REMEDIAL INVESTIGATION/ ALTERNATIVES ANALYSIS REPORT

3021 ORCHARD PARK ROAD SITE
BCP SITE NO. C915289
ORCHARD PARK, NEW YORK

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Prepared for:

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RI/AA REPORT

3021 Orchard Park Road Site

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Certification

I, Thomas H. Forbes, certify that I am currently a NYS registered Professional Engineer as defined in 6 NYCRR Part 375 and that this RI/AA Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

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Signature of Environmental Professional

Seal

1.0 INTRODUCTION

3021-3041 Orchard Park Road LLC and CCS Oncology, P.C., have elected to pursue cleanup and redevelopment of the 3021 Orchard Park Road Site under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). The parties were accepted into the BCP as Co-Applicants with "Volunteer" status and entered into a Brownfield Cleanup Agreement (BCA) with NYSDEC on November 7, 2014 (BCP Site No. C915289).

1.1 Purpose and Scope

This Remedial Investigation/Alternatives Analysis (RI/AA) Report has been prepared by Benchmark Environmental Engineering and Science, PLLC, in association with TurnKey Environmental Restoration, LLC (Benchmark TurnKey), on behalf of the Co-Applicants to present historic and recent RI findings, describe environmental conditions across the Site, and evaluate remedial alternatives for the Site.

This RI/AA Report contains the following sections.

- Section 1.2 presents a description of the Site.
- Section 1.3 summarizes the Site's environmental history.
- Section 1.4 presents the Constituents of Potential Concern (COPCs) at the Site.
- Section 1.5 summarizes the RI field work activities.
- Section 2.0 describes the Site's natural physical characteristics and remaining infrastructure.
- Section 3.0 presents a discussion of the RI sampling and methodology.
- Section 4.0 presents the RI findings.
- Section 5.0 describes potential chemical constituent migration pathways.
- Section 6.0 provides a qualitative human health exposure assessment, and fish and wildlife resources impact assessment.
- Section 7.0 develops remedial action objectives; evaluates the future use of the Site; develops and screens remedial alternatives; and presents the preferred remedial alternative for the Site.
- Section 8.0 identifies post-remedial requirements that will be followed to assure the efficacy of the remedy.

- Section 9.0 lists the cited references.

1.2 Site Description

The Site is comprised of an approximate 5.06-acre parcel located at 3021-3041 Orchard Park Road in the Town of Orchard Park, Erie County, New York, and identified as Erie County Tax Map SBL #152.12-02-1.1 (see Figures 1 and 2). The Site is bound by Michael Road and commercial properties (Strikers Bowling and Sports Bar and Grill, Pappas Restaurant, Josie's Women's Fashion & Accessories, Player's Sports, All About Hair & Nails Salon, and Southtowns Physical Therapy) to the north; Walgreens and KeyBank to the east; Rite Aid to the South; and Orchard Park Road, and health/dental offices (Vascular Associates of Western New York and Inspire Dental Group) to the west. The Site is improved with a commercial multi-unit shopping plaza and associated parking (see Figure 2). The existing building currently contains seven units identified by address as follows (see Figure 3):

- 3025 – Currently Vacant – Former Tops/Antique Mall
- 3027 – Existing Family Dollar
- 3031 – Currently Vacant –Former CVS Pharmacy
- 3035 – Currently Vacant –Former Hair Salon/Dry Cleaner
- 3037 – Currently Vacant –Former Paint Shop
- 3039 – Currently Vacant –Former Dry Cleaner/Insty-Prints Printing Center
- 3041 – Existing Credit Union

1.3 Site Environmental History

Previous investigations included a Phase I Environmental Site Assessment (ESA) and a Limited and Focused Subsurface Soil and Groundwater Investigation by LCS in October 2013 and May 2014, respectively. To supplement the findings of the LCS reports, Benchmark TurnKey conducted a Supplemental Phase II Environmental Investigation in June 2014. As part of the site redevelopment, a geotechnical investigation was performed in November 2014. The following assessments and investigations have been completed on the Site and are included in Appendix A.

1.3.1 Phase I ESA & Subsurface Soil & Groundwater Investigation

The former use of the property as a dry cleaner from 1979-2008 was identified as a recognized environmental condition in a Phase I ESA performed by LCS, Inc. (LCS) dated October 10, 2013 (Ref. 1). In order to evaluate Site soil and groundwater quality, a Limited and Focused Subsurface Soil and Groundwater Investigation was performed at the Site by LCS and detailed in a Report dated May 14, 2014 (Ref. 2). The investigation included the advancement of nine soil borings (BH-1 through BH-9), six of which were converted into temporary monitoring wells (TPMW-1 through TPMW-6).

The investigation identified photoionization detector (PID) measurements above background concentrations (i.e., 0.0 parts per million, ppm) at 53 of the 63 soil samples collected and characterized several of the borings as having "solvent-type" odors. Groundwater samples collected from the temporary monitoring wells identified chlorinated volatile organic compounds (cVOCs) including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC) at concentrations above the NYSDEC Class GA Groundwater Standards/Guidance Values (GWQSs/GVs) (6NYCRR Part 703) on the southeastern portion of the property. None of the soil samples submitted for laboratory analysis by LCS contained VOCs or cVOCs in exceedance of the 6NYCRR Part 375 Protection of Groundwater or Commercial Soil Cleanup Objectives (SCOs). The Report recommended additional investigation to assess the vertical and horizontal extent of cVOC impacts identified in soil and groundwater as well as a vapor intrusion study beneath the existing building to evaluate impacts to indoor air quality. LCS borings are shown on Figure 4.

1.3.2 Supplemental Phase II Environmental Investigation

In June 2014, Benchmark TurnKey conducted a Supplemental Phase II Environmental Investigation (Ref. 3). The Phase II Investigation included the advancement of six shallow interior soil borings through the existing concrete floor (SB-1 through SB-6), installation of five exterior temporary monitoring wells (BH-11/TPMW-7 through BH-14/TPMW-11), and collection of sub-slab vapor, indoor air, and outdoor air samples. Investigation locations are shown on Figure 4. The Phase II Report identified the following:

- One temporary monitoring well (TPMW-11) installed adjacent to the southeast corner of the building contained elevated concentrations of cVOCs (PCE, TCE, cis-1,2-DCE, and VC) above the GWQSs/GVs. Although benzene was detected at a concentration slightly above the GWQS at this location, it was not identified in any other groundwater sample and is therefore considered to be a localized impact and not a constituent of concern.

- Two of the interior soil samples collected contained elevated concentrations of PCE above the Part 375 Protection of Groundwater SCOs.
- The sub-slab vapor and indoor air samples for all cVOCs were assessed by the NYSDOH Soil Vapor Intrusion Guidance matrices (Ref. 4). Based on the concentrations of PCE and carbon tetrachloride, the matrices recommended: "take reasonable and practical actions to identify source(s) and reduce exposures" and "monitor soil vapor/indoor air," respectively.

Based on the above findings, the Benchmark TurnKey Phase II Report recommended the following:

- Remediation of impacted soil identified within the building to mitigate contributions to sub-slab vapor intrusion and/or further degradation of groundwater quality and minimize health and environmental risk if exposed during building renovation work or demolition.
- In-situ groundwater remediation in the area east of the former drycleaner.
- Installation and operation of a sub-slab depressurization system within the building to protect current and future occupants from potential sub-slab vapor intrusion.

1.3.3 Geotechnical Investigation

On November 10 and 11, 2014, EmpireGeo Services, Inc. (EmpireGEO) performed a geotechnical investigation of southeastern corner of the existing building in preparation for a facility addition in that location (Ref. 5). The geotechnical site evaluation included the advancement of five geotechnical borings, identified by EmpireGEO as B-4 through B-8. (Three additional borings, designated as B-1 through B-3, where initially proposed for another building addition but were subsequently eliminated from the scope of the investigation and geotechnical evaluation.) Benchmark TurnKey personnel were present during geotechnical drilling activities to ensure the work was performed in accordance with the BCA and DER-10. As such, EmpireGEO boring IDs were re-labeled by Benchmark TurnKey to maintain consistent nomenclature with the planned RI. The re-named EmpireGEO borings (shown parenthetically), that will be referenced as such going forward, included: B-1 (B-6), B-2 (B-8), B-3 (B-7), B-4 (B-5), and B-5 (B-4). Boring locations identified per Benchmark TurnKey nomenclature are presented on Figure 4.

In addition to the geotechnical nature of the investigation, Benchmark TurnKey collected a waste characterization composite sample from borings B-3 (B-7) and B-4 (B-5) and two subsurface soil samples from borings B-1 (B-6) and B-5 (B-4); the results of which are discussed in Section 4.0 of this Report.

All five test borings were advanced through unconsolidated overburden to split spoon and auger refusal (assumed top of bedrock), which ranged between 16.4 and 21.6 feet below ground surface (fbgs). At refusal, boring B-1 (B-6) was cored into bedrock approximately 5 feet using an NQ 2 size double tube core barrel. Boring logs were prepared and are presented in the geotechnical report (see Appendix A).

Unconsolidated overburden at the Site, in order of depth from ground surface, included: asphalt (approximately 2 to 3 inches); asphalt subgrade material (approximately 2 to 3 feet); miscellaneous fill soils (approximately 2 to 6 feet); native soil consisting predominantly of clayey silt, silty clay, sandy silt, and sand; and highly weathered shale bedrock (suspected Windom Shale). More competent bedrock (auger refusal) was encountered at depths ranging from 16.4 to 21.6 fbgs. Recovered weathered bedrock was described as grey black, soft to medium hard, highly to slightly weathered, thinly bedded shale. Core recovery was approximately 40% with a rock quality designation (RQD) value of 0% indicating very poor rock mass quality.

Depth to groundwater was measured within borings B-3 (B-7) and B-4 (B-5) ranged between 12.7 and 4.8 feet, respectively. EmpireGEO suspected that groundwater did not have sufficient time to reach static conditions when measured at these locations.

1.4 Constituents of Potential Concern (COPCs)

Based on findings of the above-referenced investigations and the historical Site use, the following Constituents of Potential Concern (COPCs) were identified:

- ***Soil:*** cVOCs
- ***Groundwater:*** cVOCs
- ***Soil Vapor:*** cVOCs

1.5 Summary of Field Work Activities

Field activities performed to complete the work described herein were conducted by Benchmark TurnKey in accordance with the approved RI Work Plan (Ref. 6). Field activities included: Geoprobe drilling; monitoring well installation, development, and sampling; subslab vapor sampling; and storm water underdrain assessment and sampling. The details of each work element are presented in this Report.

2.0 SITE PHYSICAL CHARACTERISTICS

2.1 Site Topography and Drainage

The Site topography slopes gently to the north-northeast. The surface of the Site is covered with an asphalt parking lot and perimeter landscaped vegetation. Precipitation (i.e., rain or melting snow) discharges to stormwater catch basins located within the parking lot and Michael Road to the north, and to the subsurface via infiltration within landscaped areas and a vegetated swale located on the western and northern edges of the property. Surface and shallow groundwater flow is affected by the existing underdrain system, as well as underground utility lines and the building foundation.

2.2 Geology & Hydrogeology

2.2.1 Unconsolidated Overburden

The Site is located within the Erie-Ontario lake plain physiographic province, which is typified by little topographic relief and gentle slope toward Lake Erie, except in the immediate vicinity of major drainage ways (Ref. 7). The surficial geology of the Lake Erie Plain consists of a thin glacial till (if present), glaciolacustrine deposits, recent alluvium, and the soils derived from these deposits. Subsurface investigations described the overburden soil as a sandy lean clay (till), which is consistent with the New York State Surficial Geologic Map of New York (Ref. 8). The U.S. Department of Agriculture (USDA) Soil Conservation Service soil survey map of Erie County shows the Site located mostly within a Remsen silty clay loam with 0-3% slopes (RfA) and partially within a Canandaigua silt loam (Cc) (Ref. 9). The majority of the Site is covered with asphalt parking and the one-story building. Surface soil only exists in vegetated green space within the easement areas along Orchard Park and Michael Roads.

