# FINAL STATEMENT OF BASIS

Land Disposal Area
Knolls Atomic Power Laboratory – Knolls Laboratory
Site No. 447017
EPA ID No. NY6890008992
Town of Niskayuna, Schenectady County, New York

June 27, 2022

Prepared by:
Division of Materials Management
New York State Department of Environmental Conservation

# FINAL STATEMENT OF BASIS FOR PROPOSED REMEDY

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## Introduction

This Statement of Basis (SB) proposes an engineered cover system with targeted excavation for either on-site consolidation and covering or focused off-site disposal, in conjunction with natural attenuation, groundwater monitoring, and institutional controls as the remedy to address chemical contamination associated with the Resource Conservation and Recovery Act (RCRA) corrective action requirements for the Land Disposal Area (LDA) at the Knolls Atomic Power Laboratory (KAPL) – Knolls Laboratory. This remedy is intended to address areas of surface and subsurface soil/material with chemical concentrations exceeding 6 New York Codes, Rules and Regulations (NYCRR) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs) or containing solid waste material/debris, and associated groundwater and seep contamination. Other RCRA Corrective Action at the Knolls Laboratory will be addressed in either a separate unit-specific or a site-wide Statement of Basis, as necessary.

The purpose of this SB is to provide background information related to the investigation and characterization of the chemical releases in the LDA, to present the remedy proposed by the New York State Department of Environmental Conservation (Department or NYSDEC), in consultation with the New York State Department of Health, and to present the basis for its selection. This document provides the opportunity for the public to be informed of and to participate in the development of the remedial program for the LDA. Public input on the proposed corrective measure and on the information that supports its selection is an important contribution to the corrective measure selection process. The Department may modify the proposed remedy or select another remedy based on new information and/or public comments.

## Facility Background

**Location:** The LDA is located in the eastern portion of the 170-acre U.S. Government-owned KAPL, Knolls Laboratory (Figure 1). The Knolls Laboratory is located in the Town of Niskayuna, Schenectady County, New York, on the south bank of the Mohawk River. Based on the proximity of six Solid Waste Management Units (SWMUs), the Department determined that it would be acceptable to consolidate these SWMUs and evaluate the corrective actions collectively as the LDA. Detailed information on the individual SWMUs compromising the LDA and their contaminants is presented below.

**Site Features:** The LDA is a relatively flat undeveloped area, with steeper slopes adjacent to drainage pathways and along fill faces. The East Boundary Stream and Midline Stream establish natural boundaries to the south and north of the LDA, respectively. The Knolls Laboratory Building Q12 (salt shed) is located along the southern border of the LDA. As shown on Figure 2 relative to the entire facility, the six SWMUs, totaling approximately 7.3 acres, include the Former Landfill, Mercury Disposal Area, North Field, Pyrophoric Area, West Field, and C&D Area No. 1. Figure 3 provides a more detailed view of the LDA, including topography and geophysical anomalies, indicating areas containing possible buried metal objects.

**Current Zoning and Land Use:** The Knolls Laboratory is zoned for research and development uses within the Town of Niskayuna and equates to an industrial use under the Department's land use categories. The Knolls Laboratory is bounded to the north by the Mohawk River; to the east by a mixture of open land, parks, and the closed Town of Niskayuna municipal landfill; to the south by a low-density suburban residential area; and to the west by the General Electric Global Research Center. Buildings and support facilities occupy approximately 60 acres of the Knolls Laboratory. The remainder of the Knolls Laboratory (approximately 110 acres) consists of undeveloped woods and fields.

The LDA is located in an area of undeveloped open fields and woods outside of the fenced security area. Other than use of the service roads for routine security patrols, seasonal snow staging and salt shed use, access to the closed landfill, and equipment and material staging/laydown and retrieval, Knolls Laboratory personnel rarely access the LDA.

**Past Uses of the Site:** Construction of the Knolls Laboratory began in 1948, and laboratory operations at the Knolls Laboratory began in 1949. The site was previously used for farming, although the dates are unknown. Any other prior usage is unknown. The principal function of the Knolls Laboratory is research and development in the design and operation of Naval nuclear propulsion plants. From the late 1940s through the mid to late 1970s, waste material is known and/or alleged to have been disposed in the LDA SWMUs (Figures 2 and 3).

**Site Geology and Hydrology:** The geology and groundwater in the LDA are dominated by a dense, clay-rich, low permeability glacial deposit, locally referred to as "gray till". The gray till underlies the entire LDA and ranges in thickness from 25 to 55 feet. Owing to its low permeability, the gray till inhibits vertical movement of groundwater. Consequently, groundwater in the LDA is found in sand and gravel above the gray till and also as localized perched groundwater where the shallow porous fill material rests on deposits of relatively low permeability silt and clay. Groundwater flows preferentially into the permeable sand and gravel, and the "perched groundwater" moves along the gray till surface. The permeable sand and gravel are oriented north-south within a north-south trending trough in the surface of the gray till. As shown on Figure 4, groundwater movement is therefore constrained into an overall north-south flow orientation. Just north of the Former Landfill, an apparent divide exists in the water table, separating northward groundwater flow from southward groundwater flow, which may be the result of increased recharge through the relatively porous fill material and the perching of the

groundwater on the underlying silt and clay. This mounding of the groundwater surface occurs beneath the central portion of the fill material located in the Pyrophoric Area and the area to the south and west. Groundwater flows subradially from the central mound of groundwater and is assimilated into the localized flow patterns within the surrounding sand and gravel deposits. Depth to groundwater varies from 3 to 5 feet below ground surface near Midline Stream and East Boundary Stream to the north and south, respectively, and is typically 12 to 16 feet below ground surface in the central portion of the LDA. The depth to bedrock underlying the Knolls Laboratory generally ranges between 10 and 70 feet below grade and consists of horizontal shales and sandstones of the Upper-Middle Ordovician aged Schenectady Formation.

## Enforcement Status

In accordance with the Corrective Action requirements of the KAPL – Knolls Laboratory 6 NYCRR Part 373 Hazardous Waste Management Permit (Part 373 Permit) [NYSDEC Permit Number 4-4224-00024/00001], the U.S. Department of Energy – Naval Reactors Laboratory Field Office (U.S. DOE-NRLFO) is required to perform corrective measures at the Knolls Laboratory where necessary to protect human health and the environment, for all releases of hazardous and/or mixed wastes (hazardous waste and radioactive material), including hazardous constituents, from any SWMU. In 2004[1] and 2005[2], the Knolls Laboratory achieved two significant RCRA milestones with documentation of control of human exposures to chemical contamination and control of contaminated groundwater migration to off-site receptors. In essence, these milestones mean that the Department evaluated the facility for concerns related to exposure to humans from specific pathways as well as impacts from migration of any contaminated groundwater. The Department determined that there is no offsite exposure risk and contaminated groundwater migration was under control.

## Solid Waste Management Units

The operational history of the six LDA SWMUs is summarized as follows:

*Former Landfill* - Disposal operations within the Former Landfill pre-date KAPL operations, when the previous landowner (farmer) used a former unlined sand and gravel pit for the disposal of scrap metal and household waste. From 1948 to 1974, KAPL used this area for the disposal of what was found to be office and cafeteria waste and C&D debris (*e.g.*, wood, bricks, concrete, asphalt, and wire) based on test pits excavated during the RCRA Facility Investigation (RFI). The buried waste is located on the western portion of the Former Landfill extending over an area of approximately 1.5 acres. The waste is approximately 4 to 10 feet thick and is covered by 1 to 5 feet of sandy soil. Incidental pieces of

[1] U.S. Department of Energy, Schenectady Naval Reactors, Knolls Atomic Power Laboratory, Niskayuna, New York, RCRA Corrective Action Environmental Indicator RCRIS Code (CA750), Migration of Contaminated Groundwater Under Control, NYSDEC, October 26, 2004.

[2] U.S. Department of Energy, Schenectady Naval Reactors, Knolls Atomic Power Laboratory, Niskayuna, New York, RCRA Corrective Action Environmental Indicator RCRIS Code (CA725), Current Human Exposures Under Control, NYSDEC, August 3, 2005.

concrete, asphalt, and metal are present at the surface along the slopes adjacent to the Former Landfill, resulting in an estimated overall size of 2.1 acres.

