that further treatment is not warranted based on operational data.

2 DESIGN INVESTIGATIONS

Additional data collection to complete the remedial design is not proposed for this Work Plan.

3 DESIGN SCOPE

3.1 Remedial Technologies

In-Situ Thermal Remediation

ISTR modifies the chemical and physical behavior of VOCs, as well as improves soil permeability, as follows:

- Vapor pressure and Henry's Law constant increase with temperature, thus increasing mass transfer into the vapor phase, enhancing mass transport and recovery;
- Adsorption coefficients (K_D) decrease with increased temperature, further increasing mass transfer into the vapor phase for recovery; and
- Increasing temperature reduces moisture content in the soil pore spaces, thereby increasing effective soil permeability.

Soil Vapor Extraction

The removal of VOCs by SVE is controlled by one or more of the following processes: advection, volatilization, desorption, and diffusion. The SVE process creates a pressure gradient that draws fresh air through the impacted soil and volatilizes constituents. The contaminant mass in the vapor stream is then recovered and treated via ex-situ processes.

Compounds with a Henry's Law constant greater than 0.01 (dimensionless) or a vapor pressure greater than 0.5 mm of mercury (Hg) are generally amenable to removal by SVE (USEPA, 1997). The main contaminants detected in the VOC Source Area are TCE and toluene, which are amenable to removal by SVE based on their Henry's Law constants (ranging from 0.002 to 1.25) and/or vapor pressures (ranging from 8 to 230 mm Hg).

3.2 Description of Remedial Action

Northrop Grumman will solicit bids from qualified thermal remediation contractors following submittal and approval by NYSDEC of this Work Plan. The scope of work for the selected remedial contractor will include preparation of a Remedial Action Work Plan (RAWP) consistent with DER-10 Section 5.3(a) and (b) for NYSDEC approval. The scope will also include providing field labor, equipment, materials, sampling, and associated resources to implement the remedy.

The estimated target treatment zone (TTZ) for the remedy is 11,000 square feet in area and would generally be comprised of three vertical intervals as follows:

- 15-foot interval in the LPZ (estimated 40-55 ft bls), representing the core of the TTZ;

- 10-foot interval above the LPZ (estimated 30 – 40 ft bls) that will be heated to prevent vaporized VOCs from condensing in soil before they can be removed by the SVE wells; and
- 5-foot interval below the bottom of the LPZ (estimated 55 – 60 ft bls) that will be heated to promote uniform heating of the overlying LPZ.

A conceptual design for ISTR/SVE was submitted in the Pre-Design Report including a thermal and SVE well layout (**Figure 5**). A conceptual process flow diagram is shown as **Figure 6**. The final design will be determined by the selected thermal remediation contractor. The conceptual ISTR system includes the following components:

- Thermal wells to distribute heat throughout the TTZ;
- Energy distribution and delivery system for the thermal wells; and
- Temperature and pressure monitoring points to collect operational data.

The conceptual SVE system includes the following components:

- SVE wells screened to capture vapors from the TTZ;
- Ex-situ off-gas and condensate treatment systems to meet applicable SCGs; and
- A temporary impermeable vapor cover (e.g., cement, asphalt, geotextile) extending outside the TTZ to enhance extraction of the volatilized VOCs and minimize short circuiting from the atmosphere.

Remediation will be provided by the selected thermal remediation contractor using electrical resistance heating (ERH), thermal conductive heating (TCH), or other applicable thermal method. Extracted off-gas from the SVE wells will be treated by thermal oxidation, granular activated carbon, or other applicable method to meet SCGs and health and safety requirements. Produced liquids will be contained for subsequent treatment, recycling, or discharge. Spent carbon and any other treatment residuals will be characterized and managed offsite at an appropriate treatment or disposal facility.

3.3 Additional Requirements

The following additional requirements will be addressed in the RAWP, per DER-10, Section 5.3:

- A Community Emergency Response Plan (CERP);
- A health and safety plan, including a Community Air Monitoring Plan (CAMP); and
- A Remedial Action Monitoring Plan (RAMP) will not be included because this project would not require a RAMP per DER-10 Section 5.1(e).

Green remediation principles will be applied during remedy implementation to minimize energy consumption, air emissions, water use, impacts to land and ecosystems, material consumption, and waste generation.

4 PERMITS OR OTHER AUTHORIZATIONS

Permits and other authorizations to be addressed by the design are identified in **Table 2**.

5 SCHEDULE

The schedule for the remedial design is provided in **Figure 7**.

6 POST CONSTRUCTION PLANS

6.1 Site Management Plan

DER-10, Section 6.2 requires a site-specific Site Management Plan (SMP) upon completion of the final remedial action unless no restrictions are required. The VOC Source Area remedy is only one element of a multi-element remedial program for the Park, which also includes soil remediation for PCBs and metals, and ongoing operation of remedial systems for the Park soil gas and groundwater. Per DER-10, Section 6.1(a)(3), a site will have only one SMP to encompass all site management activities identified for the remedy or remedies. Accordingly, the information and conditions applicable to the VOC Source Area remedy will be incorporated into a site-wide SMP that will be submitted to NYSDEC prior to submittal of the final engineering report for the last element of the Park remedy, which is for PCBs and metals in soil.

6.2 Operation, Maintenance, and Monitoring Plan

An Operation, Maintenance, and Monitoring Plan (OM&M Plan) will be submitted to NYSDEC as part of the RAWP. The OM&M Plan will be prepared by the selected remedial contractor to ensure safe and efficient operation of remedial equipment. The OM&M Plan will include a Monitoring Plan prepared in accordance with DER-10, Section 6.2.2 for monitoring the performance and effectiveness of the remedy.

