



Environmental, Planning, and Engineering Consultants

1695 Church Street
Unit 3
Holbrook, NY 11741
tel: 631-285-6980
www.akrf.com

May 31, 2019

Ms. Kusum Sinha, Ed.D, Superintendent of Schools
Garden City UFSD
56 Cathedral Avenue
Garden City, NY 11530

**Re: Summary of Environmental Conditions
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York**

Dear Ms. Sinha:

AKRF, Inc. (AKRF) has prepared this report for the Garden City Union Free School District (GC UFSD) in response to a question raised by a community member in connection with a United States Environmental Protection Agency (EPA) Superfund site referred to as the Old Roosevelt Field Contaminated Groundwater Area Site (hereafter referred to as the “Superfund Site”). The Superfund Site is an approximately 1,000-acre property located in the Village of Garden City. It is currently developed with the Roosevelt Field shopping mall, other smaller shopping plazas, and office buildings. This report provides a summary of the EPA’s findings from environmental investigations related to the Superfund Site, and an analysis as to whether the contamination could potentially affect Locust School, which is approximately 1,500 feet to the south at 220 Boylston Street, see **Figure 1-1**.

Executive Summary

The groundwater beneath the Superfund Site is impacted by chlorinated solvents, including tetrachloroethene (PCE) and trichloroethene (TCE), which is a result of historical use as an airfield. The chlorinated solvent plume in groundwater has been identified at concentrations above drinking water quality standards. EPA determined that the main potential for human exposure would be through ingestion of or direct contact with contaminated groundwater. EPA conducted an evaluation of several remedial alternatives to protect human health and the environment in areas impacted by the chlorinated solvent plume. The selected remedy includes the pumping and treatment of water prior to distribution to the public. As part of the remedy, the Village of Garden City conducts routine analysis of treated water from the public supply wells before it can be consumed by the public, and tests specifically for PCE and TCE, among other contaminants.

While their primary focus has been on groundwater impacts, soil vapor was evaluated closer to the source of contamination where the groundwater plume was shallower (i.e., within the Superfund Site). Areas where contamination was shallower present a greater potential for vapor to migrate to the surface; however, soil vapor sampling conducted at the Superfund Site did not indicate a vapor intrusion concern, and as described below, the contamination “sinks” as it migrates downgradient. Therefore, the potential for vapor intrusion closer to the Locust School is further reduced by a buffer of overlying uncontaminated shallow groundwater, and EPA did not conduct soil vapor sampling further downgradient from the Superfund Site in close proximity the Locust School.

The Upper Glacial aquifer (water table) is located at approximately 26 to 38 feet below ground surface (bgs) beneath the Superfund Site and at approximately 23 to 28 feet bgs at Locust School. Groundwater contamination beneath the Superfund Site is not present at the water table, but rather begins within the Upper Glacial aquifer at approximately 95 feet bgs and extends to approximately 200 feet bgs in the Magothy aquifer. This is to be expected as both PCE and TCE are denser than water, so contamination has a tendency to sink deeper both beneath the source site and as it migrates away from the source site. Based on samples collected from the monitoring wells nearest to the Locust School (approximately 1,500 feet to the south), contaminants are reportedly between 320 to 370 feet bgs and not present within the top 110 feet bgs, and do not warrant additional monitoring or mitigation.

