Final
Construction Completion Report for Soil Remediation

Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

August 2020

Contract: W912QR-12-D-0010
Delivery Order: W912P418F0049

Prepared for:

U.S. Army Corps of Engineers
Buffalo District
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STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Final
Construction Completion Report for Soil Remediation
Tonawanda Landfill Vicinity Property, Erie County, New York
U.S. Army Corps of Engineers
Buffalo District

Plexus Scientific Corporation has completed the preparation of the Final Construction Completion Report. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used, and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing U.S. Army Corps of Engineers policy.

Significant concerns and explanation of the resolutions are documented within the project file. As noted above, all concerns resulting from independent technical review of the project have been considered.

[redacted]
Project Manager

_____8/11/2020__________
Date

[redacted]
Independent Technical Review Team Leader

_08/11/2020_____
Date

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ACRONYMS AND ABBREVIATIONS

%	percent
µCi/mL	microcurie per milliliter
AEC	Atomic Energy Commission
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
BCY	bank cubic yards
bgs	below ground surface
BPA	blank purchase agreement
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
COR	Contracting Officer's Representative
cpm	counts per minute
CQCP	Contractor Quality Control Plan
CQCSM	Contractor Quality Control System Manager
CRZ	Contaminant Reduction Zone
CSP	Certified Safety Professional
DAC	derived air concentration
DFOW	definable feature of work
DOE	Department of Energy
DQCR	Daily Quality Control Reports
DU	decision unit
DUL	decision unit layer
EnSol	EnSol, Inc.
EZ	Exclusion Zone
ft	foot/feet
ft^2	square foot/feet
FUSRAP	Formerly Utilized Sites Remedial Action Program
IMC	Intermodal Container
ISOCS	*In-Situ* Object Counting System
KeV	kilo-electronvolts
LANL	Los Alamos National Laboratories
m	meter
m^2	square meter
NaI	sodium iodide
NELAC	National Environmental Laboratory Accreditation Conference
New Enterprise	New Enterprise Stone and Lime Company, Inc.
NPDES	National Pollution Elimination Discharge System
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSSCO	New York State Soil Cleanup Objective

ACRONYMS AND ABBREVIATIONS (continued)

OSHA	Occupational Safety and Health Administration
OU	operable unit
Pace	Pace National
PAMP	Perimeter Air Monitoring Plan
PCB	Polychlorinated Biphenyl
pCi/g	picocuries per gram
Plexus	Plexus Scientific Corporation
POTW	publicly owned treatment works
PPE	Personal Protective Equipment
QC	Quality Control
Ra-226	radium-226
RAM	Radioactive Material
RMS	Resident Management System
ROD	Record of Decision
RPP	Radiation Protection Plan
SM	Standard Method
SOW	Scope of Work
SPDES	State Pollutant Discharge Elimination System
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SVOC	Semi-Volatile Organic Compound
SZ	Support Zone
T&D	Transportation and Disposal
Th-230	thorium-230
TLVP	Tonawanda Landfill Vicinity Property
TWP	Temporary Well Point
U.S.	United States
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan
USACE	United States Army Corps of Engineers
USCS	Unified Soils Classification System
USEPA	United States Environmental Protection Agency
U_{total}	total uranium
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria

1.0 INTRODUCTION

Plexus Scientific Corporation (Plexus) was awarded a contract to provide soils remediation at the Landfill Operable Unit (OU; also referenced as "the site") at the Tonawanda Landfill Vicinity Property (TLVP), in the Town of Tonawanda, in Erie County, New York. Contract Number W912QR-12-D-0010, Delivery Order Number W912P418F0049 was issued by the United States (U.S.) Army Corps of Engineers (USACE) – Buffalo District, under the Formerly Utilized Sites Remedial Action Program (FUSRAP), which was established to identify, investigate, and clean-up or control sites previously used by the Atomic Energy Commission (AEC) and its predecessor, the Manhattan Engineer District.

Soils at the vicinity property are contaminated with FUSRAP-related constituents of concern (COCs): radium-226 (Ra-226), thorium-230 (Th-230), and total uranium (U_{total}), which consists of uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238) isotopes.

1.1 Document Purpose

The purpose of the Construction Completion Report (CCR) is to provide a summary of the remediation activities that occurred during the soils remediation project and the results of the sampling activities that occurred.

1.2 Project Summary

Mobilization to the site occurred on May 28, 2019, and demobilization occurred on December 20, 2019. Excavation of FUSRAP-related material began on June 13, 2019, and continued until December 12, 2019. In addition to short demobilizations for holidays, significant demobilization occurred during the month of August 2019 and final grading and seeding occurred in the spring of 2020.

A total of 3,476 bank cubic yards (BCY) were excavated from the eight excavation areas identified in the Scope of Work (SOW). Of the eight individual excavation areas, three required additional excavation beyond the planned limit due to elevated field readings and/or failed excavation sidewall confirmation samples.

Water that entered the excavations was treated on-site and discharged either to the Town of Tonawanda's sanitary sewer system under an Industrial Sewer Connection Permit, or to the ground surface under a State Pollutant Discharge Elimination System (SPDES) permit equivalency. A total of 3,139,140 gallons of excavation contact water was treated and discharged.

Including duplicates, analytical results were reported for 349 excavation confirmation decision unit (DU) layer samples, 38 composite waste characterization samples, 83 treated wastewater samples, 6 backfill samples, and 2 filter samples.

Perimeter, work area, and mobile air monitoring equipment was in place throughout the duration of the project. Although there were some periodic exceedances of response and action levels for total respirable dust, a review of the data indicates that the exceedances were not from excavation activities and radioactivity did not exceed any response or action level.

1.3 Conference Calls / Progress Meetings

Plexus arranged and conducted weekly conference calls and progress meetings during the soils remediation project. Meeting minutes are included in **Appendix A**.

1.4 Site Information

Site information, including site location, background, topography and drainage; nature and extent of contamination; and the selected remedy were presented in Section 2.0 of the Site Operations Plan (Plexus, 2019a).

2.0 OBJECTIVE AND SCOPE

The objective of the soils remediation project was to implement the remedy selected in accordance with the Record of Decision (ROD) for the Landfill OU (USACE, 2017). The remedy selected in the ROD for the Landfill OU is Alternative 3, Targeted Shallow Removal and Off-Site Disposal of FUSRAP-Related Material. Implementing this remedy involved excavating FUSRAP-related materials exceeding clean-up goals within the top 1.5 meters (m; 5 feet [ft]) of the surface and transporting the material off-site for disposal. The clean-up goals used for FUSRAP-related COCs (Ra-226, Th-230, and U_{total}) at the Landfill OU are presented in **Table 2-1** (USACE, 2018).

Table 2-1. Clean-up Goals for FUSRAP-Related COCs at the Landfill OU

FUSRAP-Related COCs	Units	Background[a]	Recreational Adult Surface Soil Goal[b]	Recreational Adult Subsurface Soil Goal[b]
Ra-226	picocuries per gram (pCi/g)	0.95	5	15
Th-230	pCi/g	0.92	14	42
U_{total}[c]	pCi/g	1.75	152	457
U-238 as U_{total} Surrogate	pCi/g	0.86	75	224

a. Average background values for the Landfill OU.

b. The depth and area requirements as specified in 10 Code of Federal Regulations (CFR) Part 40, Appendix A, Criterion 6-(6). Surface soil is defined as 0–15 centimeters (0–6 inches) below ground surface (bgs). Subsurface soil is considered to be at depths greater than 15 centimeters (6 inches) bgs. The clean-up goals must be achieved (on average) over a 100 square meters (m^2; 1,076 square feet [ft^2]) area.

c. U_{total} is a sum of the isotopes U-234, U-235, and U-238.

To implement the selected remedy, Plexus conducted the following activities in accordance with the SOW:

<u>General</u>

- Developed work plans for USACE review and acceptance;
- Managed the project and provided construction quality control (QC);
- Established, maintained, and followed a safety and health program;
- Established and followed analytical data quality procedures based on USACE, U.S. Environmental Protection Agency (USEPA), and New York State Department of Environmental Conservation (NYSDEC) guidance;
- Performed multi-media radiological and chemical sampling and analysis;
- Maintained electronic files, data, maps, tables, databases, geographic information system files, and project administrative files;
- Prepared reports and documentation during and after completion of the soils remediation project; and

- Provided public relations support.

Site Activities

- Documented the condition of the site and all areas that were used during or disturbed by the soils remediation project;
- Conducted topographic surveys prior to site activities;
- Mobilized the required workforce and equipment;
- Installed and maintained support facilities and air monitoring stations (including off-site air monitor);
- Implemented radiological and construction site safety procedures;
- Monitored worker exposures and environmental contamination spread through routine contamination control surveys;
- Operated and maintained air monitoring program to enable early detection and an emergency notification system of potential contaminant emissions prior to site activities and during the remedial action;
- Cleared and grubbed the site to enable performance of the remedial action;
- Managed stormwater and wastewater collected from excavation areas;
- Obtained discharge permit from the Town of Tonawanda publicly owned treatment works (POTW);
- Treated all collected wastewater to meet the discharge requirements of the POTW discharge permit, and discharged to the on-site POTW discharge location as well as a mutually agreed upon surface water discharge location;
- Installed drainage management techniques during construction, demobilization, and restoration that preclude water and sediment transport into adjacent residential properties;
- Excavated and handled contaminated soil debris;
- Conducted radiation measurements using an *in-situ* gamma spectroscopy system (e.g. Canberra *In-Situ* Object Counting System [ISOCS]) for each waste container;
- Conducted sidewall confirmation soil sampling to document attainment of the remediation goals;
- Restored the excavations with clean backfill and seeded the area with the Tonawanda Landfill approved seed mixture;
- Conducted pre- and post-construction gamma walkover surveys for work areas that may be impacted;
- Conducted radioactivity contamination surveys on equipment prior to release from the site and decontaminated equipment found to have levels of contamination exceeding release standards;
- Deconstructed temporary measures used for the soils remediation project, including haul roads and culverts; and
- Demobilized the workforce and equipment from the site.

3.0 MOBILIZATION

Following project work plan and premobilization activity completion, Plexus mobilized equipment/materials, facilities, and personnel to the site in preparation for site operations.

3.1 Site Layout

The site was laid out as described in the Site Operations Plan (Plexus, 2019a). Administrative trailers were established adjacent to Intermodal Container (IMC) storage areas and a radiation technician trailer was established in the north of the site in close proximity to the excavation operations. Water treatment and storage capabilities were placed adjacent to the discharge point for the Town of Tonawanda's treatment facility. The gravel road across the capped portion of the landfill was reinforced with 6-inches of stone to allow for the movement of loaded vehicles without damaging the protective cover and temporary haul roads were created to reach each planned excavation area. Axle scales were placed next to the work areas for the on-site weighing of IMCs prior to their transport to the storage area. The layout of the construction site during the remedial action is presented on **Figure 3-1**.

3.2 Civil Survey

A civil survey was conducted to establish the baseline conditions of the site. The civil survey was conducted to document the initial topography of the area and identify the excavation limits. **Figure 3-2** depicts pre-excavation topography. The initial topography data was used to restore the site prior to demobilization. Civil surveys were conducted during site operations and post-demobilization. Civil survey data files were transmitted to the USACE.

3.3 Clearing and Grubbing

Temporary haul roads, excavation areas, and trailer staging areas were cleared of vegetation prior to performing excavation activities. Clearing consisted of the felling, trimming, and cutting of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish. Trees, stumps, roots, brush, and other vegetation was cut off flush with or below the original ground surface.

Grubbing consisted of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots. Grubbed material, together with logs and other organic or metallic debris, was disposed of at Lardon Disposal and Recycling. Disposal tickets for the clearing debris are presented in **Appendix B**.

3.4 Temporary Well Point Decommissioning

The 12 USACE-installed temporary well points (TWPs; TWP-1 and TWP-3 through TWP-14) were abandoned in accordance with NYSDEC Policy CP-43 using the "Casing Pulling" method (NYSDEC, 2009). The casing and pre-packed screens were stockpiled within the excavations and were loaded into IMCs for disposal with the FUSRAP wastes. **Appendix C** contains the abandonment records for each well.

The Town of Tonawanda owned monitoring wells (e.g., L-2, L-3, and BM-4) were protected and remained in place throughout the remediation. None of the town-owned monitoring wells were damaged during the soils remediation project.

3.5 Perimeter Air Monitoring

Perimeter air monitoring was conducted to measure, document, and respond to potential airborne contaminants at the perimeter of the site and within the work areas during the remedial activities in accordance with the Perimeter Air Monitoring Plan (PAMP; Plexus, 2019e). Air monitoring consisted of the establishment of four fixed perimeter monitoring stations, two work area monitoring stations: one upwind and one downwind of active excavation activities, and one background monitoring station. Each monitoring station consisted of a real-time dust monitor and either a low- or high-volume air sampler. A hand-held dust monitor was also employed during the remedial activities to supplement the work area monitoring stations and to monitor dust levels of other site activities.

3.5.1 Background (Baseline) Air Monitoring

Background (baseline) air monitoring was conducted over the course of three days prior to commencing ground disturbing activities to establish baseline conditions (Plexus, 2019e). The background results were used to assist in the determination of whether dust or radioactivity were equivalent to area background ranges or related to site activities. During the background air monitoring, particulate filters were collected each day and counted for gross alpha and beta radioactivity using a Ludlum Model 2929 scaler interfaced with a Ludlum Model 43-10-1 alpha/beta scintillation detector.

Th-230 has the most restrictive derived air concentration (DAC) limit of the radionuclides of interest at TLVP due to its dominant alpha emissions and associated alpha energies. As such, monitoring and control of airborne material during ground disturbing activities was guided primarily by results of dust monitoring and measured long-lived alpha concentrations in air. **Table 3-1** depicts the long-lived gross alpha radioactivity of the baseline air filter samples. Analytical results for the baseline alpha air measurements are presented in **Appendix D**. Two filters with the highest, measured long-lived alpha radioactivity were submitted to an off-site National Environmental Laboratory Accreditation Conference (NELAC)-certified laboratory for radionuclide analyses (i.e., Ra-226, Th-230, isotopic uranium, and isotopic thorium). **Table 3-2** presents the laboratory analytical results by radionuclide for the baseline/background filters.

Table 3-1: Long-Lived Gross Alpha Concentrations for Baseline Air Samples

Sample Location	Sample Collection Date	Concentration (microcurie per milliliter [µCi/mL])
6967 N - Area H	5-31-19	1.6E-14
7041 W - Area H	5-31-19	2.1E-14
7958 E - Area H	5-31-19	1.1E-14
7646 S - Area H	5-31-19	8.1E-15
8362 S. Trailer	5-31-19	-1.9E-15
6967 N - Area H	6-3-19	**4.6E-14***
7041 W - Area H	6-3-19	3.7E-14
7958 E - Area H	6-3-19	4.3E-14
7646 S - Area H	6-3-19	**5.7E-14***
8362 S. Trailer	6-3-19	2.6E-14

Sample Location	Sample Collection Date	Concentration (microcurie per milliliter [µCi/mL])
6967 N - Area H	6-4-19	1.8E-14
7041 W - Area H	6-4-19	1.6E-14
7958 E - Area H	6-4-19	2.0E-14
7646 S - Area H	6-4-19	5.4E-15
8362 S. Trailer	6-4-19	1.4E-14
* Two highest sample results were submitted for radionuclide analyses (i.e., Ra-226, Th-230, isotopic uranium, and isotopic thorium analyses).		

Table 3-2: Radionuclide Concentrations for Baseline Air Samples

Sample ID / Sample Location	Radionuclide	Concentration (µCi/mL)
L1111617-01 / 6967 N - Area H	Uranium-234	3.56E-15
	Uranium-235	1.19E-16
	Uranium-238	2.64E-15
	Thorium-228	-3.99E-15
	Thorium-230	-1.94E-15
	Thorium-232	1.38E-15
	Radium-226	3.25E-15
L1111617-02 / 7646 S – Area H	Uranium-234	1.75E-15
	Uranium-235	-3.38E-16
	Uranium-238	3.17E-15
	Thorium-228	-1.72E-15
	Thorium-230	-1.10E-15
	Thorium-232	3.65E-15
	Radium-226	6.22E-15

3.5.2 Site Operations Air Monitoring

Perimeter air monitoring for dust and radioactivity was conducted on days when ground disturbing activities were performed. Upwind and downwind air monitors for dust and radioactivity located adjacent to excavation areas continuously sampled air during times when excavation of FUSRAP material was performed. Air monitoring also included real-time recording of daily meteorological data (i.e., wind direction, wind speed, temperature, and relative humidity). **Appendix E** contains monthly air monitoring summary reports. **Appendix F** contains the weekly air monitoring reports which includes the daily monitoring results.

3.6 Radiation Monitoring

A gamma walkover survey was conducted during premobilization to establish the baseline conditions of the site and additional walkovers were performed when initial work areas were expanded. The results of the gamma walkover survey were graphed for analysis in accordance with the details of the gamma walkover survey presented in the Radiation Protection Plan (RPP, Plexus, 2019b). **Figure 3-3** depicts a compilation of the initial gamma walkover survey and subsequent expansions.

3.7 Background Radiation and Decision Unit Screening Values

Background readings in units of counts per minute (cpm) were obtained using a Ludlum Model 44-10 sodium iodide (NaI) detector at two on-site reference locations determined not to have been impacted by FUSRAP material and at one off-site reference location adjacent to the landfill. A minimum of ten background readings were recorded for both uncollimated and lead-collimated detector configurations. The lower and upper background readings were adjusted by factors of 1.5 and 2, respectively, to arrive at separate screening value ranges for the two detector configurations. The screening values were then applied during gamma scans of sidewalls within excavated areas for each 30-ft DU to determine if further excavation was required or if the DU was ready for confirmation sampling in accordance with the Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP; i.e., if readings were consistently below the screening values).

Initial scans of a DU were performed with the uncollimated detector to rapidly identify potential "hot spots" that remained after excavation and determine if further soil excavation was needed. If readings were within or above the uncollimated screening value range, then the area was re-surveyed with the collimated detector to better isolate surface areas that might require further excavation and/or to confirm the DU was ready for confirmation sampling.

Uncollimated Screening

Background readings for the uncollimated detector collected at an on-site reference location ranged between approximately 8,300 and 9,000 cpm. In accordance with the UFP-QAPP (Plexus, 2019c), factors of 1.5 and 2 were applied to these background values, respectively to yield a range of uncollimated screening criteria between 12,500 and 18,000 cpm. Background readings recorded on radiological survey forms are contained in **Appendix D**. **Figure 3-4** depicts the reference area used to acquire background measurements with the uncollimated detector. Uncollimated background readings are presented in **Table 3-3**.

Collimated Screening

Background readings for the collimated detector collected at an unimpacted on-site location ranged between approximately 2,700 and 3,500 cpm. In accordance with the UFP-QAPP (Plexus, 2019c), factors of 1.5 and 2 were applied the average background values to yield an uncollimated screening criteria between 4,000 and 7,000 cpm. Background readings recorded on a radiological survey form are contained in **Appendix D**. **Figures 3-5** depicts the reference area used to acquire background measurements with the collimated detector. Collimated background readings are presented in **Table 3-3**.