6.3 Environmental Easement

Northrop Grumman will work with the Town of Oyster Bay, the real property owner, to prepare an adequate and agreed upon Environmental Easement Package that will be submitted to NYSDEC. The easement package would include the following, as appropriate:

- Copies of current deeds and supporting documentation;
- Copies of tax maps;

- Proof of authority to obligate owner of property;
- Legal description of easement areas;
- Site survey;
- Notice to Municipality;
- Certified easement checklist; and
- Signed transfer tax forms.

Following submittal of the easement package, NYSDEC will prepare the easement and send it to the Town of Oyster Bay. The easement should be executed prior to the planned issuance of the certificate of completion for the final element of the Park remedy, which is for PCBs and metals in soils. The executed easement will be recorded in the Nassau County Clerk's Office.

6.4 Institutional Controls

The ROD addresses institutional controls for OU3 in Sections 7.12 and 7.13. Institutional controls will be included in the site-wide SMP and incorporated in an environmental easement filed by the Town of Oyster Bay. Institutional controls will be executed to require compliance with the provisions of the approved SMP.

6.5 Post-Construction Sampling

Post-construction performance monitoring will include: measurements of applied heat, soil temperature, applied vacuum, and soil vacuum distribution; sampling of recovered soil vapor and treated emissions; and soil sampling in the treatment areas to confirm the RAO has been achieved. Specific sampling methods and protocols will be presented in the RAWP. Performance testing data collected during the system start-up, testing, and monitoring will be included in the construction completion report for the VOC Source Area.

7 REFERENCES

Arcadis, 2015. Pre-Design Sampling and Remedial Technology Evaluation Report for VOC Source Area, Operable Unit 3 – Bethpage, New York. NYSDEC Site #1-30-003A, October 2015.

Arcadis, 2011. Remedial Investigation Report (Site Area), Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. NYSDEC Site #1-30-003A, Revised February 8, 2011.

Arcadis, 2010. Site Area Feasibility Study, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. NYSDEC Site #1-30-003A, Revised March 4, 2011.

Arcadis, 2008. Site Area Feasibility Study, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. NYSDEC Site #1-30-003A, February 2008.

Arcadis. 2006. Remedial Investigation/Feasibility Study Work Plan -- Former Grumman Settling Ponds, Operable Unit 3 -- Bethpage, New York. NYSDEC Site #1-30-003A, Revised March 8, 2006.

NYSDEC. 2013. Record of Decision, Northrop Grumman – Bethpage Facility, Operable Unit Number: 03, State Superfund Project, Bethpage, Nassau County, Site No. 130003A, March 29, 2013.

NYSDEC. 2010. DER-10 / Technical Guidance for Site Investigation and Remediation, May 3, 2010.

USACE, 2014. Engineering Manual (EM)200-1-21, Environmental Quality, Design: In Situ Thermal Remediation, May 30, 2014.

USEPA, 1997. Engineering Forum Issue Paper: Soil Vapor Extraction Implementation Experiences, January 1997.

Tables

Table 1: Potentially Applicable Standards, Criteria, and Guidance (SCGs) for the VOC Source Area

Division of Environmental Remediation SCGs	
SCG Document	**Description**
6 NYCRR Part 375	Requirements regarding remedial programs, private party programs, state funded programs, state assistance to municipalities
DER-10 - Technical Guidance for Site Investigation and Remediation	Issued 05/03/2010; Effective 06/18/2010. This Program Policy provides an overview of the site investigation and remediation process for the Inactive Hazardous Waste Disposal Site Remedial Program, known as State Superfund Program; Brownfield Cleanup Program; Environmental Restoration Program; and Voluntary Cleanup Program; and for certain petroleum releases.
CP-51 - Soil Cleanup Guidance Policy	Issued 10/21/2010; Effective 12/03/2010. This Commissioner Policy provides a uniform and consistent process for the selection of soil clean-up levels appropriate for each of the remedial programs in DEC. This policy is intended for the use and guidance of both DEC staff and remedial parties, and it is used in conjunction with applicable statutes, regulations and guidance.
DER-23 Citizen Participation Handbook for Remedial Programs	Issued 1/21/2010. Policy provides guidance on how to fulfill citizen participation requirements in accordance with 6 NYCRR Part 375.
DER-31 - Green Remediation	Issued 08/11/2010; Effective 09/17/2010. This Program Policy establishes a preference for remediating sites in the most sustainable manner while still meeting all legal, regulatory and program requirements.
DER-33 - Institutional Controls - A Guide to Drafting and Recording Institutional Controls	Issued 12/03/2010; Effective 01/14/2011. This Program Policy provides an overview of the drafting and recording of Institutional Controls (ICs) for remedial programs in DEC's Division of Environmental Remediation.
Division of Air Resources SCGs	
SCG Document	**Description**
6 NYCRR Part 257 - Air Quality Standards	Applicable air quality standards.
DAR-1 - Guidelines for the Control of Toxic Ambient Air Contaminants	Policy provides guidance for the control of toxic ambient air contaminants and outlines procedures for evaluating sources of air pollution.
6 NYCRR Part 201 - Permits and Regulations	Prohibits construction and/or operation without a permit and/or certificate
6 NYCRR Part 211 (211.1) - General Prohibitions	Prohibits emissions of air contaminants that are injurious to human, plant or animal life, or cause a nuisanace.