The geology and hydrogeology of the Site was investigated as part of the RI activities. The native overburden soils across the Site consist of Sandy Lean Clay.

2.2.2 Bedrock

Bedrock observed beneath the Site during the RI was identified as the Hamilton Group. Bedrock of the Hamilton Group is a Middle Devonian age bedrock that consists mostly of dark gray/black shales and thin silty limestones, and usually quite fossiliferous with many calcareous concretions (Ref. 10). The Hamilton Group is thickest toward southeastern New York State; over 1,000 feet south of Syracuse; 500 feet in the Finger Lakes; and approximately 220 feet south of Buffalo. The Hamilton Group consists of four formations: the Marcellus (oldest) (Dhmr), Skaneateles (Dhsk), Ludlowville (Dhld), and Moscow (Dhmo) Formations. The top of the Hamilton Group is distinct and is drawn at the base of the black shales of the Geneseo Shale Member of the Genesee Group, a finely laminated, black petroliferous shale. Specifically, the bedrock (weathered and competent) observed during the RI is identified as the Windom Shale of the Moscow Formation.

The depth to bedrock determined during the RI was approximately 11.5 (MW-1B) to 17.0 fbgs (MW-2B and MW-3B). Bedrock observed during the RI was described as a very weathered, fissile shale unit followed by a more competent shale bedrock unit. The weathered shale unit was approximately 3.0 to 6.5 feet thick.

2.2.3 Hydrogeology

The Site is located in the Erie-Niagara River Basin. In the Erie-Niagara Basin, the major areas of groundwater are within coarser overburden deposits and limestone and shale bedrock. Based on the location and topography of the Site, groundwater would appear to flow toward the East Branch of Smokes Creek approximately 0.3 miles (±1,538 feet) southwest of the Site and/or north toward an intermittent tributary of Cazenovia Creek approximately 0.1 miles (±645 feet) away. Groundwater flow patterns and hydraulic gradient (vertical and horizontal) at the Site are discussed in more detail in Section 3.2.3.

2.3 Climate

Western New York has a cold continental climate with moisture from Lake Erie causing increased precipitation. Average annual precipitation is reportedly 40.5 inches and snowfall is 93.6 inches (Ref. 11) to the northern part of the watershed with over 150 inches per year falling on the southern portion of the watershed. Average monthly temperatures range from 24.5 degrees Fahrenheit in January to 70.8 degrees Fahrenheit in July (Ref. 11). The ground and lakes typically remain frozen from December to March. Winds are generally from the southwest (240 degrees) with a mean velocity of 10 miles per hour (Buffalo Airport, 1999).

2.4 Population and Land Use

The Town of Orchard Park, encompassing 38.52 square miles, has a population of 29,054 (Ref. 12). The Site is located in Census Tract 013701 in the Town of Orchard Park and is zoned Business 2. The Site is located in a moderately developed commercial use area of the Town of Orchard Park.

2.5 Utilities and Groundwater Use

The Site has access to all major public and private utilities, including potable water, sanitary sewer, electric, and natural gas.

Groundwater at the Site is assigned Class "GA" by 6NYCRR Part 701.15. Currently, there are no known deed restrictions on the use of groundwater at the Site and there are no groundwater supply wells on the property. Regionally, groundwater has not been developed for industrial, agriculture, or public supply purposes. Municipal potable water service is provided to the Site and surrounding area by the Erie County Water Authority with water distribution by the Town of Orchard Park Water District 8.

2.6 Wetlands and Floodplains

There are no State or Federal wetlands or floodplains located on the Site. The East Branch of Smoke Creek and two associated perennial ponds are located ±0.3 miles southwest of the Site. An intermittent tributary to Smoke Creek is located ±0.1 miles northeast of the Site. No regulated wetlands are located within a ½-mile radius of the Site.

3.0 Remedial Investigation Approach

The RI was designed to focus on: further defining the nature and extent of contamination within the BCP Site boundary; identifying the source of contamination; defining chemical constituent migration pathways; qualitatively assessing human health and ecological risks (if necessary); and obtaining data of sufficient quantity and quality to evaluate the potential feasibility and efficacy of reasonable remedial alternatives to support a NYSDEC-approvable remedial action plan for the Site.

This section of the Report presents a discussion of the rationale for the data collection program, including the methods employed to collect samples and make field measurements and observations, and the methods used to chemically analyze the environmental samples during the RI. The RI included the following field activities to delineate and characterize on-site soil and assess groundwater quality:

- Visual, olfactory, and PID characterization of subsurface soil through advancement of exploratory borings.
- Collection of subsurface soil samples for analysis of Target Compound List (TCL) plus CP-51 list VOCs, TCL semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) metals, PCBs, pesticides, and herbicides.
- Advancement of on-site soil borings completed as overburden groundwater monitoring wells located at up-gradient (2 wells) and down-gradient (3 wells) BCP Site boundaries.
- Advancement of on-site soil borings completed as bedrock groundwater monitoring wells located at cross-gradient (1 well) and down-gradient (2 wells) BCP Site boundaries.
- Measurement of groundwater levels in all on-site monitoring wells.
- Collection and analysis of groundwater samples from the newly installed monitoring wells for analysis of TCL plus CP-51 list VOCs, TCL SVOCs, TAL metals, PCBs, pesticides, and herbicides. Samples were also analyzed for nitrate, sulfate, total and dissolved iron, manganese, methane, ethene, ethane, and total organic carbon (TOC) to ascertain the appropriate groundwater treatment amendment(s).
- Assessment of the Site underdrain storm sewer system, including catch basin sediment sampling for TCL plus CP-51 list VOCs, TCL SVOCs, TAL metals, and PCBs; and storm water sampling for TCL plus CP-51 VOCs.

RI field activities were conducted by Benchmark TurnKey in accordance with the approved RI Work Plan (Ref. 6). Environmental sample collection was performed in accordance with Benchmark TurnKey's Field Operating Procedures (FOPs); USEPA- and NYSDEC-approved sample collection and handling techniques were used. Samples for chemical analysis were analyzed in accordance with USEPA SW-846 methodology with equivalent NYSDEC Category B deliverables. Analytical results were evaluated by a third-party data validation expert in accordance with provisions described in the RI Work Plan. Each sampling location was surveyed via GPS and plotted on the Site base map. Table 1 summarizes the analytical testing program followed during the RI for soil and sediment sampling. Table 2 summarizes the analytical testing program followed during the RI for groundwater and storm water sampling. Soil vapor samples collected during the RI were analyzed for TO-15 VOCs.

3.1 Soil Investigation

A soil investigation was completed to assess potential impacts related to the historic use of the Site. The soil investigation included the collection of subsurface (0.3 to 22 fbgs) soil samples. Additional focus was placed on the southeastern portion of the property within the planned "Vault Area." This area is slated for construction of a new concrete vault to house a linear accelerator (LINAC) unit, a device used for external beam radiation treatments for cancer patients.

Figure 4 shows the RI soil boring/sample locations for the Site. Appendix B includes the boring logs, photographic log, and community air monitoring program (CAMP) data for the soil investigation.

3.1.1 Subsurface Soil Sampling

A total of 33 subsurface soil exploratory boring locations were advanced during the RI. These subsurface locations were used to supplement the 15 previously completed borings (during the Phase II and Supplemental Phase II Investigations) for a total of 48 subsurface investigation locations.

Borings were either advanced using direct-push or rear-mounted drilling methods with continuous sampling. Geoprobe® borings were advanced from existing grade through unconsolidated overburden to a minimum of 4-feet below the water table or refusal, whichever occurred first, using direct-push and continuous 4-foot macro-core soil sampling drilling methods. Rear-mounted drill rig borings were advanced from existing grade through unconsolidated overburden to the top of competent bedrock approximately 18.5 fbgs or auger refusal, whichever occurred first, using 4.25-inch I.D. hollow stem augers (HSA) and continuous 2-foot split spoon soil sampling drilling methods. Recovered samples were described in the field by qualified Benchmark TurnKey personnel by visual-manual observation in accordance with ASTM Method D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), scanned for total volatile organic vapors with a calibrated MiniRAE 3000 PID equipped with a 10.6 eV lamp, and characterized for impacts via visual and/or olfactory observations in approximate two-foot depth intervals. A summary of investigation borings is presented in Table 1.

Upon completion of each boring, field results including PID, visual, and olfactory results were reviewed and recorded. The sample interval identified as the most impacted (i.e., greatest PID scan result and/or evidence of visual/olfactory impacts) were selected for analysis. In the event that either the impacts were ubiquitous from grade to final depth or no impacts were identified, a representative sample interval was selected based on the discretion of the field scientist and at times in consultation with the Project Manager and/or NYSDEC.

In general, one subsurface soil sample was collected from each boring location and analyzed for TCL plus CP-51 VOCs, TCL SVOCs, TAL metals, PCBs, pesticides, and herbicides.

3.1.2 Soil Sample Analyses

Samples were transferred to laboratory supplied, pre-cleaned sample containers, stored on ice in a cooler, and transported via chain of custody command to Alpha Analytical (Alpha) for analysis. Alpha is an independent, NY State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified facility approved to perform the analyses prescribed for this RI. Alpha also has NYSDOH Contract Laboratory Program (CLP) certification while maintaining Analytical Services Protocol (ASP) accreditation. Alpha employed analytical testing methods described in USEPA Test Methods for Evaluating Solid Wastes contained in SW-846 (revised 1991).

3.2 Groundwater Investigation

Benchmark TurnKey conducted a groundwater investigation program at the Site to better assess groundwater quality, flow direction, and hydraulic gradient to determine potential groundwater contaminant migration pathways. Figure 4 shows the location of the RI monitoring wells MW-1A, -1B, -2A, -2B, -3A, -3B, -4A, and -5A. Table 3 presents the monitoring well construction details. Table 4 presents depth to groundwater measurements and calculated groundwater elevations as well as the catch basin invert elevations used to generate the isopotential maps discussed in Section 3.2.3. Appendix C includes the boring and monitoring well construction logs. The following sections describe the groundwater investigation and sampling methodology. Monitoring well installation, well development, and groundwater sample collection details are also discussed.

3.2.1 Monitoring Well Installation and Development

In December 2014, Benchmark TurnKey installed five overburden (MW-1A thru MW-5A) and three bedrock (MW-1B thru MW-3B) groundwater monitoring wells. The eight boring/monitoring well locations were advanced into the unconsolidated overburden and/or bedrock material as described in Section 3.1 to depths between 11 and 25 fbgs; these depths were at least five feet below the first encountered groundwater. Recovered soil samples were visually described and scanned for total volatile organic vapors with a PID. Low level PID measurements were only identified at wells MW-1B (maximum PID = 3.0 at 3 fbgs) and MW-2B (maximum PID = 2.1 at a depth of 17 fbgs). All other PID measurements were reported as 0.0 ppm.

Subsequent to boring completion, each monitoring well was constructed of 2-inch I.D. flush-joint Schedule 40 PVC solid riser and machine slotted screen (0.010-inch slot size). Monitoring well screens ranged from 7 to 15 feet in length. The well screen and attached riser were placed within the borehole, and the filter sand pack was installed within the borehole annulus to a level of 2- to 3-feet above the top of the well screen. A bentonite seal 2- to 3-feet thick was installed immediately above the sand layer. Medium bentonite chips were used for the seal and allowed to hydrate sufficiently. Due to the shallow nature of the overburden wells, bentonite chips were used in lieu of cement/bentonite grout to complete well construction to within one foot below the ground surface. Cement/bentonite grout was used in the bedrock wells to within one foot below the ground surface.

Each newly installed overburden and bedrock monitoring well was completed with keyed alike locks and a lockable J-plug within an 8-inch diameter steel flush mounted road box anchored within a 2-foot by 2-foot by 1-foot square concrete pad. The concrete surface pad was placed around each road box and sloped to allow surface water to drain away from the well.