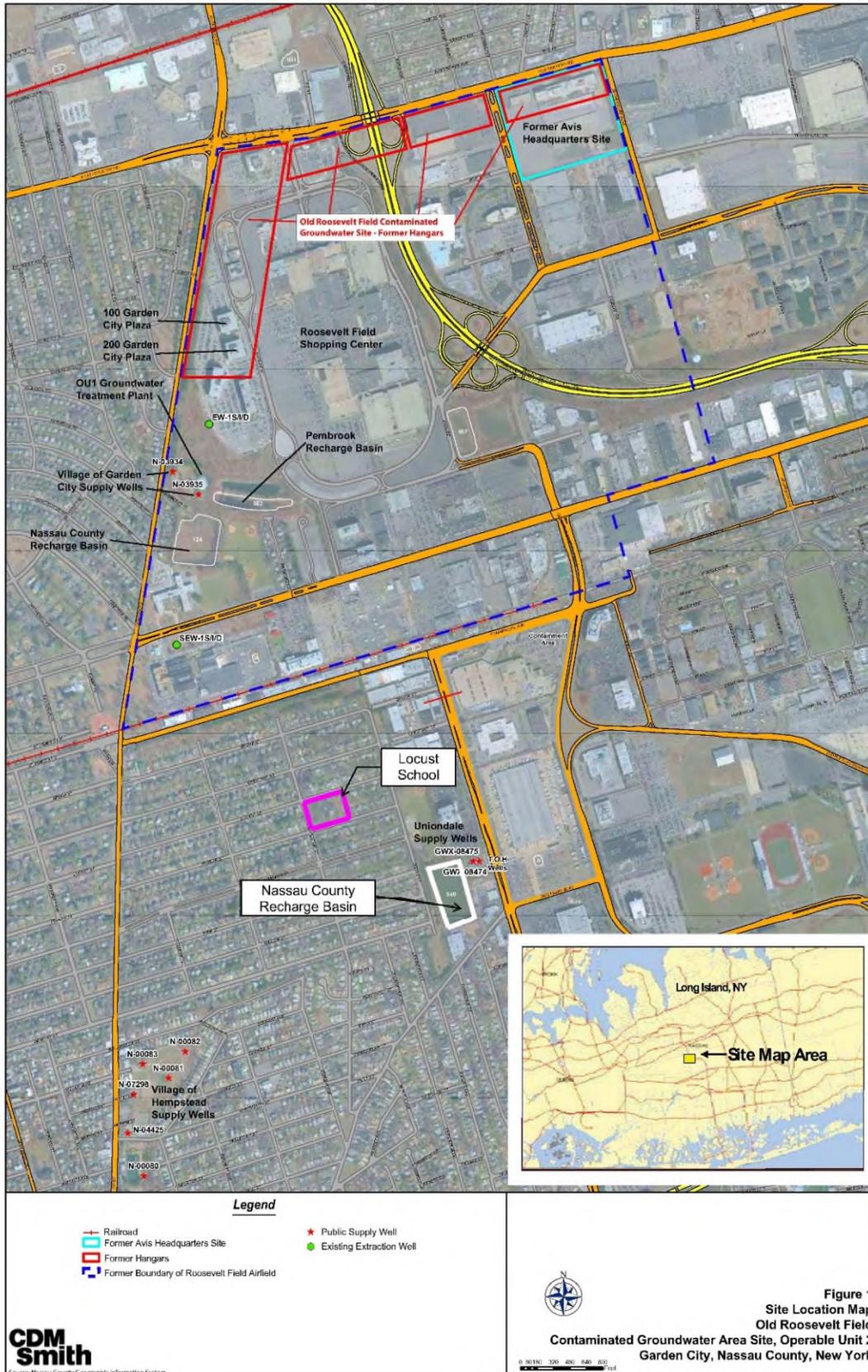


Figure 1-1, CDM, 2018

Even within the Superfund Site, the studies concluded that the potential for soil vapor intrusion of PCE and TCE into buildings is minimal. Since the portion of the plume beneath Locust School is at least 275 feet deeper than at the Superfund Site (and is only within the Magothy aquifer, with over 250 feet of non-solvent contaminated groundwater above), the EPA did not require testing of soil vapor in off-site areas such as Locust School, as the exposure pathway was deemed incomplete.

Based on the information presented by EPA and the physical principals of soil vapor migration, it is AKRF's professional opinion that potential soil vapor from the PCE and TCE contaminated groundwater reported at 320 to 370 feet beneath the Locust School does not have any meaningful potential to migrate upwards through an approximately 250-foot buffer of groundwater not impacted by chlorinated solvents. Therefore, soil vapor testing does not appear necessary.

Site History and Background

Historically, the Roosevelt Field airfield was operated by the United States Army and Navy between approximately 1911 and 1951 as a facility to receive, refuel, crate, and ship army aircrafts. Operations included repair, maintenance, and metal fabrication. Operations ceased at the end of World War II and the area was vacated in 1946. It was subsequently used as a commercial airport up until May 1951. The last of the navy plane hangars was removed in 1971 (EPA, September 2007; EPA, March 2018).

In the 1970s and 1980s, chlorinated solvents, a subset of chemicals commonly used in manufacturing, commercial, and industrial operations, including degreasing, cleaning solutions, paint thinners, resins, and glues, were identified during environmental investigations. Most notably, chlorinated solvents were detected in two approximately 400-foot deep Village of Garden City public drinking water supply wells (denoted as Wells 10 and 11) located along Clinton Road near the southern boundary of the Site. The primary Contaminants of Concern (COC) included the chlorinated solvents TCE and PCE.

In May 2000, the former Roosevelt Field airfield was listed on the National Priorities List (NPL) due to the presence of TCE and PCE in public supply wells that provide drinking water to the surrounding community (EPA, March 2018). The NPL is a list of sites established by the EPA of some of the most serious uncontrolled or abandoned hazardous waste sites identified for probable remedial action under the Superfund Program. NPL/Superfund sites constitute an immediate threat to human health and the environment, and require environmental investigation and remediation.