Table 3-3: Uncollimated and Collimated 2x2 NaI Background Readings

Uncollimated (cpm)		Collimated (cpm)
8366		3350
8431		3320
8612		3420
8546		3520
9069		3130
8576		3370
9138		3350
8340		3470
9035		2693
--		3197
--		3318
--		3120
--		3300
Mean	8705	3276
Min	8340	2693
Max	9138	3520

3.8 Worker Safety Protection Measures

Worker safety protection measures employed included the use of trained/qualified personnel; use of personal protective equipment (PPE); establishment of exclusion, contamination reduction, and support zones (EZ, CRZ, and SZ, respectively); controlling access between zones; implementation of work practices to minimize the spread of contamination; routine monitoring for contamination; decontamination; and verification of contamination-free equipment prior to release.

Equipment and personnel that entered EZs or CRZs were screened for contamination and decontaminated when necessary. Records of personnel entry/exit through the CRZ and equipment release forms are included in the daily reports (**Appendix G**). Routine inspections of work areas, haul roads, and support facilities (e.g., trailers, sanitary facilities, etc.) were documented and the documentation provided within the daily reports (**Appendix G**). At no time was contamination outside the EZ identified that required decontamination.

Work safety also included implementing safety measures for the workers entering the excavations and for potential trespassers. Excavations were inspected daily by an Occupational Safety and Health Administration (OSHA) Competent Person to determine the stability of the excavation sidewalls. Excavation sidewalls were benched or sloped when necessary and entry/egress ramps/ladders were employed to facilitate access to/from the excavations. Air monitoring was performed prior to entry into excavations as required by the Accident Prevention Plan/Site Safety and Health Plan (APP/SSHP; Plexus, 2019b). Due to the presence of water in the excavations overnight and on non-work periods, floatation safety devices were deployed.

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4.0 SITE OPERATIONS

Site operations commenced once mobilization activities were completed. Site operations are summarized below.

4.1 Soil Excavation

The selected remedy for the Landfill OU included the excavation of FUSRAP-related material from the limits of eight distinct excavation areas where FUSRAP-related material exceeded the clean-up goals. The limits of excavation included eight distinct areas where FUSRAP-related material exceeded the clean-up goals. These areas were identified as Areas A (western most) through H (eastern most). As part of mobilization, the limits of excavation for Areas A through H were identified in the field by a licensed surveyor. Throughout the excavation operations, the surveyor returned to the site to survey the vertical and lateral limits of the excavations. **Figures 4-1** through **4-8** depict the initial and final limits of each excavation area.

Soil excavation began at Area A and progressed eastward to finish at Area H. A tracked excavator was used to excavate the FUSRAP-related material until the water table was encountered. When the water table was encountered, a sump was installed to collect the water from the excavation. Water handling is discussed in **Section 4.2**. With the excavation water under control, the excavator continued to excavate the FUSRAP-related material and consolidate the soil into working piles within the excavation or to directly load the material into awaiting IMCs. The working piles were used for two purposes. The first was to facilitate the draining of free liquids and/or the addition of amendments to solidify the material. The second was to move FUSRAP-related material from one location to another within the excavation because of restrictions on placing material outside of the excavations. Once the working pile and awaiting IMC were within the swing radius of the excavator, the FUSRAP-related material was loaded into the IMC. IMC handling is discussed in **Section 4.3**. At no time during the remediation was uncontained FUSRAP-related material left outside the limit of excavation overnight.

As the excavations progressed, the sidewalls were surveyed using a 2x2 NaI Detector (collimated and uncollimated) for radioactivity to determine if confirmation samples could be collected. **Section 5.2.2** discusses the field surveying method and the layout of excavation DUs. If radiation screening indicated the presence of FUSRAP-related material above established limits, a minimal amount (e.g., excavator bucket scraping) of additional material was removed from the excavation. Additional over excavation, based on radiological surveys, was performed in Areas D, E, and G.

Additional excavation of material was also performed when excavation confirmation sample results exceeded the clean-up goals. When confirmation sample results exceeded clean-up goals, the entire DU (approximately 30 ft in length), to the depth of the failed DU layer, was excavated approximately 5 ft back. Areas D and E both had confirmation samples that exceeded clean-up goals. The process of surveying the sidewalls for radioactivity, scraping material above the survey range, then scanning again was repeated until detector survey results were below the pre-determined range and then confirmation samples were collected.

4.2 Water Handling

Water management, both stormwater and excavation water (wastewater), was required throughout the project.

4.2.1 Stormwater Handling

Stormwater was managed through the installation of erosion control features such as silt fence and soil berms. Silt fences were installed down gradient of areas of disturbance in accordance with the approved erosion and sediment control plan. Silt fences were inspected weekly and after significant rain events and repairs were made as needed. Soil berms, constructed using approved backfill material, were installed up gradient of the excavations to divert surface waters around the open excavations. Any stormwater that entered the excavations was handled as wastewater.

4.2.2 Wastewater Handling

A varying amount of water was present in each of the eight excavation areas. In order to facilitate the removal of soil, the water within the excavations required removal and treatment before being discharged. To address the excavation water, a water treatment system was installed. The initial system configuration consisted of several pumps, an 18,000-gallon weir tank, a skid mounted bag filter system, and a 20,000-gallon storage tank. A quiet running pump was used to remove water from the excavation and pump it to the 18,000-gallon weir tank where solids were allowed to settle. Water from the weir tank was then pumped through the skid mounted bag filters to remove suspended sediment. The treated water was then stored in the 20,000-gallon tank until approved for release.

The SOW required all excavation water to be discharged to the Town of Tonawanda's sanitary sewer system for treatment. An Industrial Sewer Connection Permit, issued by the Town of Tonawanda, was obtained to allow the discharge of treated excavation dewatering water to the sanitary sewer system (**Appendix H**). The permit required samples be collected for every 20,000 gallons treated and review and approval of analytical results, by the Town, prior to release of treated water to the sanitary sewer system. Early in the execution of the project an unexpected significant amount of water was being generated during the excavation operations, therefore five additional 20,000-gallon storage tanks were brought to the site to store the water until the Town approved the treated water for release.

The maximum available storage capacity of 120,000 gallons was typically utilized in two to three days. As an alternative to discharging to the Town of Tonawanda's sanitary sewer system, analytical data was reviewed and determined to be compliant with Federal and State surface water discharge limitations. As a project performed pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), permits and approvals are not required for discharging to the surface. However, the substantive requirements of discharging treated water to the surface must still be met. After communicating the intent to treat excavation water and discharge to the surface, the water treatment system was reconfigured to allow for discharge to the surface and additional storage tanks initially brought on-site to store treated water until approved by the Town of Tonawanda for release to the sanitary sewer were decontaminated and removed from the site. Excess storage tanks were removed from the site at the end of September 2019.

Discharge of treated water to the surface began in September 2019 and continued until demobilization in December 2019. The treated water was discharged to the surface drainage ditch west of the excavation areas (**Figure 3-1**). The discharge point was routinely inspected to ensure there was no erosion occurring. Inspections were also performed downstream to ensure that adjacent areas were not flooded by the discharged water. A total of 3,139,140 gallons were removed, treated, and discharged during the remedial action.

4.3 Material Handling and Manifesting

A total of 3,476 BCY of FUSRAP-related material was removed from the excavation areas and was placed in 339 containers: 335 IMCs provided by the USACE's Transportation and Disposal (T&D) Contractor and 4 roll-offs provided by Plexus (see last paragraph of this section for roll-off usage explanation). IMCs were received and staged in the IMC storage areas. IMCs were inspected after they were off-loaded by the USACE T&D Contractor. Issues identified with incoming IMCs included water or residual wastes present, non-functioning lids, missing or compromised rear gasket seals, missing or broken latches, and visible holes. IMCs requiring repairs were either removed from the site or separated from usable IMCs until repairs could be completed on-site.

Empty IMCs were brought to each individual excavation area on an as-needed basis by a roll-off truck. The IMC was placed on the ground for loading by the excavator. Once filled, liners were folded into the IMC and the IMC was sealed. The IMC was visually inspected by radiation technicians to identify areas that may have become contaminated by loading or other operations and both random and biased locations on the IMC were scanned using a Ludlum Model 44-9 with pancake detector. Wipe samplers were collected and analyzed for removable contamination. The inspection of each IMC was documented on radiological survey forms that accompanied the IMC to the disposal facility. Once determined to meet radiation control release criteria, the IMC was loaded back onto the roll-off truck and transported to a set of axle scales to be weighed. Full IMCs were unloaded in the IMC storage area.

To ensure compliance with the waste acceptance criteria of the disposal facility, an external dose rate measurement was taken, and a Canberra ISOCS was used to determine compliance with the disposal facility's waste acceptance criteria. IMCs that exceeded the disposal facility's waste acceptance criteria were returned to the excavation area for reconfiguration. Reconfigured IMCs were handled in the same manner as newly filled IMCs.

IMCs that met the disposal facility's waste acceptance criteria were manifested for transportation and disposal by the USACE T&D Contractor. ISOCS scan results (including QC), radiological survey forms (scans), Sample Count Record (wipes), and radiological survey report (containing dose rate measurements) were included with each waste manifest package. Completed manifest packages were presented to the USACE for review and signature. Once a manifest package was provided to the USACE, the IMC was marked ready for removal.

The total quantity of FUSRAP-related material excavated exceeded the USACE T&D Contractor contract capacity and four tarped roll-off containers were used to transport the additional material to the disposal facility. The roll-offs were handled in the same manner as the IMCs. Completed waste manifests for each of the 339 containers (IMCs/roll-offs) shipped from the site are presented in **Appendix I**. Manifests for the roll-off containers are identified with "R" at the end of the container tracking number.

4.4 Backfilling Methods

Due to the presence of water in the excavations, stone was used to backfill the lower portion of the excavations up to a thickness of 2 ft. Above the stone, approved backfill material consisting of clayey material was then placed to complete the backfill. Stone was placed in 8- to 10-inch loose lifts using a decontaminated excavator. The clayey material was also placed in 8- to 12-inch loose lifts, to an elevation slightly above grade to account for settlement over the winter, with the excavator when the excavations were too deep or small for heavy equipment to enter. Compaction in the smaller excavations was achieved with a sheep's-foot roller compactor. When accessible, heavy equipment (e.g., bulldozer) was used to compact the backfill. Compaction testing occurred in accordance with the project specifications and is discussed in **Section 6.0**.

4.5 Site Restoration

Site restoration included the final grading and seeding of the site. The objective of the final grade is to maintain a minimum of 5 ft of cover over the bottom of the excavation and contour the site to drain while restoring the site as close as possible to the original contours. Final grading plans were provided to the USACE in advance of the Spring 2020 remobilization. Survey stakes with the planned final grade were installed and a bulldozer was used to place topsoil, sourced from the same material as the clayey backfill, to the final grade elevations. After final grade contours were confirmed, all disturbed areas were hydroseeded with the approved seed, fertilizer, and mulch mix which is specified in the SOP by the Town of Tonawanda. The final site topography is depicted on **Figure 4-9**.

4.6 Demobilization

After site operations were completed, the following demobilization activities were conducted:

- Demolition, removal, and disposal of temporary access roads, parking lots, and equipment laydown areas constructed for the project;
- Dismantling and disposal of erosion and sedimentation control measures;
- Civil and gamma walkover surveys;
- Decontamination of all equipment, tools, temporary facilities, and supplies for unrestricted use or controlled as contaminated material for disposal;
- Decontamination and removal/demolition of all wastewater handling/treatment equipment;
- Verification surveys on all decontaminated equipment, tools, temporary facilities, and supplies prior to release from the site (included in the daily reports in **Appendix G**);
- Disposal of used PPE and decontamination waste;
- Removal of all temporary facilities, access restrictions, and signage;
- Repair of all off-site areas damaged by remedial activities; and
- Demobilization of site personnel, equipment, tools, temporary facilities, and supplies.

The final site conditions documented by the gamma walkover survey are depicted on **Figure 4-10**. A final site inspection was performed with the USACE and Town of Tonawanda on May 22, 2020. At the conclusion of the final site inspection, demobilization was considered complete.

5.0 ENVIRONMENTAL SAMPLING

Environmental samples were collected from treated excavation water, excavation sidewalls, IMCs, and backfill sources. Analytical analyses included radionuclides and environmental chemistry. Samples were shipped to Pace National (Pace) in Tennessee for analysis. Geotechnical samples were subcontracted by Pace to Beaver Engineering in Tennessee. Pace's analytical laboratory reports are presented in **Appendix J**. Geotechnical samples were also provided to PSI Intertek of New York and results are presented in **Appendix K**.

5.1 Treated Excavation Water Samples

Water samples were collected from treated excavation water prior to its release to the Town of Tonawanda's treatment facility or, later in the project, to the drainage feature located to the north of the excavation areas. A total of 78 samples, excluding QC samples, were collected from treated excavation water.

5.1.1 Sample Collection Method

Two sample collection methods were utilized during the soils remediation project for the collection of treated excavation water samples. One method was used when treated excavation water was discharged to the POTW. A second method was used when treated excavation water was discharged to the surface. When discharging to the POTW, and in compliance with the discharge permit, one sample was collected directly from each full 20,000-gallon storage tank. When discharging to the surface, one sample was collected for every 20,000 gallons of treated excavation water with no more than one sample collected per day. When discharging to the surface, samples were collected from a sample port on the bag filter housing or directly from the discharge piping at the point of discharge.

5.1.2 Analytical Methods

The discharge permit granted by the Town of Tonawanda (**Appendix H**) required sampling for isotopic uranium (total and soluble), isotopic thorium (total and soluble), and Ra-226 (total and soluble) every 20,000 gallons and priority pollutant analysis every 6 months. In accordance with the UFP-QAPP (Plexus, 2019c), wastewater samples were analyzed for radionuclides by:

- Isotopic uranium – American Society for Testing and Materials (ASTM) Method D3972M;
- Isotopic thorium – Los Alamos National Laboratories (LANL) Method ER200M; and
- Ra-226 – Standard Methods (SM) Method 7500 Ra(B)M.

And for priority pollutants by:

- Volatile Organic Compounds (VOCs) – USEPA Method 8260C;
- Semi-Volatile Organic Compounds (SVOCs) – USEPA Method 8270D;
- Target Analyte List Metals – USEPA 6020A;
- Mercury – USEPA Method 7470A;
- Polychlorinated Biphenyls (PCBs) – USEPA Method 8082A;
- Pesticides – USEPA Method 8081A; and

- Cyanide – SM Method 4500CN.

It should be noted that after approximately 240,000 gallons had been treated and approved for release, the town, in an email dated July 10, 2019, eliminated the permit requirement for soluble radiological analysis (**Appendix H**). This analytical methodology (total only) continued under the permit equivalency.

5.1.3 Analytical Results

Analytical results for priority pollutants are presented in **Table 5-1**. A comparison to acceptable levels is not included in the table because the Town of Tonawanda performed their own assessment of the data to determine if the wastewater was acceptable to discharge to the sanitary sewer system. Under the permit equivalency, a comparison to 6 New York Codes, Rules, and Regulations (NYCRR) Part 380 was not included in the table because metals were not known or suspected to be present at the site.

Analytical results for radionuclides are presented in **Table 5-2**. For samples collected for compliance with the discharge permit issued by the Town of Tonawanda, analytical results are compared to the 6 NYCRR Part 380 for discharges to sanitary sewers. For samples collected for surface discharge under the permit equivalency, analytical results are compared to the Department of Energy (DOE) Radioactive Material (RAM) limits. None of the analytical results exceeded either the 6 NYCRR Part 380 limits or the DOE RAM limits.

5.2 Excavation Screening and Sidewall Confirmation Samples

To document the achievement of the clean-up goals, excavation confirmation samples were collected. Excavation confirmation samples were collected from every sidewall of each of the eight excavation areas. Because the remedial action only removed FUSRAP-related material from within the first 5 ft of the surface, no excavation floor samples were collected. Prior to the collection of excavation confirmation samples, the sidewalls were field surveyed using radiological detection equipment to determine whether additional excavation was necessary or if confirmation samples were to be collected. The following sections detail the screening and sampling process.

5.2.1 Confirmation Sample Locations

A total of 318 confirmation samples, excluding QC samples, were collected from the eight excavation areas. Confirmation samples were collected from excavation sidewalls that were subdivided into separate DUs. Each DU was approximately 30 ft in length and no excavation area had fewer than 3 DUs. Areas A, B, and F each had the fewest DUs at 3 each and Excavation Area D had the most DUs at 15. **Table 5-3** provides the final number of DUs at each excavation area. **Figures 5-1** through **5-8** depict the actual location and number of DUs at each excavation.

Table 5-3. Decision Units

Excavation Area	Final Number of Decision Units
A	3
B	3
C	4
D	15
E	7
F	3
G	8
H	8
Total	51

Each DU was comprised of six DU layers (DUL). One composite confirmation sample, consisting of 10 aliquots, was collected from each of the six DULs. The six DULs represent the following depths:

- 0-6 inches below grade,
- 6-12 inches below grade,
- 12-24 inches below grade,
- 24-36 inches below grade,
- 36-48 inches below grade, and
- 48-60 inches below grade.

5.2.2 Field Screening Method

Prior to collecting confirmation samples, each sidewall was field surveyed using a 2-inch by 2-inch NaI detector. Initially, the NaI detector was used uncollimated; however, when elevated readings were encountered, the NaI detector was collimated. Survey results were compared to applicable (e.g., collimated/uncollimated) screening values established during the remedial action (e.g., 1.5 – 2 times background). **Section 3.7** details the screening values established for comparison to the survey readings. If survey readings were below applicable screening values, then confirmation samples were collected. If survey readings exceeded applicable screening values, additional excavation was performed until survey readings were below applicable screening values and confirmation samples were collected.

Excavation Areas D, E, and G all required additional excavation as a result of elevated field survey results. **Appendix L** contains the field forms used to document the survey results, the approximate location of the DU and, where applicable, the approximate areas where additional excavation was performed.

5.2.3 Sample Collection Method

Confirmation samples are 10-point composite samples from each DUL created by randomly collecting 10 aliquots of approximately equal volume and placing them into a stainless-steel bowl. The soil was then thoroughly mixed and a single sample (or two, when duplicates were required) was collected from the bowl. Excess sample material was disposed of by placing it either back into the excavation or into an IMC. Decontaminated stainless-steel spoons and bowls were used for each DUL sample collected. Samples were placed into sealable plastic bags for shipment to the laboratory in sealed coolers.

5.2.4 Analytical Methods

Confirmation samples were shipped to Pace for rapid turnaround time analyses of the FUSRAP-related COCs: Ra-226, Th-230, and U-238. Ra-226 (186 kilo-electronvolts [KeV]) and Th-234 (surrogate for U-238) were analyzed by DOE Method Ga-01R/901.1 and Th-230 was analyzed by LANL Method ER200M. Bismuth-214 was also reported by DOE Method Ga-01R/90.1 for use as a surrogate for Ra-226 when interference from U-235(185.7 KeV) was suspected in the Ra-226 (186 KeV) results.

5.2.5 Analytical Results

Analytical results, by excavation area, are presented in **Table 5-4**. Results are compared against the clean-up goals for FUSRAP-related COCs (**Table 2-1**) after subtraction of background concentrations and a sum of ratios is calculated. In several instances the results for Ra-226 appeared to exceed the clean-up goals. These exceedances were suspected to be the result of interference from the presence of U-235. In these cases, a two-tiered approach approved by the USACE, was used to evaluate the results (**Appendix M**). In the two-tiered approach, the results for Bismuth-214 were used as a surrogate for Ra-226. Depending on the ingrowth duration, the applicable correction factor was applied to derive the Ra-226 value. In several cases, after application of the two-tiered approach, the confirmation samples were determined to be below the clean-up goals. In instances where results remained above the clean-up goals, the entire DU, to the depth of the exceedance, was excavated an additional 5 ft laterally and new confirmation samples were collected. At the conclusion of the project, all excavation confirmation sample results were below the clean-up goals.