The eight RI wells were developed to remove the fines from the filter pack and well casing using a dedicated disposable polyethylene bailer for surging and a non-dedicated submersible pump for purging in accordance with NYSDEC and Benchmark TurnKey FOPs prior to sampling. In general, 10 well volumes were removed from each monitoring well. However, because approximately 150 gallons of potable water was lost during bedrock well installation, an equivalent volume of water was subsequently purged from each bedrock well. Appendix C includes the well development field forms.

3.2.2 Groundwater Sample Collection & Analysis

RI groundwater sampling was conducted January 12-13, 2015 (Round 1) and March 25, 2105 (Round 2). During both rounds of groundwater sampling, the eight RI wells were purged and sampled using a non-dedicated submersible pump with dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures. Appendix C includes the well sampling logs. Prior to and immediately following collection of groundwater samples, field measurements pH, temperature, turbidity, dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, and water level were monitored for stabilization. These field parameters as well as visual and olfactory observations were recorded on groundwater field data sheets (Appendix C).

During the first round, all collected groundwater samples were placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to Alpha for TCL plus CP-51 VOC, TCL SVOC, TAL metals, PCB, pesticide, and herbicide analyses in accordance with USEPA SW-846 methodology (see Table 2). Groundwater samples collected from wells MW-1B, -3A, -3B, -4A, and -5A were field filtered and analyzed for dissolved metals due to turbidity measurements above 50 Nephelometric Turbidity Units (NTUs). During the second round and following NYSDEC approval, groundwater sample analyses were limited to TCL plus

CP-51 VOCs. Alpha provided equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment of groundwater data (see Section 3.6).

3.2.3 Groundwater Elevation, Flow, and Gradients

Static depth to groundwater was measured in 8 of the 9 RI wells on February 16, 2015 and March 25, 2015 and all nine wells on April 6, 2015. Table 4 summarizes the groundwater and underdrain invert elevations measured during all three RI events. Figures 5 through 7 present the shallow (overburden) groundwater isopotential maps and Figures 8 through 10 present the bedrock groundwater isopotential maps for each event. Groundwater elevations were surveyed relative to a point on the southeastern corner of the concrete plaza sign foundation located along the western boundary of the Site, which was assigned an arbitrary elevation of 500 feet above mean level (fmsl).

Examination of the overburden isopotential maps indicate that shallow groundwater flow is dominated by the existing underdrain system present beneath the asphalted areas across the Site. Shallow groundwater (i.e., approximately 2 fbgs) is intercepted and directed by the underdrain system toward the northeast corner of the Site where it exits through a single catch basin (CB-3) and connects to the Orchard Park storm sewer system on Michael Road. A localized (and possibly natural) groundwater mound extends from the southeast corner of the Site, beneath the on-site building, toward and intercepted by the western portion of the underdrain system. Subsequent groundwater flow from this mound is west-northwest. In addition, the underdrain system has created a localized groundwater sink in the western portion of the Site (see Figures 5 through 7). Shallow groundwater flow associated with this sink is inward toward the underdrain system. Additional discussion regarding the underdrain system is presented in Section 3.4.

Examination of the bedrock isopotential maps indicates that bedrock groundwater flowed in a northwesterly direction during the February, March, and April 2015 events and was not affected by the underdrain system.

Vertical hydraulic gradient (VHG) is generally used for delineating the direction and magnitude of vertical groundwater flows. VHGs are calculated by comparing nested well pairs screened across separate hydrogeologic units; in the case of this Site, an overburden unit (“A” wells) and bedrock unit (“B” wells). VHGs are computed by subtracting the hydraulic head value in the deeper “B” well from the value in the shallower “A” well of a nested pair and dividing the remainder by the vertical distance between the midpoints of the well screens. A downward flow component is indicated if the gradient is negative, meaning the hydraulic head is less at depth. Conversely, an upward flow component is indicated if the gradient is positive, meaning the hydraulic head is greater at depth. The magnitude of the calculated gradient indicates its significance.

Based on the VHG calculations, well pairs MW-1A/B, located within the center of the groundwater mound, exhibited a predictably strong downward gradient during the February and March 2015 events and some weakening (yet still downward) gradient during the April 2015 event. Conversely, well pair MW-3A/B located on the fringe of the groundwater mound exhibited a predictably weak, but consistently upward vertical gradient during the February and March 2015 events followed by a weak downward vertical gradient in April 2015. A variable vertical hydraulic gradient was also observed at well pair MW-2A/B: a weak downward gradient was observed in February and April with a weak upward gradient in March 2015.

The horizontal hydraulic gradient for the groundwater mound area of the Site from well MW-1A to MW-4A was relatively consistent during February and March 2015 (0.021 ft/ft and 0.020 ft/ft, respectively) and approximately half that in April 2015 (0.011 ft/ft). The February and March gradients represent a fairly steep gradient which apparently moderated in April, possibly due to an expected rise in water levels being captured by the underdrain system, reducing the gradient.

3.3 Soil Vapor Assessment

Based on the results of the June 2014 Supplemental Phase II Environmental Investigation, an active sub-slab depressurization (ASD) system is planned for the southern portion of the existing building. In order to ascertain the portions of the existing building that will require an ASD system, two additional subslab vapor samples (SV-2 and SV-3) were collected within the on-site building at the locations shown on Figure 11. Subslab vapor samples were analyzed for VOCs via Method TO-15.

3.4 Storm Sewer Assessment & Investigation

To assess potential pathways for contaminants to enter the subsurface, the existing storm sewer underdrain system at the Site was evaluated. Each catch basin (CB) location was surveyed and identified as CB-1 through CB-6 (see Figure 2). The field survey also included piping invert elevations and estimated drainage patterns using asphalt stress patterns observed at the surface in conjunction with the invert pattern within each catch basin. Figure 2 presents the underdrain system configuration and Site discharge point (CB-3).

Based on the configuration of the underdrain system proximate to the cVOC-impacted area and following consultation with the NYSDEC, catch basins CB-1, CB-2, and CB-3 were sampled. Two sediment samples were collected from catch basins CB-1 and CB-2 for TCL plus CP-51 VOC analysis. In addition, the sediment from catch basin CB-1 was analyzed for TCL SVOCs, TAL metals, and PCBs. Sediment was not present in catch basin CB-3; therefore, only a surface water sample was collected for TCL plus CP-51 VOC analysis. Storm water was not present within catch basins CB-1 and CB-2.

3.5 Field Specific Quality Assurance/Quality Control Sampling

In addition to the soil and groundwater samples described above, field-specific quality assurance/quality control (QA/QC) samples were collected and analyzed to ensure the reliability of the generated data as described in the QAPP and to support the required third-party data usability assessment. Site-specific QA/QC samples included matrix spikes, matrix spike duplicates, blind duplicates, equipment blanks, and trip blanks collected at a frequency of 1 per 20 samples for each environmental media (see Tables 1 and 2).

3.6 Data Usability Summary Report

In accordance with the Work Plan, the laboratory analytical data was independently assessed and, as required, submitted for independent review. Ms. Judy Harry of Data Validation Services (DVS) located in North Creek, New York performed the data usability summary assessment for the soil, sediment, groundwater, and storm water samples collected during the RI. The validation involved a review of the summary form information and sample raw data, and a limited review of associated QC raw data. Specifically, the following items were reviewed:

- Data Completeness
- Laboratory Case Narrative
- Custody Documentation

- Holding Times
- Surrogate and Internal Standard Recoveries
- Trip/Method Blanks
- Laboratory Control Samples (LCS)
- Field Duplicate Correlations
- Matrix Spike Recoveries and Duplicate Correlations
- Instrumental Tunes
- Calibration Standards
- ICP Serial Dilution Evaluations
- ICP Interference Check Samples
- Method Compliance
- Sample Result Verification

Data evaluation was performed by DVS using the most current methods and quality control criteria from the USEPA's Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review*, and Contract Laboratory Program*, National Functional Guidelines for Inorganic Data Review*, as well as professional judgment. Appendix D includes the Data Usability Summary Report (DUSR) that was prepared in accordance with Appendix 2B of NYSDEC's DER-10 guidance. Those items listed above that demonstrated deficiencies are discussed in detail in the DUSR.

In summary, most sample results are usable either as reported or with minor qualification or edit. However, the following results are rejected and not usable:

- One volatile analyte (1,4-dioxane) in all samples due to processing limitations (poor response in calibration standards).
- One semi-volatile analyte (phenol) in sample B-18 (4-6) was rejected due to apparent matrix effects.
- Results for three SVOCs (2,4-dinitrophenol, hexachlorocyclopentadiene, caprolactum, and 4,6-dintro-2-methylphenol) in sample B-5 (0.4-4.0) and four SVOCs (2,4-dinitrophenol, hexachlorocyclopentadiene, and 4,6-dintro-2-methylphenol) in sample SED-1 were rejected due to apparent matrix effects.

In general, accuracy, data completeness, comparability, and representativeness are acceptable, and sample precision is good. Analytical results that were edited or qualified per the DUSR have been modified appropriately on the data summary tables. Appendix E includes the analytical data packages for the RI.

3.7 NYSDEC EQuIS Deliverables

EQuIS is an environmental data management system selected by the NYSDEC to manage all of their environmental, geotechnical, and limnological data. As of April 2011, all investigation and post-cleanup monitoring data submitted to the Division of Environmental Remediation (DER) under a remedial program (i.e., State Superfund, Brownfield Cleanup Program, Environmental Restoration Program, Petroleum Spills, Voluntary Cleanup Program, or Consent Order) must be concurrently entered into New York State's designated EQuIS Database in Electronic Data Deliverable (EDD) format. This necessitates upload of the laboratory analytical results as well as the geographic location (survey coordinates) of the sampling points. On April 15, 2015, Benchmark TurnKey submitted all analytical data in EDD format associated with the RI to the NYSDEC on behalf of the Co-Applicants to satisfy this requirement. On ________, 2015, the NYSDEC issued a confirmation email of their receipt and successful upload of the EDD formatted files, which is included in Appendix E.

3.8 Site Mapping

All sample locations, monitoring wells, and relevant Site features are located on the Site base map developed during the RI. Benchmark TurnKey employed a Trimble GeoXT handheld GPS unit to identify the locations of all soil borings, newly installed wells, and catch basins relative to New York State planar grid coordinates. Additional geospatial data related to underdrain system pipe inverts, structure locations, and subsurface structures was collected. Monitoring well riser and protective casing elevations were measured by ground elevation survey on February 16, 2015 relative to a point on the southeastern corner of the concrete plaza sign foundation located along the western boundary of the Site, which was assigned an arbitrary elevation of 500 fmsl.

4.0 REMEDIAL INVESTIGATION FINDINGS

This section describes pertinent field observations and analytical results in Site soil, groundwater, soil vapor, and storm water/sediment reported during the RI.

4.1 Soil

For the purpose of comparison, the soil analytical data summary tables include Unrestricted Use Soil Cleanup Objectives (USCOs) as published in 6NYCRR Part 375-6 "Remedial Program Soil Cleanup Objectives." USCOs (Track 1) are deemed protective of human health and groundwater irrespective of end use of the property. Accordingly, the USCOs represent conservative SCOs that are often difficult to achieve on former urbanized or historic fill sites. Nevertheless, USCOs for soil are presented on Table 5 per NYSDEC policy, as a basis for comparison against the concentrations that might be expected in virgin soils not affected by anthropogenic activities or biased by fill containing non-soil materials.

The soil data is also compared to Restricted-Residential Use and Protection of Groundwater SCOs (RRSCOs and PGW SCOs, respectively) per 6NYCRR Part 375-6 (see Table 6). Redevelopment of the Site as a consolidated Western New York multi-disciplinary world class cancer treatment center is proposed. While there are presently no SCOs specific to property used in a medical treatment capacity, the more conservative RRSCOs will be used in lieu of commercial SCOs as health-based screening criteria to evaluate the remedial alternatives presented in Section 7.0. The RRSCOs are deemed appropriate due to the nature of the planned facility operations (i.e., medical treatment) and potentially greater sensitivity of patient receptors. It is also feasible that the duration of visits by adult and child receptors at a medical treatment facility may be greater than those under a typical commercial scenario.