Table 2: Permits, Access Agreements, and Authorizations for the VOC Source Area

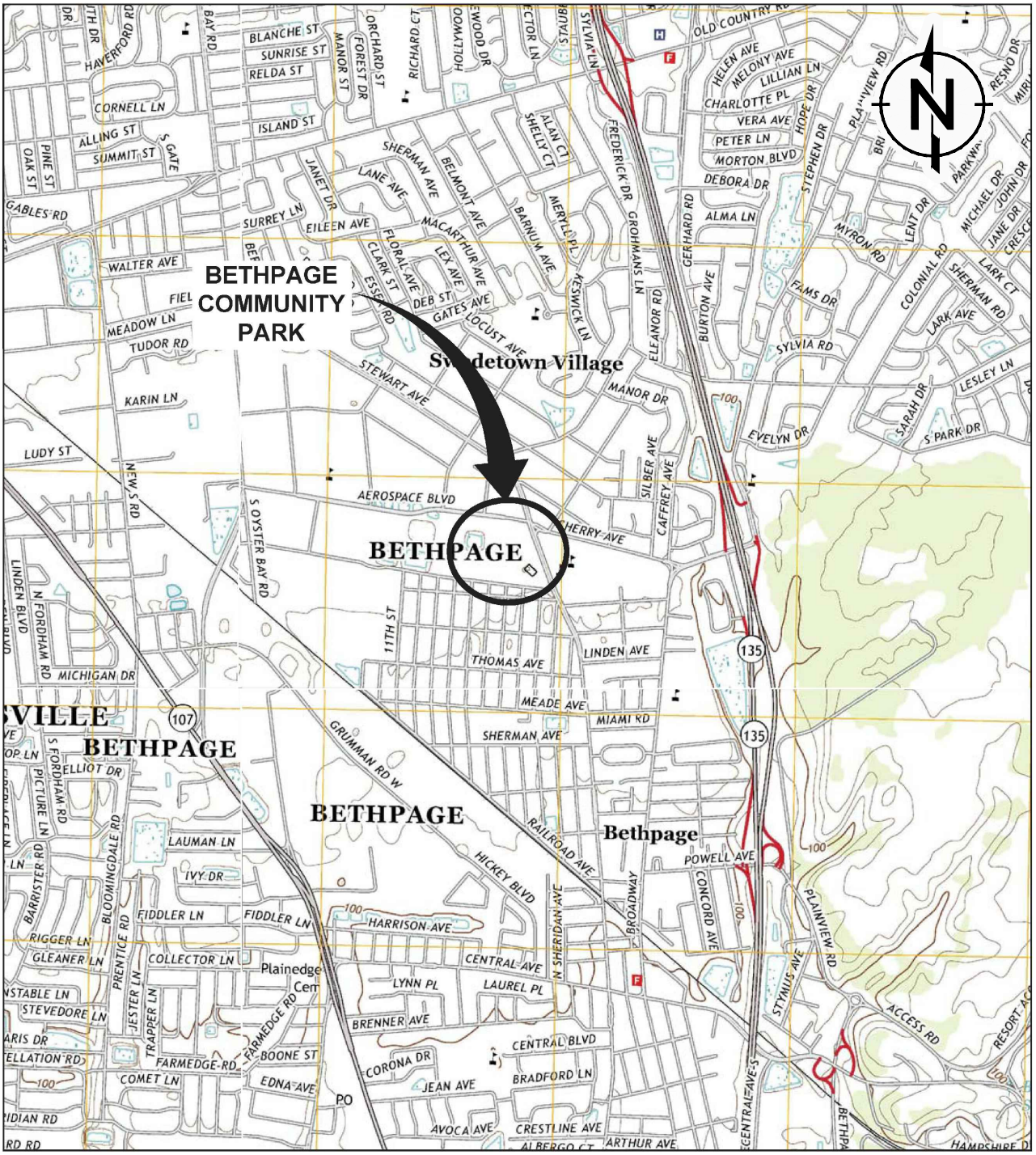
Required Permits	Authority	Description
Building Permit	TOB	Assumes permits required per TOB Building Department for construction of temporary secondary containment and a temporary impermeable surface cover.
Electrical Permit	TOB	Permits required per TOB Building Department for power drop and building connections
Underground Injection Control Permit	USEPA	Permits required to install Class V injection wells.
Exempted Permits [(1)]	**Authority**	**Description**
Air Discharge Permit	NYSDEC	Assumes Air Discharge Permit exempted in accordance with DER-10 Section 1.10
SPDES Permit	NYSDEC	Assumes SPDES Permit exempted in accordance with DER-10 Section 1.10
Water Withdrawal Permit	NYSDEC	Assumes Water Withdrawal Permit exempted in accordance with DER-10 Section 1.10.
Access Agreements	**Authority**	**Description**
ISTR/SVE Equipment	TOB	Access agreements will need to be obtained for thermal and SVE wells, treatment system,and conveyance pipelines.

Notes and Abbreviations:

DER-10	NYSDEC Technical Guidance for Site Investigation and Remediation
NYSDEC	New York State Department of Environmental Conservation
TOB	Town of Oyster Bay

1. If the remedial program meets certain criteria, DER-10 Section 1.10 provides for exemption of certain permits.

Figures



SOURCE:

"FIGURE 1, BETHPAGE COMMUNITY PARK", ARCADIS.

0 1/2 1
SCALE IN MILES

2,000 0 2,000 4,000
SCALE IN FEET

AREA LOCATION

EMAGIN
Environmental Management & Global Innovations, Inc.