*Mercury Disposal Area* - The Mercury Disposal Area was an unlined earthen pit approximately 2 feet wide by 5 feet long by 4 feet deep in which old batteries were disposed. During inspection of the area in the late 1970s, mercury droplets associated with the batteries were observed in the soil. In the early 1990s, the battery carcasses and soil contaminated with mercury were excavated from the pit and disposed offsite. In addition to the excavated pit, a shallow depression approximately 2 feet wide by 5 feet long by 2 feet deep was located just south of the excavated pit. Three soil piles of unknown source, all approximately 2 feet high, also were present in the immediate vicinity of the pit and the depression.

In 2010, excavation activities were conducted in the Mercury Disposal Area as part of the SPRU North Field Project [Note this is a separate designation from the KAPL North Field SWMU]. As much as 2 feet of soil from the Mercury Disposal Area was excavated and disposed offsite, though field personnel indicated at the time that removal and off-site disposal of the upper 0.5 to 1 foot of soil from this area was typical. The area was subsequently graded to blend with the surrounding contours.

*North Field* - The North Field is located in what was a soil borrow area during construction of the Knolls Laboratory and covers an area of approximately 1.5 acres. A north-south trending hill, approximately 10 to 20 feet high, was removed to provide clean fill. Historical employee accounts and some historical physical evidence (*e.g.,* broken containers, glass shards, bottles, and a protruding drum) indicated that chemicals of an unspecified nature may have been buried in the North Field. Investigation activities did not indicate evidence of buried material in the North Field or releases of chemical constituents.

*Pyrophoric Area* - Between the early 1950s and late 1970s, zirconium alloy chips and powder were burned or buried in the Pyrophoric Area, which covers approximately 1.5 acres. A fire accelerant (kerosene or methanol) was used to aid the burning, which took place on a 4-foot-square, ¼-inch-thick steel plate located near the former pyrophoric shed[3]. Approximately 7,100 pounds of scrap zirconium alloy were reportedly burned or buried in this area. Because of the reactive nature of zirconium, unburned zirconium was immersed in oil and buried in approximately 30, 1-gallon and 5-gallon containers in the vicinity of the former pyrophoric shed. Several of the containers were exhumed in the late 1980s. Buried material that consists mostly of C&D debris, was found in the western portion of the Pyrophoric Area. The buried material is 6 to 8 feet thick and is thinly covered with sandy soil, though some debris is visible at the surface. An approximately 6-inch thick layer of pyrophoric burn residue (from the burning of zirconium alloy) was found on the ground surface in the eastern portion of the Pyrophoric Area.

In 2010, portions of the Pyrophoric Area, including part of the surface pyrophoric burn residue and much of the easternmost portion of the buried waste, were excavated and disposed offsite as part of the

[3] The pyrophoric shed and surrounding fence were dismantled in 2017.

SPRU North Field Project. In addition to the C&D debris known to be present, several empty crushed drums were found in an area previously suspected to be a source of volatile organic compounds (VOCs) found in groundwater (*i.e.,* VOC source area) within and adjacent to the Pyrophoric Area. The maximum depth of the excavation in the Pyrophoric Area was approximately 10 feet. Based on pre-excavation and post-excavation elevation contours, approximately 600 cubic yards of debris and soil are estimated to have been excavated from the VOC source area and disposed offsite. This excavation was backfilled as part of the SPRU North Field Project.

*West Field* - Historical employee interviews indicated that the West Field was a shallow unlined disposal area in which chemical wastes of an unspecified nature were buried more than 40 years ago over a period of about 1 year. Based on historical information, the general area of the West Field is shown on Figure 3, covering approximately 0.5 acres. Buried material consisting of laboratory debris (*e.g.,* glassware and tubing) and C&D debris was identified in the West Field. The waste is 4 to 6 feet thick and is covered with 1 to 2 feet of sandy soil, though soil fill with sporadic wood debris was found as deep as 8 feet in an isolated area. Although not within the defined boundaries of any LDA SWMU, the area between the West Field and the Pyrophoric Area and Former Landfill has been called the West Field Extended and comprises an area of approximately 1.3 acres. Waste material in the West Field Extended typically consists of 6 to 8 feet of C&D debris, with some areas comprising 1 to 3 feet of silty sandy fill with sporadic C&D debris.

*C&D Area No.1* - The C&D Area No.1 encompasses roughly 0.4 acres in a partial bowl-like feature, with an elevated rim and a lower mostly flat interior. The rim of the bowl comprises an undisturbed ridge of soil to the north and east, a remnant of early site soil borrow-area excavations, and a ridge of merged soil piles to the south, consisting of sand and gravel with large cobbles. Broken asphalt slabs, chunks and slabs of reinforced concrete, small piles of concrete rubble, and vitrified clay pipe are scattered on the ground surface. Occasional pieces of metal and asphalt are also present. An isolated small pile of concrete rubble is located approximately 75 feet southeast of the area. The source of the concrete material is unknown. Investigation activities indicated no evidence of buried material at this location.

## Environmental Assessment

### Nature and Extent of Contamination:

In accordance with the requirements in the Part 373 Permit, environmental investigations were implemented at each of the individual SWMUs shown on Figure 3 to identify the presence and extent of chemical releases at each SWMU and determine if any remediation was necessary. Groundwater, seep, and soil samples were collected to support these efforts. The findings for the LDA environmental investigations indicated that chemical releases have occurred. A summary of the findings for groundwater and each SWMU is provided below. Full reports on the investigations are available at the document repository identified at the end of this SB or from the Department upon request.

For the purposes of identifying areas to be remediated, the investigation analytical results for the LDA soil were compared to the respective 6 NYCRR Part 375 Unrestricted Use SCOs or site-specific background concentrations that were previously approved by the Department for metals, including concentrations for four metals that exceed SCOs (See Table 1 below). The site-specific background metals concentrations were approved by the Department in February 2006.[4] This approval pre-dates the Department's establishment of the 6 NYCRR Part 375 SCOs and the Commissioner Policy-51/Soil Cleanup Guidance Supplemental SCOs[5]. Figure 5 shows the locations of concern based on that comparison and also shows locations where waste material/debris was observed. RFI analytical results for groundwater, seeps, and surface water were compared to the respective Class GA groundwater standards and Class A surface water standards identified in 6 NYCRR Part 703 and Class GA groundwater guidance values and Class A surface water guidance values identified in Technical and Operational Guidance Series (TOGS) No. 1.1.1. Figure 6 summarizes the water data to show the extent of the VOC plume where water concentrations exceed the groundwater and surface water quality criteria.

Table 1 – Approved Site-specific Metal Background Concentrations Used Herein

| Metal | Reference Document | SCO/Supplemental SCO (ppm[6]) | Site-Specific Approved Background (ppm[6]) |
|---|---|---|---|
| Aluminum | CP-51 | 10,000[7] | 15,200 |
| Calcium | CP-51 | 10,000[7] | 31,600 |
| Iron | CP-51 | 2,000[8] | 35,700 |
| Nickel | Part 375-6.8 | 30[9] | 33.8 |

[4] RCRA Facility Assessment Sampling Visit Report for Separations Process Research Unit SWMUs/AOC, February 2002, approved February 2006.
[5] Supplemental SCOs are presented in NYSDEC Commissioner Policy-51/ Soil Cleanup Guidance, issued October 21, 2010.
[6] ppm - parts per million
[7] Supplemental SCO for Protection of Ecological Resources
[8] Supplemental SCO for Residential Use
[9] SCO for Unrestricted Use

*Soil/Material*

A summary of investigation conclusions is presented below for each of the LDA SWMUs.

Former Landfill

The waste in the Former Landfill typically extends to depths of 10 feet or less but has been found as deep as 12 feet. The waste is above the water table, except at two locations where water is perched on shallow gray till. The waste material consists mostly of office and cafeteria waste, with some C&D debris. Isolated crushed and empty 1-gallon cans of duplicating cleaning solvent and isopropyl alcohol were present sporadically within the waste. A light ballast was found at one location.