The following discussions concerning soil data are limited to soil quality as indicated by the more meaningful comparison to RR and PGW SCOs. To the extent RR and PGW SCOs are exceeded, USCOs would be exceeded as well. Soil analytical results versus the RRSCOs are presented graphically on Figure 12.

4.1.1 Field Observations

Much of the Site is covered with asphalt underlain with a Poorly Graded Gravel with Sand subbase. Beneath the asphalt and subbase, the native soil was generally described as a brown to dark grey Sandy Lean Clay (till). Shallow groundwater was encountered generally between 1.5 and 6 fbgs during advancement of the borings. PID readings measured above background (0.0 ppm) were relegated to the southeastern corner of the Site with a good correlation to soil analytical results discussed in the following sections. Landscaped areas and a vegetated swale located on the western and northern edges of the property are present, but are within the Orchard Park and Michael Road right-of-ways and utility corridors.

4.1.2 VOCs

No VOCs were detected in subsurface soil samples at concentrations above RRSCOs. However, VOCs (primarily cVOCs) were detected in five subsurface soil samples above the PGW SCOs. Exceedances included:

- 2-Butanone (vault area B-1)
- Acetone (vault area B-1, west of building BH-6)
- cis-1,2-DCE (southeast corner B-6)
- trans-1,2-DCE (southeast corner B-6)
- PCE (under building B-24, under building SB-5, under building SB-6)
- TCE (southeast corner B-6)

Both 2-butanone (i.e., methyl ethyl ketone) and acetone are common laboratory artifacts.

4.1.3 SVOCs

No SVOCs were detected in subsurface soil samples at concentrations above RR or PGW SCOs.

4.1.4 Inorganic Compounds

Metals detected in subsurface soil at concentrations above the RRSCOs only included arsenic in two samples; the concentrations of which were only slightly above the RRSCO. Exceedances included:

- Arsenic (east side of building B-15)
- Arsenic (under building B-20)

No metals were detected in subsurface soil samples at concentrations above PGW SCOs.

4.1.5 Pesticides/Herbicides

No pesticides were detected in subsurface soil at concentrations above RR or PGW SCOs. Herbicides were not detected in subsurface soil samples.

4.1.6 PCBs

No PCBs were detected in subsurface soil at concentrations above RR or PGW SCOs.

4.1.7 Waste Characterization

In anticipation of off-site disposal of the cVOC-impacted soil encountered during previous investigations in the vicinity of the planned vault, RI borings B-3 and B-4 were advanced to determine the waste profile (see Figure 4). Two samples from the 2-4 fbgs interval were collected and analyzed for waste profile parameters, including Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, ignitability, corrosivity, and reactivity (sulfide and cyanide). In addition, boring B-23 was advanced in the vault area and sampled from the 2-4 fbgs interval for analysis of TCL plus CP-51 VOCs, TCL SVOCs, TAL metals, and PCBs. With the exception of low concentrations of PCE (0.0037 mg/L) and barium (0.62 mg/L), all other TCLP results were reported as non-detect and the soil was deemed not ignitable, non-reactive, and non-corrosive. These results, in conjunction with those from boring B-23, indicate that the vault area soils do not exhibit hazardous waste characteristics.

4.2 Groundwater

In order to assess groundwater quality at the Site in relation to the cVOC-impacted area located in the southeast corner of the Site, groundwater samples were collected during two separate RI monitoring events to supplement data from previous investigations. Previous investigation groundwater samples collected by LCS from temporary monitoring wells TPMW-1 through TPMW-6 occurred May 7-8, 2014 and groundwater samples collected by TurnKey from temporary monitoring wells TPMW-7 through TPMW-11 occurred May 22, 2014. RI groundwater sampling of wells MW-1A/B, MW-2A/B, MW-3A/B, MW-4, and MW-5 occurred January 12-13, 2015 (Round 1) and March 25, 2015 (Round 2).

Table 7 presents the analytical results of groundwater samples collected during previous investigations. Tables 8 and Table 9 present the RI analytical results for Rounds 1 and 2. Tables 7 through 9 compare the groundwater analytical data to the NYSDEC Class "GA" GWQS/GVs, which are deemed protective of human health when groundwater is used as a drinking water source. Although municipal supplied water is available and will be provided and used as a potable source for Site redevelopment, the Class "GA" GWQS/GVs are conservatively used as a measure of the environmental impacts to groundwater per NYSDEC policy. Groundwater analytical results versus the Class GA GWQS/GVs are presented graphically on Figure 13.

4.2.1 Field Observations

No odors or sheen were noted during well development or sampling.

4.2.2 VOCs

Five VOCs were detected in groundwater at concentrations above GWQS/GVs:

- Benzene (TPMW-11)
- cis-1,2-DCE (TPMW-1, TPMW-2, TPMW-7, TPMW-11, & MW-4A)
- PCE (TPMW-1, TPMW-2, & TPMW-11)
- TCE (TPMW-1, TPMW-2, & TPMW-11)
- Vinyl Chloride (TPMW-2, TPMW-7, & TPMW-11)

4.2.3 SVOCs

No SVOCs were detected in groundwater at concentrations above GWQSs/GVs.

4.2.4 Inorganic Compounds

Inorganic compounds detected in groundwater at concentrations above GWQS/GVs were generally limited to naturally occurring minerals such as iron, magnesium, manganese, and/or sodium. The groundwater samples from RI wells MW-1B, MW-3A, MW-3B, MW-4A, and MW-5A were analyzed for dissolved inorganic compounds (due to elevated turbidity greater than 50 NTUs) and found to contain concentrations of dissolved iron, magnesium, manganese, and sodium above GWQSs/GVs.

4.2.5 Pesticides/Herbicides

Pesticides and herbicides were not detected in any groundwater samples.

4.2.6 PCBs

PCBs were not detected in any groundwater samples.

4.3 Soil Vapor

Table 10 summarizes the pre-remedial soil vapor analytical results from previous investigations and the RI. Only 3 of the 7 cVOCs currently addressed under NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Ref. 4) were detected and at very low concentrations, including:

- Carbon tetrachloride (indoor ambient air and outdoor ambient air)
- PCE (subslab vapor, indoor air, and outdoor air)
- TCE (SV-2)

Figure 14 presents these soil vapor analytical results graphically.

4.4 Storm Water/Sediment

Sediment analytical results versus the RRSCOs are summarized in Table 6 and presented graphically on Figure 12. Sediment sample SED-1 collected from catch basin CB-1 contained three cVOCs at concentrations well above their respective RR and PGW SCOs, including:

- cis-1,2-DCE
- PCE
- TCE

Sediment sample SED-2 collected from catch basin CB-2 had detections of these same three compounds, but at concentrations well below the RR and PGW SCOs.

Storm water analytical results versus the Class GA GWQS/GVs are summarized in Table 8 and presented graphically on Figure 13. No VOCs were detected in catch basin CB-3 storm water above the Class GA GWQSs/GVs; water was not present in catch basins CB-1 and CB-2 at the time of sampling.

4.5 Summary of Remedial Investigation Findings

Consistent with the initial findings of the Supplemental Phase II Investigation, the RI confirmed that cVOC-impacts are limited and localized to the southeastern corner of the Site, immediately behind the existing building, with the highest concentrations identified in catch basin CB-1. The horizontal extent of this area of concern (AOC) is based on RI and previous investigation results and is identified on Figure 15. As expected however, residual impacts via soil and soil vapor were identified beneath the building adjacent to and west of the AOC (see Figures 12 and 14). Although shallow groundwater is being controlled via the site-wide underdrain system, RI results indicate cVOC impacts within the AOC are not migrating away from this area at concentrations above regulatory limits via this pathway.

5.0 FATE AND TRANSPORT OF SITE CONTAMINANTS

Soil sample results exceeded RRSCOs for certain contaminants (cVOCs and select metals). In addition, groundwater samples indicated minor exceedances of Class "GA" GWQSs/GVs for cVOCs in several temporary wells. Accordingly, the historic and RI data were incorporated with the physical characterization of the Site to evaluate the fate and transport of contaminants in Site media. The mechanisms by which the contaminants can migrate to other areas or media are briefly outlined below.

5.1 Fugitive Dust Generation

Contaminants present in soil can be released to ambient air as a result of fugitive dust generation. Fugitive dust may be generated during excavation of impacted soil and sediments, as well as during redevelopment activities. Therefore, this migration pathway is potentially relevant under the current land use scenario. Under the planned future land use scenario, the majority of the Site will still be covered by the existing building; asphalt driveway and parking areas; sidewalks; and remaining small areas covered by grass and/or ornamental landscaping. Therefore, this migration pathway is not relevant under the reasonably anticipated future land use (i.e., restricted-residential), as long as paved (i.e., asphalt and concrete) and soil covered areas across the Site are maintained.

5.2 Volatilization

Volatile chemicals, when present in soil and/or groundwater at elevated levels, may be released to ambient air or building indoor air through volatilization from or through the soil pore space. Volatile chemicals typically have a low organic-carbon partition coefficient (K_{oc}), low molecular weight, and a high Henry's Law constant.

VOCs were not detected in soil at concentrations above RRSCOs but were detected in groundwater above Class GA GWQSGVs; therefore, the groundwater-to-air pathway is relevant.

5.3 Surface Water Runoff

Under the current and future use scenarios, the potential for soil particle transport with surface water runoff is very low as the majority of the Site is covered by the existing building; asphalt driveway and parking areas; sidewalks; and grass and/or ornamental landscaping. Although storm water runoff during excavation activities is possible, erosion controls are typical construction practices and would be implemented as a component of the remedial measure or in the case of redevelopment, the Site Management Plan required for BCP Sites that do not achieve the unrestricted use SCOs.

5.4 Leaching

VOCs were detected at concentrations above PGWSCOs in near-surface and subsurface soil across the Site. VOC impacts were also identified in samples collected from several groundwater (primarily temporary) monitoring wells. Although the majority of the Site is covered by impermeable surfaces (i.e., asphalt, concrete, and building) that limit infiltration of precipitation, leaching due to groundwater table fluctuation and limited percolation is considered a relevant migration pathway.

5.5 Groundwater Transport

As discussed in Section 3.2.3 and illustrated in Figures 5 through 7, shallow groundwater flow is dominated in the western portion of the Site by an existing underdrain system, which has caused the groundwater in this area to flow inward creating an artificial groundwater sink. Intercepted groundwater is then conveyed by the underdrain system toward the northeast corner of the Site where it exits through a single catch basin (CB-3) and connection to the Orchard Park storm sewer system on Michael Road. In addition, a pronounced (and possibly natural) groundwater mound was identified in the eastern portion of the Site, which flows in a west-northwest direction toward, and eventually captured by, the western underdrain system. Contaminants present in on-site groundwater may be transported across the Site via this pathway. Although analytical results of storm water collected from catch basin CB-3 indicate the presence of COPCs TCE and PCE, they are at concentrations well below NYSDEC TOGS 1.1.1 (see Table 8). Therefore, the cVOC impacts identified in the southeastern corner of the Site appear to be localized and generally remaining on-site.

The Site and surrounding area are serviced by a municipal (supplied) water service, with no evidence of potable wells in the area. As such, transport off-site via groundwater migration is a relevant migration pathway; however, contaminants present would not reach receptors at significant exposure point concentrations.

5.6 Exposure Pathways

Based on the fate and transport analysis provided above, the pathways through which contaminants detected on-site could potentially migrate to other areas or media under the current use scenario are: fugitive dust emissions via physical disturbance of soil particles, volatilization, leaching, and, to a lesser extent, groundwater transport.

Under the future use scenario, it is unlikely that site-related contaminants would reach off-site receptors at significant exposure point concentrations based on the: proposed remedial measures; anticipated Environmental Easement that will restrict groundwater for potable use; vapor barrier and active subslab depressurization (ASD) system; and NYSDEC/NYSDOH requirements for a Site Management Plan that addresses soil handling and dust controls during future excavation at remedial program construction sites.