Soil Vapor Intrusion

The presence of solvent-contaminated groundwater associated with the Site raised concern about the potential for contaminated vapors to migrate into nearby buildings through cracks in the foundation or other openings, including sewer lines ("What is Vapor Intrusion," EPA). This process is known as soil vapor intrusion. As vapors build up in an enclosed area, they can become a health risk for occupants or visitors of a building. Such vapors are often odorless and it may not be obvious that vapor intrusion is occurring. Soil vapor intrusion is determined through the implementation of a sampling plan, which includes the collection of sub-slab soil vapor samples, indoor air, and ambient (outdoor) air samples. The laboratory analytical results are used to compare the concentrations of the air quality inside the building and the contaminants in soil vapor beneath the building. **Figure 2-1** illustrates the basic soil vapor intrusion principles.

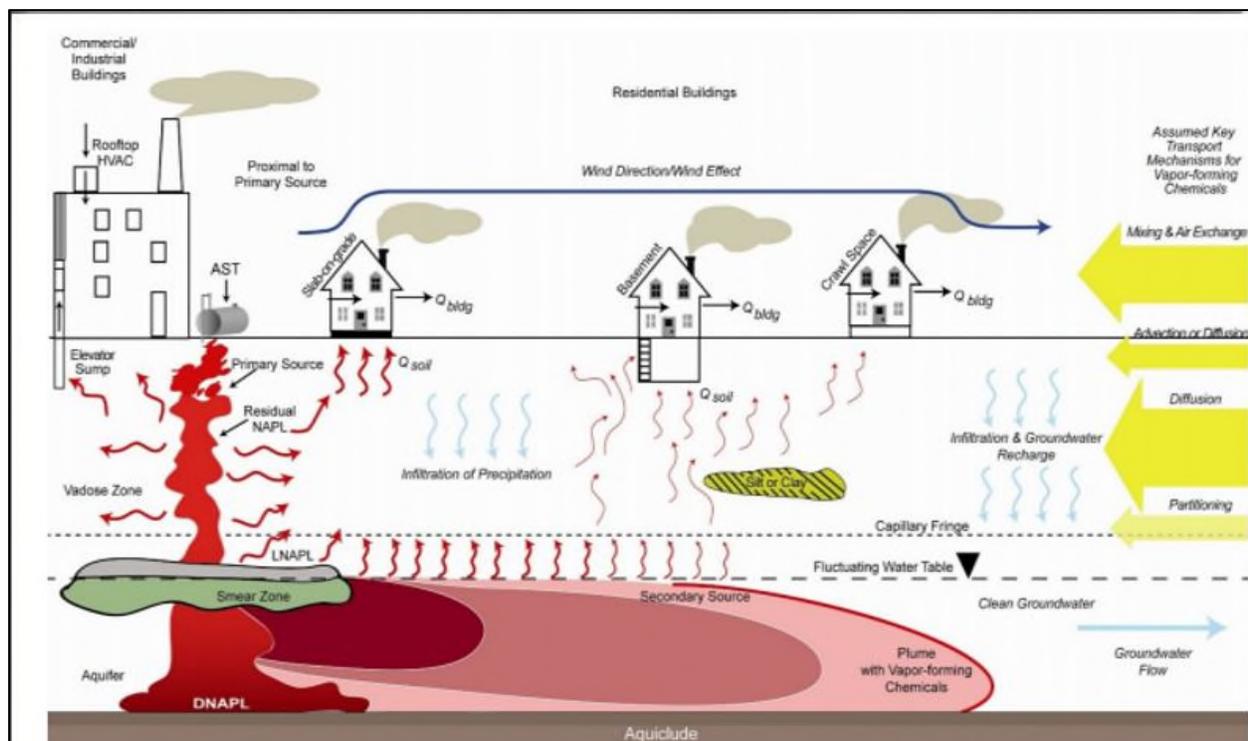


Figure 2-1, EPA, 2017

Previous Site Investigations

The EPA divided the Superfund Site into two operable units; Operable Unit 1 (OU1) was defined as the source area within Roosevelt Field Mall and the western portion of the Superfund Site, with measurable extents down-gradient (south) along Clinton Road; Operable Unit 2 (OU2) was defined as the eastern portion of the Superfund Site at the southeastern intersection of Old Country Road and Clinton Road and intended to address groundwater contamination down-gradient of the source area (OU1). Enclosed **Figure 3-1** indicates the locations and extents of OU1 and OU2.