An isolated pocket of unique waste exists at the base of the slope on the southwest side of the Former Landfill. A black sand-like material with a tar-like odor was discovered within the remnants of a deteriorated and unidentifiable rusted container found at 3 to 3.5 feet below grade. The black sand-like material extends to approximately 4 feet below grade over an area roughly 2-feet square. The location of the black sand-like material is separate from the main disposal area, with no evidence of lateral continuity of waste between the two areas.

Overall, the VOC, semi-volatile organic compound (SVOC), polychlorinated biphenyl (PCB), and metals results for the Former Landfill are below the Unrestricted Use SCOs, with concentrations exceeding the respective Unrestricted Use SCO in a few isolated locations. Gasoline-related VOCs exceeding the Unrestricted Use SCOs were found at one location within the waste, and concentrations of PCBs and metals above the Unrestricted Use SCOs were detected in the black sand-like material. However, data from test pits and soil borings indicate the constituents are not migrating substantially from the waste in the Former Landfill into the underlying and adjacent soil.

Groundwater information for the Former Landfill is addressed below in the *Groundwater, Seeps, and Surface Water* section.

Mercury Disposal Area

Polynuclear aromatic hydrocarbons (PAHs) and PCBs were found throughout the surface soil in the Mercury Disposal Area, with concentrations of PAHs and PCBs exceeding the respective Unrestricted Use SCOs each in only one sample. The occurrence and distribution of certain metals indicates that the soil has been affected by a source of metals which has since been removed. Mercury concentrations were found exceeding the Unrestricted Use SCO in one isolated area. As described above, affected soil was removed in 2010 during the SPRU North Field Project, possibly leaving one location with mercury concentrations greater than the Unrestricted Use SCO within the upper one to two feet of soil remaining at that location. Mercury concentrations up to 1.43 ppm were found in the upper 2 feet of soil at that location prior to excavation by the SPRU North Field Project.

Groundwater was not identified as a media of concern in the Mercury Disposal Area and therefore was not sampled.

Pyrophoric Area

The soil in the Pyrophoric Area has been affected by VOCs, PAHs, PCBs, and metals. The extent of influence from the PAHs, PCBs, and metals is limited to the surface and shallow disposed waste and the soil in immediate contact with the disposed material. An area exhibiting VOC soil concentrations above the Unrestricted Use SCOs was found in the eastern portion of the fill area, and VOCs evidently have migrated from this area and have become isolated in thin deep soil zones below the Pyrophoric Area and West Field Extended. This area of high VOC soil concentrations appears to be the principal source area of VOCs detected in groundwater within and downgradient of the Pyrophoric Area (i.e., VOC source area). As described above, VOC-affected soils in the VOC source area were removed in 2010 as part of the SPRU North Field Project.

VOC soil concentrations above the Unrestricted Use SCOs isolated in deeper soil samples collected from the gray till contact indicate that the VOCs have moved vertically through the soil column in the VOC source area and have migrated laterally along the gray till surface. These high VOC concentrations appear to be isolated mostly in the 6 to 12 inches of soil immediately above the gray till. VOCs are present elsewhere in the waste/fill associated with the Pyrophoric Area, but the concentrations are not indicative of a VOC source area.

Pyrophoric burn residue from the burning of zirconium alloys was identified in the eastern portion of the Pyrophoric Area. The pyrophoric burn residue is recognizable in the field by its black sandy texture, and it appears to be the cause of the geophysical anomaly (Figure 3) in the eastern portion of the Pyrophoric Area. The pyrophoric burn residue, an indicator of where the zirconium alloys may have been burned, exhibits a distinct profile of chromium, cobalt, iron, nickel, and vanadium at concentrations exceeding Unrestricted Use SCOs. The extent of pyrophoric burn residue is limited to surficial material, which is typically 6 inches thick.

Concentrations of PAHs, PCBs, and metals present in soil are associated with the waste and soil fill material in the Pyrophoric Area. However, data from samples below the waste and fill indicate that the elevated concentrations of PAHs, PCBs, and metals are associated with the solid and stable waste or fill and do not migrate substantially into the underlying soil. With the exception of the VOCs, the chemical constituents are incidental to the solid and stable waste and are not readily migrating beyond the immediate disposal area.

Groundwater information for the Pyrophoric Area is addressed below in the *Groundwater, Seeps, and Surface Water* section.

North Field

Chemical concentrations related to a possible gasoline release and a concentration of cyanide suggested by early LDA environmental investigation data were not confirmed by the LDA RFI. In considerations of the findings, no further action is recommended for the North Field.

Groundwater was not identified as a media of concern in the North Field and therefore was not sampled.

West Field and West Field Extended

The soil in the West Field and West Field Extended has been affected by PAHs, PCBs, and metals associated with the shallow buried waste in these areas. However, the extent of the influence is limited to the soil in immediate contact with the waste. VOCs in the West Field proper were not detected at concentrations above the Unrestricted Use SCO. Overall, VOCs were found in the West Field Extended at concentrations less than the Unrestricted Use SCO, with the exception of VOC concentrations greater than the Unrestricted Use SCO discovered below the waste isolated within silt and clay and at the gray till surface, indicative of migration under the West Field Extended from a nearby source area. The chemical constituents are incidental to the solid and stable waste and are not readily migrating beyond the immediate disposal area. The VOCs found at depth in the West Field Extended appear to be associated with a mature and stable release from a nearby and undefined source area.

Groundwater information for the West Field and West Field Extended is addressed below in the *Groundwater, Seeps, and Surface Water* section.

C&D Area No.1

Overall, the PAH, PCB, and metals results for the C&D Area No.1 are less than the Unrestricted Use SCO. PAHs and PCBs were found throughout the upper 6 inches of soil in the C&D Area No.1, which is consistent with the presence of C&D debris. Concentrations of PAHs greater than Unrestricted Use SCOs were detected in one isolated sample. PCB concentrations greater than the Unrestricted Use SCO were detected in two surface soil samples; however, the PCB concentrations in these samples are less than the Residential SCO. The occurrence and distribution of certain metals may represent a subtle effect on the soil from the C&D debris in this area, but concentrations of those metals are less than the Unrestricted Use SCO.

The soil in the southern rim of C&D Area No.1 has been affected by the VOC trichloroethylene (TCE). Concentrations of TCE exceeding the Unrestricted Use SCO were detected in shallow soil in a small area in the southwest rim of C&D Area No.1. TCE concentrations exceeding the Unrestricted Use SCO appear to be limited to the upper 1 to 2 feet of the gray till, which is found at depths of 1.5 to 3 feet below ground surface in the area of the release.

TCE concentrations exceeding the Unrestricted Use SCO were also found in shallow and deep soil in a small area in the southeast rim of C&D Area No.1. TCE concentrations greater than the Unrestricted Use SCO are present in the soil at or near the surface of the gray till found at 4 to 7 feet deep and extend

to a depth of 25 feet in an isolated area. The vertical extent of the TCE is uncharacteristically deep for the gray till and appears to be the result of a concentrated release of TCE directly onto a confined surface of the gray till which enhanced localized vertical migration into the gray till rather than lateral migration and diffusion across the gray till surface.

Groundwater was found in only one boring, located adjacent to the TCE release in the southeast rim, and is limited to a thin seam of fine sand isolated within the gray till. Isolated saturated lenses of fine sand are not uncommon in the gray till and are capable of transmitting small quantities of water. However, these sand lenses are not connected, and water is rapidly depleted from these small, isolated sand lenses with little or no recharge. Based on the limited groundwater observed in this area only one well was installed and sampled. TCE was detected in the localized groundwater at a concentration less than the Class GA groundwater standard. The minor groundwater TCE concentration in close proximity to the high soil TCE concentrations indicates that the TCE has become effectively immobilized within the gray till.

*Groundwater, Seeps, and Surface Water*

Groundwater has been affected by VOCs in a portion of the LDA. As illustrated on Figure 6, the VOCs are present in a narrow north-south oriented plume that is controlled and constrained in movement and extent by the sand and gravel deposits and underlying gray till within the immediate area of the LDA. As illustrated on Figure 4, the three sub-plumes of the northward moving portion of the groundwater plume merge north of the Pyrophoric Area. In the southern end of the investigation area, the VOC plume narrows south of the groundwater divide, where converging groundwater from the Former Landfill and groundwater from the west constrict the width of the plume. Groundwater and the associated plume flows southward through a narrow area adjacent to the western portion of the Former Landfill. Seeps located near the base of the slope in this area are evidence of the convergence and discharge of groundwater. Seepage is less evident along the eastern portion of the slope of the Former Landfill, with only one intermittent seep identified. VOCs associated with the groundwater plume have been detected in the western seeps at concentrations greater than Class GA and Class A water quality criteria. VOCs have not been detected in the seep to the east, and VOCs have not been detected in nearby downgradient surface water samples.