ENVIRON
ENVIRON Engineers of North Carolina, PC
CERTIFICATE NUMBER: 0012568

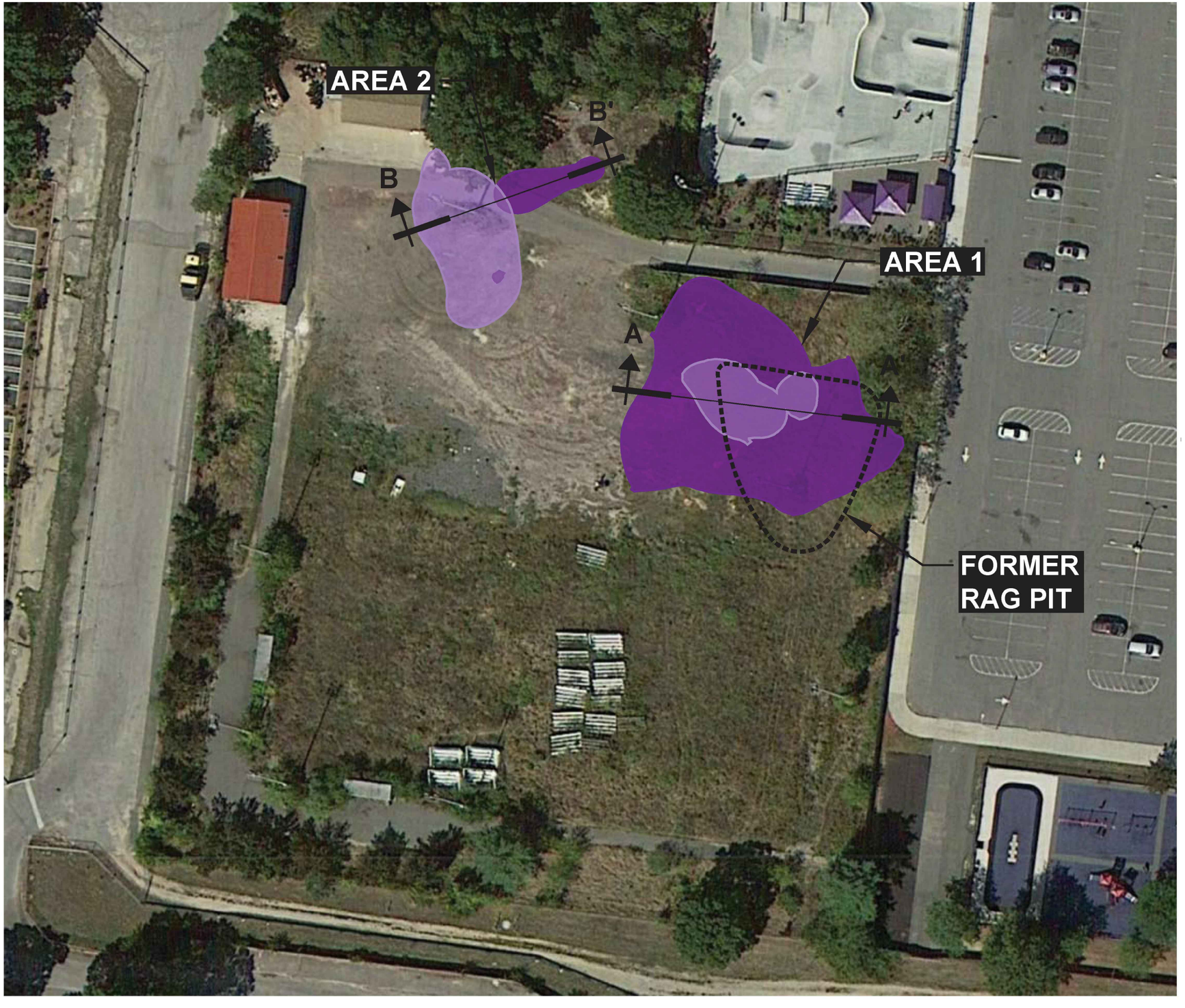
DRAFTED BY: MSB | DATE: 06/03/2016

SITE LOCATION MAP
BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

FIGURE
1

PROJECT: 0740870A

CAN 6/29/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >



LEGEND:

TVOC CONCENTRATIONS GREATER THAN 10 mg/kg IN SHALLOW SOILS (5-15 FEET BELOW LAND SURFACE)

TVOC CONCENTRATIONS GREATER THAN 10 mg/kg IN DEEP SOILS (40-55 FEET BELOW LAND SURFACE)

TVOCs TOTAL VOLATILE ORGANIC COMPOUNDS

mg/kg MILLIGRAMS PER KILOGRAM

A A' SECTION LINE OF TVOCs IN SOIL (SEE FIGURES 5 AND 6)

SOURCE:

"FIGURE 2, BETHPAGE COMMUNITY PARK, AREAL EXTENT OF TVOCs IN SOILS GREATER THAN 10 MG/KG", ARCADIS.