Operable Unit 1:

CDM Federal Programs Corporation (CDM) conducted a Remedial Investigation (RI) at OU1 in 2006 on behalf of EPA. The RI included the collection of soil, groundwater, and soil vapor samples from areas throughout OU1 at varying depths. Groundwater samples were collected from pre-existing monitoring wells and from the Village of Garden City's public supply wells, 10 and 11. Groundwater from the pre-existing wells was analyzed at three intervals: the top of the water table or upper glacial aquifer [approximately 50 feet below ground surface (bgs)], top of the Magothy aquifer (approximately 100 feet bgs), and the lower Magothy aquifer at the deepest boring depth (approximately 450 feet bgs). Groundwater analytical results were compared to the Site-Specific Groundwater Screening Criteria (SSGWSC) of 5 micrograms per liter ($\mu\text{g/L}$). The SSGWSC was selected as the lowest (most conservative) drinking water quality standard as listed by the EPA, New York State Department of Environmental Conservation (NYSDEC), and New York State Department of Health (NYSDOH) (CDM, July 2007).

CDM reported that the highest levels of PCE (up to 350 $\mu\text{g/L}$) and TCE (up to 260 $\mu\text{g/L}$) were detected in groundwater samples collected between approximately 185 and 417 feet bgs. PCE and TCE concentrations in supply Well 10 (denoted as GWP-10) were reported to be 270 and 170 $\mu\text{g/L}$, respectively, and in Well 11 (denoted as GWP-11) at 50 and 160 $\mu\text{g/L}$, respectively, both at approximately 400 feet bgs. CDM determined that four wells (SVP/GWM-4, GWX-10019, GWP-10, and GW-11), which exhibited the highest concentrations of chlorinated solvents were the core of the PCE and TCE contaminant plume in OU1 (CDM, July 2007), as shown below on **Figure 3-2**.