6.0 QUALITATIVE HUMAN HEALTH & WILDLIFE ASSESSMENT

6.1 Human Health Exposure Assessment

A qualitative exposure assessment consists of characterizing the exposure setting (including the physical environment and potentially exposed human populations), identifying exposure pathways, and evaluating chemical fate and transport.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has the following five elements:

- Receptor population
- Contaminant source
- Contaminant release and transport mechanism
- Point of exposure
- Route of exposure

An exposure pathway is complete when all five elements of an exposure pathway are documented; a potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway is not documented but could reasonably occur. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway does not exist in the present and will not exist in the future.

6.1.1 Receptor Population

The receptor population includes the people who are or may be exposed to contaminants at a point of exposure. The identification of potential human receptors is based on the characteristics of the Site, the surrounding land uses, and the probable future land uses. The Site is currently occupied by two businesses within a larger building. Under current Site use conditions, receptors would include business customers, indoor occupants/ workers, and construction/maintenance workers that may be employed to perform work on the property. Customers might be comprised of adolescents and adults, whereas indoor occupants and outdoor construction/maintenance workers would be limited to adults.

The reasonably anticipated future use of the Site is for a restricted-residential-like purpose, which is consistent with surrounding property use and zoning. Exposed receptors under the future use scenario may be comprised of indoor workers, outdoor workers (e.g., groundskeepers or maintenance staff), and construction workers who may be employed at or perform work on the property. Site visitors/customers may also be considered receptors; however, their exposure would be similar to that of the indoor worker but at a lesser frequency and duration. Therefore, consideration of the indoor worker is conservatively protective of the Site visitor.

6.1.2 Contaminant Sources

The source of contamination is defined as either the source of contaminant release to the environment (such as a waste disposal area or point of discharge) or the impacted environmental medium (soil, air, biota, water) at the point of exposure. Section 4.0 discusses the COCs present in unremediated Site media at elevated concentrations. In general, these are limited to cVOCs and, to a lesser extent, select inorganic compounds in soil and groundwater.

6.1.3 Contaminant Release and Transport Mechanisms

Contaminant release and transport mechanisms carry contaminants from the source to points where people may be exposed, and are specific to the type of contaminant and site use. For non-volatile COCs present in Site soil/fill, contaminant release and transport mechanisms will generally be limited to fugitive dust migration and direct contact during intrusive work (e.g., during excavation and construction), as the Site is substantially covered by buildings, parking lots, driveways, and grassed areas.

For volatile COCs present in groundwater, the potential exists for exposure through pathways associated with soil gas migration. This would include both the outdoor pathway (primarily to construction workers involved in subsurface activities where volatiles are present at elevated concentration) as well as the indoor vapor intrusion pathway, also referred to as "soil vapor intrusion."

Concerning the indoor air pathway, the NYSDOH has issued a guidance document for assessing potential impacts to indoor air via soil vapor intrusion (Ref. 4). The sub-slab vapor and indoor air samples collected during the Supplemental Phase II Investigation were assessed by the NYSDOH Soil Vapor Intrusion Guidance matrices. Based on the concentrations of PCE and carbon tetrachloride, the matrices recommended: "take reasonable and practical actions to identify source(s) and reduce exposures" and "monitor soil vapor/indoor air," respectively.

As such, under the future (un-remediated) use scenario, soil vapor intrusion is a relevant transport mechanism. Concerning the outdoor air pathway, the potential exists for exposure to VOCs under the current and future use scenarios for construction workers in select areas of the Site.

6.1.4 Point of Exposure

The point of exposure is a location where actual or potential human contact with a contaminated medium may occur. Based on the exceedances of RRSCOs for cVOCs and ubiquitous metals in soils and exceedance of GWQS/GVs for VOCs in groundwater, the point of exposure is defined as the southeastern portion of the Site.

6.1.5 Route of Exposure

The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, dermal absorption). Based on the types of receptors and points of exposure identified above, potential routes of exposure are listed below:

Current Use Scenario

- Indoor Occupant/Worker – inhalation
- Construction and Outdoor Worker – skin contact, inhalation, and incidental ingestion

Future Use Scenario

- Indoor Occupant/Worker – inhalation
- Construction and Outdoor Worker – skin contact, inhalation and incidental ingestion

6.1.6 Exposure Assessment Summary

Based on the above assessment, the potential exposure pathways for the current and future use conditions are listed below.

Current Use Scenario

- Indoor Occupant/Worker – inhalation of volatile organics via indoor air migration
- Construction and Outdoor Worker – direct contact, incidental ingestion, and inhalation of non-volatile contaminants present in soil and volatile contaminants present in groundwater during intrusive activities, and inhalation of volatile organics present in soil and groundwater via outdoor air migration.

Future Use Scenario

- Indoor Occupant/Worker – inhalation of volatile organics via indoor air migration
- Construction and Outdoor Worker – direct contact, incidental ingestion, and inhalation of non-volatile contaminants present in soil and volatile contaminants present in soil and groundwater during intrusive activities, and inhalation of volatile organics present in soil and groundwater via outdoor air migration.

In most instances, these exposures can be readily mitigated through the use of personal protective equipment (PPE); proper soil/fill management during intrusive activities; engineering controls including placement of asphalt, building, and landscape cover; and construction of vapor barriers or sub-slab depressurization systems in existing or newly constructed buildings.

6.2 Fish and Wildlife Impact Assessment (FWIA)

The Site is currently developed with a commercial building, parking lots, driveways, and small landscaped areas, which has limited the availability of suitable cover type for reestablishment of biota. The redevelopment plan includes the potential for additional structures. As such, based on the Fish and Wildlife Resource Impact Analysis Decision Key included as Appendix F (NYSDEC DER-10 Appendix 3C; Ref. 13), no fish and wildlife resources impact analysis is warranted.

7.0 REMEDIAL ALTERNATIVES ANALYSIS

This section provides an analysis of the selected remedial approach by media using the Remedy Selection Evaluation Criteria identified in Section 4.2 of Guidance Document DER-10: Technical Guidance for Site Investigation and Remediation (Ref. 13). In accordance with DER-10 Section 4.4(d)2, remedial alternatives will be developed and comparatively assessed for the Site against the following NYSDEC defined cleanup tracks:

- Track 1, 6NYCRR Part 375-3.8(e)(1) allows the site to be used for any purpose without restriction (i.e., unrestricted use) provided site media meets 6 NYCRR Part 375 SCOs. The soil cleanup must achieve the unrestricted use criteria at any depth above bedrock without the use of institutional/engineering controls.
- Track 2, 6NYCRR Part 375-3.8(e)(2) soil cleanups may consider the current, intended, or reasonably anticipated future use in determining the appropriate cleanup levels for soil. This track requires that the remedial party implement a cleanup that achieves the SCOs in the tables in 6 NYCRR 375-6.7(b) for the top 15 feet of soil (or bedrock if less than 15 feet). Institutional and engineering controls are allowed for soil (for the top 15 feet of soil or bedrock if less than 15 feet) for less than five years (defined as short-term controls). Institutional and engineering controls that limit site use and the use of on-site groundwater can be used without regard to duration. Track 2 cleanups at restricted-residential, commercial, or industrial use sites require site management plans to ensure that material removed from the site (post-remedial action) is managed appropriately and to ensure that any buffer zone protecting adjacent residential use sites or ecological resources is maintained.
- Track 4, 6NYCRR Part 375-3.8(e)(4) soil cleanups uses site-specific information to identify site-specific SCOs (or site-specific action levels; SSALs) that are protective of public health and the environment under a restricted use scenario. For Track 4 remedies, restrictions can be placed on the use of the property in the form of institutional and engineering controls if they can be realistically implemented and maintained in a reliable and enforceable manner. For restricted-residential use, the top two feet of all exposed surface soil that are not otherwise covered by the components of the development of the site (e.g. buildings, pavement) shall not exceed the RRSCOs. Areas that exceed the RRSCOs must be covered by material meeting the requirements of the generic soil cleanup table contained in 6NYCRR Part 375-6.7(d) for restricted-residential future Site use.

7.1 Standards, Criteria, and Guidance

According to DER-10 Section 1.3(b)71, Standards, Criteria, and Guidance (SCGs) mean standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable or not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with, and with consideration being given to guidance determined, after the exercise of scientific and engineering judgment, to be applicable. This term incorporates both the CERCLA concept of "applicable or relevant and appropriate requirements (ARARs)" and the USEPA's "to be considered (TBCs)" category of non-enforceable criteria or guidance. For purposes of this Guidance, "soil SCGs" mean the SCOs and supplemental soil cleanup objectives (SSCOs) identified in 6NYCRR 375-6.8 and the Commissioner Policy CP-51 on Soil Cleanup Guidance (Ref. 14).

Additional discussions concerning the specific chemical-, action-, and location-specific SCGs that may be applicable, relevant, or appropriate to remedy selection at the Site are presented below. In each case, the identified SCGs are generally limited to regulations or technical guidance in lieu of the environmental laws from which they are authorized, as the laws are typically less prescriptive in nature and are inherently considered in the regulatory and guidance evaluations. Table 11 summarizes the SCGs by media that may be applicable or relevant and appropriate to the Site.

7.1.1 Chemical-Specific SCGs

Chemical-specific SCGs are usually health- or risk-based concentrations in environmental media (e.g., air, soil, water), or methodologies that when applied to site-specific conditions, result in the establishment of concentrations of a chemical that may be found in, or discharged to, the ambient environment. The determination of potential chemical-specific SCGs for a site is based on the nature and extent of contamination; potential migration pathways and release mechanisms for site contaminants; the reasonably anticipated future site use; and the likelihood that exposure to site contaminants will occur.

RI sampling included the collection and analysis of subsurface soil. Table 6 presents this data with a comparison to the Part 375 RRSCOs and PGW SCOs. Groundwater samples collected during the Phase II ESA and RI are summarized on Tables 7, 8, and 9 with a comparison to Class "GA" GWQSs/GVs.

One of the remedial alternatives to be assessed for the Site is a Track 4 cleanup for soil/fill; therefore, a site-specific action level (SSAL) for arsenic was developed for the Site. Arsenic is a ubiquitous metal with urban background soils in New York State frequently containing concentrations in excess of the RRSCO (16 mg/kg). Accordingly, comparison of the arsenic data to site-specific background or average concentration is considered appropriate. To determine the arsenic background concentration, Benchmark TurnKey performed a statistical analysis using all of the arsenic concentrations for soil/fill across the Site (28 samples). The analysis revealed a 95% upper confidence limit (UCL) on the mean of approximately 12 mg/kg. On other BCP sites, the NYSDEC recommended using twice the 95% UCL on the mean for arsenic as the SSAL for removal (a soil cover system and SMP were components of the final remedy). Therefore, the SSAL for arsenic is 24 mg/kg.

7.1.2 Location-Specific SCGs

Location-specific SCGs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in a specific location. Some examples of these unique locations include: floodplains, wetlands, historic places, and sensitive ecosystems or habitats. The location of the Site is a fundamental determinant of its impact on public health and the environment.

7.1.3 Action-Specific SCGs

Action-specific SCGs are restrictions placed on particular treatment or disposal technologies. Examples of action-specific SCGs are effluent discharge limits and hazardous waste manifest requirements.

7.2 Remedial Action Objectives

The development of an appropriate remedial approach begins with definition of site-specific Remedial Action Objectives (RAOs) to address substantial public health and ecological risk or other significant environmental issues identified during remedial investigations.