A source area of the principal VOCs [perchloroethylene, trichloroethylene, cis-1,2-dichloroethylene, and vinyl chloride] present in the groundwater plume was found in the Pyrophoric Area, coincident with the highest VOC concentrations in groundwater. Outside the VOC source area, similarly high VOC concentrations were found shallower than the gray till surface in one isolated sample within the silt and clay beneath the fill just west of the Pyrophoric Area. The isolation of the high VOC concentrations vertically within the soil column indicates the VOCs have migrated laterally to this location from the VOC source area or possibly from a separate source area in nearby fill. Non-aqueous phase VOC liquids were not found in soil elsewhere in the LDA nor were non-aqueous phase liquids found in the groundwater monitoring wells.

## Health Assessment

The LDA is located outside the fenced security area; however, public access to the LDA is controlled through the Knolls Laboratory access security measures and a combination of routine surveillance and patrol measures and topographic and natural barriers. Groundwater is not used as a drinking water or industrial water supply because the Knolls Laboratory is served by a public water supply.

VOCs in groundwater may migrate into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings, affecting the indoor air quality of those structures. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. The LDA is undeveloped, therefore soil vapor intrusion sampling is not necessary. Evaluation and possible mitigation of potential vapor intrusion will be required if buildings are constructed at the LDA in the future. Department approval will be required prior to any building construction.

## Remediation Objectives

The remediation objectives (or corrective action objectives) and actions to attain them are found in the following table:

| Remediation Objective | Remedial Action |
|---|---|
| **Human Health** | |
| 1. Prevent to the extent practicable, potential current and future exposure to chemical constituents of concern in soil/material, at concentrations in excess of Unrestricted Use SCOs. | • Use restrictions/administrative controls<br>• Targeted excavation, consolidation and/or off-site disposal of surface and subsurface soil/material with chemical concentrations exceeding Unrestricted Use SCOs<br>• Engineered cover system |
| 2. Prevent, to the extent practicable, potential current and future exposure to chemical constituents of concern in groundwater and seeps, at concentrations in excess of Class GA groundwater and Class A surface water standards, respectively. | • Use restrictions/administrative controls<br>• Groundwater, seep and surface water monitoring |
| 3. Prevent, to the extent practicable, potential future exposure resulting from soil vapor intrusion into future buildings at the LDA. | • Use restrictions/administrative controls<br>• Require Soil Vapor Intrusion evaluation for all future structures and take actions to address exposures, if necessary. |

| | |
|---|---|
| **Ecological Receptors** | |
| 3. Prevent, to the extent practicable, potential impacts to biota from exposure to chemical constituents of concern in soil/material, at concentrations in excess of Unrestricted Use SCOs. | • Targeted excavation, consolidation and/or off-site disposal of surface and subsurface soil/material with chemical concentrations exceeding Unrestricted Use SCOs<br>• Engineered cover system |
| 4. Prevent, to the extent practicable, potential impacts to biota from exposure to chemical constituents of concern in seeps, at concentrations in excess of Class A surface water standards. | • Groundwater, seep and surface water monitoring |
| **Cross-media Transfer** | |
| 5. Prevent, to the extent practicable, potential future migration of source chemical constituents of concern in soil/material from impacting groundwater and surface water, at concentrations in excess of Class GA groundwater and Class A surface water standards, respectively. | • Targeted excavation, consolidation and/or off-site disposal of surface and subsurface soil/material with chemical concentrations exceeding Unrestricted Use SCOs<br>• Engineered cover system<br>• Groundwater, seep and surface water monitoring |
| 6. Prevent, to the extent practicable, chemical constituents of concern in groundwater and seeps from impacting downgradient surface water, at concentrations in excess of Class A surface water standards. | • Targeted excavation, consolidation and/or off-site disposal of surface and subsurface soil/material with chemical concentrations exceeding Unrestricted Use SCOs<br>• Engineered cover system<br>• Groundwater, seep and surface water monitoring |
| **Resource Restoration** | |
| 7. Reduce, to the extent practicable, chemical constituents of concern in groundwater exceeding Class GA groundwater standards downgradient of the waste management/plume area boundary. | • Targeted excavation, consolidation and/or off-site disposal of surface and subsurface soil/material with chemical concentrations exceeding Unrestricted Use SCOs<br>• Engineered cover system<br>• Groundwater, seep and surface water monitoring |

## Point of Compliance

The shallow buried solid waste in the Former Landfill, the western Pyrophoric Area, the West Field and the West Field Extended combined with the VOC plume is considered the waste management/plume area (Figures 5 and 6). The groundwater point of compliance (POC), for the purpose of meeting the

respective groundwater and surface water standards and guidance values, is anticipated to be downgradient of the waste management/plume area at the Midline and East Boundary Streams. The groundwater POCs will be included in the post-remediation Water Quality Monitoring Plan (WQMP) to be provided by Knolls Laboratory to the Department for approval.

## Proposed Remedy

Based on the results of the investigations and the evaluation presented here, the Department is proposing an engineered cover system with targeted excavation for either on-site consolidation and covering or focused off-site disposal, in conjunction with natural attenuation, groundwater monitoring, and institutional controls. The components of the remedy are shown on Figures 7 and 8 and described below. Any of the areas outside of those denoted in these figures and not specifically investigated, were not believed to have any contamination.

1. Targeted Excavation, Consolidation and/or Off-Site Disposal

The proposed remedy will include targeted excavation to remove surface and subsurface soil with chemical concentrations exceeding Unrestricted Use SCOs and to remove surficial material/debris within the C&D Area No. 1 (shallow and deep soil, surficial debris), eastern Pyrophoric Area (pyrophoric burn residue and affected shallow soil), and the area southwest of the Former Landfill (black sand-like material). Excavated material will be consolidated into the existing unlined area of the western Pyrophoric Area and West Field Extended, with the exception of the black sand-like material from the Former Landfill, which will be disposed offsite. None of the material targeted for excavation and consolidation is known to contain contaminants at concentrations exceeding the Industrial Use SCOs. Soil from an isolated area of Mercury Disposal Area soil will be evaluated during a pre-construction investigation, with excavation and management of soil conducted, as necessary. Areas of targeted excavation will be backfilled, using backfill from an approved source or an acceptable alternative fill material in accordance 6 NYCRR Part 375-6.7(d) and as determined for emerging contaminants, and restored based on site use requirements. The areas of targeted excavation and the Soil/Material Consolidation Area are depicted on Figure 8. The final limits of excavation would be determined during remedy construction based on the results of confirmation sampling at the excavation limits.

2. Engineered Cover System

The proposed remedy will include construction of an engineered cover system within the waste management/plume area to eliminate direct contact with soil/material containing chemical concentrations exceeding Unrestricted Use SCOs and to mitigate migration via erosion of chemical constituents of concern in exposed soil/material. The cover system will include a combination of soil and gravel covers, with a minimum 12-inch thickness and finished with vegetation, asphalt and/or gravel surface coverings (based on anticipated future uses) to provide stability and resistance to erosion. An erosion and sediment control plan will be provided by Knolls Laboratory for Department approval, plus a Post-Remedial Care Plan, reviewed and approved by the Department, will address maintenance of the

cover. Any fill brought to the LDA will meet the requirements for the identified site as set forth in 6 NYCRR Part 375-6.7(d) and as determined for emerging contaminants.

The projected lateral limit of the proposed cover is shown on Figures 7 and 8. Also shown on Figure 8 is the conceptual location of the Soil/Material Consolidation Area, which will be covered with the engineered cover.

Evaluation and possible mitigation of potential vapor intrusion into future buildings constructed on the LDA will be required if buildings are constructed at the LDA in the future. Department approval would be required prior to any building construction.