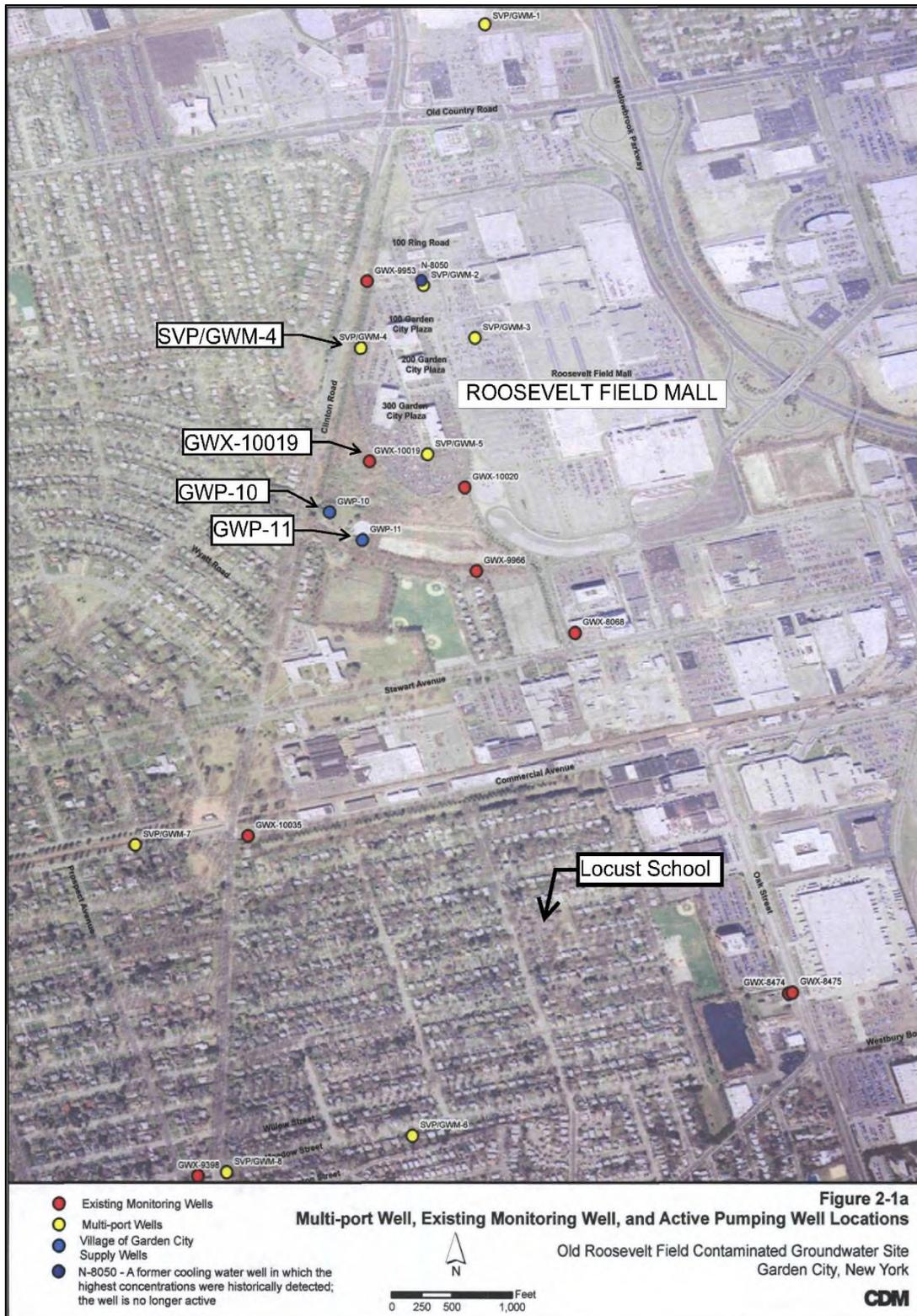


Figure 3-2, CDM, 2007

CDM screened soil gas from 158 locations across the western and northern portions of Roosevelt Field Mall. The soil gas was screened by purging air from 15 feet bgs and 35 feet bgs and measured relative concentrations of total volatile organic compounds (VOCs) using a ppbRae. A ppbRae does not identify specific compounds. Thirty-six soil gas samples were collected around the perimeter of three office buildings and along a west-adjacent grassy area, referred to as Hazelhurst Park. Of the soil gas screening results, five samples collected from 15 feet bgs had total VOC readings above 100 parts per billion per volume (ppbv). Eighty-five percent of the locations had reported readings at or below 10 ppbv. Of the soil gas screening results collected from 35 feet bgs, nine samples had total VOC readings above 100 ppbv. Eighty-three percent of the locations had reported readings at or below 10 ppbv.

Soil gas analytical results were compared to the *EPA Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, dated November 2002 (the regulatory standard at the time of sampling). EPA reported that soil vapor samples exceeded the screening criteria for TCE of 2.2 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in four soil vapor samples collected along Clinton Road, over 4,000 feet north of Locust School. No other compounds were detected above the EPA criteria in soil vapor samples.

Between June and December 2007, EPA collected additional sub-slab and indoor air samples from commercial buildings within the Roosevelt Field Mall complex and neighboring residential properties located west of Clinton Road, adjacent to the mall. EPA reported that none of the indoor air sample concentrations exceeded the applicable criteria as presented in the NYSDOH October 2006 *Guidance for Evaluating Soil Vapor*. In 2017, NYSDOH issued an update to the guidance document for TCE and PCE; however, the indoor air concentrations in comparison to the sub-slab soil vapor concentrations were still below the criteria which would require a mitigation system to be installed or further monitoring of the affected area. The highest concentrations of PCE and TCE in sub-slab vapor samples were detected at 110 Ring Road and 400 Garden City Plaza, both over 3,000 feet north of Locust School. The associated indoor air sample concentrations for the respective sampling events were below the NYSDOH criteria, meaning that no additional monitoring or mitigation to minimize the potential exposure would be required.

Based on the findings of the OU1 RI, CDM concluded that the main COCs found in groundwater associated with the Superfund Site included PCE, TCE, and several breakdown products including 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), and carbon tetrachloride. These compounds are denser than water and sink in groundwater as they migrate off-site with groundwater flow. Groundwater flow beneath the Superfund Site was intercepted by pumping from the supply wells 10 and 11, which reportedly prevented the solvent plume from migrating further south.

Operable Unit 2:

CDM conducted an RI at OU2 between 2014 and 2016. The investigation included the collection of groundwater samples across OU2, which encompassed the location of Locust School. Groundwater analytical results were compared to the SSGWSC of 5 $\mu\text{g}/\text{L}$. CDM reported that the highest concentrations of PCE (ranging from 360 to 600 $\mu\text{g}/\text{L}$) were detected in deep groundwater samples collected at approximately 340 to 375 feet bgs in wells MW-16I1 and MW-16I2, located up-gradient of Locust School and MW-18I, located approximately 350 feet down-gradient of Locust School. TCE was detected between 79 and 120 $\mu\text{g}/\text{L}$ in wells MW-16I1 and MW-16I2, and at 110 $\mu\text{g}/\text{L}$ in well MW-18I. In shallow groundwater sampled from monitoring well 307, located approximately 400 feet north of Locust School, PCE and TCE were not detected above the laboratory reporting limits in samples collected between 100 and 110 bgs. Groundwater is located approximately 23 to 28 feet bgs within the vicinity of Locust School; however, due to the documented (deep) depth of the contamination and that the contaminants “sink” as they migrate (travel) in groundwater, sampling of shallower groundwater was not conducted beneath the Locust School above 100 feet bgs.