0 50
SCALE IN FEET

AREAL EXTENT OF TVOCs IN SOILS GREATER THAN 10 MG/KG

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

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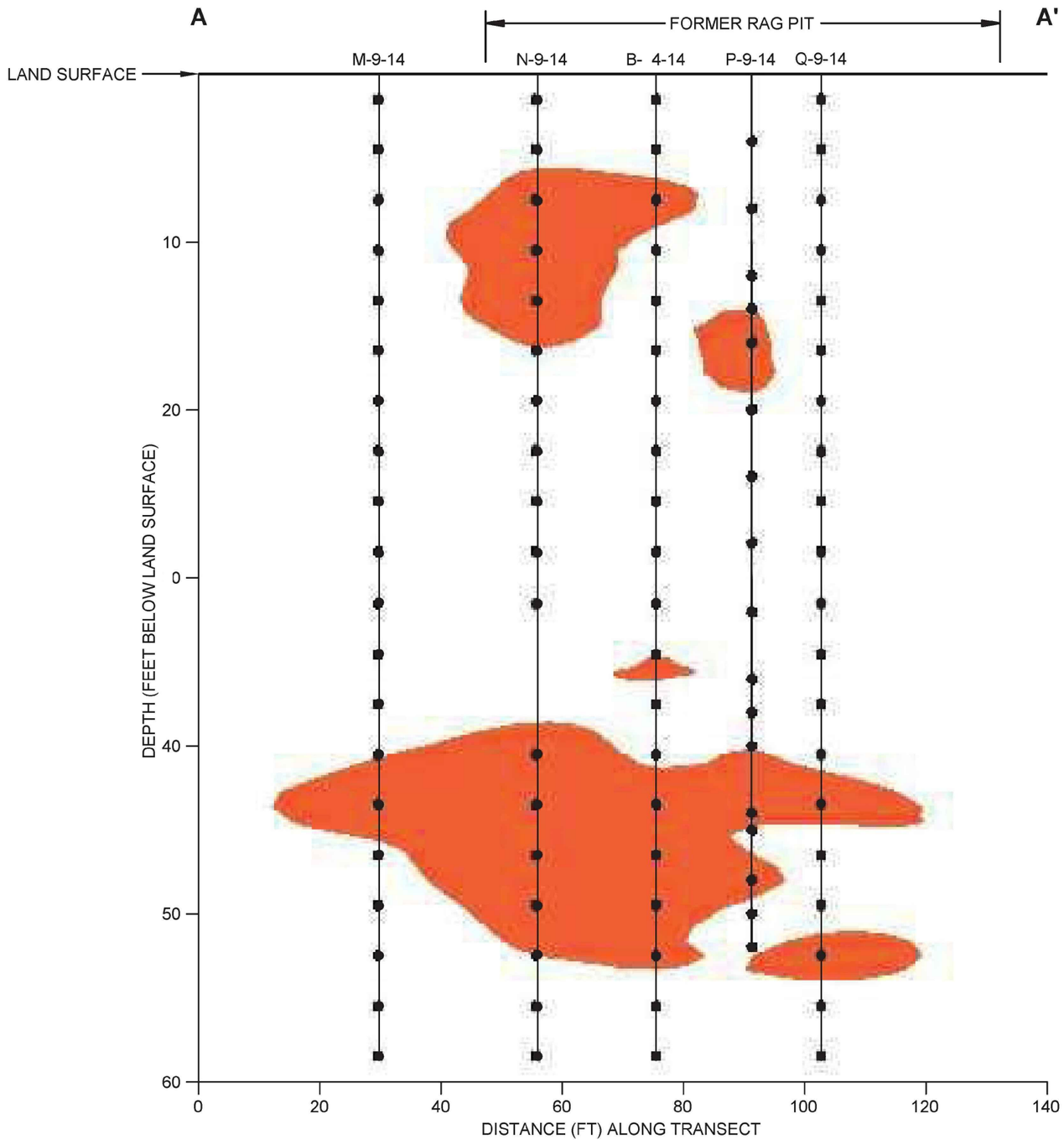
Environmental Management & Global Innovations, Inc.

ENVIRON
ENVIRON Engineers of North Carolina, PC
CERTIFICATE NUMBER: 0012568

DESIGN BY: ARCADIS	DATE: 06/03/2016
DRAFTED BY: MSB	SCALE: AS SHOWN
APPROVED BY: WK	PROJECT: 0740870A

FIGURE 2

CAN 6/29/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >



LEGEND:

TVOCs GREATER THAN 10 mg/kg

M-9-14 SOIL BORING ID

SOIL SAMPLE

VERTICAL EXAGGERATION:

TVOCs TOTAL VOLATILE ORGANIC COMPOUNI

mg/kg MILLIGRAMS PER KILOGRAM

SOURCE:

"FIGURE 3, BETHPAGE COMMUNITY PARK, CROSS SECTION A-A' OF TVOCs IN SOIL (AREA 1)", ARCADIS.

0 50

SCALE IN FEET

CROSS SECTION A-A' OF TVOCs IN SOIL (AREA 1)