5.3 IMC Samples

The purpose of the IMC samples was to evaluate waste acceptance criteria (WAC) compliance. A total of 34 IMC samples, excluding quality control samples, were collected and analyzed to monitor the contents of the 339 containers shipped from the site.

5.3.1 Sample Collection Method

Waste characterization samples were collected at a frequency of 1 for every 10 IMCs filled. An aliquot was collected from the first excavator bucket of material that was placed into the IMC. The aliquot was placed into a container with other aliquots collected from up to 9 other IMCs. After aliquots were collected from 10 IMCs, the material was mixed to create a representative composite sample for submittal to the laboratory. Field forms (**Appendix N**) were completed as aliquots were collected to document the individual IMC containers that the waste characterization sample represents. Deviations from the sampling frequency occurred and are discussed in **Section 8.0**.

5.3.2 Analytical Methods

IMC samples were shipped to Pace for a standard turnaround time analysis of isotopic uranium by ASTM Method D3972M, isotopic thorium by LANL Method ER200M, and bismuth-214 (surrogate for Ra-226) by DOE Method Ga-01-R/901.1.

5.3.3 Analytical Results

Analytical results were provided to the USACE and are not presented or evaluated in this document.

5.4 Backfill Samples

Backfill samples were collected from backfill sources at an approximate rate of one every 1,000 cubic yards to ensure that imported material did not exceed the site clean-up goals and the New York State Soil Cleanup Objectives (NYSSCOs) for the intended future use of the site. Approximately 4,000 cubic yards of backfill material were used, and a total of seven backfill samples were collected. Sample analyses varied depending on the source of the backfill. Backfill was obtained from two sources: EnSol, Inc. (EnSol) and New Enterprise Stone and Lime Company, Inc. (New Enterprise). The backfill material (soil) that was sourced from EnSol came from their North Youngman Commerce Center's recycling facility, and the backfill material (virgin stone) that was sourced from New Enterprise came from their quarry at 8615 Wehrle Drive, Williamsville, New York. All backfill material (soil and virgin stone) was required to meet geotechnical (SOW), chemical (NYSSCOs), and radiological standards (site clean-up goals). The virgin stone was certified by New Enterprise to meet only geotechnical and chemical standards, while the soil was certified by EnSol to meet only chemical standards. As a result, Plexus collected one sample from the virgin stone obtained from New Enterprise to evaluate its compliance with the radiological standards, and Plexus collected six samples from the soil obtained from EnSol to evaluate its compliance with the geotechnical and radiological standards.

5.4.1 Sample Collection Method

Backfill samples were collected by EnSol and Plexus to certify compliance with the geotechnical, chemical, and radiological standards required by the project. EnSol certified that their backfill material (soil) was in compliance with the chemical standards by collecting multi-point composite and grab (VOC analyses only) samples from stockpiled material. Plexus certified that the backfill material (soil) was in compliance with the geotechnical standards and radiological standards by collecting grab samples from stockpiled material. Sample media was collected by Plexus using a gloved hand, the collected material was then placed directly into a sample container for shipment to the laboratory.

No sampling of the backfill material (virgin stone) obtained from New Enterprise was required to evaluate its compliance with the chemical and radiological standards because, as virgin stone and consistent with NYSDEC guidance, no sampling is required. No geotechnical testing of the virgin stone was required because New Enterprise certified its compliance with the geotechnical standards. A letter from New Enterprise attesting to the nature of the stone is included in **Appendix N**.

5.4.2 Analytical Methods

The backfill samples (soil) collected by EnSol to evaluate chemical standard compliance were analyzed by:

- Hexavalent Chromium – USEPA Method 7196A;
- Metals – USEPA Method 6010C;
- Mercury – USEPA Method 7471B;
- PCBs – USEPA 8082A;
- Chlorinated Pesticides – USEPA 8081B;
- SVOCs – USEPA 8270D;
- Herbicides – USEPA 8151A;
- Total Cyanide – USEPA 9014; and
- VOCs – USEPA 8260C.

The backfill samples (soil and virgin stone) collected by Plexus to evaluate radiological standard compliance were analyzed by:

- Th-234 (surrogate for U-238) and Ra-226 (186 KeV) – DOE Method Ga-01R/901.1; and
- Th-230 – LANL Method ER200M.

The backfill samples (soil) collected by Plexus to evaluate geotechnical standard compliance were analyzed by:

- Atterberg Limits – ASTM D4318;
- Soil Classification – ASTM D2487;
- Grain Size Distribution – ASTM D422; and
- Standard Proctor – ASTM D698.

5.4.3 Analytical Results

Analytical results for radionuclides are presented in **Table 5-5** and are compared to the clean-up goals for surface soil, the most conservative clean-up goal. None of the sample results exceed the clean-up goals for surface soils.

Analytical results for geotechnical samples are provided in **Appendix K**. The specifications provided a wide range of suitable Unified Soils Classification System (USCS) soil types (i.e., GW, GP, GM, GC, SW, SP, SM, SC, ML, MH, CL, or CH) for use as backfill. **Table 5-6** presents the soil classification for each soil sample collected. Geotechnical data for sample TLVP-BF-3, the virgin stone material, is presented in **Appendix O**.

Table 5-6. Backfill Soil Classification

Sample ID	USCS Classification
TLVP-BF-1	CL
TLVP-BF-2	CL
TLVP-BF-3	N/A
TEVP-BF-4*	CL-ML

N/A – Not Applicable
* Correct sample name per PSI Report PTR:08061128-7-S11 (**Appendix O**).

Appendix J contains the analytical results and data tables provided by EnSol for all other backfill analyses.

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6.0 QUALITY CONTROL

Plexus's QC program was presented in the Contractor Quality Control Plan (CQCP; Plexus, 2019d) and included a Contractor Quality Control System Manager (CQCSM) on-site during remedial activities. Quality control activities included submittal of documents for USACE approval or for informational purposes, the performance of specific testing activities, routine calibration of field equipment, and implementation of a three-phase inspection system.

Document submittals were made through the Resident Management System (RMS) and via email to the Contracting Officer's Representative (COR). Document submittals include work planning documents, weekly air monitoring reports, sample analytical reports, waste manifest packages, and backfill requests. Many of the documents are included in this report as appendices.

Specific testing methods and frequencies for various media were presented in Table 3-1 of the CQCP. **Table 6-1** below provides the required testing and the document(s) that contains the required testing results and where the documentation is located.

Table 6-1. Required Quality Control Testing

Testing	Media	SOW / Specification Section	Frequency	Compliance Document(s)	Location
Meteorological Monitoring	Weather	5.2.1	Continuous	Daily Reports, Weekly Air Monitoring Report	**Appendix G**, **Appendix F**
Radiological Monitoring	Soil, Air, Facilities, Materials, Packaging	5.2.2	Baseline, Periodic	Daily Reports, Construction Completion Report	**Appendix G**, Section 3.5, Section 3.6
Air Monitoring and Sampling	Off-Site Air, On-Site Air	5.2.3	Prior to Mobilization. During remediation.	Construction Completion Report	Section 3.5
Surface Water, Groundwater, Liquid Waste	Surface Water, Groundwater, Liquid Waste	5.2.5	Prior to disposal*.	Construction Completion Report	Section 5.1
Soil Sampling	Confirmation Soil	5.2.6	Each DU Layer	Construction Completion Report	Section 5.2
Soil Sampling	IMC samples	5.2.6	Every 10 IMCs*	Construction Completion Report	Section 5.3
Soil Sampling	Off-site borrow fill and topsoil	5.2.6	Every 1,000 cubic yards	Construction Completion Report	Section 5.4

Table 6-1. Required Quality Control Testing

Testing	Media	SOW / Specification Section	Frequency	Compliance Document(s)	Location
Radioactive Contaminated Media Sampling	Equipment, Facilities, Soil, Infrastructure, Waste	5.2.7	Each	Daily Reports, Construction Completion Report	**Appendix G**, Section 5.3
Laboratory Chemical Analysis	Soil, Wastewater	5.2.8	TBD; Every 6 Months / 20,000 gallons*	Construction Completion Report	Section 5.1, Section 5.4
Radioactive Waste Analysis	Soil; Any	5.2.9	Every 10 IMCs*	Construction Completion Report	Section 4.3, Section 5.3
Geotechnical Testing	Backfill, Topsoil	5.2.10	Every 1,000 cubic yards	Construction Completion Report	Section 5.4
Compaction Testing	Backfill	5.1.2.9	Once per lift*	Construction Completion Report	**Appendix P**

* – Testing frequency varied from requirements as a result of approved deviations. See **Section 8** for details.

QC sampling requirements for the soils remediation project were identified on Worksheet #20 (Field QC Summary) of the UFP-QAPP (Plexus, 2019c) and field calibration requirements were identified on Worksheet #22 of the UFP-QAPP (Plexus, 2019c). **Appendix Q** contains the calibration certificates and data summaries for daily response checks for the field radiation instruments. Per the Field QC Summary worksheet, the collection of field duplicates was required at a frequency of 1 per 10 field samples for all chemical and radiological analyses. Field duplicate collection was not required for geotechnical analyses. The field duplicate sampling summary is presented in **Table 6-2**.

Table 6-2. Field Duplicate Sampling Summary

Sample Type	Analytes	Primary Sample Quantity	Field Duplicate Quantity
Treated Excavation Water	Isotopic Uranium, Isotopic Thorium, and Ra-226	77	5
Treated Excavation Water	Priority Pollutants	1	*
Confirmation	Ra-226, Th-230, and U-238	318	31
IMC	Isotopic Uranium, Isotopic Thorium, and Ra-226	34	4

Table 6-2. Field Duplicate Sampling Summary

Sample Type	Analytes	Primary Sample Quantity	Field Duplicate Quantity
Backfill[1]	Ra-226, Th-230, and U-238	4	*
Filters	Ra-226, Th-230, and U-238	2	*

1) Chemical analyses were conducted by Ensol or not required, i.e., virgin stone provided by New Enterprise.
* No duplicate was collected because less than 10 primary samples were collected.

The actual number of field duplicate samples collected during the project were less than 10 percent (%) for only the radiological treated excavation water samples. The potential impact of this variance on data quality is evaluated in the data usability assessment report, which is presented in **Appendix R**. The data usability assessment report incorporates the findings of data validation and professional judgement to evaluate the usability of the data set for its intended purpose. Data generated for the project were validated in accordance with the UFP-QAPP. A 100% Stage 2b validation was conducted on all radiological and chemical data. No geotechnical data were validated. The data validation reports are presented in **Appendix S**.

The three-phase inspection system consisted of a preparatory phase, an initial phase, and a follow-up phase. During the preparatory phase, for each definable feature of work (DFOW), a preparatory meeting was held with the CQCSM, Site Superintendent, other QC personnel, and the field lead for the DFOW. Minutes from the preparatory meetings are presented in **Appendix T**. The initial phase occurred shortly after the preparatory phase and included an inspection of the work to ensure that the work was proceeding in accordance with the contract requirements. The follow-up phase occurred daily to assure the project continued to be in compliance with contract requirements. Initial and follow-up activities were captured in the Daily Quality Control Reports (DQCR; **Appendix G**).

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7.0 SAFETY AND HEALTH PHASE-OUT REPORT

A Site Safety and Health Officer (SSHO) was on-site during remediation activities. The SSHO conducted daily tailgate meetings, discussed lessons learned from incidents, inspected open excavations, in-briefed site workers, maintained on-site health and safety records, and monitored workers throughout the remedial activities.

7.1 Summary

Incidents, including reportable, first-aid only, property, and near missed are summarized below:

- Reportable injury incidents – zero.
- First aid only injury incidents – zero.
- Property damage incidents – 4 incidents; 3 of 4 incidents were minor; one incident had no witnesses, one incident was due to landfill debris, and one incident was suspected vandalism.
- Near miss incidents – 8 near misses reported; 2 of 8 near misses were by new employees; 3 of 8 near misses were related to excavation hazards.

7.2 Property Damage Incidents

The following property damage incidents occurred during the remedial activities:

1. 06/20/2019

   Description: Plexus employee walked by rental truck and noticed two minor dents, driver side along truck bed.

   Root Cause: Unknown – no one witnessed truck being damaged.

   Corrective Action: SSHO recommended parking rental vehicles away from hotel storage of their cleaning carts. Rental truck had been parked near carts prior to noticing dents, and SSHO had observed cleaning carts rolling into parking lot.

   Lessons Learned: Inspect rental vehicles regularly, park vehicles away from potential sources of damage.

2. 07/18/2019

   Description: While moving excavator to Excavation D southeast corner for radiological scanning and decontamination, the ground gave way, causing the excavator to sink. Due to the rapid dissolution of ash and debris layer, the operator was unable to stabilize excavator, and it sank on an angle into the excavation. Sidewall soil was quickly pushed down by dozer to give excavator an easier path to traverse that was not too steep, and the excavator was able to straighten up and drive out of the excavation. Removing the excavator in a timely manner was critical because it was losing motor oil due to its angle, and needed to get back into an upright position as quickly as possible.

   Root Cause: The ground under the excavator (within footprint of Excavation D) gave way, causing the excavator to sink into the excavation.

   Corrective Actions:

- Operating an excavator within an excavation containing standing water requires the operator to maintain a safe distance (6 ft or more) from the excavation wall when repositioning the excavator. Additional distance beyond 6 ft will be determined by the excavation Competent Person. This information was provided to all site workers during a safety stand down that was conducted after their lunch break.
- The Project Certified Safety Professional (CSP) added this additional information to Activity Hazard Analysis (AHA) Table 10-9 in the APP/SSHP.
- The oil spill of approximately 1.5 gallons was absorbed by spill control booms, and disposed of at an off-site disposal facility.
- Equipment rental company was notified, and representative was on-site 07/18/2019 to inspect equipment. Engine door needed to be replaced, but this damage did not affect usability of excavator.

Lessons Learned: Changing soil and excavation conditions due to standing water. Need to better evaluate the safety of excavations throughout the day (see Corrective Action Bullet 1).

3. 08/07/2019

Description: During 08/07/2019 excavation inspections, Excavation B fence was found to be open and the life ring for Excavations A – C was missing and unable to be located.

Root Cause: Vandalism/property stolen is suspected.

Corrective Action: Life ring was later found stored on-site.

Lessons Learned: Life ring needs to be secured so it is more visible for use in an emergency, but it should be secured to make it difficult to quickly grab and steal.

4. 08/08/2019

Description: Two site rental vehicles got a flat tire at the North trailer parking area.

Root Cause: Nails punctured tires in two site rental vehicles.

Corrective Action: Tires were either replaced or patched.

Lessons Learned: In a landfill there may be trash/debris that could cause vehicle damage, especially to tires.

7.3 Near Miss Incidents

The following near miss incidents occurred during the remedial activities:

1. 06/04/2019

Description: Near Laydown Area B, forklift operator was moving a load of interlocking mats. While dodging ruts in the unimproved road, the mats slid and shifted from forklift prongs.

Corrective Action: Use extra straps to secure loads of mats, stabilize unimproved road with grading, gravel, and/or interlocking mats.

Lessons Learned: Loads need additional securing when travelling on unimproved roads.

2. 06/04/2019

Description: Perimeter air monitoring station, new Plexus employee incorrectly used a safety can to refuel generator, causing fuel to splash on the (cooled) generator.

Corrective Action: New employee was instructed on proper safety can use.

Lessons Learned: Do not assume a level of training for even small tasks.

3. 06/27/2019

   Description: Excavation B, determined to be unsafe for entry into excavation for sample collection due to inadequate access/egress and excessive water in excavation. There was not enough water storage space available in order to remove water from excavation.

   Corrective Action: Excavation B was roped off with "Danger" red tape and sampling technicians not permitted to enter excavation to collect soil samples until hazards were corrected. Additional water storage space was set-up, and water was pumped out of the excavation, and then the subcontractor excavator operator sloped Excavation B in accordance with APP requirements.

   Lessons Learned: Daily inspections, adequate water storage space, and regular oversight of excavation subcontractor continues to be required.

4. 07/15/2019

   Description: IMC loading area, while loading an IMC onto a transport truck, the IMC was not in exact alignment with the slide rails. When the IMC was approximately halfway onto the boom, it slipped to the left and came off the slide rails.

   Corrective Action: Corrected alignment, inspected truck for safety, and discussed importance of good communication and proper alignment with ground spotter and truck driver.

   Lessons Learned: Proper alignment is critical for safely lifting and transporting IMCs.

5. 07/15/2019

   Description: CRZ – IMC Storage Area, a loader was placing an empty IMC in the CRZ when a new temporary employee was observed opening an IMC container lid before the loader's forks were clear of the container. Loader was stopped temporarily, and employee was moved away from the immediate work area.

   Corrective Action: SSHO and subcontractor Supervisor reviewed hazard of being in close proximity to an IMC while it is being moved or still attached to equipment.

   Lessons Learned: Ensure all new employees are given clear instruction on how to safely perform their task.

6. 07/16/2019

   Description: Excavation D (Part 1), determined to be unsafe for entry into excavation for sample collection due to lack of benching or sloping at 5 – 6 ft depth, and inadequate access/egress within 25 ft in some areas.

   Corrective Action: Sampling technicians not permitted to enter excavation to collect soil samples until hazard was corrected. Subcontractor excavator operator sloped Excavation D in accordance with APP requirements.

Lessons Learned: Daily inspections and regular oversight of excavation subcontractor continues to be required.

7. 07/22/2019

   Description: Excavation F, determined to be unsafe for entry into excavation for sample collection due to sidewall being undercut from logs being removed. There was a large amount of logs and burned debris beginning at the 4 ft depth.

   Corrective Action: Sampling technicians not permitted to enter excavation to collect soil samples until hazard was corrected. Excavation F was made safe for entry into excavation by shaving off debris and sloping the sidewalls to compensate for the undercut.

   Lessons Learned: In a landfill there may be trash/debris that may affect the stability of the excavation sidewalls.

8. 08/01/2019

   Description: Area D, ground site workers observed standing with their backs turned to moving heavy equipment.

   Corrective Action: Ground site workers warned about complacency and to watch continually when heavy equipment is moving in their work area.

   Lessons Learned: Need to regularly remind site workers about basic safety precautions so they keep safety active and do not become complacent.

8.0 SCOPE DEVIATIONS AND CORRECTIVE MEASURES

There were few deviations from the SOW during the execution of the project.

8.1 Wastewater Handling

The SOW required that all water that entered the excavation be disposed of at the POTW. The site was set up to remove and treat excavation water prior to release to the POTW. The discharge permit required approval of post-treatment analytical results prior to granting permission to release treated water. When significantly more water was entering the excavations than was anticipated, site operations were significantly slowed because all available storage capacity (120,000 gallons) was utilized in 2-3 days and the quickest sample analysis time was about one week.

To correct this, and remove the delay between treatment and discharge, Plexus sought approval to discharge treated water to the surface. Because the remedial action is being performed under CERCLA, a National Pollution Elimination Discharge System (NPDES) permit equivalency was developed and provided to the USACE and NYSDEC for approval/acceptance. A comparison was made between treated water test results and the DOE RAM limits. All treated water sample results indicated that the water was acceptable for discharge to the surface. After transmitting the comparison to the USACE and NYSDEC, Plexus was granted permission to discharge to the surface immediately after treatment without having to provide sample results before discharge. The frequency of radionuclide sampling of the treated water was also modified from 1 sample per 20,000 gallons to one sample per day of dewatering activities or one sample per 20,000 gallons, whichever was less.