No other groundwater samples were reportedly collected from the upper 110 feet bgs within a 400-foot radius of Locust School. Groundwater was sampled in the upper 150 feet bgs in monitoring wells sampled

further up-gradient and down-gradient of Locust School in 2016. In monitoring well MW-16S located approximately 1,000 feet north of Locust School, PCE and TCE in groundwater at 125 to 135 feet bgs were reported to be 120 µg/L and 53 µg/L, respectively, above the SSGWSC of 5 µg/L. In monitoring well SVP-14, located approximately 1,600 feet southwest of Locust School, PCE was detected at a concentration of 0.3 µg/L and TCE was not detected in groundwater at 100 feet bgs. Due to their proximity to Locust School, these samples may not be indicative of groundwater conditions immediately surrounding Locust School.

CDM concluded that the southern edge of the OU2 PCE/TCE plume began at 160 to 170 feet bgs in monitoring well MW-15S and extended to approximately 447 feet bgs in monitoring well SVP-6-1. It was determined that the PCE/TCE groundwater plume sinks deeper within the Magothy aquifer as it migrates south beneath Locust School and the surrounding neighborhood.

Based on the findings of the 2014-2016 OU2 RI, CDM determined that there was no exposure pathway from the PCE and TCE-contaminated groundwater, since supply wells 10 and 11 were outfitted with a groundwater treatment system. If future public wells were to be installed without a treatment system, future residents may be exposed to the contaminated groundwater (CDM, February 2018). However, the Village of Garden City is aware of the contamination and is working with the EPA and NYSDEC to ensure that water provided to the public is treated and tested to ensure its quality.

Record of Decision and EPA Proposed Remedies

In 2007, the EPA issued a *Record of Decision* (ROD) for OU1. The ROD outlines the selected remedy to mitigate and monitor the extent of the groundwater contamination throughout OU1 and includes an evaluation of remedial alternatives with respect to multiple categories, such as their effectiveness of protecting human health and the environment, cost efficiency, implementability, and community acceptance (EPA, September 2007). Components of the OU1 selected remedy included:

- Groundwater modeling to update the PCE and TCE plume distribution in order to design a groundwater treatment system;
- Installation of contaminant extraction wells, to prevent contaminated groundwater from reaching public supply wells 10 and 11;
- Aboveground treatment of groundwater prior to being discharged to a recharge basin or re-injected beneath the ground. The treated water would be used to dilute the concentrations of PCE and TCE in the groundwater;
- Vapor intrusion sampling, including the collection of indoor air samples from six buildings during the winter heating season, and construction of vapor mitigation systems, if necessary; and
- Long-term monitoring of the remedy on the PCE/TCE contaminant plume with potential restrictions on future groundwater use.

In the 2007 ROD, the EPA acknowledged that there is a vapor intrusion concern based on previous subsurface investigations. As such, the EPA conducted a vapor intrusion evaluation of OU1 in April and June 2007. Sub-slab vapor and indoor air samples were collected from beneath the concrete slab at the six commercial buildings over 3,000 feet north of Locust School at the Roosevelt Field Mall, identified in the ROD. In June 2007, sub-slab vapor samples were collected from seven homes located west of Clinton Road, west-adjacent to the Roosevelt Field Mall. EPA compared the indoor air and soil vapor concentrations to the criteria provided in the NYSDOH October 2006 *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, as updated in May 2017. EPA reported that the vapor and indoor air concentrations were below the action levels that would require further mitigation and/or monitoring. As such, EPA concluded that soil vapor intrusion is not a concern (EPA, March 2018).

In March 2018, the EPA prepared a ROD for the proposed remedy in OU2. Components of the selected OU2 remedy included many of the same measures identified for OU1, and are summarized below:

- Aboveground treatment of groundwater prior to being discharged to a recharge basin or re-injected beneath the ground. The treated water would be used to dilute the concentrations of PCE and TCE in the groundwater.
- Implementation of long-term groundwater monitoring in OU1 and OU2 to track changes in PCE and TCE levels in groundwater over time.
- Limits on the use of groundwater in certain supply wells until the chemical concentrations are at a safe level for drinking purposes.
- Development of a Site Management Plan (SMP) which would ensure that the selected remedy continues to protect the environment and human health after construction completion.

EPA's opinion was that the main route of exposure for OU2 was through the use of water from the public supply wells (Wells 10 and 11), and that there was not a vapor intrusion concern based on the previous investigations (EPA, March 2018).

Summary and Conclusions

A community member raised the question about whether the PCE and TCE groundwater contamination emanating from the Superfund Site has affected the Locust School through soil vapor intrusion. The results of the investigations conducted under the oversight of the EPA concluded that the main exposure pathway would be through the ingestion or direct contact with groundwater contaminated with TCE and PCE as opposed to vapor intrusion. The remedy selected by the EPA to address groundwater contamination includes the continued pumping of groundwater from approximately 400 feet bgs from existing public supply wells, followed by its treatment and chemical analysis, before distributing it to the public or injecting it back into the ground. Since the local water authorities are aware of the contamination, have implemented treatment technologies to remove it, and test the water prior to distribution, the risk from this route of exposure has been mitigated. As part of the remedy, the Village of Garden City routinely analyzes the levels of multiple compounds, including PCE and TCE, at 10 supply wells prior to distribution to the public. Groundwater samples from each well are analyzed prior to and following treatment. During the most recent testing event in 2017, the maximum reported concentration of PCE and TCE was 1.0 µg/L in samples collected after groundwater treatment.