3. Monitoring

A post-remediation WQMP, to be provided by Knolls Laboratory and approved by the Department, will be implemented to assess the performance and effectiveness of the remedy and collect data for timely remedial decision-making. Periodic sampling and analyses of groundwater, seeps and surface water will be performed to evaluate and document the effectiveness of the engineered cover system and chemical concentrations proximal to surface water, and within and downgradient of the waste management/plume area for the purpose of monitoring plume stability. The WQMP will also include a schedule of monitoring and frequency of submittals to the Department. If determined necessary by the Department, emerging contaminant sampling shall be included in the WQMP.

A Post-Remedial Care Plan (PRCP), to be provided by Knolls Laboratory and approved by the Department, will be implemented to monitor and evaluate the effectiveness of the remedy. Upon its approval, the PRCP will become part of the Part 373 Permit. Post-remedial care monitoring will involve periodic inspection, maintenance and monitoring activities to monitor and maintain the integrity and effectiveness of the engineered cover system and monitoring locations. The PRCP will also identify institutional controls, such as land use and administrative controls, implemented at the LDA for the purpose of documenting access/use restrictions and requiring the continued maintenance and monitoring of engineering controls to maintain protectiveness of human health and the environment.

4. Institutional Controls

Institutional controls in the form of land use and administrative controls will be implemented for the LDA at the Knolls Laboratory for the purpose of documenting access/use restrictions and requiring the continued maintenance and monitoring of engineering controls to maintain protectiveness of human health and the environment. The institutional controls will limit site and groundwater use (both potable and process) as well as require maintenance of corrective measure components. Institutional controls will also require that activities with the potential to expose contaminated material (and require health and safety precautions), or impair the integrity of the engineered cover, be performed in accordance with a PRCP. Additional controls may be imposed through revision of the Part 373 Permit Conditions. Land use for the LDA is restricted and the institutional controls will reflect restricted use.

## Public Participation

The preferred remedy in a Draft SB was made available for public review and comment during the timeframes listed below. The Department encouraged the public to review and comment on the corrective measure alternative described in this document. The Department had the ability to modify the proposed remedy based on new information and/or public comments.

Document Availability

The Draft SB and the referenced reports[10] were made available during the public comment period at the following repository:

Schenectady County Public Library
Niskayuna Branch
2400 Nott Street East
Niskayuna, New York 12309
(518) 386-2249

The Final SB, as well as the Draft SB and referenced reports, is available electronically upon request or at https://www.dec.ny.gov/data/DecDocs/447017/.

Public Comment Period

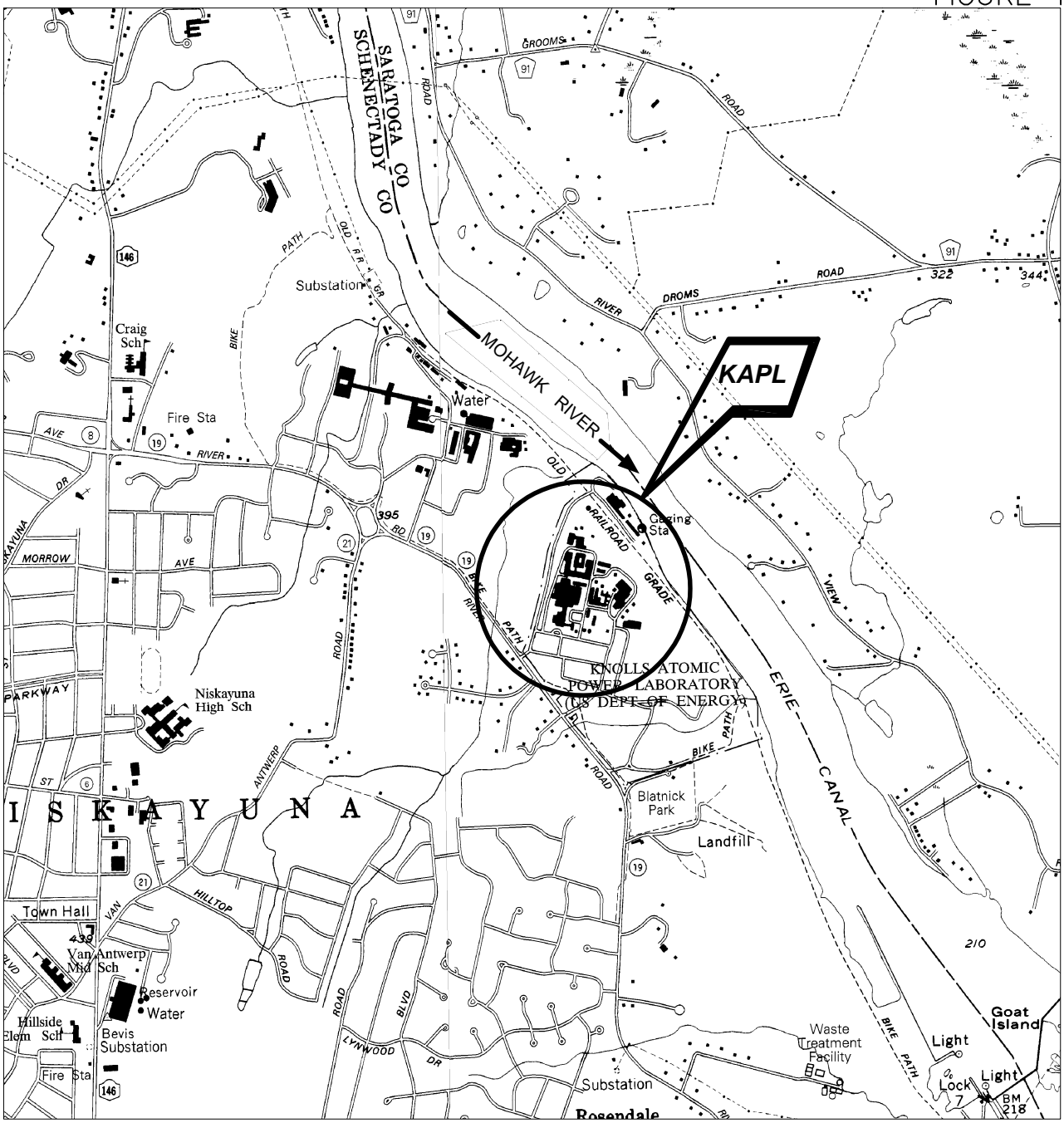
A public comment period was held from April 13, 2022 to May 30, 2022.

The Department did not receive any comments during the public comment period. As such, no Responsiveness Summary will be prepared and/or issued.

[10] RCRA Facility Assessment Sampling Visit Report for the Knolls Site Land Disposal Area, Knolls Atomic Power Laboratory, September 2006, Revised December 2007; RCRA Facility Investigation Report for the Land Disposal Area, Knolls Atomic Power Laboratory, October 2011 (Revised July 2016, Revised November 2016); KAPL Land Disposal Area, Focused Corrective Measures Study Report, Knolls Atomic Power Laboratory, May 2018