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

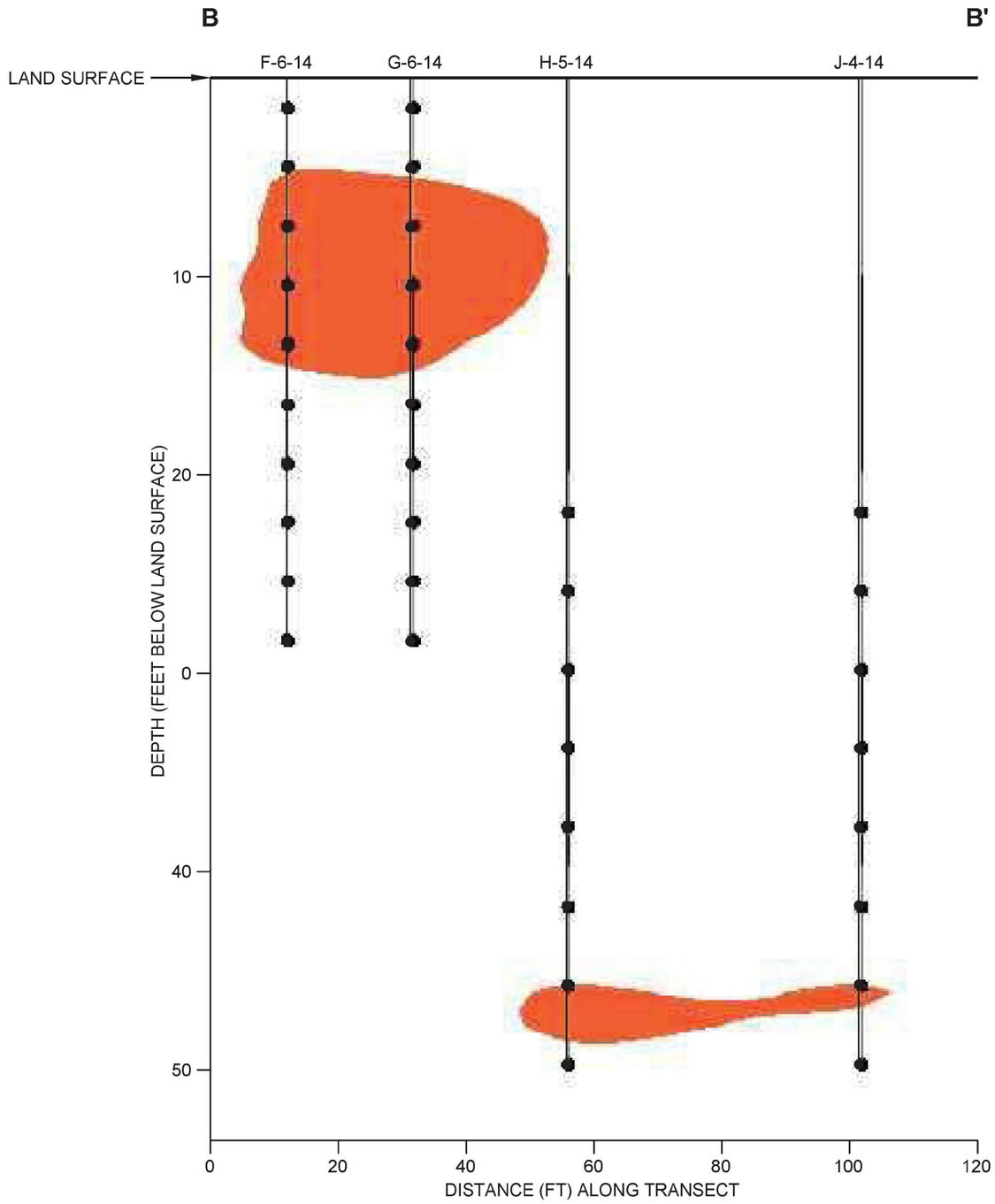
EMAGIN
Environmental Management & Global Innovations, Inc.

ENVIRON
ENVIRON Engineers of North Carolina, PC
CERTIFICATE NUMBER: 0012568

DESIGN BY: ARCADIS	DATE: 06/03/2016
DRAFTED BY: MSB	SCALE: NOT TO SCALE
APPROVED BY: WK	PROJECT: 0740870A

FIGURE 3

CAN 6/29/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >



LEGEND:

TVOCs GREATER THAN 10 mg/kg

F-6-14 SOIL BORING ID

SOIL SAMPLE

VERTICAL EXAGGERATION:

TVOCs TOTAL VOLATILE ORGANIC COMPOUNDS

mg/kg MILLIGRAMS PER KILOGRAM

SOURCE:

"FIGURE 4, BETHPAGE COMMUNITY PARK, CROSS SECTION B-B' OF TVOCs IN SOIL (AREA 2)", ARCADIS.

CROSS SECTION B-B' OF TVOCs IN SOIL (AREA 2)

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

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DESIGN BY: ARCADIS	DATE: 06/03/2016	FIGURE 4
DRAFTED BY: MSB	SCALE: NOT TO SCALE	
APPROVED BY: WK	PROJECT: 0740870A	