In developing the RAOs, consideration is given to the reasonably anticipated future use of the Site and the applicable SCGs. The redevelopment plan for the Site includes a consolidated Western New York Southdown's multi-disciplinary world class cancer center that will house: radiation oncology, medical oncology, breast surgeons, gynecologic surgeons, vascular surgeons, primary physicians, and diagnostic imaging. The plan includes a vault (see Figure 2) that will house a linear accelerator (LINAC), which is a device most commonly used for external beam radiation treatments for cancer patients. The vault will be constructed of lead and concrete walls so that the high-energy x-rays are shielded. Due to the weight of the LINAC, the vault requires 3 feet of structural fill and a 1-foot thick reinforced concrete slab for support. A new stand-alone building is a possibility for the northwestern portion of the Site (see Figure 2) to potentially house additional medical practices.

Accordingly, appropriate RAOs for the Site have been defined as:

7.2.1 Soil RAOs

- Remove or treat soil areas of concern (i.e., soil deemed unacceptable to remain on-site, even under a Track 4 approach) as necessary to protect public health and the environment.
- Prevent ingestion/direct contact with soil where contaminant levels exceed RRSCOs. Although the proposed redevelopment is technically a commercial use, the RRSCOs are conservatively employed as screening criteria per Section 4.1 due to the nature of the facility operations (i.e., medical treatment), the potential greater sensitivity of patient receptors, and the possible extended duration of visits by such receptors.
- Prevent migration of contaminants that may result in unacceptable off-site concentration.
- Prevent inhalation of or exposure to contaminants potentially volatilizing from contaminated soil.
- Implement and maintain engineering and institutional controls to assure that the Site is not used in a manner inconsistent with the reasonably anticipated future use scenario.

7.2.2 Groundwater RAOs

- Remove or treat potential sources of groundwater contamination.
- Prevent ingestion of groundwater containing contaminant levels exceeding NYSDEC Class GA GWQS/GVs.
- Prevent contact with or inhalation of volatile compounds emanating from contaminated groundwater.
- Prevent degradation of off-site groundwater quality.

- Implement and maintain engineering and institutional controls to assure that the Site is not used in a manner inconsistent with the reasonably anticipated future use scenario.

7.3 General Response Actions

General Response Actions (GRAs) are broad classes of actions that are developed to achieve the RAOs and form the foundation for the identification and screening of remedial technologies and alternatives.

7.3.1 Soil

The GRAs available to address the RAOs for near-surface/subsurface soil include:

- Institutional controls (e.g., Site Management Plan, Environmental Easement)
- Engineering controls (e.g., cover system)
- Treatment (e.g., in situ or ex situ)
- Excavation and off-site disposal

7.3.2 Groundwater

The GRAs available to address the RAOs for groundwater include:

- Monitored natural attenuation
- Institutional controls
- Engineering controls (e.g., pump-and-treat)
- Treatment (e.g., in situ or ex situ)

7.4 Evaluation of Alternatives

NYSDEC's Brownfield Cleanup Program calls for remedy evaluation in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (Ref. 13). In addition to achieving RAOs, the remedial alternatives are evaluated against the following criteria consistent with 6NYCRR Part 375-1.8(f):

- **Overall Protectiveness of Public Health and the Environment**. This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, engineering controls, or institutional controls.

- **Compliance with Standards, Criteria, and Guidance (SCGs)**. Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards, and guidance.
- **Long-Term Effectiveness and Permanence**. This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: (i) the magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment from the remaining wastes or treated residuals), (ii) the adequacy of the engineering and institutional controls intended to limit the risk, (iii) the reliability of these controls, and (iv) the ability of the remedy to continue to meet RAOs in the future.
- **Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment**. This criterion evaluates the remedy's ability to reduce the toxicity, mobility, or volume of Site contamination. Preference is given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site.
- **Short-Term Impacts and Effectiveness**. Short-term effectiveness is an evaluation of the potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during construction and/or implementation. This includes a discussion of how the identified adverse impacts and health risks to the community or workers at the Site will be controlled, and the effectiveness of the controls. This criterion also includes a discussion of engineering controls that will be used to mitigate short term impacts (i.e., dust control measures), and an estimate of the length of time needed to achieve the remedial objectives.
- **Implementability**. The implementability criterion evaluates the technical and administrative feasibility of implementing the remedy. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.
- **Cost-Effectiveness**. Capital, operation, maintenance, and monitoring costs are estimated for each remedial alternative and presented on a present worth basis. The estimated soil areas and volumes presented are estimates of the maximum in-place extent of impacted soil. The cost estimates developed for the remedial alternatives include contingencies for excavation inefficiencies as well as volume to weight assumptions; therefore, the quantities in the cost tables differ from those presented in the report text.

- **Community Acceptance**. This criterion evaluates the public's comments, concerns, and overall perception of the remedy. The Community Acceptance criterion incorporates public concerns into the evaluation of the remedial alternatives. Therefore, Community Acceptance of the remedy will be evaluated after the public review of the remedy selection process as part of the final NYSDEC remedy selection/approval.
- **Land Use**. In addition to the above criteria, 6NYCRR Part 375-1 specifies that the criterion of Land Use (i.e., the current, intended, and reasonably anticipated future land uses of the Site and its surroundings) be considered in the selection of the remedy. The reasonably anticipated future use of the Site is in a commercial capacity. Appendix G presents the land use evaluation for the Site.

7.4.1 Comparison to Unrestricted SCOs (Track 1 Cleanup)

Exceedances of the Part 375 unrestricted use SCOs were noted in a few soil and sediment samples; specifically, cVOCs and select metals (see Figure 16). Three sample locations (SB-5, SB-6, B-24) contained concentrations of cVOCs (PCE) above the unrestricted use SCOs and are within the building footprint and up to 4 feet below the floor. Three additional sample locations beneath the building floor detected concentrations of arsenic (B-19, B-20, B-22) and nickel (B-19) above the unrestricted use SCOs. Other exceedances of the unrestricted use SCOs outside the building footprint up to 8 fbgs include: cVOCs (B-1, B-6); arsenic (B-9, B-10, B-15); mercury (B-5); and nickel (B-15, MW-1B, MW-2B, MW-3B); two of these samples containing nickel above the SCO were collected from 12 to 14 fbgs. The sediment samples collected from catch basin CB-1 detected concentrations of cVOCs, silver, and zinc above the unrestricted use SCOs.

In March 2015, groundwater was encountered between 1.7 and 6.6 fbgs; therefore, dewatering would be required for excavation alternatives. Since the total depth of impact has not been determined, it will be assumed that the required remedial depth of 15 fbgs (or to the top of bedrock, if encountered sooner) will require remediation for the select areas noted. Therefore, the in-place volume of impacted soil (saturated and unsaturated) requiring remediation under a Track 1 cleanup is approximately 4,110 cubic yards (CY) for VOCs, 445 CY for arsenic, and 225 CY for mercury. An estimated 4,900 SF of the building concrete floor would need to be removed to access the impacted soil. An estimated 0.3 CY of sediment in catch basin CB-1 also requires remediation under the Track 1 approach.

7.4.2 Comparison to Restricted Use SCOs (Track 2 Cleanup)

Only the sediment sample collected from catch basin CB-1 contained cVOCs above the Part 375 RRSCOs. However, three soil samples within the building footprint (B-24, SB-5, SB-6) and two outside the building footprint (B-1 and B-6) contained cVOC concentrations above the Part 375 protection of groundwater SCOs. Groundwater samples collected also contained concentrations of cVOCs above GWQS/GVs. The only metal detected at concentrations above its RRSCO is arsenic (B-15, B-20). The volume of impacted soil and sediment requiring remediation under a Track 2 cleanup is essentially the same as the Track 1 cleanup except the soil at location B-5 would not require remediation for mercury; therefore, the Track 2 cleanup alternative will not be evaluated further.

7.4.3 Comparison to Restricted-Use SCOs (Track 4 Cleanup)

Under a Track 4 cleanup for the Site, surface soil with concentrations above RRSCOs would require 2 feet of compliant soil cover that achieves the lowest of the three applicable contaminant-specific SCOs (i.e., protection of public health, groundwater, or ecological resources) or an impervious cover (i.e., buildings, hardscape). The Track 4 cleanup also must consider: 1) the less common exposure scenario of the construction or maintenance worker who may need to perform periodic grounds keeping or other subsurface work (e.g., utility repairs) involving work beneath the cover system, and 2) the need to remediate grossly impacted soil (such as those exhibiting strong visual and olfactory impact impact) where feasible per NYSDEC cleanup policy. The Track 4 cleanup activities would include: soil excavation, in situ groundwater remediation, institutional controls (e.g., groundwater and land use restrictions, Site Management Plan and Environmental Easement), and engineering controls (e.g., cover systems, subslab depressurization system) as components of the final remedy to reduce future potential exposure to impacted soil and groundwater.

7.4.4 Groundwater

Groundwater collected from monitoring well MW-4A, and temporary monitoring wells TPMW-1, -2, -7, and -11 contained concentrations of cVOCs above GWQS/GVs. The inorganic compounds detected in groundwater monitoring wells at concentrations above GWQS/GVs were limited to iron, magnesium, manganese, and sodium, which are considered ubiquitous groundwater constituents for this area.

7.4.5 Identification of Remedial Alternatives

The following remedial alternatives have been developed in accordance with the RAOs, GRAs, and NYSDEC regulation and policy:

- Alternative 1: No Action
- Alternative 2: Unrestricted Use (Track 1) Cleanup
- Alternative 3: Restricted-Use (Track 4) Cleanup

7.4.5.1 Alternative 1: No Action

The no action alternative is defined as performing no remedial actions on the Site. In addition, no engineering or institutional controls would be put in place under this alternative.

Overall Protectiveness of Public Health and the Environment – This alternative would not protect public health and the environment as the soil and groundwater are impacted above the SCOs. Future site workers would be exposed to contamination and impacted groundwater would be allowed to migrate off-site. Therefore, this alternative would not meet the RAOs for the Site.

Compliance with SCGs – Soil with contaminant concentrations in excess of the SCOs remain and groundwater concentration exceed the GWQS/GVs. Therefore, this alternative does not comply with the SCGs.

Long-Term Effectiveness and Permanence – This alternative provides no long-term effectiveness and permanence since the risk of exposure to impacted soil and groundwater remains.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – There is no reduction of toxicity, mobility, or volume of contaminants with this alternative.

Short-Term Impacts and Effectiveness – There are no short-term impacts associated with the no action alternative.

Implementability – There are no technical or administrative implementability issues associated with the no action alternative.

Cost-Effectiveness – There are no capital or operation, maintenance, and monitoring (OM&M) costs associated with the no action alternative.

Community Acceptance – The community would not accept this alternative as performing no remedial action is not protective of public health and the environment.

Land Use – This alternative is not consistent with the reasonably anticipated future use of the Site in a restricted-residential capacity as it is not protective of public health and the environment.

7.4.5.2 Alternative 2: Unrestricted Use (Track 1) Cleanup

Alternative 2 consists of excavation and off-site disposal of all soil that contains chemical constituents at concentrations greater than 6NYCRR Part 375 SCOs for unrestricted use and/or has evidence of grossly contaminated media. Achieving these Track 1 remediation goals (Section 4 and Part 4.4 (d)(2) of DER-10) obviates the need for engineering and institutional controls related to Site soils. For unrestricted use scenarios, excavation and off-site disposal of impacted soil is generally regarded as the most applicable remedial measure, because engineering controls cannot be used to supplement the remedy.

Table 5 indicates the soil samples with concentrations above the unrestricted use SCOs. Since soil impacts were observed up to 14 fbgs, the alternative assumes an impact to the required cleanup depth of 15 fbgs. Figure 16 illustrates the areas assumed to be impacted above the unrestricted use SCOs. Thus, the volume of impacted soil requiring excavation and off-site disposal, allowing for excavation inefficiencies and contingency, is approximately 7,200 CY (est. 11,520 tons). An estimated 4,900 square feet of the building floor would require removal to access the impacted soil.