# FIGURES

FIGURE 1




ADAPTED FROM: NISKAYUNA & SCHENECTADY QUAD., N.Y. STATE U.S.G.S. 7.5 MIN. QUAD

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NISKAYUNA, NEW YORK
LAND DISPOSAL AREA
STATEMENT OF BASIS


QUADRANGLE LOCATION

SITE LOCATION MAP

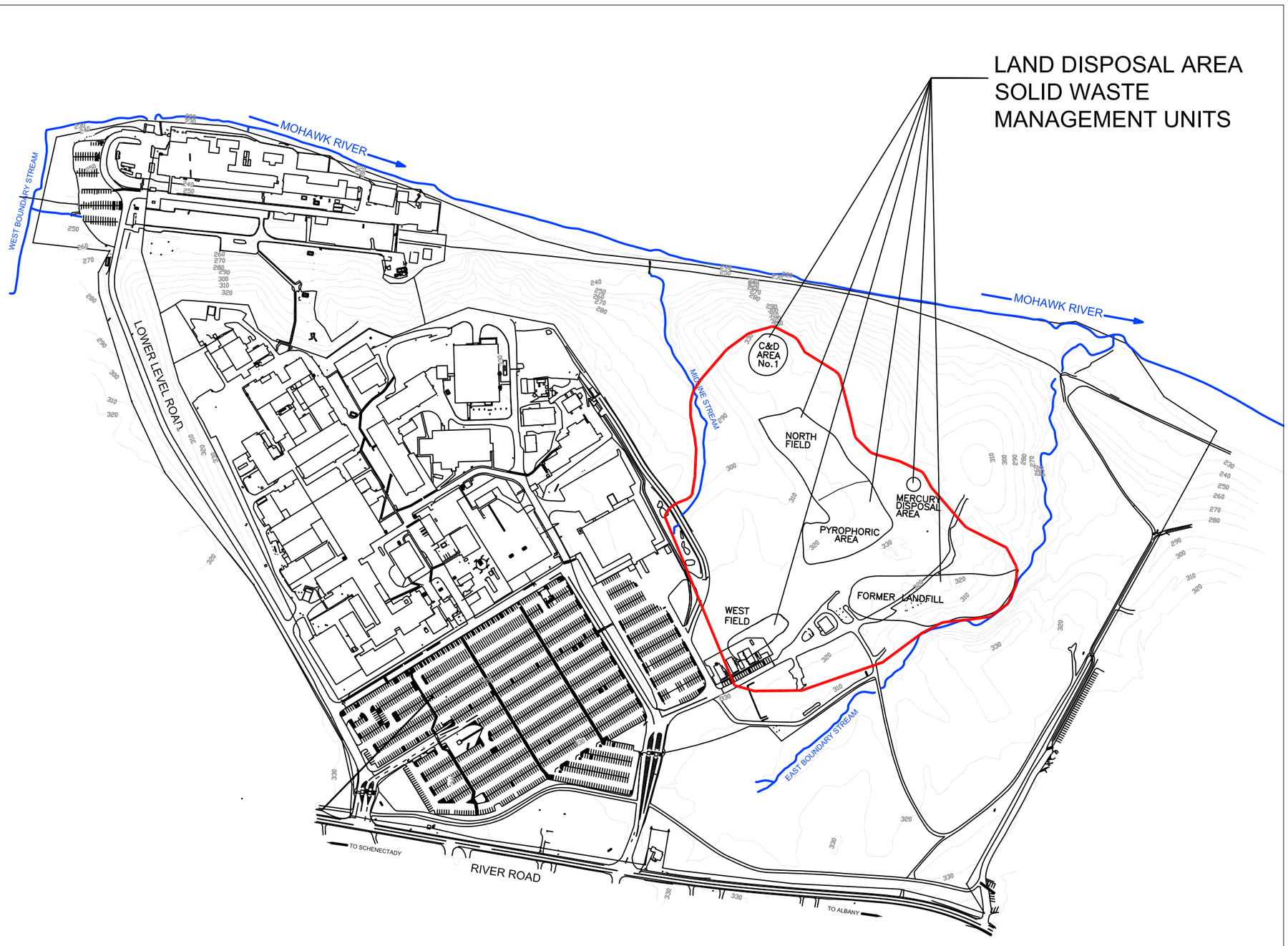
1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

N

SCALE: 1:24000




N

LEGEND

APPROXIMATE BOUNDARY OF LAND DISPOSAL AREA INVESTIGATION

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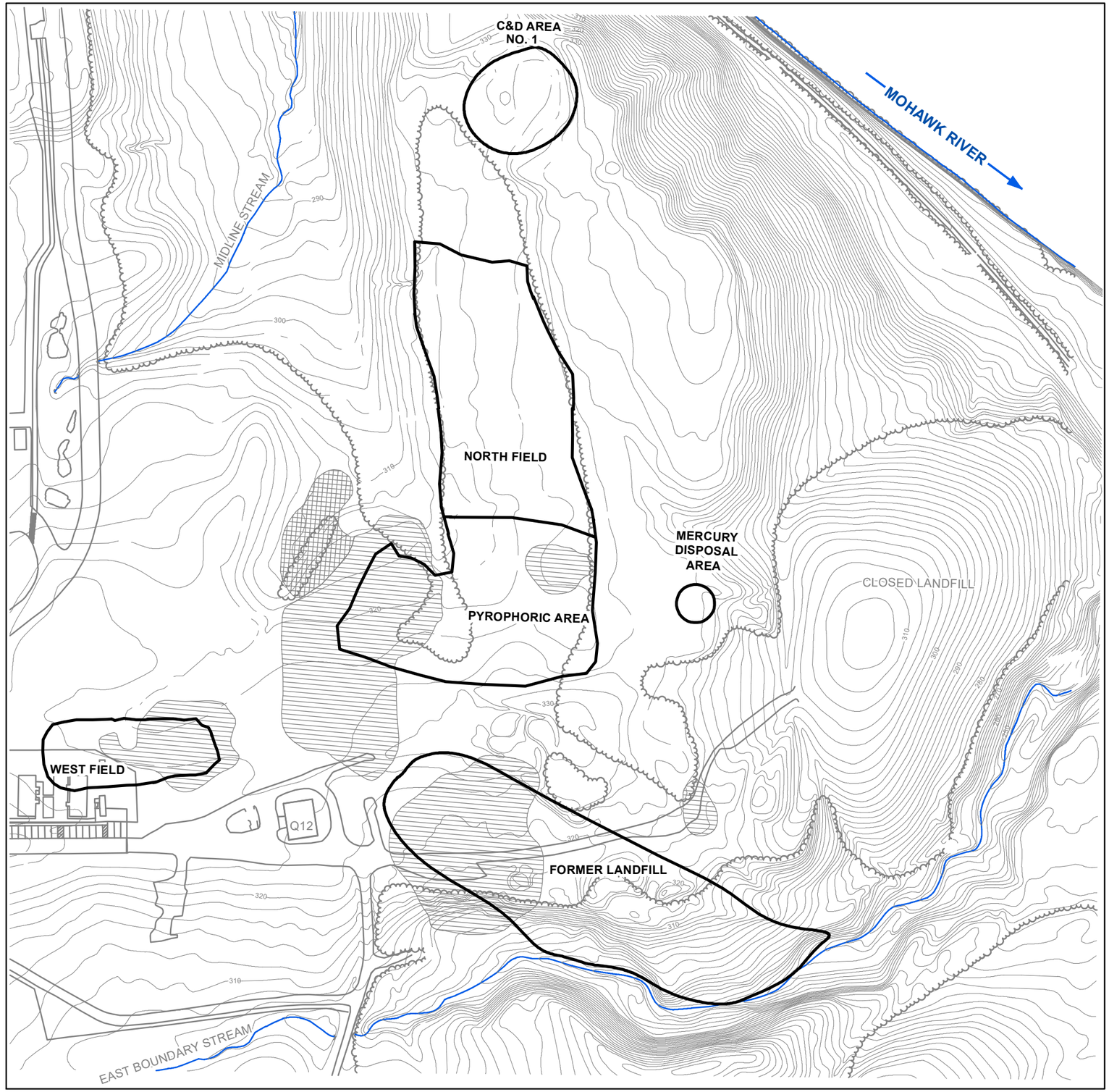
# FIGURE 2

KNOLLS LABORATORY MAP

0 400 800

SCALE IN FEET




N

## Legend

- Topographic Contour (2-Foot Interval)
- Area Containing Possible Buried Metal Objects
- Area Containing Possible Conductive Soil or Groundwater

Note:
1. Temporary office structures in and southwest of the West Field will be removed or relocated.