During previous investigations, PCE and TCE were not detected in groundwater sampled beneath Locust School in the upper 110 feet bgs. The chlorinated solvent contamination (PCE and TCE) emanating from the Superfund Site sinks deeper as it migrates with natural groundwater flow in a southerly direction away from the Superfund Site. Deep groundwater contamination is reported to be present between approximately 320 to 370 feet beneath the ground surface in proximity to Locust School. PCE and TCE were not detected in groundwater from the upper 110 feet beneath Locust School in the nearest monitoring wells sampled between 2014 and 2016.

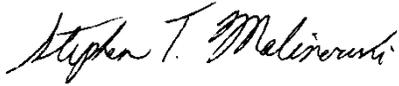
While the selected remedy is primarily focused on groundwater, the studies conducted under EPA's oversight included numerous soil vapor tests performed in areas where concentrated portions of the plume were encountered at shallower groundwater depths. Since the portion of the contaminant plume beneath Locust School was reported at 320 feet bgs and contamination was not detected above 110 feet bgs, there is an approximately 250-foot buffer of groundwater that is not contaminated with chlorinated solvents. Consequently, EPA considered the exposure pathway for potential vapor intrusion is incomplete and did not require testing of soil vapor near Locust School. Additionally, the results of soil vapor testing conducted within OU1 (closer to the source of contamination) did not indicate that soil vapor intrusion was a concern and do not require additional monitoring or mitigation.

Based on the information presented by EPA and the physical principals of soil vapor migration, it is AKRF's opinion that the PCE and TCE contaminated groundwater reported at 320 to 370 feet beneath Locust School within the Magothy aquifer at concentrations up to 600 µg/L does not have the potential to migrate upwards through the Upper Glacial Aquifer and into Locust School. The potential for soil vapor intrusion at Locust School is minimal as the demonstrated presence of uncontaminated shallow groundwater (with respect to

chlorinated solvents) above the solvent plume serves as a buffer and prevents the volatilization of PCE and TCE. Furthermore, soil vapor and indoor air sampling conducted at the source of the plume where groundwater contamination was reported to be encountered at shallower depths, did not indicate a vapor intrusion concern or the need for further mitigation or monitoring.

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

Sincerely,
AKRF, Inc.



Stephen Malinowski, QEP
Vice President



Marc Godick, LEP
Senior Vice President

cc: A. Bosco/AKRF

Attachments – References

Figures – Figure 3-1 – Conceptual Site Model

W:\Projects\180480 - GC UFSD ENVIRONMENTAL 2018-2019\Technical\Hazmat\Task A and B\DRAFT_GCUFSD Letter Report_AKRF_20190325.docx/