Based on the total concentrations, the impacted soil is assumed to be characteristically non-hazardous and would therefore be disposed in a commercial solid waste disposal facility under a Contained-In Determination (see Appendix H) to relieve land ban exclusions related to listed (cVOC-impacted soil). Excavated materials would require handling and preparation for off-site transportation and disposal. Due to the shallow groundwater table, a dewatering system would be installed to facilitate excavation activities. Water generated during the dewatering activities would be treated on-site via temporary water treatment system and then discharged to the sanitary sewer under a temporary discharge permit. Excavated areas would be backfilled with material meeting the BCP criteria presented in DER-10 and 6NYCRR Part 375 to the pre-excavation elevations and grades, and all disturbed areas would be restored with topsoil and grass seeding; hardscape; or new concrete floor.

Under this alternative, the groundwater concentrations would be expected to decrease over time since the source will have been removed. However, a restriction on groundwater use may be included as a component of the remedial program per 6NYCRR Part 375-3.8(e)(1)(iii).

Overall Protectiveness of Public Health and the Environment – Excavation and off-site disposal to unrestricted use SCOs would be protective of public health under any reuse scenario. However, this alternative would permanently use and displace approximately 7,200 CY of valuable landfill airspace, causing ancillary environmental issues due to reduced landfill capacity, and would require excavating, transporting, and placing that same quantity of clean soil from an off-site borrow source to backfill the excavation, also contributing to detrimental off-site environmental issues.

Compliance with SCGs – Excavation and off-site disposal would need to be performed in accordance with applicable, relevant, and appropriate SCGs. Soil excavation activities would necessitate preparation of and adherence to a community air monitoring plan (CAMP) in accordance with Appendices 1A and 1B of DER-10.

Long-Term Effectiveness and Permanence – This alternative would remove all impacted soil and the source of groundwater contamination, thereby providing long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – Through removal of all impacted soil, this alternative would permanently and significantly reduce the toxicity, mobility, and volume of contamination on the Site. However, since this alternative transfers Site soil from one environment to another, an overall reduction of toxicity and volume would not occur, although mobility of soluble constituents would be reduced in the commercial landfill with a liner, leachate collection, and a cover system.

Short-Term Impacts and Effectiveness – The principal advantage of a large-scale excavation to achieve unrestricted SCOs is reliability of effectiveness in the long-term. The short-term adverse impacts and risks to the community, workers, and environment during implementation of this alternative are significant. Site workers would be at greater risk of injury due to the depth of the excavation and increased use of heavy equipment. Other physical hazards, primarily related to potential accidents from heavy truck traffic, would be expected as the excavation work would require removal of approximately 515 truckloads of soil and import of a similar number of clean loads from the borrow source. Dust control methods would be required to limit the release of particulates during placement of the backfill soils; however, substantial disruption of the neighboring community would occur due to material transport and deliveries and noise from heavy equipment used to construct the remedy. This action would result in storm water impacts at the borrow source(s) and on-site; diesel fuel consumption on the order of 5,200 gallons (assuming 80 miles round trip to a local landfill; 8 miles per gallon), with several hundreds of gallons also consumed by excavation and grading equipment. The USEPA's estimated CO_2 generation rate for diesel engines is approximately 22.2 pounds per gallon of diesel consumed. Accordingly, this alternative would produce over 100,000 pounds of greenhouse gas.

This alternative represents a significant adverse effect in the short-term; however, the RAOs would be achieved once the soil is removed from the Site and backfill soils are in place (est. 3 months).

Implementability – Significant technical implementability issues would be encountered in construction of this unrestricted use alternative. Technical implementability issues may include, but are not limited to: access to the various areas within the building to cut and remove the concrete floor; shoring/stabilizing excavation sidewalls to prevent sloughing during the 15-foot excavations; the need for construction, maintenance, and operation of dewatering facilities; groundwater and/or storm water handling, treatment and/or discharge/disposal; and traffic coordination for trucks entering and exiting the Site. In addition, floor removal and deep excavation of native material adjacent to and within the footprint of the building will result in geotechnical and safety issues relating to structural integrity of building foundation. No significant administrative implementability issues are expected under this alternative; however it would likely necessitate the temporary relocation of existing building tenants due to the extent of the interior excavations and the disruption of business operations.

Cost-Effectiveness – The remedial costs for implementation of Alternative 2 are estimated at $941,900. Table 12 provides a breakdown of these remedial costs.

Community Acceptance – Since this alternative is protective of public health and the environment, the community would likely accept the unrestricted use alternative; however, significant short-term disruption may result in complaints by neighbors and current building tenants. Community acceptance will be evaluated based on comments to be received from the public in response to Fact Sheets and other planned Citizen Participation activities.

Land Use – This alternative is consistent with the reasonably anticipated future use of the Site.

7.4.5.3 Alternative 3: Restricted-Use (Track 4) Cleanup

A Track 4 cleanup approach would include focused remedial efforts to address areas of elevated impact and/or source materials with cover to address areas of the Site where impacts remain above RRSCOs. As discussed in Section 7.1.1, the arsenic SSAL of 24 mg/kg is proposed under the Track 4 alternative, with cVOC-impacted areas remediated to RRSCOs to the extent feasible. Soil concentrations that meet the NYSDEC Part 375-6.8(b) RRSCOs as well as the PGW SCOs but exceed the arsenic SSAL may remain in-place without additional cover material provided the arsenic concentration is below 24 mg/kg and the soil is not grossly impacted. Appendix I presents the statistical analysis to support the arsenic SSAL. The Track 4 approach will include the following components as illustrated on Figure 17:

- Excavation of an approximate 42-foot by 42-foot by 4 feet deep area for the planned vault followed by off-site disposal of asphalt and soil as non-hazardous waste under a Contained-In Determination. Dewatering of the excavation will be performed as necessary with collected water treated and discharged to the sanitary sewer under a temporary discharge permit. Groundwater treatment amendments will be applied to the bottom of the excavation and mixed prior to backfilling with approximately 3 feet of structural fill. A vapor barrier with minimum thickness of 6-mil will be placed over the fill followed by a 1-foot thick reinforced concrete slab. An estimated 1,200 pounds of 3-DMicroEmulsion™ (3-DMe), 400 pounds of Chemical Reducing Solution (CRS®), and 2 gallons of Bio-Dechlor INOCULUM® Plus (BDI Plus) will be applied at a bottom depth of approximately 4 fbgs.

- Excavation of an estimated 0.3 CY of soil for the three footers to support the planned Porte Cochere followed by off-site disposal of asphalt and soil under the Contained-In Determination.
- Removal of sediment from catch basin CB-1 followed by off-site disposal as a characteristic hazardous waste. The inverts will be plugged and the interior of the catch basin will be steam cleaned. The water will be collected and properly disposed off-site. The catch basin will be removed and the surrounding soil will be sampled. One bottom sample and a composite of soil collected from each sidewall of the CB-1 excavation will be submitted for analysis of TCL VOCs; additional soil may require excavation and off-site disposal if significant RRSCO exceedances are encountered.
- Excavation of an estimated 70 linear feet of storm sewer pipe and bedding stone from catch basin CB-1 approximately halfway to CB-2. The excavated material will be disposed off-site under the Contained-In Determination. Prior to backfilling, up to three soil samples will be collected from the bottom of the excavation for analysis of TCL VOCs; additional soil may require excavation and off-site disposal if significant RRSCO exceedances are encountered. A new catch basin (to be identified as CB-7) and new storm sewer drain pipe will be installed effectively re-routing the existing configuration away from the vault to avoid structural issues with the planned vault construction (see Figure 2).
- Direct injection of groundwater treatment amendments over an approximate 3,147 square-foot area. The amendments will be delivered over a treatment interval of approximately 4 to 14 fbgs at 12 injection point locations. Over the 12 injection points, an estimated 2,000 pounds (240 gallons) of 3-DMe, 800 pounds (91 gallons) of CRS, and 3 gallons of BDI Plus will be delivered. Water will be mixed with the 3-DMe and BDI Plus; therefore, the volume of water/ amendments per injection point is approximately 216 gallons.
- Installation of an Active Sub-slab Depressurization (ASD) system within the building areas addressed as 3031 through 3041. The ASD system will consist of 19 suction cavities, 3-inch PVC risers, 4-inch PVC overhead manifold lines, and three exterior roof fans.
- Maintenance and repair/reconstruction, as necessary, of the existing soil (landscape) and impervious (i.e., asphalt paved driveways and parking lots, and concrete pads, etc.) cover systems.

- Implementation of a Site Management Plan (SMP). For any BCP Site not remediated to meet NYSDEC Part 375 unrestricted use SCOs, preparation of an SMP that describes site-specific Engineering Controls and Institutional Controls (EC/ICs) is a required component of the final remedy. The SMP will include the following components: EC/IC Plan; Operations and Maintenance (O&M) Plan; Excavation Work Plan; Site Monitoring Plan; and Environmental Easement.

Overall Protectiveness of Public Health and the Environment – This alternative meets NYSDEC requirements for a Track 4 cleanup under the BCP regulations and is protective of public health and the environment. The RAOs for the Site would be satisfied through the planned remedial activities, including: removal and off-site disposal of impacted soil; in situ groundwater treatment to mitigate Site groundwater and reduce the potential for off-site migration; placement of a vapor barrier beneath the vault and installation of an ASD system in the building to mitigate potential on-site VOC vapor intrusion concerns; maintenance of existing cover systems (soil and imperious) across the Site; and the use of EC/ICs to prevent potential future exposure and limit the future Site use to restricted-residential.

Compliance with SCGs – The remedial activities will be performed in accordance with applicable, relevant, and appropriate SCGs (see Table 11). Imported cover material will meet backfill quality criteria per DER-10 and 6NYCRR Part 375. Subgrade activities will adhere to a CAMP in accordance with Appendices 1A and 1B of DER-10. The planned remedial actions will be fully protective of public health and the environment, and achieve all RAOs for the Site.

Long-Term Effectiveness and Permanence – Removal of impacted soil and sediment, and maintenance of the existing cover systems will prevent direct contact with soil exceeding the RRSCOs. In situ treatment will permanently reduce the potential for off-site migration of contaminated groundwater. Periodic inspection and maintenance of the cover systems will be required to assure long-term cover integrity. Placement of a vapor barrier (vault) and ASD system within the existing building will mitigate potential on-site VOC vapor intrusion concerns. The SMP will include: an O&M Plan to confirm that engineering controls (i.e., cover and ASD systems) are operating and being maintained in accordance with the SMP; an Excavation Work Plan to address any impacted soil encountered during redevelopment and post-development maintenance activities; and a Site-wide inspection program to assure that the EC/ICs placed on the Site have not been altered and remain effective. Furthermore, an Environmental Easement for the Site will be filed with Erie County, which will limit the future use of the Site to restricted-residential, restrict groundwater use, and reference the NYSDEC-approved SMP. As such, this alternative will provide long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – Excavation and off-site disposal of impacted soil will permanently and significantly reduce the toxicity, mobility, and volume of soil that could potentially be contacted or produce localized areas of environmental impact at the Site. In situ groundwater treatment will permanently reduce the toxicity and volume of contamination. Accordingly, this alternative satisfies this criterion.

Short-Term Effectiveness and Impacts – During intrusive remedial activities, air monitoring will be performed to assure conformance with community air monitoring action levels. The potential for chemical exposures and physical injuries will be reduced through safe work practices; proper personal protection equipment (PPE); environmental monitoring; establishment of work zones and Site control; and appropriate decontamination procedures. Soil excavation/backfill and in situ groundwater treatment is estimated to be completed within a 2-month period thereby limiting short-term adverse effects. Remedial activities will be performed in accordance with the approved IRM Work Plan, including health and safety plan (HASP) and CAMP. This alternative achieves the RAOs for the Site.

Implementability – No significant technical or administrative implementability issues are associated with this alternative.

Cost-Effectiveness – The estimated capital cost for Alternative 3 is $353,800. Annual OM&M costs for cover system maintenance, operation of the ASD system, groundwater monitoring, and annual certification are estimated to be $13,000. Therefore, the 30-year present worth cost to implement Alternative 3 is estimated at $608,700. Table 13 provides a breakdown of these remedial costs.