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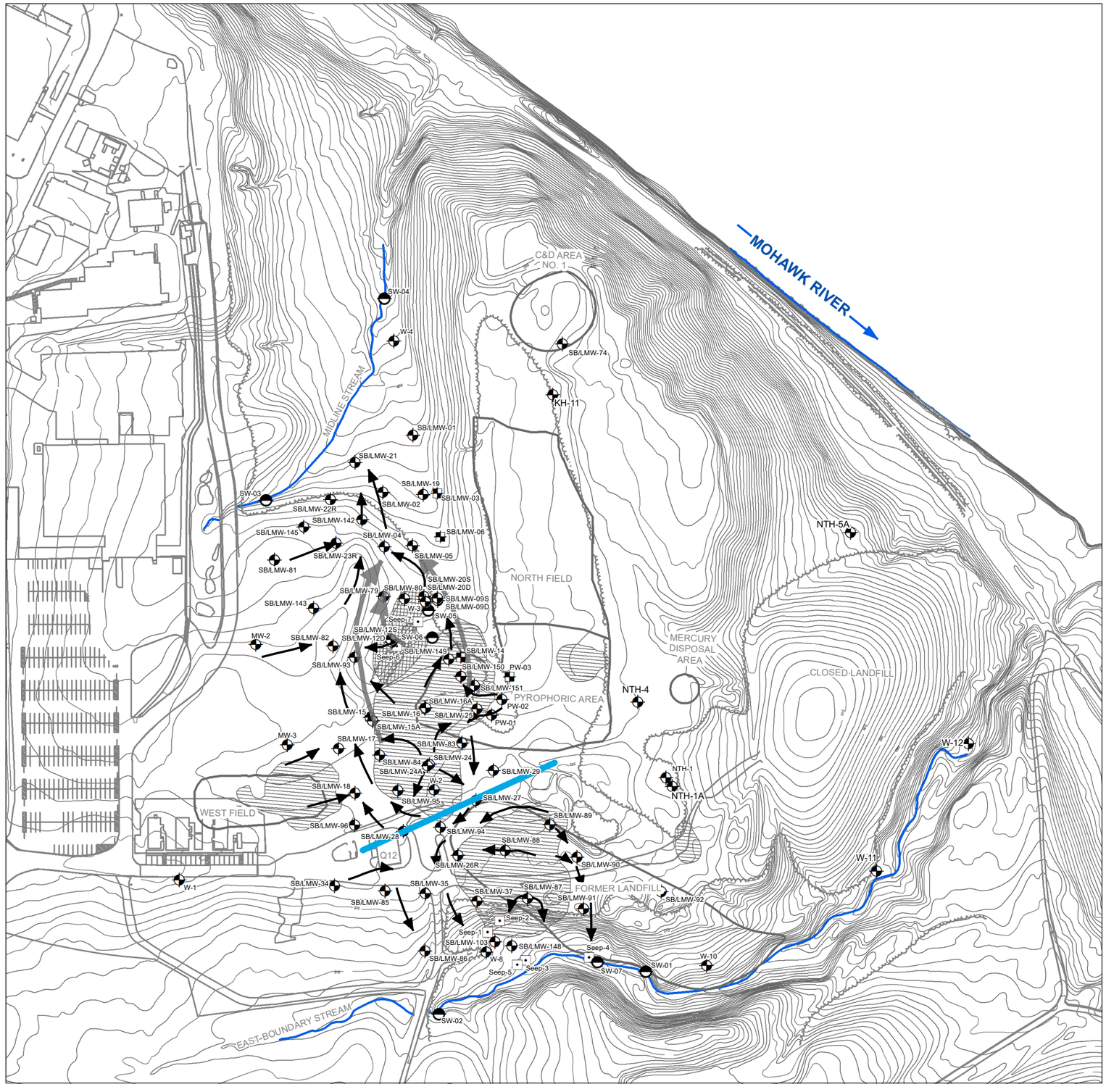
STATEMENT OF BASIS

# FIGURE 3

## LAND DISPOSAL AREA
## SWMU LOCATION MAP

0 150 300
Feet




N

## Legend

- SB/LMW-12S — Monitoring Well Location Used for Contouring
  - Well ID Prefix Designator
  - W, MW, KH, NTH - Pre-LDA RCRA Corrective Action Site Wells
  - PW - SPRU Well
  - SB/LMW - LDA Sampling Visit and RFI Boring/Well
- SB/LMW-06 — Former Well Location
- SW-03 — Surface Water Sampling Location
- Seep-1 — Seep Sampling Location
- Groundwater Flow Direction
- Northern Sub-Plume
- Groundwater Divide
- Topographic Contour (2-Foot Interval)
- Area Containing Possible Buried Metal Objects
- Area Containing Possible Conductive Soil or Groundwater

Note:
1. This figure adaped from Figures 19, 20, and 31 of the *RCRA Facility Investigation Report for the Land Disposal Area*, October 2011, Revised July 2016 and November 2016.

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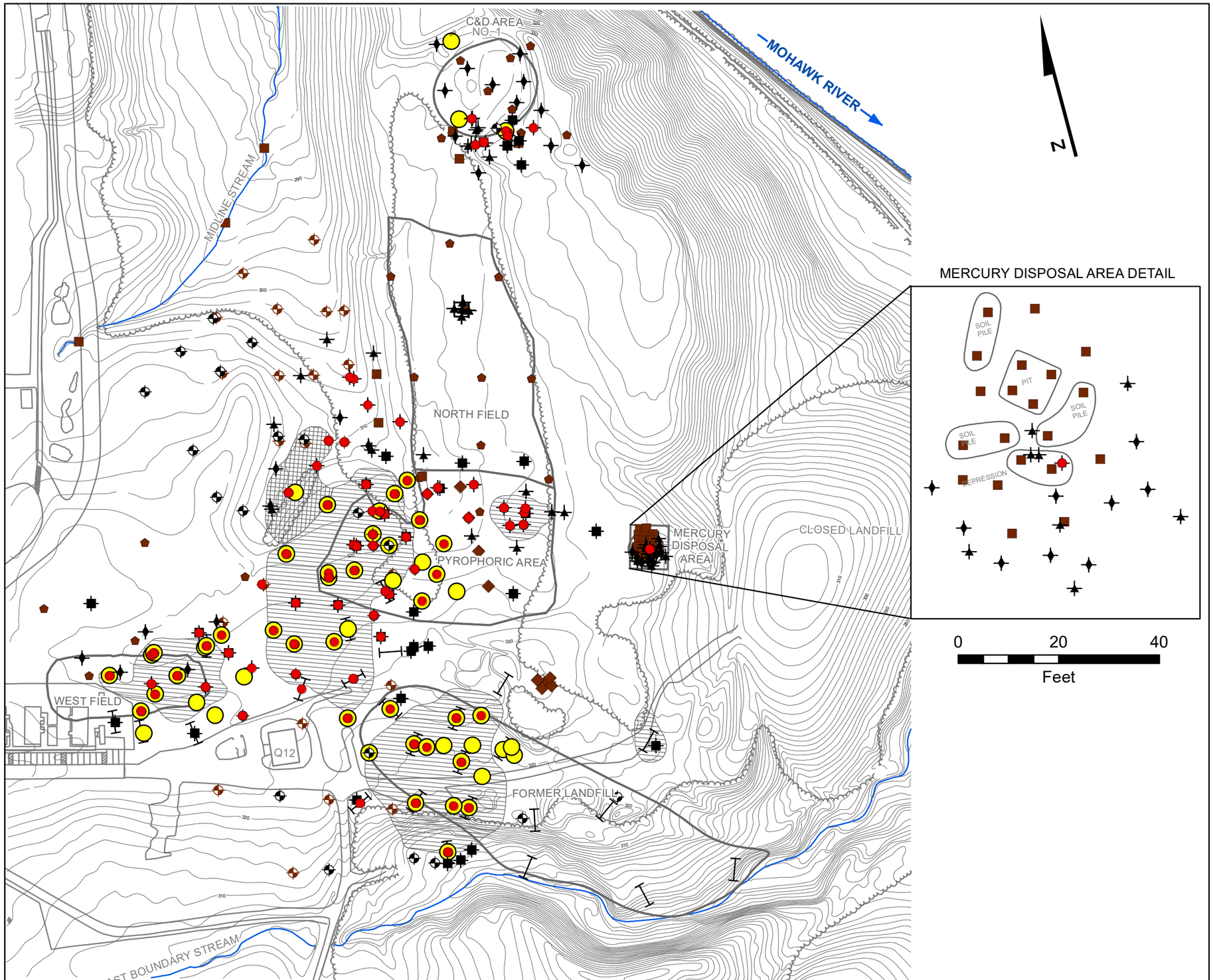
# FIGURE 4

## GROUNDWATER FLOW MAP

0 200 400
Feet




## Legend

- Location of Concern[2]
- Location Containing Waste Material/Debris
- RFI Soil Boring/Monitoring Well
- RFI Surface Soil Sample Only
- RFI Shallow Soil Boring
- RFI Deep Soil Boring
- RFI Test Pit
- SV Soil Boring/Monitoring Well
- SV Soil Boring
- SPRU Soil Boring
- SV Test Pit
- Topographic Contour (2-Foot Interval)
- Area Containing Possible Buried Metal Objects
- Area Containing Possible Conductive Soil or Groundwater

Note:

1. This figure adapted from Figure 4 of the *Focused Corrective Measures Study Report for the Land Disposal Area*, May 2018.
2. Determined based on comparison to 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives and Knolls Laboratory-specific background concentrations (metals).
3. Test pit symbol not to scale. Actual test pit length is from 8 to 10 feet.
4. Temporary office structures in and southwest of the West Field will be removed or relocated.