REFERENCES

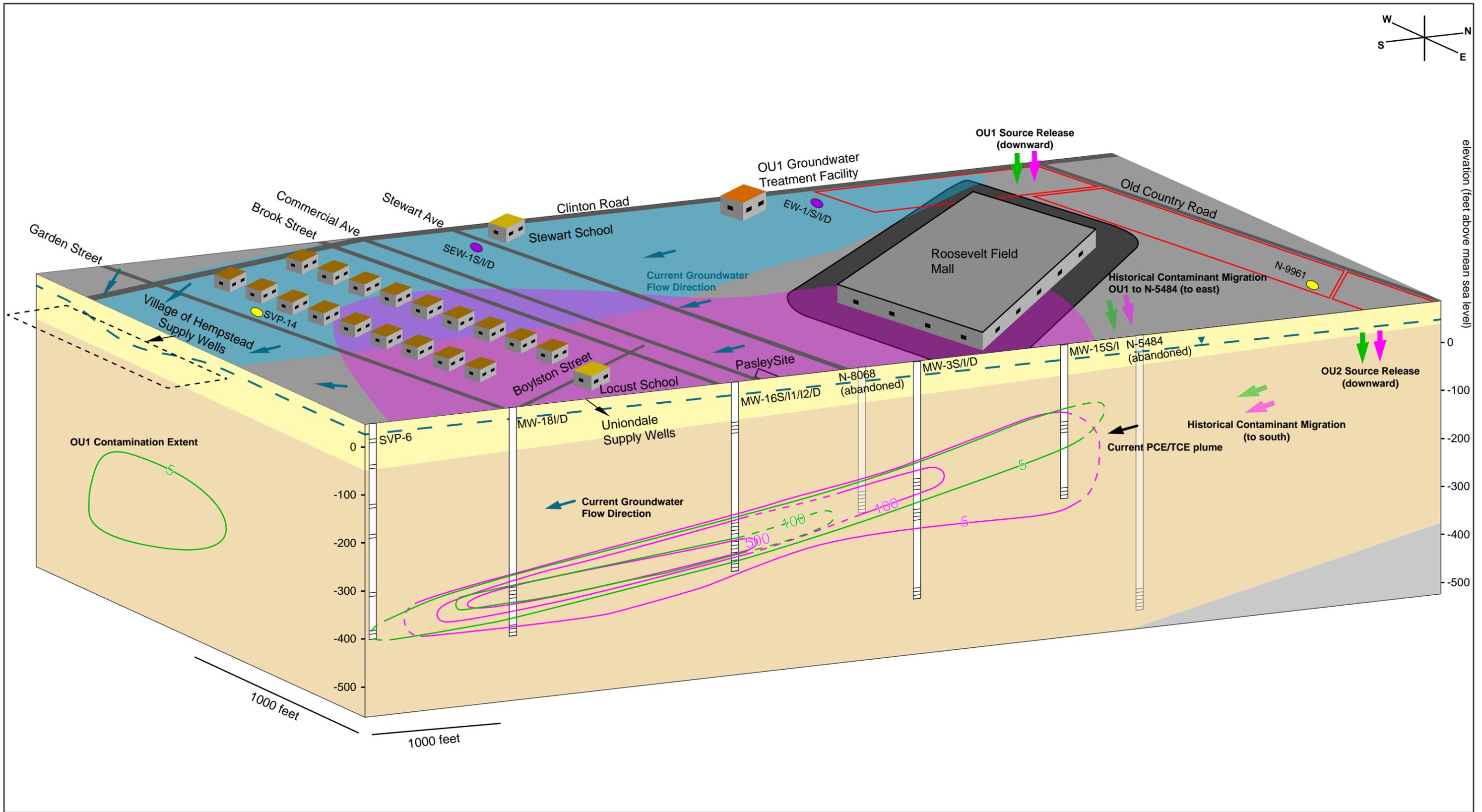
1. CDM Federal Programs Corporation, “Final Remedial Investigation Report – Old Roosevelt Field Contaminated Groundwater Site, Garden City, New York, Volume 1,” CDM, New York, NY, July 24, 2007.
2. CDM Federal Programs Corporation, “Final Remedial Investigation Report – Old Roosevelt Field Contaminated Groundwater Site, Garden City, New York, Volume 2,” CDM, New York, NY, July 24, 2007.
3. CDM Federal Programs Corporation, “Final Remedial Investigation Report – Old Roosevelt Field Contaminated Groundwater Area Site, Operable Unit 2, Remedial Investigation/Feasibility Study, Garden City, Nassau County, New York,” CDM, New York, NY, February 21, 2018.
4. Incorporated Village of Garden City, “2017 Drinking Water Quality Report,” Garden City, NY, May 2018. [Online]. Available: https://www.gardencityny.net/vertical/sites/%7B82C80390-C4CA-486E-AA10-408538E064A1%7D/uploads/2017_Drinking_Water_Quality_Report.pdf
5. USEPA, “Record of Decision – Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, Nassau County, New York,” USEPA Region 2, New York, NY, September 2007.
6. USEPA, “Record of Decision – Operable Unit Two, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Nassau County, New York,” USEPA Region 2, New York, NY, March 2018.
7. USEPA, “What is Superfund?,” USEPA, Washington, D.C., November 2018. [Online]. Available: <https://www.epa.gov/superfund/what-superfund>
8. USEPA, “What is Vapor Intrusion?,” USEPA, Washington, D.C., August 2017. [Online]. Available: <https://www.epa.gov/vaporintrusion/what-vapor-intrusion>

FIGURES



adapted from New York State Department of Environmental Conservation Interactive Mapping Gateway: <http://www.nygis.state.ny.us/gateway/index.html>

Figure 1-1
Site Location Map
Old Roosevelt Field
Contaminated Groundwater Area Site, Operable Unit 2
Garden City, Nassau County, New York



	Upper Glacial Deposits	Former Hangar (potential source area)	PCE concentration contour (micrograms per liter)
	Magothy Formation	Approximate Maximum OU1 Contamination Area	TCE concentration contour (micrograms per liter)
	Raritan Formation	Monitoring Well	Extraction Well
	Approximate Maximum OU2 Contamination Area	Extraction Well	Water Table
			Contaminant release and migration direction

Figure 5-1
Conceptual Site Model
Old Roosevelt Field
Contaminated Groundwater Area Site, Operable Unit 2
Garden City, Nassau County, New York