8.2 Transportation and Disposal

Services for the T&D of wastes were provided by the USACE's T&D Contractor under blanket purchase agreement (BPA). Due to several factors including leaking shipping containers, and significantly more, and heavier, soil being excavated than anticipated, the capacity of the BPA was reached before the end of the project.

To correct this, the USACE requested that Plexus complete the T&D work on the project. A total of six roll-off containers were obtained by Plexus, however only four were needed to complete the excavation activities.

8.3 Installation of Liners

The installation of liners was not a requirement of the SOW. However, the disposal facility experienced difficulties removing the FUSRAP material from the IMCs due to the stickiness of the material and the USACE directed Plexus to install liners in the IMCs.

8.4 IMC Waste Characterization Samples

The SOW called for one composite waste sample to be collected from every ten IMCs. A total of 16 IMCs were documented as being shipped off-site, but do not appear on an IMC tracking log indicating a sample was taken from the IMC for the composite. There is no tracking log for IMC sample TLVP-IMC-4 (**Appendix N**) which would have provided documentation for ten of the sixteen IMCs. The remaining six IMCs are not recorded on any tracking log as being sampled. No corrective measures can be taken for this deviation.

8.5 Backfill Compaction

The SOW required compaction testing of every lift of backfill placed. As the project extended into the winter, the USACE allowed material to be placed and compacted but relieved Plexus of the requirement to perform compaction testing based on dozens of satisfactory tests that demonstrated that the backfill method was sufficient to achieve the compaction requirement and eliminate any concerns regarding achievement of positive test results when dealing with potentially frozen ground. Backfill was placed in accordance with the SOW in Areas G and H and compacted; however, as approved by the USACE, no compaction testing was performed.

9.0 REFERENCES

NYSDEC, 2009. CP-43: Groundwater Monitoring Well Decommissioning Policy. November 3. http://www.dec.ny.gov/docs/remediation_hudson_pdf/cp43mwdecomm.pdf. Accessed October 29, 2018.

Plexus, 2019a. Site Operations Plan, Landfill Operable Unit, Tonawanda Landfill Vicinity Property, Tonawanda, New York. March.

Plexus, 2019b. Accident Prevention Plan/Site Safety and Health Plan for Soils Remediation, Landfill Operable Unit, Tonawanda Landfill Vicinity Property, Tonawanda, New York. March.

Plexus, 2019c. Uniform Federal Policy – Quality Assurance Project Plan for Soils Remediation, Landfill Operable Unit, Tonawanda Landfill Vicinity Property, Tonawanda, New York. March.

Plexus, 2019d. Contractor Quality Control Plan for Soils Remediation, Landfill Operable Unit, Tonawanda Landfill Vicinity Property, Tonawanda, New York. March.

Plexus, 2019e. Perimeter Air Monitoring Plan for Soils Remediation, Landfill Operable Unit, Tonawanda Landfill Vicinity Property, Tonawanda, New York. March.

USACE, 2017. Record of Decision for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property, Tonawanda, New York. Buffalo District, September.

USACE, 2018. Scope of Work (Amended) for Landfill Operable Unit of the Tonawanda Landfill Vicinity Property Soils Remediation, Formerly Utilized Sites Remedial Action Program, Erie County, New York. Buffalo District, August.

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FIGURES

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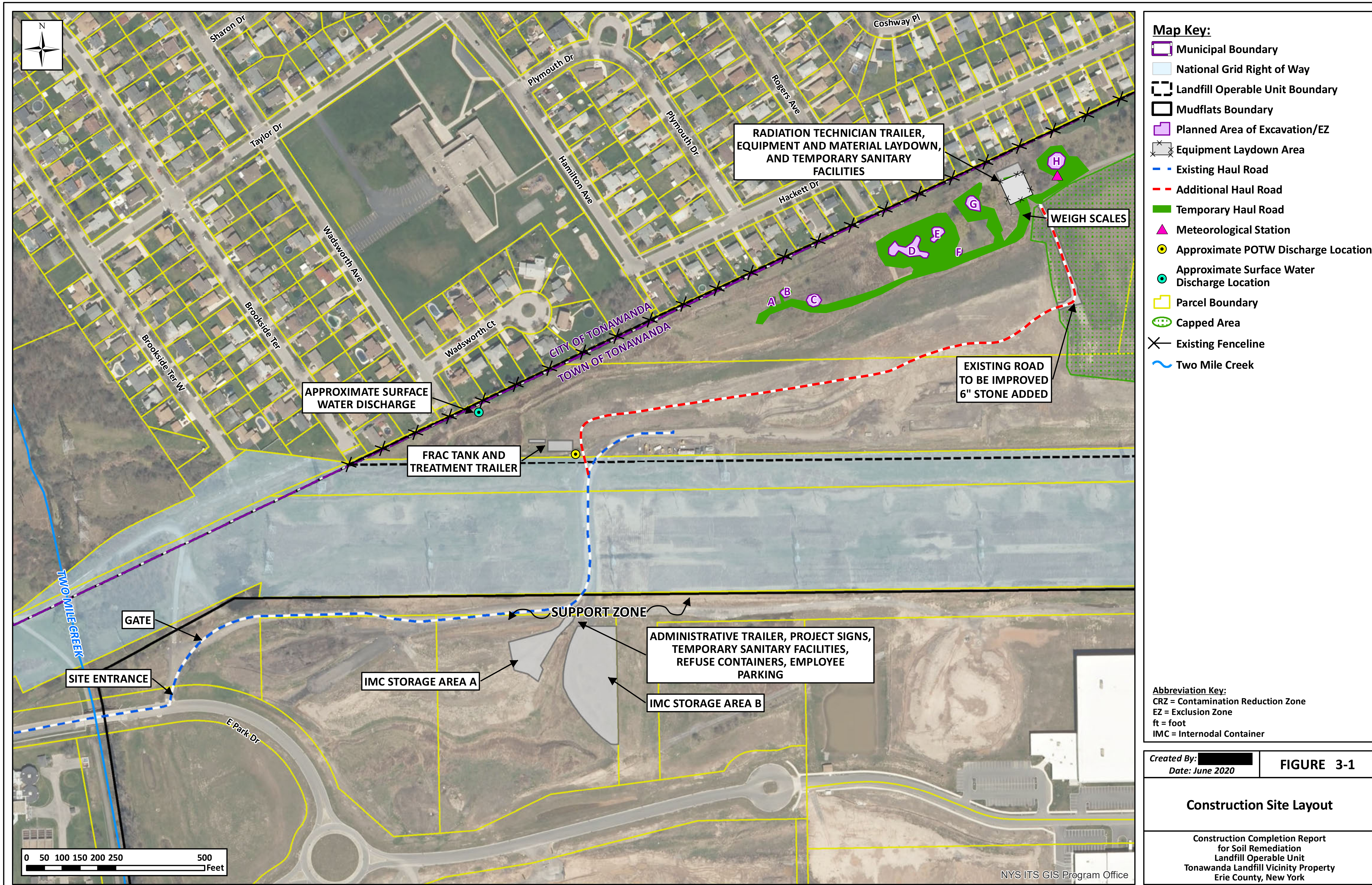
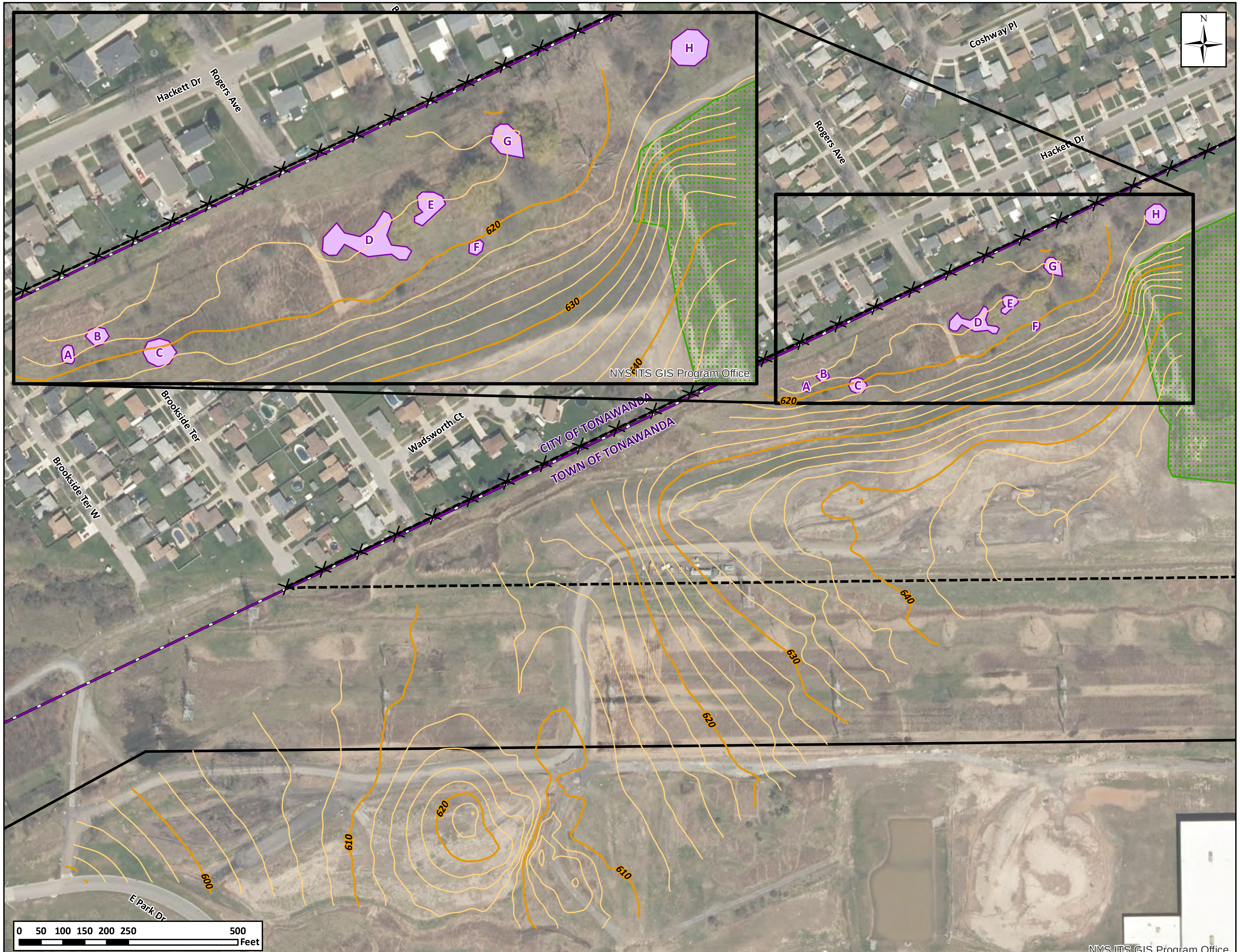


C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 3-1 - Construction Site Layout.mxd

06/12/2020 11:45



Map Key:

- Municipal Boundary
- Landfill Operable Unit Boundary
- Mudflats Boundary
- Planned Area of Excavation
- Capped Area
- Existing Fenceline
- Topographic Contour (2 ft interval)
- Topographic Contour (10 ft interval)

Created By: [redacted]
Date: March 2020

FIGURE 3-2

Pre-Excavation Topographic Survey

Construction Completion Report
for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

Map Key:

- Municipal Boundary
- National Grid Right of Way (Drive Through Only)
- Landfill Operable Unit Boundary
- Mudflats Boundary
- Planned Area of Excavation
- Equipment Laydown and Temporary Fence
- Existing Haul Road
- Additional Haul Road
- Parcel Boundary
- Capped Area
- Existing Fenceline

Reference/Counts Per Minute (CPM):

- Mean + 1 SD (<7,978)
- Mean + 2 SD (7,979-9,461)
- Mean + 3 SD (9,462-11,004)
- > 3 SD (>11,005)

Created By: [redacted]
Date: March 2020

FIGURE 3-3

Initial Gamma Walkover Survey

Construction Completion Report
for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 3-3 - Initial GWS.mxd

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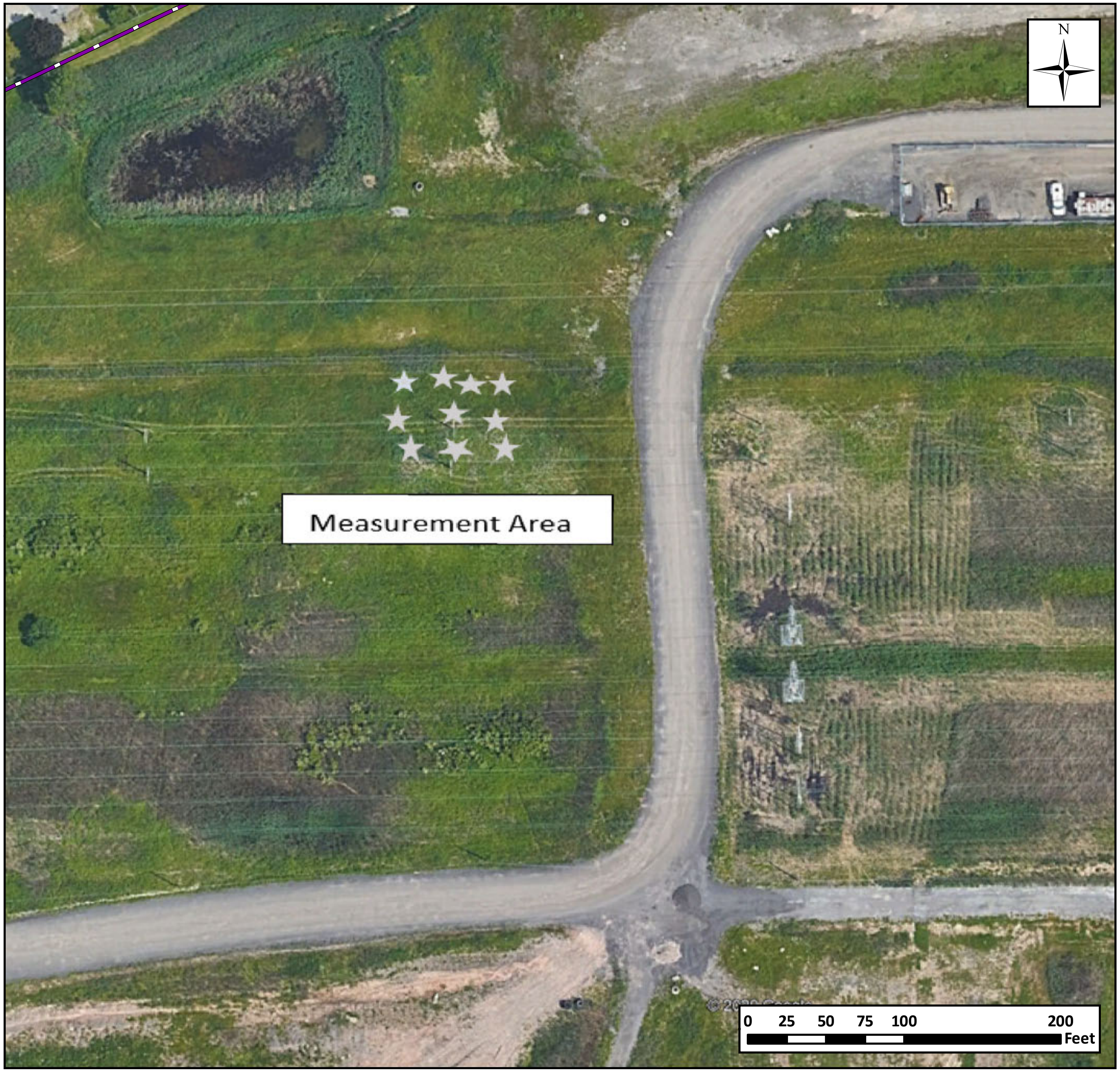


Map Key:

Municipal Boundary

Created By: [redacted]
Date: August 2020

FIGURE 3-4

On-site Reference Area
Uncollimated NaI Detector

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 3-4 - Uncollimated NaI Detector.mxd

08/11/2020 10:28

Map Key:

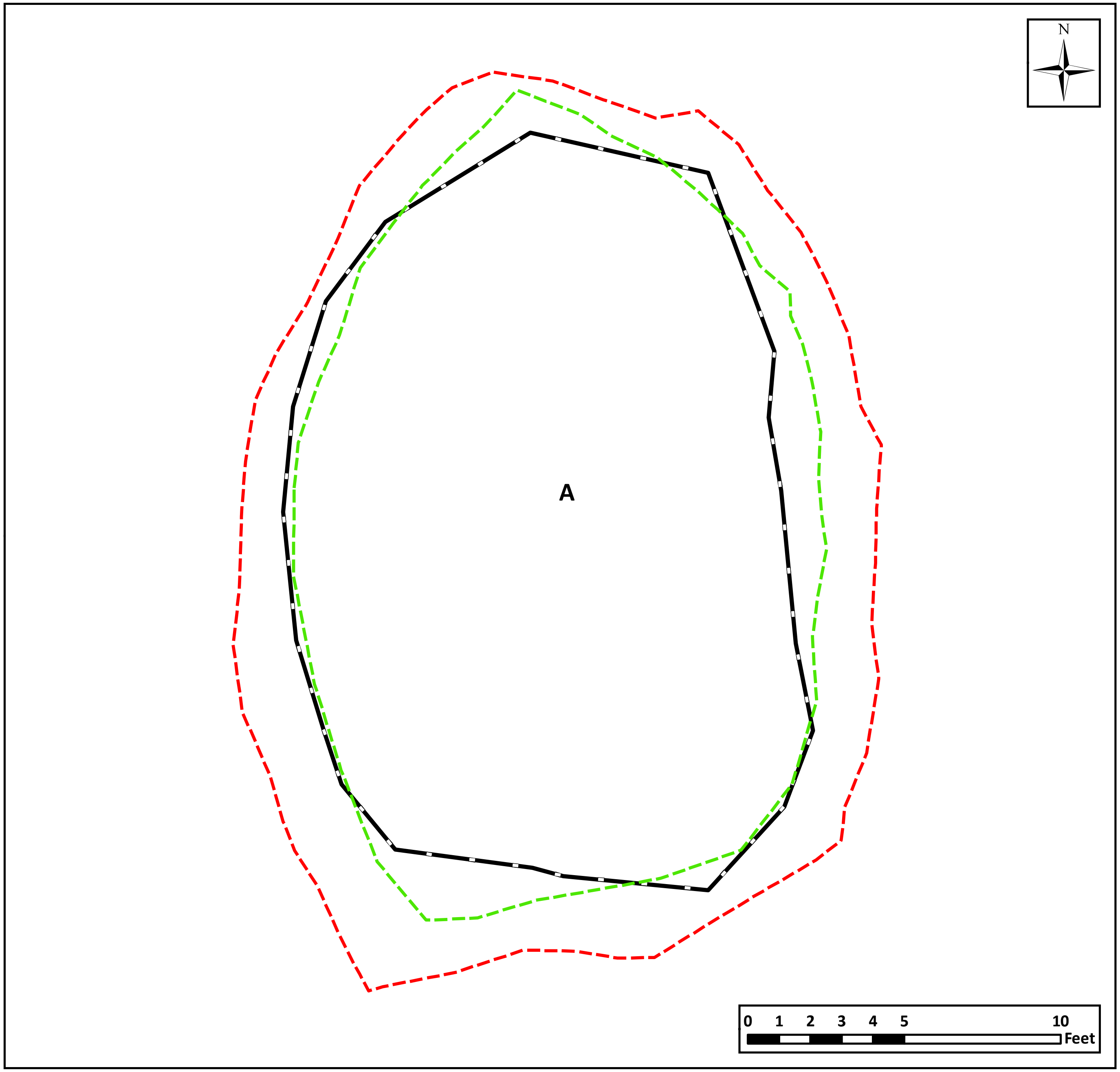
Municipal Boundary

Created By: [redacted]
Date: August 2020

FIGURE 3-5

On-site Reference Area
Collimated NaI Detector

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

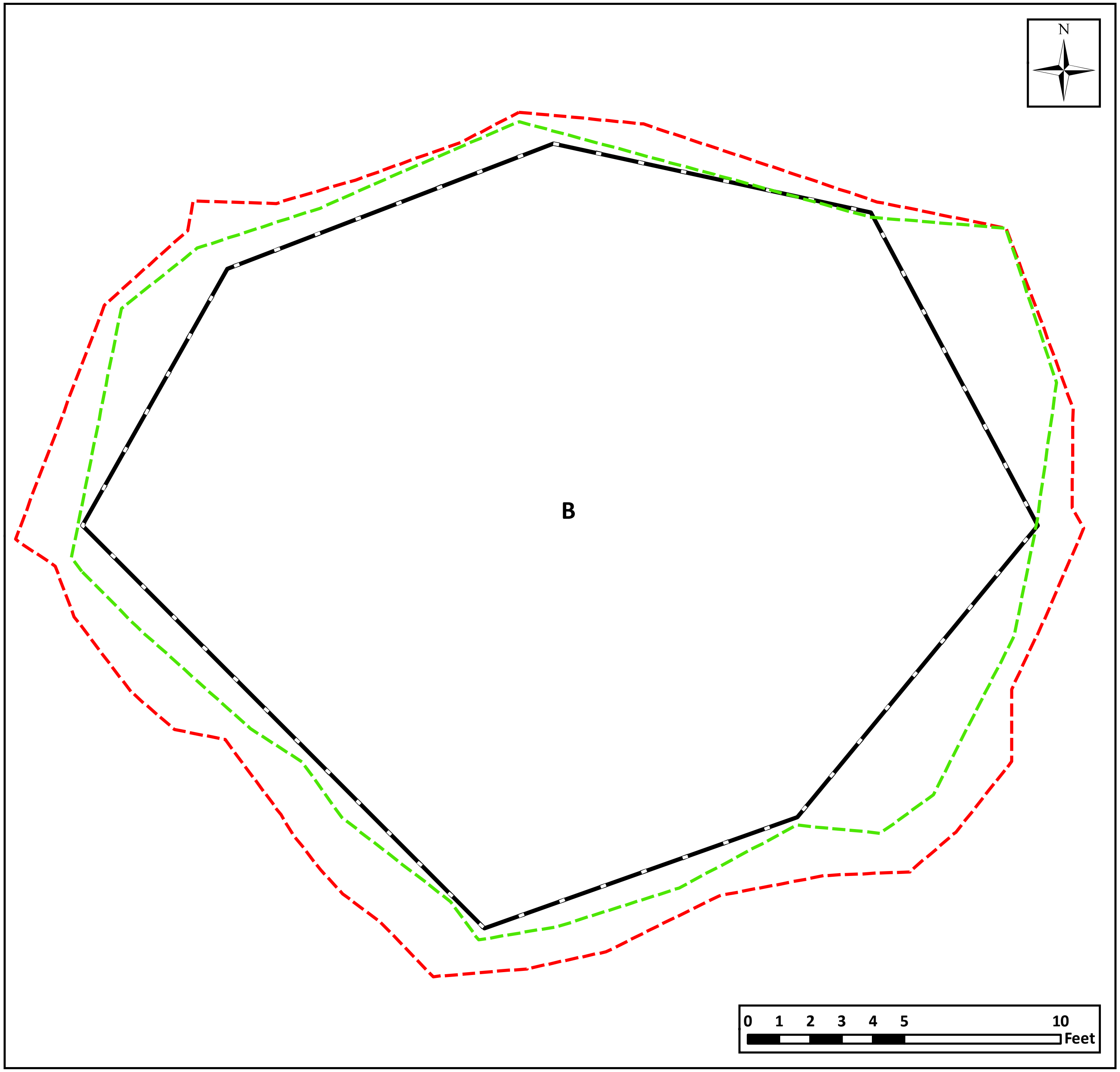
Toe of Slope

Created By: [redacted]
Date: February 2020

FIGURE 4-1

Initial and Final Excavation Limits
Excavation Area A

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

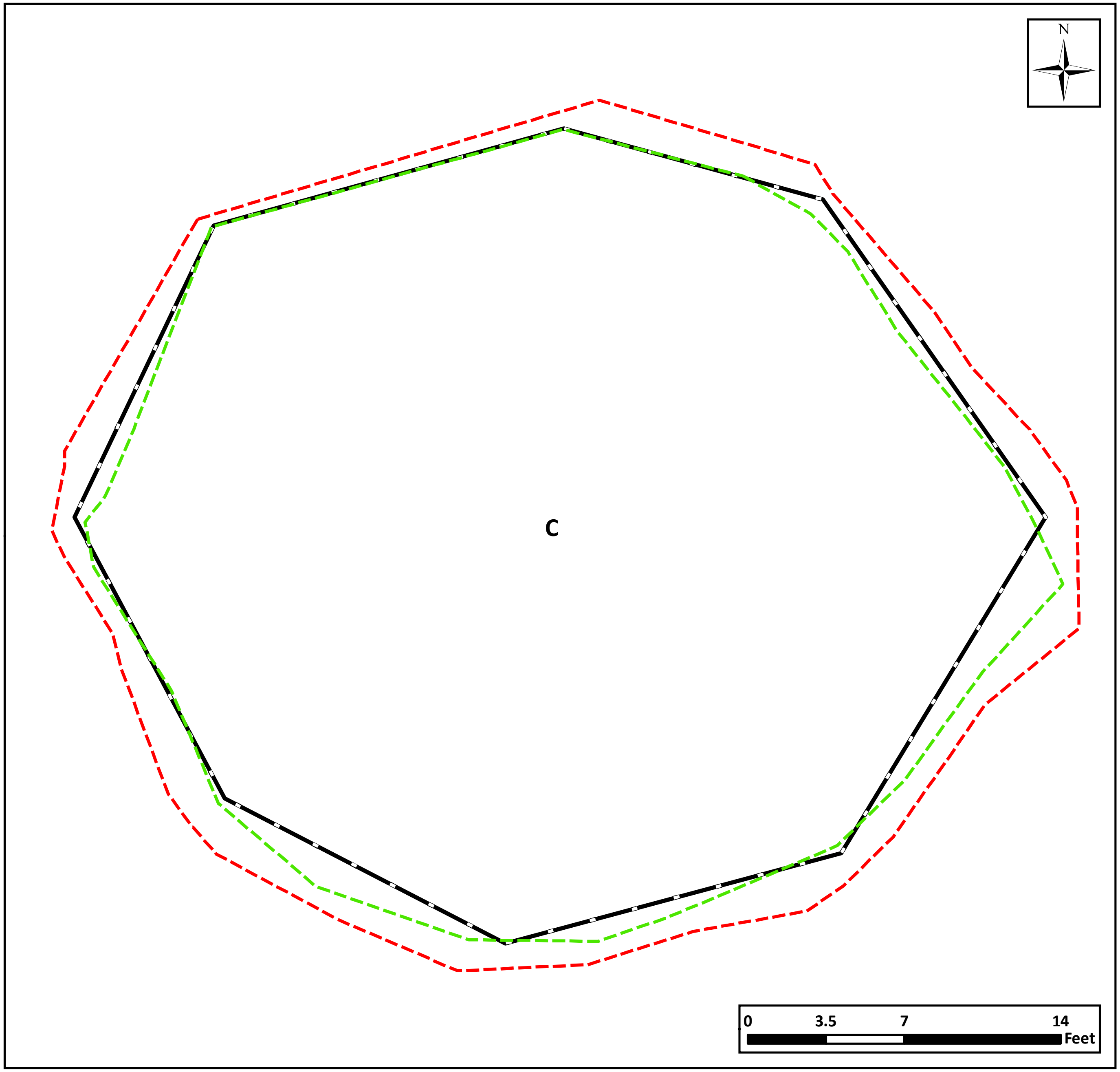
Toe of Slope

Created By: [redacted]
Date: February 2020

FIGURE 4-2

Initial and Final Excavation Limits
Excavation Area B

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

Created By: [redacted]

Date: February 2020

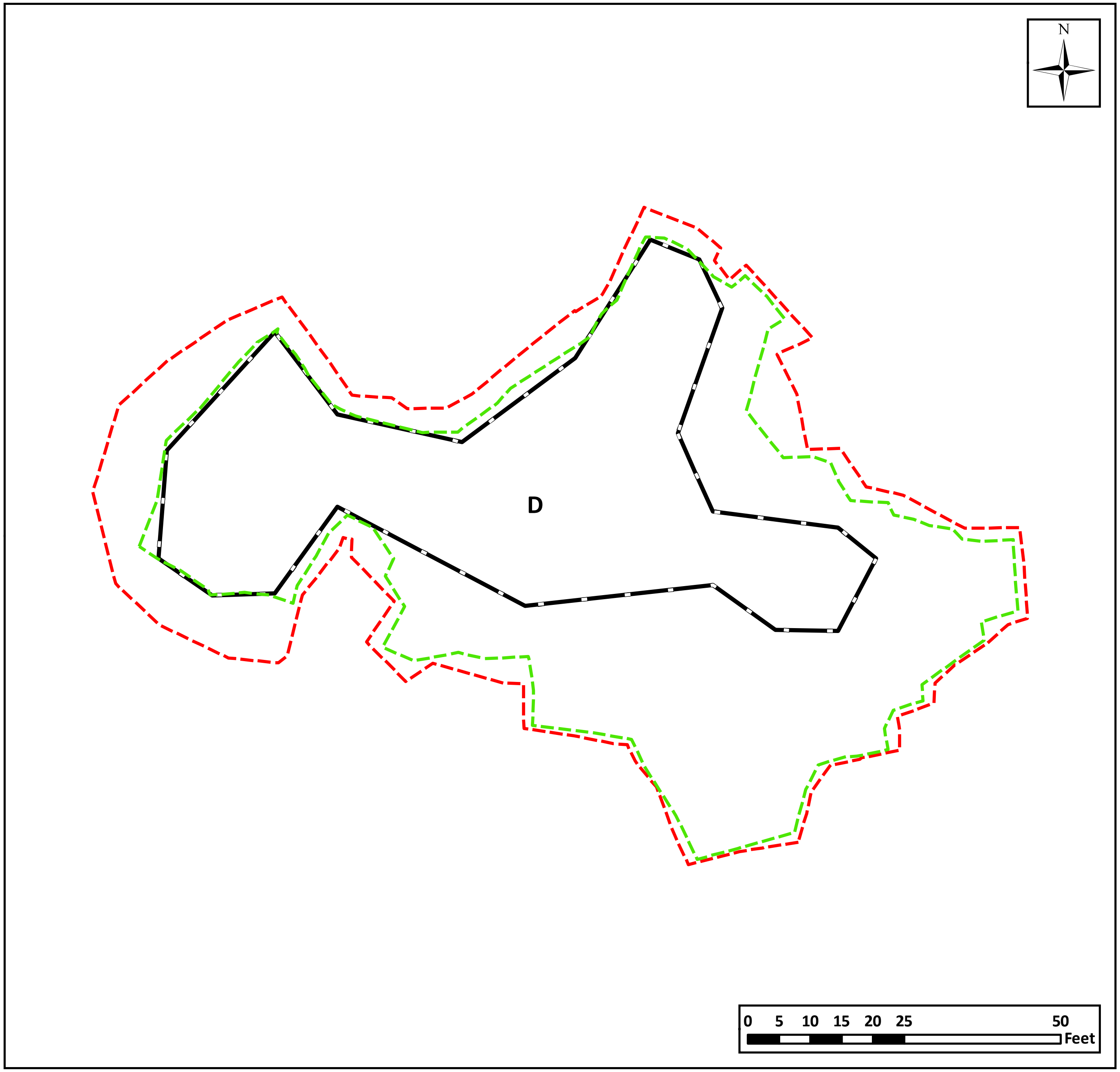
FIGURE 4-3

Initial and Final Excavation Limits
Excavation Area C

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 4-3 - C - Initial and Final Excavation Limits.mxd

02/10/2020 11:51



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

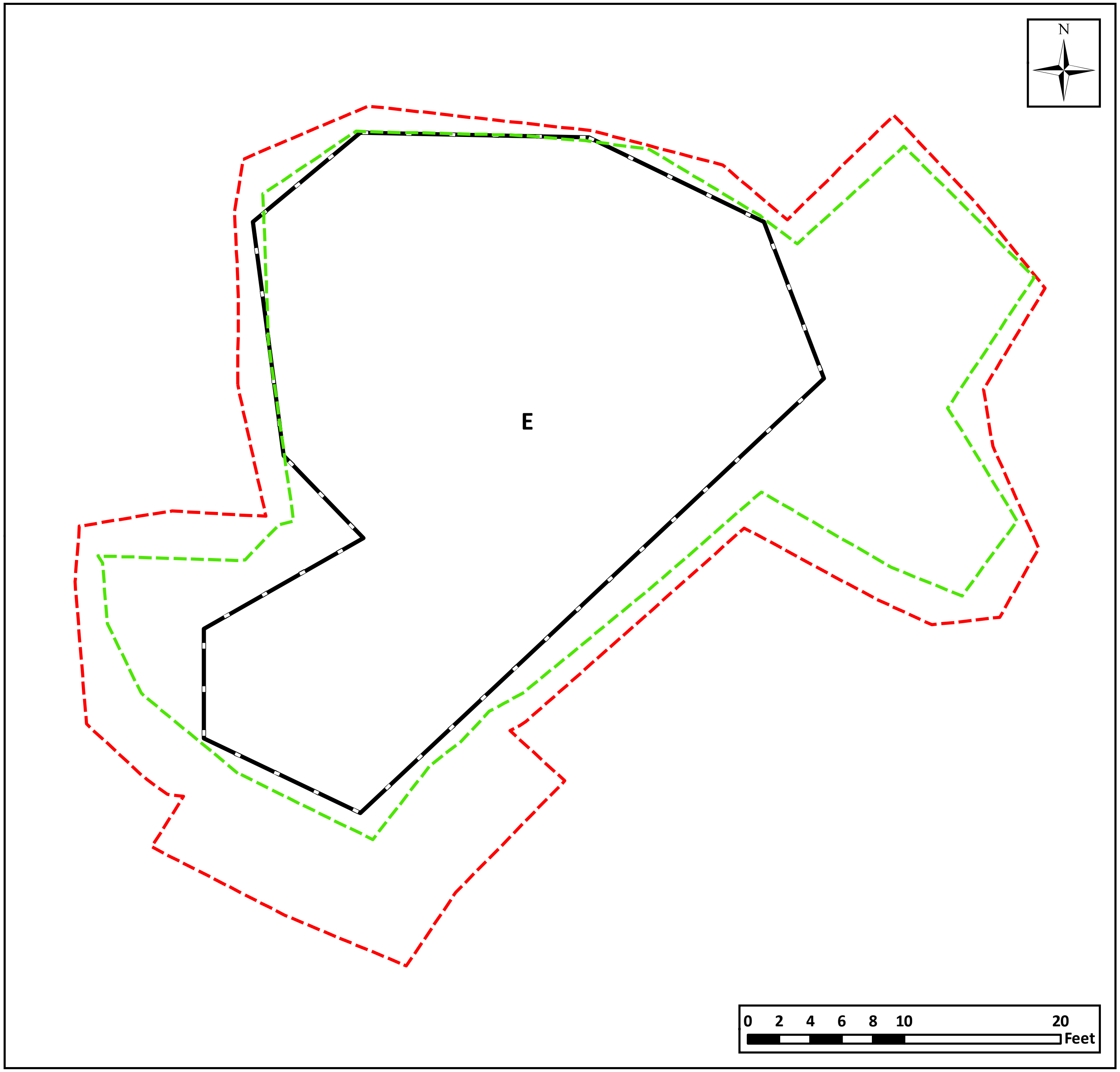
Created By: [redacted]
Date: February 2020

FIGURE 4-4

Initial and Final Excavation Limits
Excavation Area D

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 4-4 - D - Initial and Final Excavation Limits.mxd *02/10/2020 11:53*