Land Use – Based on the land use evaluation presented in Appendix G, reuse of the Site in a commercial capacity is consistent with past and current development and zoning on-site and within the vicinity of the Site, and does not pose additional environmental or public health risks.

Community Acceptance – Community acceptance will be evaluated based on comments to be received from the public in response to Fact Sheets and other planned Citizen Participation activities.

7.4.6 Comparison of Remedial Alternatives

The previous sections describe and evaluate the remedial alternatives for the Site against the screening criteria. Table 14 provides a comparison of the alternatives to identify appropriate remedial measures that will achieve the RAOs for the Site.

7.4.7 Preferred Remedial Alternative

The proposed remedial approach for the Site is *Alternative 3; Restricted-Use (Track 4) Cleanup* because it is fully protective of public health and the environment; is less disruptive to the community; is consistent with current and future land use and the redevelopment plan; and represents a more cost-effective approach than Alternative 2 while fully satisfying the RAOs for the Site. Alternative 3 would constitute the final remedy for the Site.

In summary, Alternative 3 would involve:

- Excavation of an approximate 42-foot by 42-foot by 4 feet deep area for the planned vault followed by off-site disposal of asphalt and soil under the Contained-In Determination. Groundwater treatment amendments will be applied to the bottom of the excavation and mix prior to backfilling with 3 feet of structural fill. A vapor barrier with minimum thickness of 6-mil will be placed over the fill followed by a 1-foot thick concrete slab.
- Excavation of an estimated 0.3 CY of soil for the three footers to support the planned Porte Cochere followed by off-site disposal of asphalt and soil under the Contained-In Determination.
- Removal of sediment from catch basin CB-1 followed by off-site disposal as a characteristic hazardous waste. The inverts will be plugged and the interior of the catch basin will be steam cleaned. The water will be collected and properly disposed off-site. The catch basin will be removed and the surrounding soil will be sampled. One bottom sample and a composite of soil collected from each

sidewall will be submitted for analysis of TCL VOCs; additional soil may require excavation and off-site disposal if significant RRSCO exceedances are encountered.

- Excavation of an estimated 70 linear feet of storm sewer pipe and bedding stone from catch basin CB-1 approximately halfway to CB-2. The excavated material will be disposed off-site under the Contained-In Determination. Prior to backfilling, up to three soil samples will be collected from the bottom of the excavation for analysis of TCL VOCs; additional soil may require excavation and off-site disposal if significant RRSCO exceedances are encountered. A new catch basin (to be identified as CB-7) and new storm sewer drain pipe will be installed effectively re-routing the existing configuration away from the vault to avoid structural issues with the planned vault construction (see Figure 2).
- Direct injection of groundwater treatment amendments over an approximate 3,147 square-foot area. The amendments will be delivered over a treatment interval of approximately 4 to 14 fbgs at 12 injection point locations. The volume of water/amendments per injection point is approximately 216 gallons.
- Installation of an Active Sub-slab Depressurization (ASD) system within the building areas addressed as 3031 through 3041. The ASD system will consist of 19 suction cavities, 3-inch PVC risers, 4-inch PVC overhead manifold lines, and three exterior roof fans.
- Maintenance and repair/reconstruction, as necessary, of the existing soil (landscape) and impervious (i.e., asphalt paved driveways and parking lots, and concrete pads, etc.) cover systems.
- Implementation of a SMP that will include:
    - EC/IC Plan. Engineering controls include any physical barrier or method employed to actively or passively contain, stabilize, or monitor contaminants; restrict the movement of contaminants; or eliminate potential exposure pathways to contaminants. Institutional controls at the Site will include restrictions on groundwater use and Site use to restricted-residential.
    - Excavation Work Plan to assure that future intrusive activities and soil handling at the Site are completed in a safe and environmentally responsible manner.
    - Site Monitoring Plan that includes provisions for a Site-wide inspection program to assure that the EC/ICs have not been altered and remain effective.
    - Environmental Easement filed with Erie County.

The components and details of the remedial work will be fully described in the Final Engineering Report.

8.0 REPORTING & POST-REMEDIAL REQUIREMENTS

8.1 Electronic Copy of RI/AA Report

Appendix J includes an electronic version of this RI/AA Report.

8.2 Final Engineering Report (FER)

Following completion of the remedial measures, a Final Engineering Report (FER) will be submitted to the NYSDEC. The FER will include the following information and documentation, consistent with the NYSDEC regulations contained in 6NYCRR Part 375-1.6(c):

- Background and Site description.
- Summary of the Site remedy that satisfied the RAOs for the Site.
- Certification by a professional engineer to satisfy the requirements outlined in 6NYCRR Part 375-1.6(c)(4).
- Description of engineering and institutional controls at the Site.
- Site map showing the areas remediated.
- Documentation of imported materials.
- Documentation of materials disposed off-site.
- Copies of daily inspection reports and, if applicable, problem identification and corrective measure reports.
- Two rounds of post-remedial groundwater monitoring data.
- Sub-slab and ambient air monitoring data and reports.
- CAMP data and reports.
- Photo documentation of remedial activities.
- Text describing the remedial activities performed; a description of any deviations from the IRM Work Plan and associated corrective measures taken; and other pertinent information necessary to document that the site activities were carried out in accordance with the IRM Work Plan.
- Analytical data packages and DUSRs.

8.3 Site Management Plan (SMP)

A Site Management Plan (SMP) will be prepared and submitted concurrent with the FER. The purpose of the SMP is to assure that proper procedures are in place to provide for long-term protection of public health and the environment after remedial construction is complete. The SMP is comprised of four main components:

- Engineering Control and Institutional Control (EC/IC) Plan
- Site Monitoring Plan
- Operation and Maintenance Plan
- Inspections, Reporting, and Certifications

8.3.1 Engineering and Institutional Control Plan

An institutional control in the form of a new Environmental Easement will be necessary to limit future use of the Site to restricted-residential applications, which is more restrictive than the commercial end-use of the Site, and prevent groundwater use for potable purposes.

The EC/IC Plan will include a complete description of all institutional and/or engineering controls employed at the Site, including the mechanisms that will be used to continually implement, maintain, monitor, and enforce such controls. The EC/IC Plan will include:

- A description of all EC/ICs on the site.
- The basic implementation and intended role of each EC/IC.
- A description of the key components of the ICs set forth in the Environmental Easement.
- A description of the features to be evaluated during each required inspection and periodic review, including the EC/IC certification, reporting, and Site monitoring.
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the Site remedy, as determined by the NYSDEC.

8.3.2 Site Monitoring Plan

The Site Monitoring Plan will describe the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, including:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air).

- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater quality standards.
- Assessing achievement of the remedial performance criteria.
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Site Monitoring Plan will provide information on:

- Sampling locations, protocol, and frequency.
- Information on all designed monitoring systems (e.g., well logs).
- Analytical sampling program requirements.
- Reporting requirements.
- Quality Assurance/Quality Control (QA/QC) requirements.
- Inspection and maintenance requirements for monitoring wells.
- Monitoring well decommissioning procedures.
- Annual inspection and periodic certification.

The need for and frequency of post-remedial groundwater monitoring (if required) as well as types of analyses to assess overall reduction in contamination on-site and off-site will also be included in the Site Monitoring Plan.

8.3.3 Operation and Maintenance Plan

An Operation & Maintenance (O&M) plan governing maintenance of the cover systems and ASD System will:

- Include the operation and maintenance activities necessary to allow individuals unfamiliar with the Site to maintain the cover systems and operate the ASD system.
- Include an O&M contingency plan.
- Evaluate Site information periodically to confirm that the remedy continues to be effective for the protection of public health and the environment. If necessary, the O&M Plan will be updated to reflect changes in Site conditions or the manner in which the cover system is maintained or the ASD system is operated.

8.3.4 Inspections, Reporting, and Certifications

8.3.4.1 Inspections

Site-wide inspection will be conducted annually or as otherwise approved by the NYSDEC. All applicable inspection forms and other records, including all media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format in a Periodic Review Report (PRR).

8.3.4.2 Reporting

The PRR will be submitted to the NYSDEC annually, or as otherwise approved, beginning 15 months after the Certificate of Completion or equivalent document is issued. The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. The PRR will include:

- Identification, assessment, and certification of all EC/ICs required by the remedy for the Site.
- Results of the required annual Site inspections and severe condition inspections, if applicable.
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format.
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media, which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format.
- A Site evaluation that includes the following:
  - The compliance of the remedy with the requirements of the site-specific RAWP, ROD, or Decision Document.
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications.

- Any new conclusions or observations regarding site contamination based on inspections or data generated by the Site Monitoring Plan for the media being monitored.
- Recommendations regarding any necessary changes to the remedy and/or Site Monitoring Plan.
- The overall performance and effectiveness of the remedy.

8.3.4.3 Certification

The signed EC/IC Certification will be included in the PRR described in Section 9.2.4.2: For each EC/IC identified for the Site, a Professional Engineer licensed to practice in New York State will certify that all of the following statements are true:

- The inspection of the Site to confirm the effectiveness of the EC/ICs required by the remedial program was performed under my direction.
- The EC/ICs employed at this Site are unchanged from the date the control was put in place, or last approved by the NYSDEC.
- Nothing has occurred that would impair the ability of the control to protect the public health and environment.
- Nothing has occurred that would constitute a violation or failure to comply with any SMP for this control.
- Access to the Site will continue to be provided to the NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of this control.
- If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document.
- Use of the Site is compliant with the Environmental Easement.
- The ECs are performing as designed and are effective.
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices.
- The information presented in this report is accurate and complete.

8.3.4.4 Corrective Measures Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an EC/IC, a Corrective Measures Plan will be submitted to the NYSDEC for approval. This Plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Plan until it is approved by the NYSDEC.

9.0 REFERENCES

1. LCS Inc. *ASTM E1527-05 All Appropriate Inquiries Phase I Environmental Site Assessment Report for the Property Identified as: Commercial Plaza, 3021-3041 Orchard Park Road, Orchard Park, New York*. October 10, 2013.
2. LCS Inc. *Limited and Focused Subsurface Soil and Groundwater Investigation Report for the Property Identified as: Commercial Plaza, 3021-3041 Orchard Park Road, Orchard Park, New York*. May 14, 2014.
3. TurnKey Environmental Restoration, LLC. *Supplemental Phase II Environmental Investigation, 3021-3041 Orchard Park Road, Orchard Park, New York*. June 2014.
4. New York State Department of Health. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. October 2006. (Update memo dated June 25, 2007.)
5. EmpireGeo Services, Inc. *Geotechnical Evaluation Report for Proposed Medical Campus Addition, Orchard Park, New York*. December 3, 2014.
6. Benchmark Environmental Engineering & Science, PLLC and TurnKey Environmental Restoration, LLC. *Remedial Investigation/Interim Remedial Measures/Alternatives Analysis Work Plan, 3021 Orchard Park Road Site, Orchard Park, New York*. November 2014.
7. United States Department of Agriculture (USDA), Soil Conservation Service. *Soil Survey of Erie County, New York*. December 1986.
8. *Surficial Geologic Map of New York, Niagara Sheet*, Compiled and edited by Donald H. Cadwell, University of the State of New York, The State Education Department, 1988.
9. United States Department of Agriculture (USDA), Natural Resources Conservation Service Web Soil Survey, Version 12, December 15, 2013. http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed June 17, 2014.
10. Edward J. Buehler and Irving H. Tesmer. *Geologic Map of Erie County, New York Bedrock Geology*. Buffalo Society of Natural Sciences Bulletin, Vol. 21, No. 3. 1963.
11. National Oceanic & Atmospheric Administration (NOAA) Satellites and Information. Data Tables through 2000.
12. United States Census Bureau. *Community Facts*. Orchard Park, Erie County, New York. 2010.
13. New York State Department of Environmental Conservation. *DER-10; Technical Guidance for Site Investigation and Remediation*. May 2010.

14. New York State Department of Environmental Conservation. *CP-51/Soil Cleanup Guidance*. October 21, 2010.