CAN 6/29/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >

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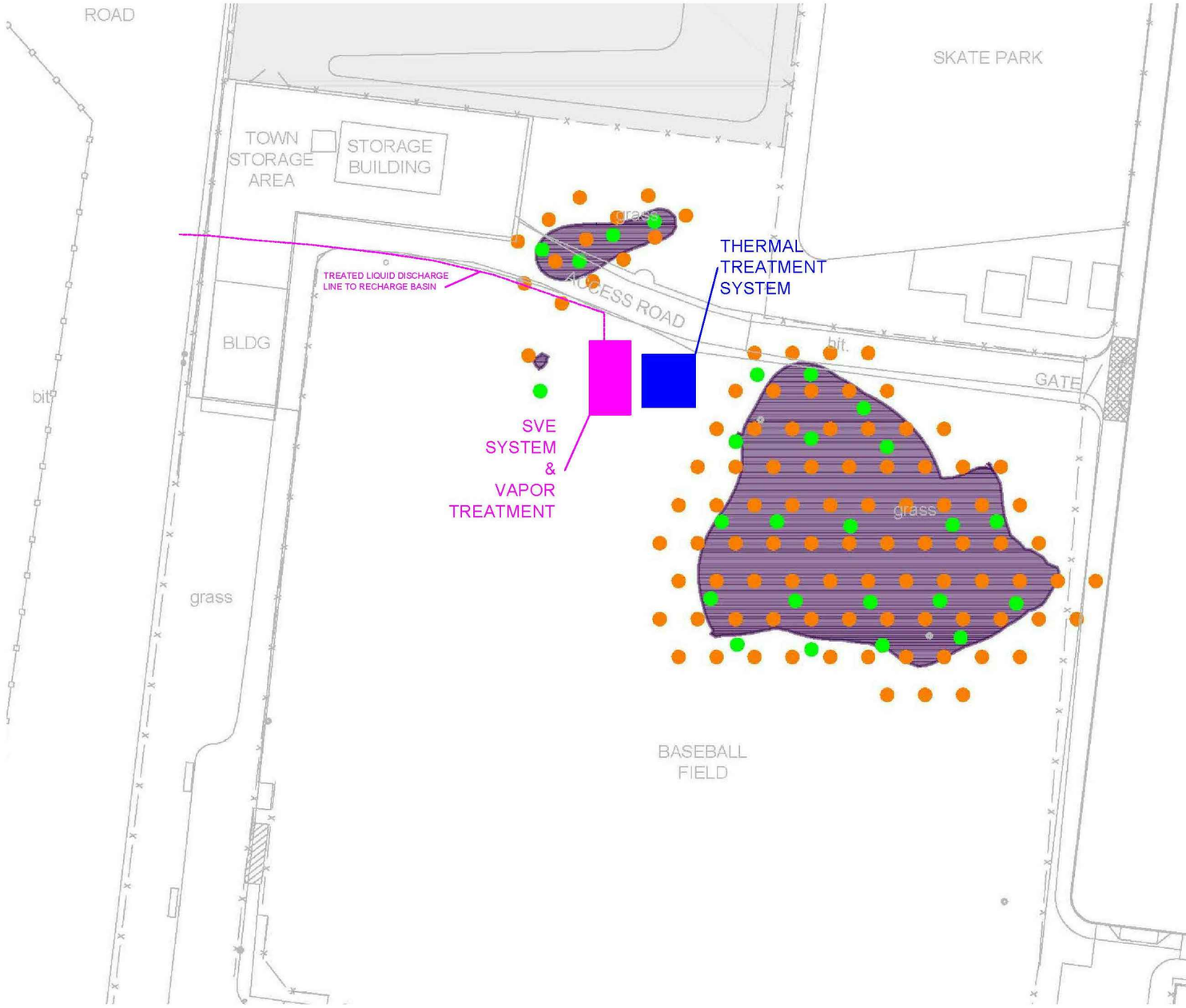

LEGEND:

- TVOC CONCENTRATIONS GREATER THAN 10 mg/kg IN SOILS 40-55 FEET BELOW LAND SURFACE
- PROPOSED EXTRACTION WELL
- PROPOSED HEATER WELL MILLIGRAM
- mg/kg PER KILOGRAM
- TVOC TOTAL VOLATILE ORGANIC COMPOUND

SOURCE:

"FIGURE 7 - TREATMENT SYSTEM LAYOUT", ARCADIS.

0 50
SCALE IN FEET

CONCEPTUAL ISTR/SVE WELL LAYOUT

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

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ENVIRON Engineers of North Carolina, PC
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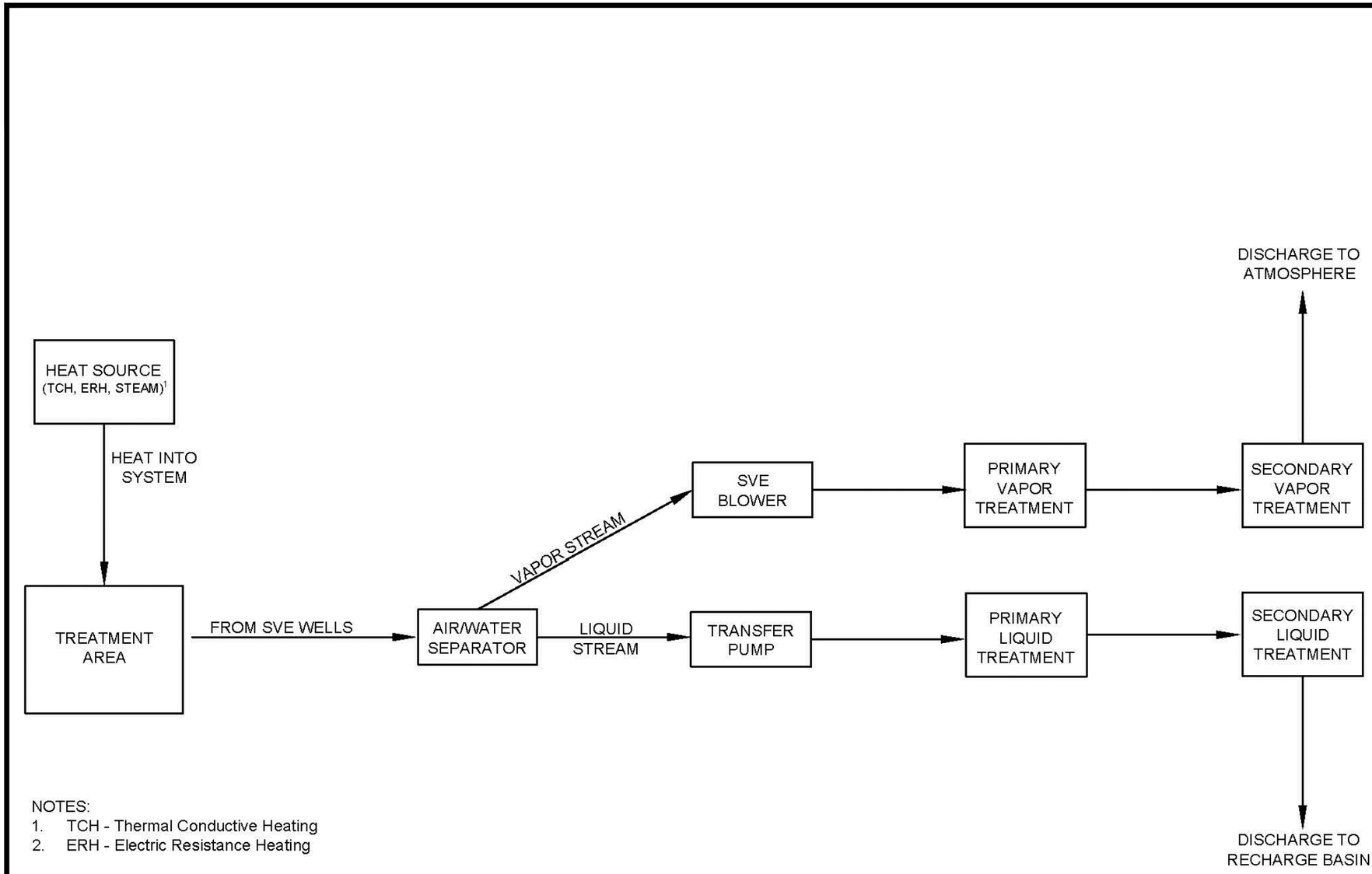
APPROVED BY: WK	PROJECT: 0740870A