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

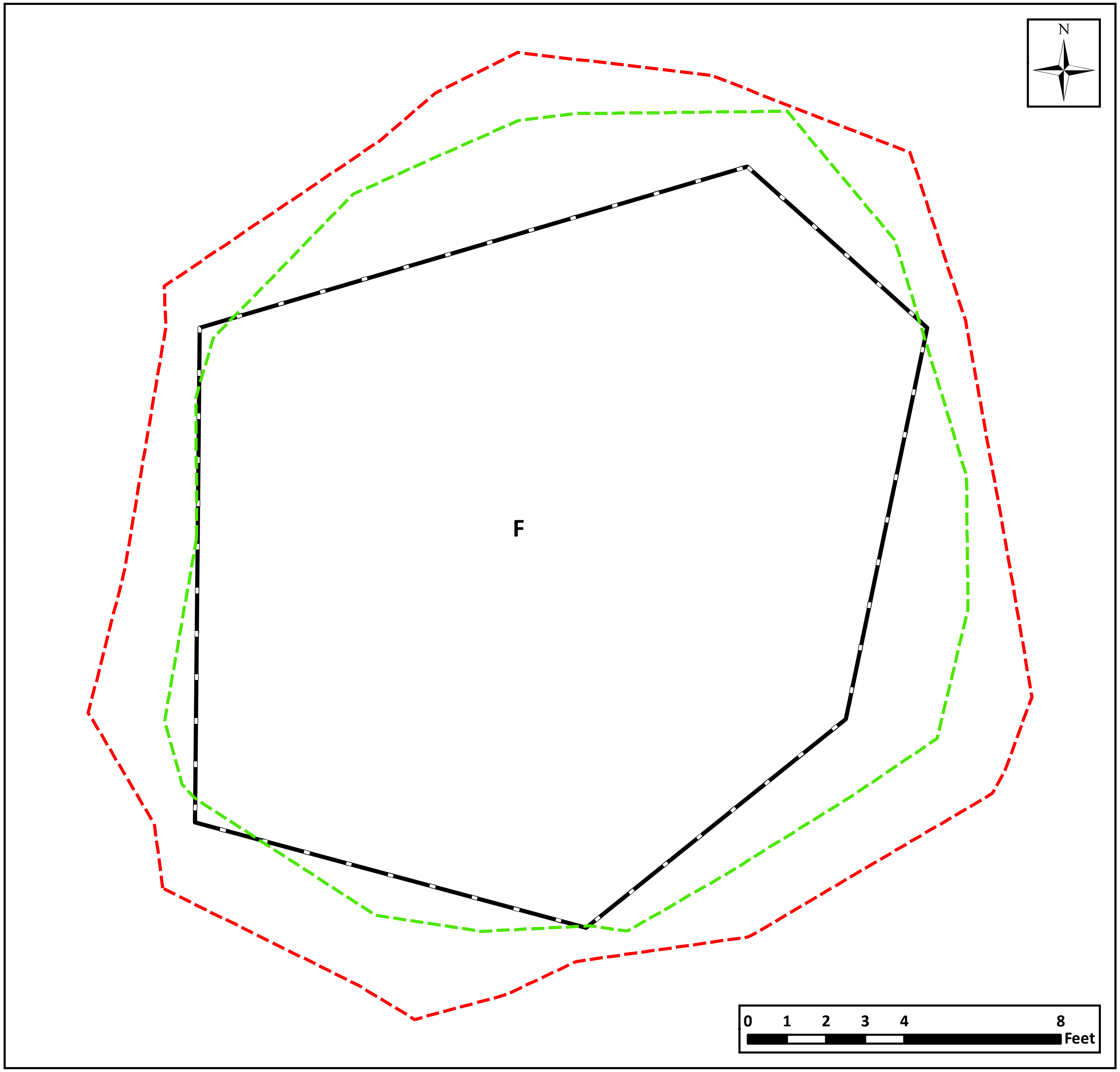
Toe of Slope

Created By: [redacted]
Date: March 2020

FIGURE 4-5

Initial and Final Excavation Limits
Excavation Area E

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

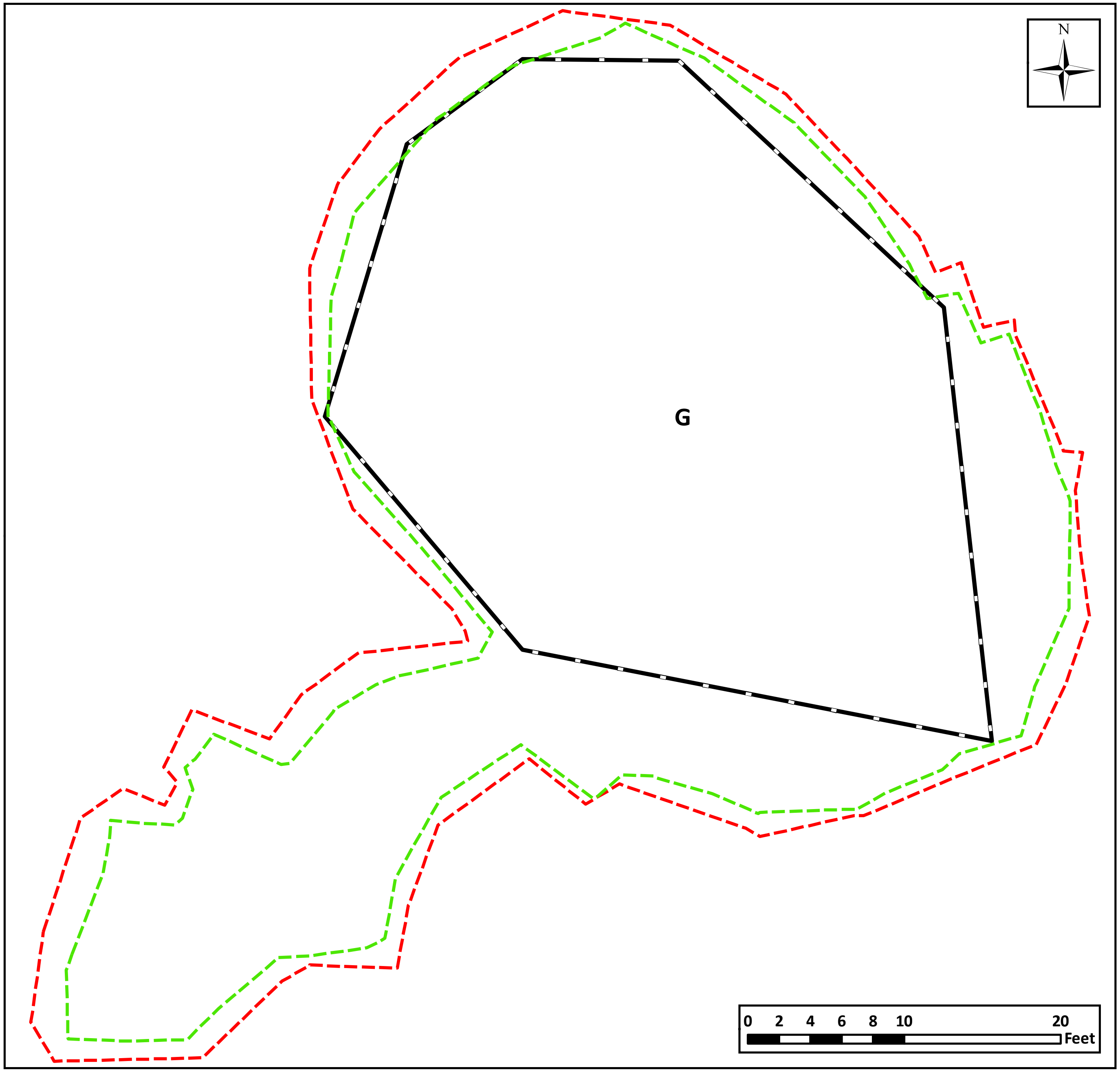
Created By: [redacted]

Date: February 2020

FIGURE 4-6

Initial and Final Excavation Limits
Excavation Area F

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

Created By: [redacted]
Date: February 2020

FIGURE 4-7

Initial and Final Excavation Limits
Excavation Area G

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 4-7 - G - Initial and Final Excavation Limits.mxd

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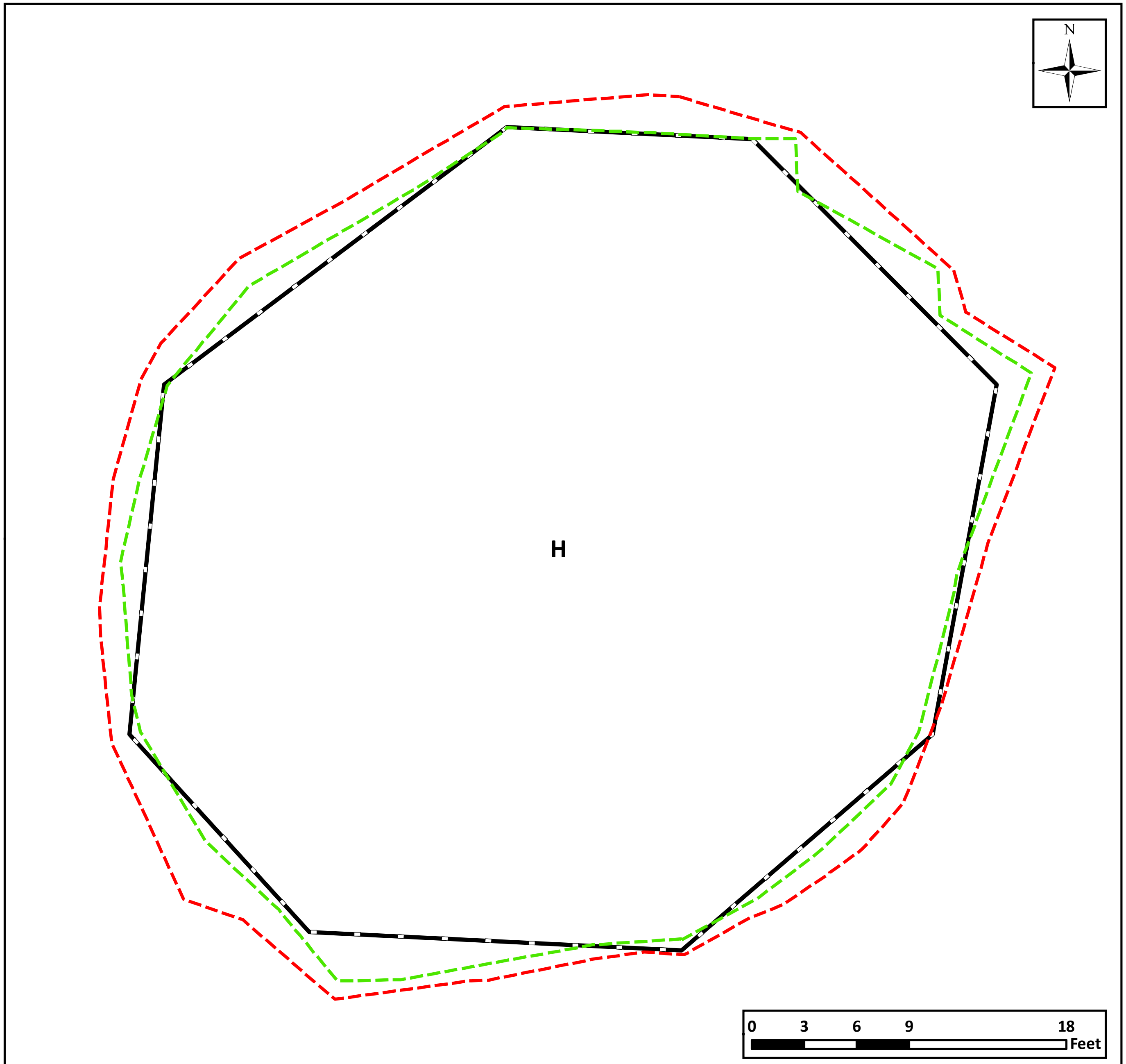


Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

Created By: [redacted]

Date: February 2020

FIGURE 4-8

Initial and Final Excavation Limits
Excavation Area H

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

Map Key:
- Municipal Boundary
- Landfill Operable Unit Boundary
- Mudflats Boundary
- Final Limits of Excavation
- Capped Area
- Existing Fenceline
- Topographic Contour (2 ft interval)
- Topographic Contour (10 ft interval)

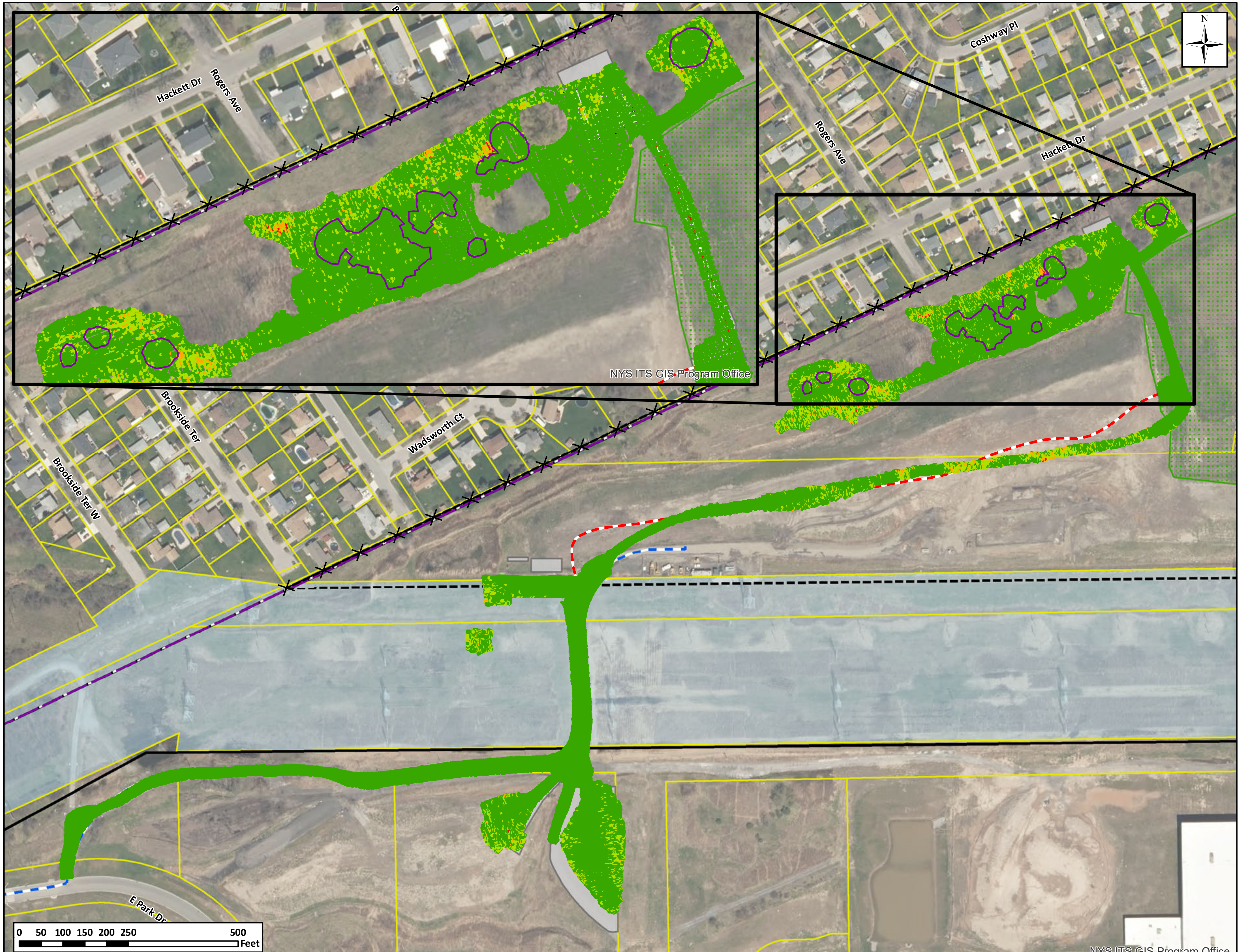
Note:
Post-excavation topographic survey was limited to the disturbed ground within the Formerly Utilized Sites Remedial Action Program (FUSRAP) excavation area.

Created By: [redacted]
Date: June 2020

FIGURE 4-9

Final Site Condtions

**Construction Completion Report
for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York**



Map Key:

- Municipal Boundary
- National Grid Right of Way (Drive Through Only)
- Landfill Operable Unit Boundary
- Mudflats Boundary
- Final Limits of Excavation
- Equipment Laydown and Temporary Fence
- Existing Haul Road
- Additional Haul Road
- Parcel Boundary
- Capped Area
- Existing Fenceline

Reference/Counts Per Minute (CPM):

- Mean + 1 SD (<7,844)
- Mean + 2 SD (7,845-8,844)
- Mean + 3 SD (8,845-9,844)
- >3 SD (>9,844)

Created By: [redacted]
Date: June 2020

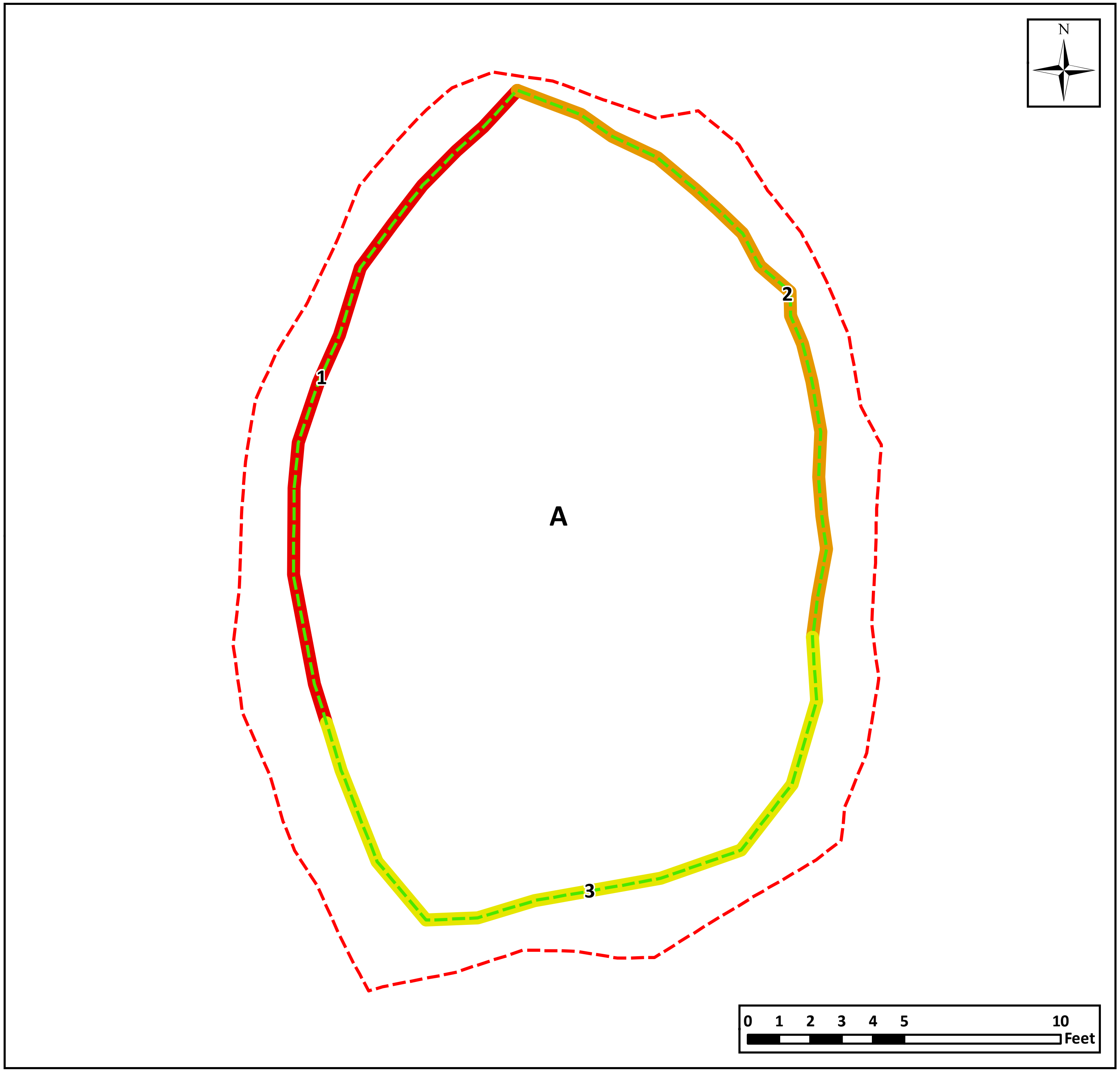
FIGURE 4-10

Final Gamma Walkover Survey

Construction Completion Report
for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

C:\Users\bbouton\OneDrive - Plexus Scientific Corp\Documents\GIS_PRJ_BU\Tonawanda\Maps\CCR\Figure 4-10 - Final GWS.mxd