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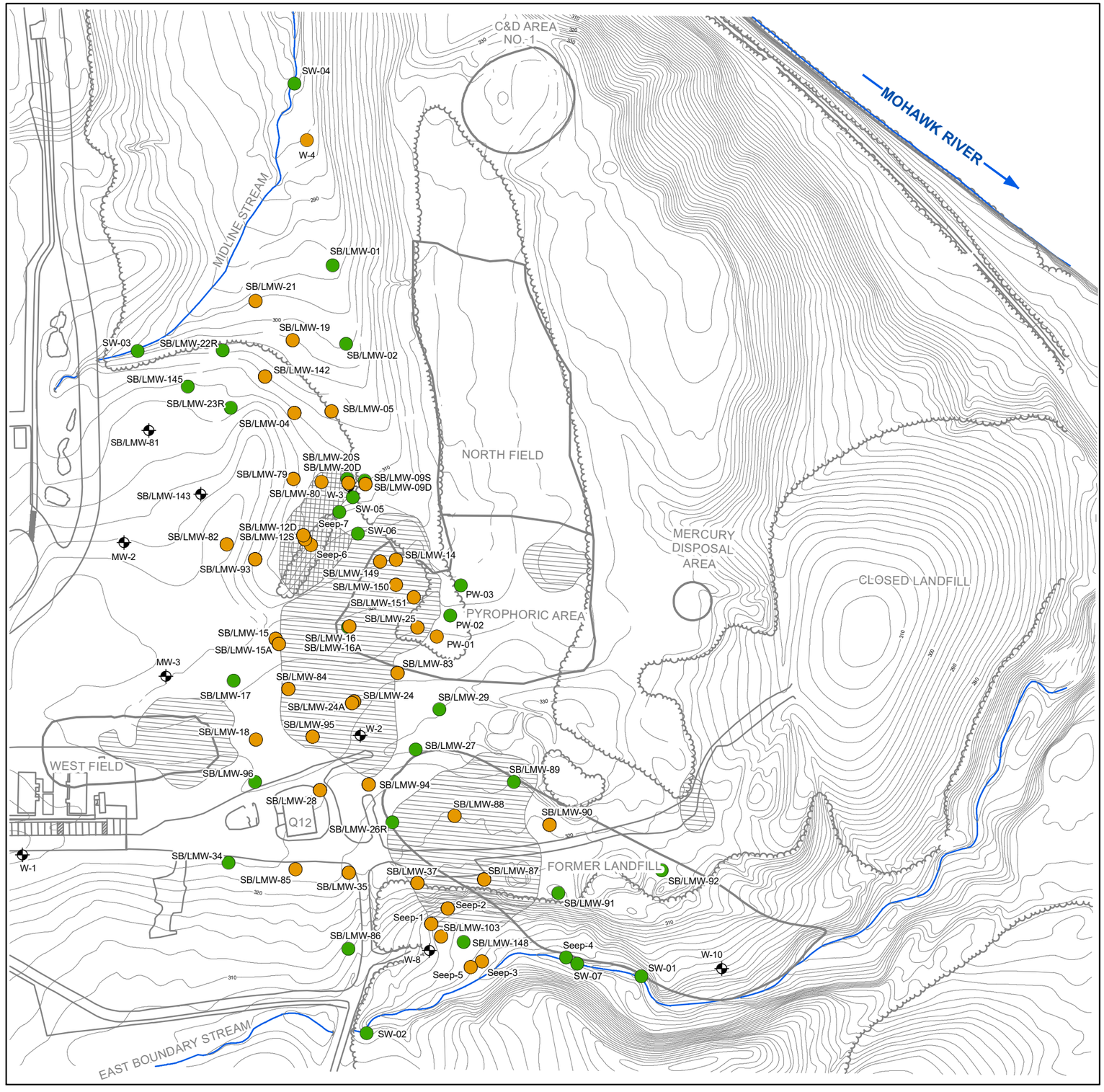
# FIGURE 5

## SOIL LOCATIONS OF CONCERN AND LOCATIONS CONTAINING WASTE MATERIAL/DEBRIS

0 150 300
Feet

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## Legend

- Sampled Location with One or More Results Exceeding Water Quality Criteria
- Sampled Location with No Results Exceeding Water Quality Criteria

  Sample Prefix Designator
  SB/LMW - LDA Sampling Visit and RFI Boring/Well
  PW - SPRU Well
  W, MW - Pre-LDA RCRA Corrective Action Site Well
  SW - Surface Water Sample
  Seep - Seep Sample
- Monitoring Well Location Not Sampled
- Topographic Contour (2-Foot Interval)
- Area Containing Possible Buried Metal Objects
- Area Containing Possible Conductive Soil or Groundwater

Note:
1. This figure adapted from Figure 23 of the *RCRA Facility Investigation Report for the Land Disposal Area*, October 2011, Revised July 2016 and November 2016.
2. Groundwater, seeps and surface water were compared to the respective water quality criteria: groundwater and surface water standards identified in 6 NYCRR Part 703 and groundwater and surface water guidance values identified in NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values.
3. Temporary office structures in and southwest of the West Field will be removed or relocated.

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# FIGURE 6

## VOCS IN GROUNDWATER, SEEPS, AND SURFACE WATER EXCEEDING WATER QUALITY CRITERIA

0 150 300
Feet


N

## Legend

- VOC Source Area[3]
- Topographic Contour (2-Foot Interval)
- Conceptual Engineered Cover Boundary

Note:

1. This figure adapted from Figure 8 of the *Focused Corrective Measures Study Report for the Landfill Disposal Area*, May 2018.
2. Based on the anticipated future land use of the LDA and the overall Knolls Laboratory (industrial), it is anticipated that much of the engineered cover system would be a 12-inch thick soil cover, consisting of 6-inches of common fill and 6-inches of topsoil and appropriate vegetative cover. Depending on land use within the cover area; for example, access roads and laydown areas, a combination of crushed stone or pavement at least 12-inches thick may be placed in lieu of a soil cover. The engineered cover system will include fill material to account for variations in existing grade. Final cover thicknesses and grade will provide for adequate drainage and aesthetics. Soil used to construct the engineered cover system will meet the 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.
3. Approximately 600 cubic yards of debris and soil were excavated from the VOC source area and disposed offsite in 2010 as part of the SPRU North Field Land Area Project.
4. Temporary office structures, storage containers, and staged materials within the project area will be removed or relocated.

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# FIGURE 7

## CORRECTIVE MEASURE ALTERNATIVE COMPONENTS

0 150 300
Feet


N

## Legend

- Topographic Contour (2-Foot Interval)
- Conceptual Engineered Cover Boundary Extents
- Conceptual Engineered Cover Boundary - Soil Cover
- Conceptual Engineered Cover Boundary - Gravel Cover
- Soil/Material Consolidation Area
- Conceptual Excavation Area

Note:
1. This figure adapted from Figure 9 of the *Focused Corrective Measures Study Report for the Land Disposal Area*, May 2018.
2. Temporary office structures, storage containers and staged materials within the project area will be removed or relocated.
3. All monitoring wells within the limits of the proposed soil cover were decommissioned in accorance with New York State Department of Environmental Conservation (NYSDEC) Groundwater Monitoring Well Decommissioning Policy (CP-43).
4. The conceptual excavation areas and depths are approximate. Soil/material removal would be performed to remove soil exceeding media-specific cleanup standards and/or containing material/debris.
5. Soil used to construct the engineered cover system will meet the 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.

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# FIGURE 8

## CORRECTIVE MEASURE CONCEPTUAL DESIGN

0 150 300
Feet