FIGURE 5

CAN 6/29/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >



NOTES:
1. TCH - Thermal Conductive Heating
2. ERH - Electric Resistance Heating

CONCEPTUAL PROCESS FLOW DIAGRAM

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

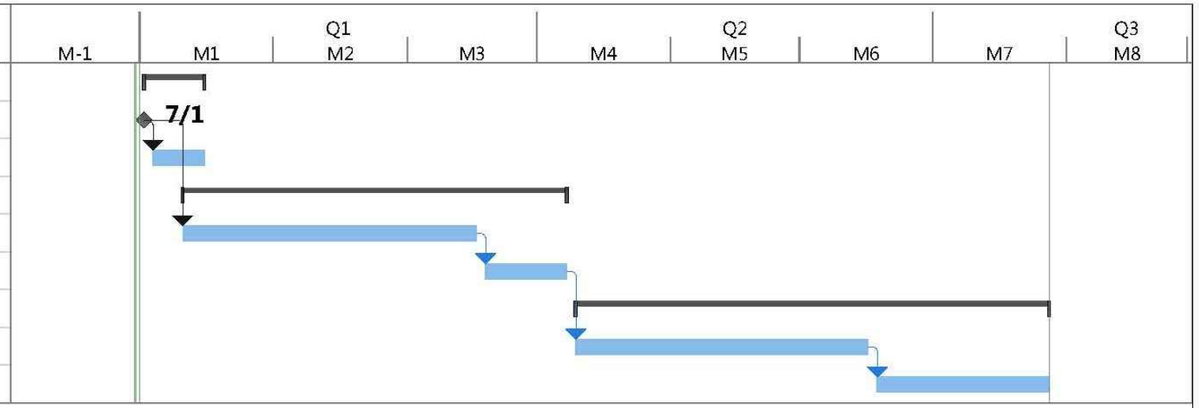
EMAGIN
Environmental Management & Global Innovations, Inc.

ENVIRON
ENVIRON Engineers of North Carolina, PC
CERTIFICATE NUMBER: 0012568

DESIGN BY: ARCADIS	DATE: 06/03/2016
DRAFTED BY: MSB	SCALE: NOT TO SCALE
APPROVED BY: WK	PROJECT: 0740870A

FIGURE
6

ID	Task Name
1	**Remedial Design Work Plan**
2	Submit Remedial Design Work Plan
3	DEC Review/Approval
4	**Remedial Contractor Procurement**
5	Prepare Bid Package and Solicit Bids
6	Review Bids and Award Contract
7	**Remedial Action Work Plan**
8	Prepare and Submit Work Plan
9	DEC Review/Approval



The Schedule assumes no delays in task implementation caused by:

- Obtaining site access agreements
- Obtaining drilling and other required permits
- NYSDEC/NYSDOH/NCDOH/TOB work plan reviews and approvals
- Availability of Subcontractors
- Weather and other force majeure events
- Additional delineation and sampling required beyond locations and depths identified in work plan
- Actions or involvements of regulatory/government agencies other than NYSDEC, NYSDOH, NCDOH, or TOB
- Other project-related conditions or events beyond the control of Northrop Grumman

Task	Inactive Summary	External Tasks
Split	Manual Task	External Milestone
Milestone	Duration-only	Deadline
Summary	Manual Summary Rollup	Progress
Project Summary	Manual Summary	Manual Progress
Inactive Task	Start-only	
Inactive Milestone	Finish-only	

CONCEPTUAL REMEDIATION IMPLEMENTATION SCHEDULE

BETHPAGE COMMUNITY PARK
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

EMAGIN
Environmental Management & Global Innovations, Inc.

ENVIRON
ENVIRON Engineers of North Carolina, PC
CERTIFICATE NUMBER: 0012568

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APPROVED BY: WK	PROJECT: 0740870A

FIGURE 7

CAN 6/30/16 P:\7AS3011 BETHPAGE\OU3\OU3 RDRAS\PARK SOILS\VOC SOURCE AREA\08 REPORTS - SUBMITTALS - PERMITS\RD WORK PLAN\THERMAL CONDUCTION HEATING-GAS THERMAL REMEDIATION\DRAFT FINAL 2016 06 23 < REMEDIAL DESIGN_1STR-SVE >