06/08/2020 16:08



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

- 1
- 2
- 3

Created By: [redacted]
Date: February 2020

FIGURE 5-1

Decision Units
Excavation Area A

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

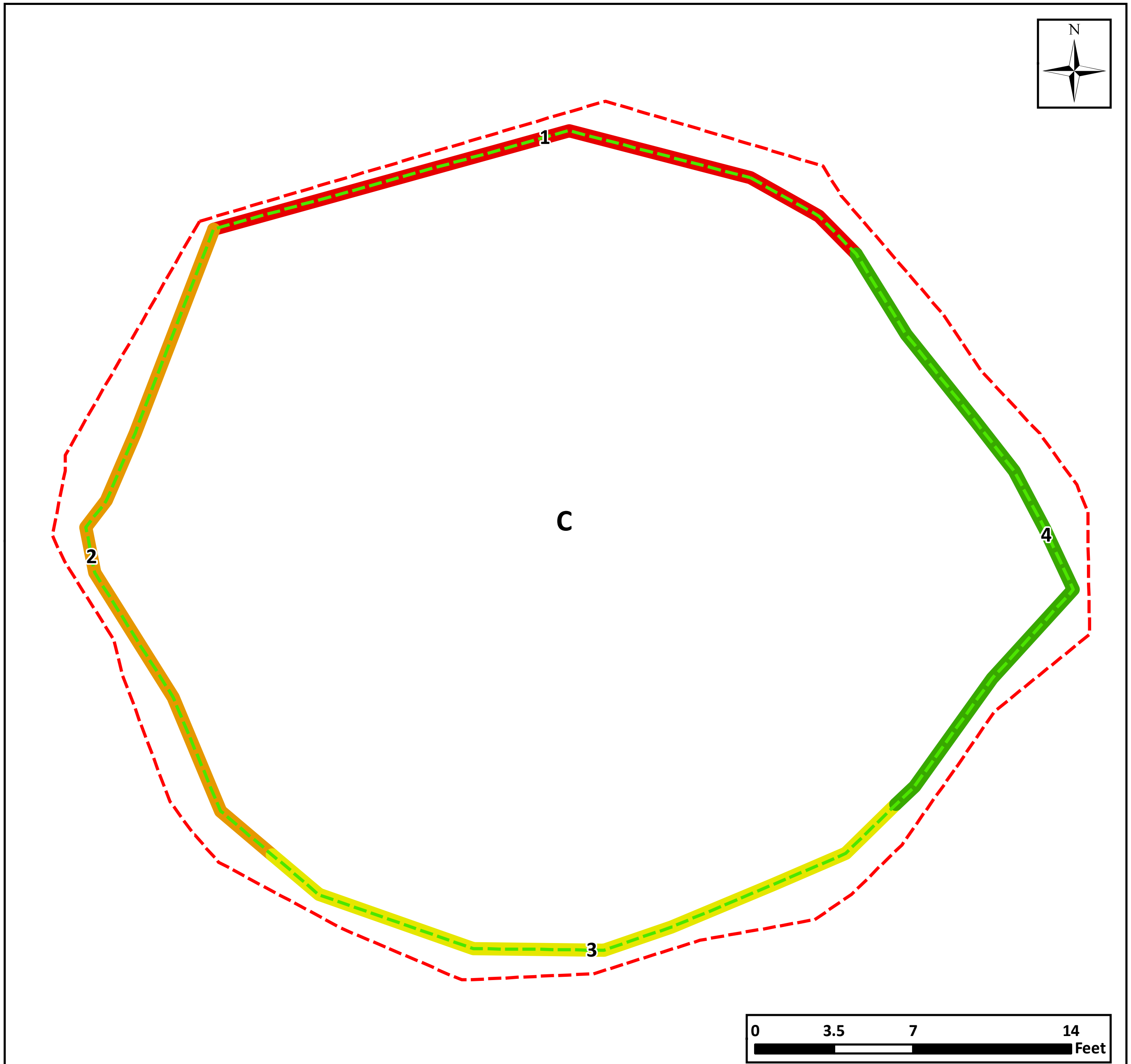
- 1
- 2
- 3

Created By: [redacted]
Date: February 2020

FIGURE 5-2

Decision Units
Excavation Area B

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

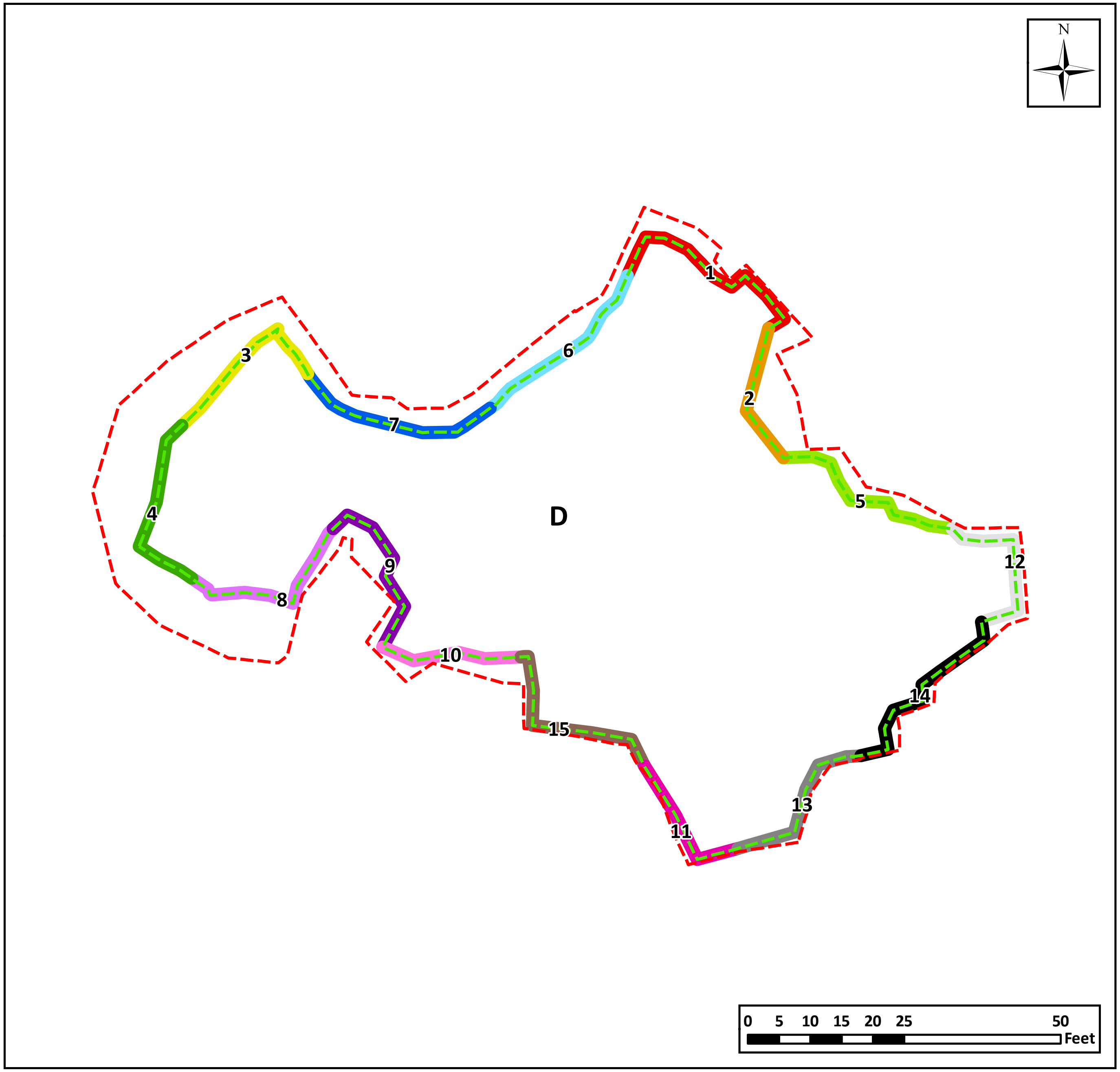
- 1
- 2
- 3
- 4

Created By: [redacted]
Date: February 2020

FIGURE 5-3

Decision Units
Excavation Area C

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

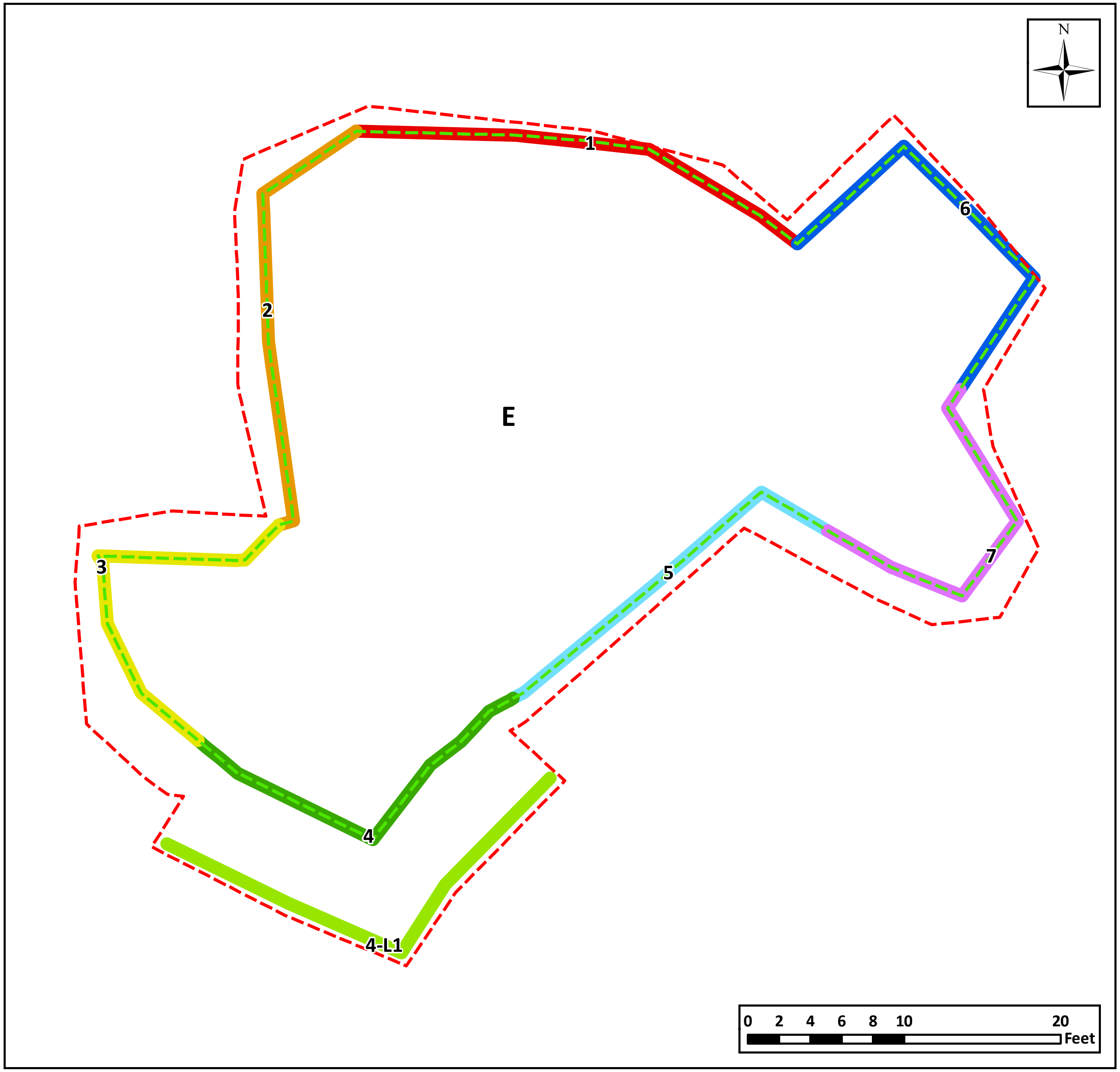
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

Created By: [redacted]
Date: February 2020

FIGURE 5-4

Decision Units
Excavation Area D

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

- 1
- 2
- 3
- 4
- 4-L1 Stepout
- 5
- 6
- 7
- 8

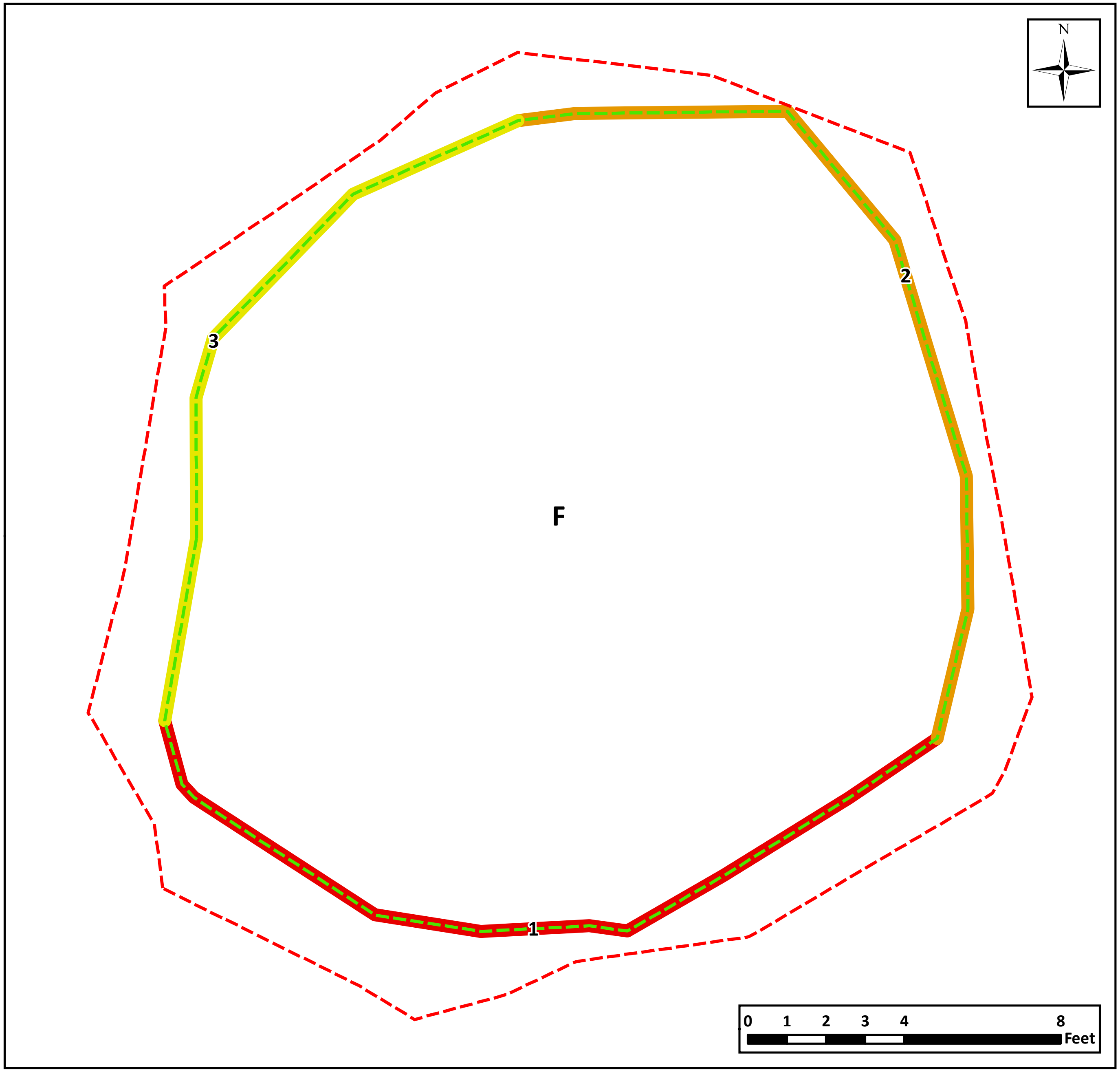
Created By: [redacted]

Date: March 2020

FIGURE 5-5

Decision Units
Excavation Area E

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

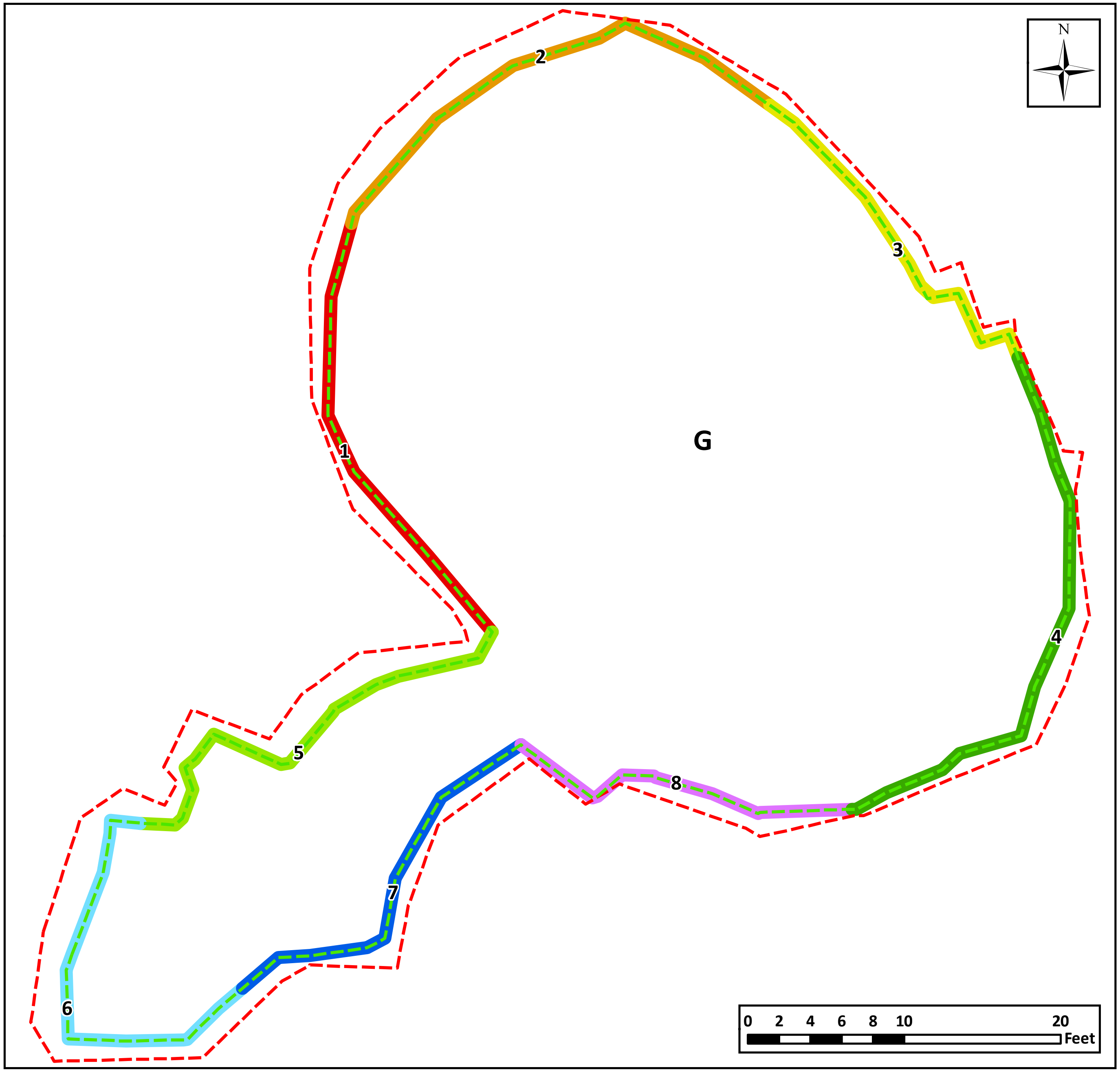
- 1
- 2
- 3

Created By: [redacted]
Date: March 2020

FIGURE 5-6

Decision Units
Excavation Area F

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Surveyed Final Excavation Limits:

- Top of Slope
- Toe of Slope

Layout of Decision Units:

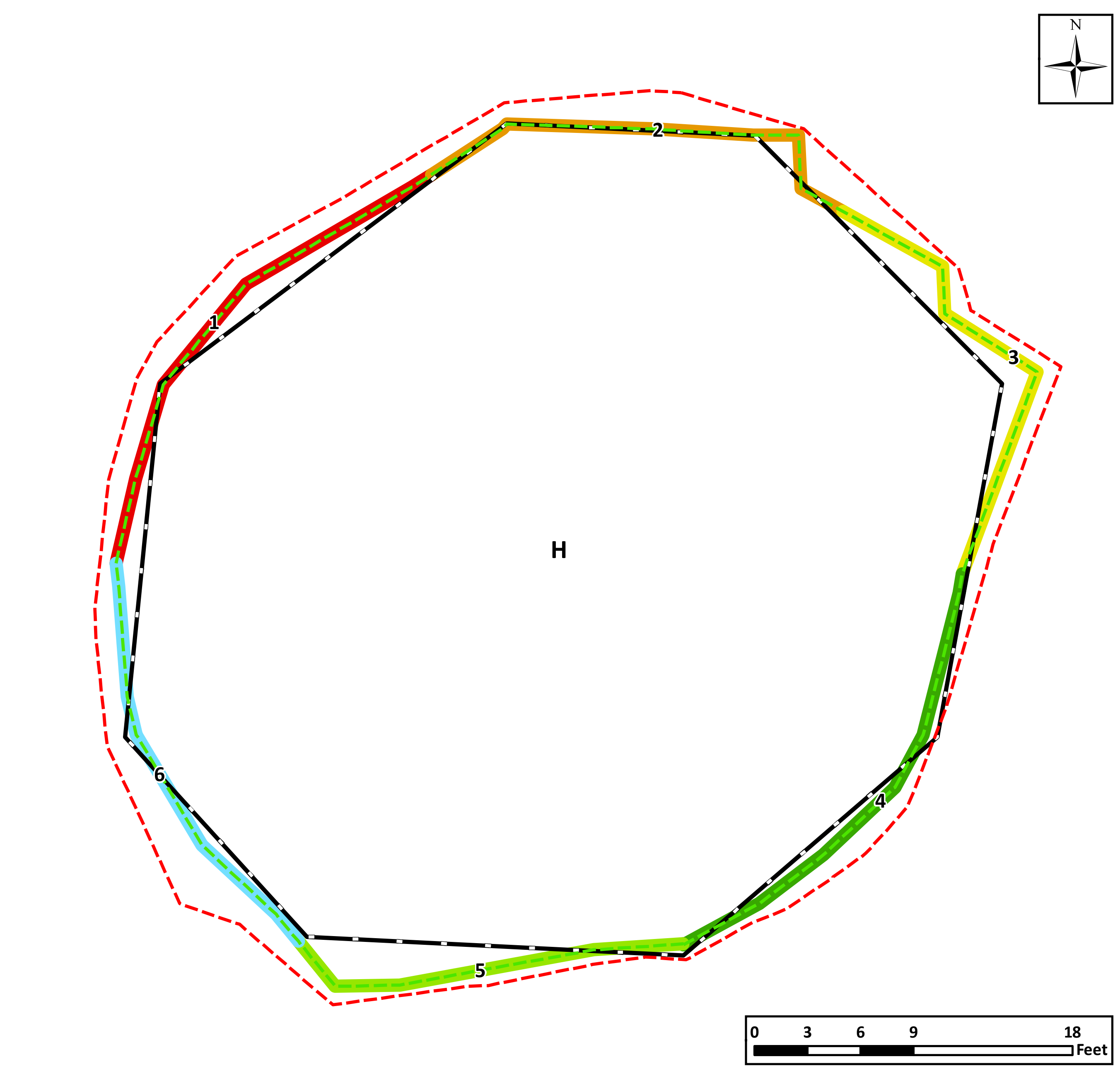
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Created By: [redacted]
Date: March 2020

FIGURE 5-7

Decision Units
Excavation Area G

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York



Map Key:

Planned Area of Excavation

Surveyed Final Excavation Limits:

Top of Slope

Toe of Slope

Layout of Decision Units:

1

2

3

4

5

6

Created By: [redacted]

Date: March 2020

FIGURE 5-8

Decision Units
Excavation Area H

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property
Erie County, New York

TABLES

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Table 5-1 - Treated Excavation Water Priority Pollutant Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Analyte	Units	TLVP-WWB-1 06/17/19
4500CN E-2011		
Cyanide	µg/L	3.11 J
6020		
Aluminum	µg/L	570
Antimony	µg/L	2.42 J
Arsenic	µg/L	7.73
Barium	µg/L	162
Beryllium	µg/L	1 U
Cadmium	µg/L	0.5 U
Calcium	µg/L	38,500
Chromium	µg/L	2.02
Cobalt	µg/L	1.05 J
Copper	µg/L	10.2
Iron	µg/L	450
Lead	µg/L	11.8
Magnesium	µg/L	39,600
Manganese	µg/L	105 J
Nickel	µg/L	3.32 J
Potassium	µg/L	69,200
Selenium	µg/L	1.57 J
Silver	µg/L	1 U
Sodium	µg/L	235,000
Thallium	µg/L	1 U
Vanadium	µg/L	10.8 J
Zinc	µg/L	17.3 J
7470A		
Mercury	µg/L	0.1 U
8081		
4,4-DDD	µg/L	0.0263 U
4,4-DDE	µg/L	0.0263 U
4,4-DDT	µg/L	0.0263 U
Aldrin	µg/L	0.0263 U
Alpha BHC	µg/L	0.0263 U
Beta BHC	µg/L	0.0263 U
Chlordane	µg/L	0.263 U
Delta BHC	µg/L	0.0263 U
Dieldrin	µg/L	0.0263 U
Endosulfan I	µg/L	0.0263 U
Endosulfan II	µg/L	0.0263 U
Endosulfan sulfate	µg/L	0.0263 U

Table 5-1 - Treated Excavation Water Priority Pollutant Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Analyte	Units	TLVP-WWB-1 06/17/19
8081		
Endrin	µg/L	0.0263 U
Endrin aldehyde	µg/L	0.0263 U
Endrin ketone	µg/L	0.0263 U
Gamma BHC	µg/L	0.0263 U
Heptachlor	µg/L	0.0263 U
Heptachlor epoxide	µg/L	0.0263 U
Hexachlorobenzene	µg/L	0.0263 U
Methoxychlor	µg/L	0.0263 U
Toxaphene	µg/L	0.263 U
8082		
PCB 1016	µg/L	0.263 U
PCB 1221	µg/L	0.263 U
PCB 1232	µg/L	0.263 U
PCB 1242	µg/L	0.263 U
PCB 1248	µg/L	0.263 U
PCB 1254	µg/L	0.263 U
PCB 1260	µg/L	0.263 U
PCB 1262	µg/L	0.263 U
PCB 1268	µg/L	0.263 U
8260C		
1,1,1-Trichloroethane	µg/L	0.5 U
1,1,2,2-Tetrachloroethane	µg/L	0.5 U
1,1,2-Trichloroethane	µg/L	0.5 U
1,1-Dichloroethane	µg/L	0.5 U
1,1-Dichloroethene	µg/L	0.5 U
1,2-Dichlorobenzene	µg/L	0.5 U
1,2-Dichloroethane	µg/L	0.591 J
1,2-Dichloropropane	µg/L	0.5 U
1,3-Dichlorobenzene	µg/L	0.5 U
1,4-Dichlorobenzene	µg/L	0.5 U
2-Chloroethyl vinyl ether	µg/L	25 U
Benzene	µg/L	0.5 U
Bromodichloromethane	µg/L	0.5 U
Bromoform	µg/L	0.5 U
Bromomethane	µg/L	2 U
Carbon tetrachloride	µg/L	0.5 U
Chlorobenzene	µg/L	0.5 U
Chlorodibromomethane	µg/L	0.5 U
Chloroethane	µg/L	2 U

Table 5-1 - Treated Excavation Water Priority Pollutant Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Analyte	Units	TLVP-WWB-1 06/17/19
8260C		
Chloroform	µg/L	2 U
Chloromethane	µg/L	1 U
cis-1,3-Dichloropropene	µg/L	0.5 U
Ethylbenzene	µg/L	0.5 U
Methylene Chloride	µg/L	2 U
Tetrachloroethene	µg/L	0.5 U
Toluene	µg/L	0.5 U
trans-1,2-Dichloroethene	µg/L	0.5 U
trans-1,3-Dichloropropene	µg/L	0.5 U
Trichloroethene	µg/L	0.5 U
Vinyl chloride	µg/L	0.5 U
8270D		
1,2,4-Trichlorobenzene	µg/L	5.1 U
2,4,6-Trichlorophenol	µg/L	5.1 UJ
2,4-Dichlorophenol	µg/L	5.1 UJ
2,4-Dimethylphenol	µg/L	5.1 U
2,4-Dinitrophenol	µg/L	5.1 U
2,4-Dinitrotoluene	µg/L	5.1 U
2,6-Dinitrotoluene	µg/L	5.1 UJ
2-Chloronaphthalene	µg/L	0.51 U
2-Chlorophenol	µg/L	5.1 UJ
2-Nitrophenol	µg/L	5.1 UJ
3,3-Dichlorobenzidine	µg/L	5.1 U
4,6-Dinitro-2-methylphenol	µg/L	5.1 U
4-Bromophenyl-phenylether	µg/L	5.1 UJ
4-Chloro-3-methylphenol	µg/L	5.1 UJ
4-Chlorophenyl-phenylether	µg/L	5.1 UJ
4-Nitrophenol	µg/L	5.1 U
Acenaphthene	µg/L	0.51 UJ
Acenaphthylene	µg/L	0.51 U
Anthracene	µg/L	0.51 U
Benzidine	µg/L	5.1 U
Benzo(a)anthracene	µg/L	0.51 U
Benzo(a)pyrene	µg/L	0.102 U
Benzo(b)fluoranthene	µg/L	0.51 U
Benzo(g,h,i)perylene	µg/L	0.51 U
Benzo(k)fluoranthene	µg/L	0.51 U
Benzylbutyl phthalate	µg/L	1.53 U
Bis(2-chlorethoxy)methane	µg/L	5.1 UJ

Table 5-1 - Treated Excavation Water Priority Pollutant Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Analyte	Units	TLVP-WWB-1 06/17/19
8270D		
Bis(2-chloroethyl)ether	µg/L	5.1 UJ
Bis(2-chloroisopropyl)ether	µg/L	5.1 U
Bis(2-Ethylhexyl)phthalate	µg/L	1.53 U
Chrysene	µg/L	0.51 U
Dibenz(a,h)anthracene	µg/L	0.102 U
Diethyl phthalate	µg/L	1.53 U
Dimethyl phthalate	µg/L	1.53 U
Di-n-butyl phthalate	µg/L	1.53 U
Di-n-octyl phthalate	µg/L	1.53 U
Fluoranthene	µg/L	0.51 U
Fluorene	µg/L	0.51 UJ
Hexachloro-1,3-butadiene	µg/L	5.1 U
Hexachlorobenzene	µg/L	0.51 UJ
Hexachlorocyclopentadiene	µg/L	5.1 U
Hexachloroethane	µg/L	5.1 U
Indeno(1,2,3-cd)pyrene	µg/L	0.51 U
Isophorone	µg/L	5.1 U
Naphthalene	µg/L	0.51 UJ
Nitrobenzene	µg/L	5.1 UJ
n-Nitrosodimethylamine	µg/L	5.1 U
n-Nitrosodi-n-propylamine	µg/L	5.1 UJ
n-Nitrosodiphenylamine	µg/L	5.1 U
Pentachlorophenol	µg/L	5.1 U
Phenanthrene	µg/L	0.51 UJ
Phenol	µg/L	1.75 J
Pyrene	µg/L	0.51 UJ

Abbreviation Key:

µg/L = micrograms per liter

J = The positive result reported is a quantitative estimate.

U = Analyte not detected in the sample. Value represents the limit of detection.

UJ = Analyte not detected in the sample. The actual quantitation/detection limit may be higher than reported.

Table 5-2 - Treated Excavation Water Radionuclide Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Sample ID	Sample Date	Filtered?	Radium-226 pCi/L	Thorium-228 pCi/L	Thorium-230 pCi/L	Thorium-232 pCi/L	Uranium-234 pCi/L	Uranium-235 pCi/L	Uranium-238 pCi/L
		PAL	87	340	160	140	680	720	750
		NYCRR[1]	60	200	100	30	300	300	300
TLVP-WWA-1TOTAL	06/17/19	Unfiltered	0.197	0.0147	-0.00237	0.0213	1.53	0.33	2.38
TLVP-WWA-1UF	06/17/19	Filtered	0.306	-0.24	-0.107	0.0277	2.8	0.266	2.06
TLVP-WWA-2TOTAL	06/17/19	Unfiltered	0.549	-0.0583	-0.0235	0.127	4.16 J	0.0651 J	4.5 J
TLVP-WWA-2UF	06/17/19	Filtered	0.17	-0.146	-0.118	-0.0146	3.64 J	0.801 J	3.82 J
TLVP-WWA-3	06/21/19	Unfiltered	0.471	-0.199	-0.101	0.115	2.97	0.0687	3.08
TLVP-WWA-3	06/21/19	Filtered	0.373	-0.211	-0.201	-0.181	2.7 J	-0.0471	2.79 J
TLVP-WWA-4	06/21/19	Unfiltered	0.637	-0.118	-0.0545	-0.0975	2.2 J	0.746 J	3.29 J
TLVP-WWA-4	06/21/19	Filtered	0.157	-0.222	-0.178	-0.143	3.1 J	0.352 J	5.94 J
TLVP-WWA-5	06/24/19	Unfiltered	0.102	-0.386	-0.177	0.0832	0.682	0.0735	0.533
TLVP-WWA-5	06/24/19	Filtered	0.0725	-0.325	0.0819	0.105	0.918	0.0704	0.95
TLVP-WWA-6	06/24/19	Unfiltered	0.264	0.265	2	0.519	0.548	0.0975	0.495
TLVP-WWA-6	06/24/19	Filtered	0.356	0.113	0.309	-0.0795	0.598	0.0898	0.73
TLVP-WWA-7	07/02/19	Unfiltered	0.0396	-0.0604	0.11	-0.0432	2.48	0.228	2.86
TLVP-WWA-7	07/02/19	Filtered	0.311	-0.19	0.00682	-0.117	3.1	0.205	2.68
TLVP-WWA-8	07/02/19	Unfiltered	0.0154	-0.129	-0.0449	-0.138	2.02	0.332	1.83
TLVP-WWA-8	07/02/19	Filtered	-0.0819	-0.265	-0.181	-0.123	3.48	0.553	3.95
TLVP-WWA-9	07/02/19	Unfiltered	0.238	-0.119	-0.0604	-0.13	3.09	0.311	2.67
TLVP-WWA-9	07/02/19	Filtered	0.0999	-0.258	-0.161	-0.117	3.22	0.108	3.4
TLVP-WWA-10	07/08/19	Unfiltered	0.213	-0.0802	-0.216	-0.133	2.63	0.22	2.01
TLVP-WWA-11	07/08/19	Unfiltered	0.0718	-0.182	-0.109	-0.0527	2.52	0.211	2.62
TLVP-WWA-11	07/08/19	Filtered	0.0201	-0.103	-0.0284	-0.2	NS	NS	NS
TLVP-WWA-12	07/08/19	Unfiltered	0.0351	-0.114	-0.0457	-0.106	3.71	0.166	3.41
TLVP-WWA-12	07/08/19	Filtered	0.187	NS	NS	NS	NS	NS	NS
TLVP-WWA-13	07/16/19	Filtered	1.02	-0.17	-0.422	-0.0777	46.2	2.54	44.1
TLVP-WWA-14	07/16/19	Unfiltered	0.456	-0.15	-0.992	-0.139	27.7	1.55	28.7 J
TLVP-WWA-15	07/17/19	Unfiltered	0.826	-0.125	-0.722	-0.0947	89	5.66	93.5
TLVP-WWA-16	07/17/19	Unfiltered	1.01	-0.134	-0.346	0.201	75.8	7	79.9
TLVP-WWA-17	07/17/19	Unfiltered	0.506	-0.155	-0.832	0.194	61.7	4.44	67.2
TLVP-WWA-18	07/17/19	Unfiltered	0.713	-0.0793	0.05	0.405	17.3	0.583	19.6
TLVP-WWA-19	07/26/19	Unfiltered	0.633	-0.0777	-0.0366	-0.0206	39.4	1.55	45.1
TLVP-WWA-20	07/26/19	Unfiltered	0.584	-0.233	-0.0283	0.0163	36.7	0.944	36.9
TLVP-WWA-21	07/26/19	Unfiltered	0.389	-0.0419	-0.0291	-0.0916	36.1	0.976	36.3
TLVP-WWA-22	07/29/19	Unfiltered	0.412	-0.0533	0.00378	1.06	23.4	0.993	24
TLVP-WWA-23	07/30/19	Unfiltered	0.157	0.109	-0.0569	0.142	4.58	0.566	3.87
TLVP-WWA-24	07/30/19	Unfiltered	0.358	-0.064	0.0444	0.306	6.67	0.432	6.89
TLVP-WWA-25	09/05/19	Unfiltered	0.919	-0.0986	0.219	0.0235	88.8	0.971	93.5
TLVP-WWA-26	09/06/19	Unfiltered	7.22	-0.0585	0.0338	-0.0159	144	5.71	142
TLVP-WWA-27	09/09/19	Unfiltered	0.657	-0.305	0.228	-0.0594	93.4 J	4.44 J	87.1 J

Table 5-2 - Treated Excavation Water Radionuclide Sampling Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

Sample ID	Sample Date	Filtered?	Radium-226 pCi/L	Thorium-228 pCi/L	Thorium-230 pCi/L	Thorium-232 pCi/L	Uranium-234 pCi/L	Uranium-235 pCi/L	Uranium-238 pCi/L
		PAL	87	340	160	140	680	720	750
		NYCRR[1]	60	200	100	30	300	300	300
TLVP-WWA-28	09/09/19	Unfiltered	1.61	-0.0712	0.044	-0.0844	63.2 J	2.45 J	63.5 J
TLVP-WWA-29	09/11/19	Unfiltered	2.01	-0.107	0.329	-0.00216	124	1.57	128
TLVP-WWA-30	09/12/19	Unfiltered	2.36	-0.142	0.114	-0.203	93.3	0.318	102
TLVP-WWA-31	09/13/19	Unfiltered	0.903	-0.0513	1.07	0.0285	59.6	1.42	65.7
TLVP-WWA-32	09/16/19	Unfiltered	1.18	-0.307	0.0874	0.154	54.7	1.35	58.2
TLVP-WWA-33	09/16/19	Unfiltered	0.512	-0.246	0.0365	-0.172	43.6	1.13	47.8
TLVP-WWA-34	09/16/19	Unfiltered	0.395	-0.217	-0.0222	-0.0456	15.3	0.647	15.9
TLVP-WWA-34-FD	09/16/19	Unfiltered	0.174	-0.129	-0.023	-0.017	16.1	0.368	15.9
TLVP-WWA-35	09/16/19	Unfiltered	0.851	-0.147	0.139	-0.0338	45.5	0.788	42.8
TLVP-WWA-36	09/23/19	Unfiltered	0.382	-0.0319	0.118	0.237	20.2	0.166	19.8
TLVP-WWA-37	09/24/19	Unfiltered	0.175	0.0133	0.014	0.0169	21.5	0.343	23
TLVP-WWA-38	09/25/19	Unfiltered	0.547 J	-0.138	0.233	0.183	50.2	0.0774	52.6
TLVP-WWA-39	09/26/19	Unfiltered	2.55	-0.228	-0.0492	-0.146	5.31	0.329	5.95
TLVP-WWA-40	09/27/19	Unfiltered	1.2	-0.00544	0.372	0.345	1.76	0.239	1.68
TLVP-WWA-40FD	09/27/19	Unfiltered	1.23	0.0414	-0.185	0.189	2.44	0.161	1.41
TLVP-WWA-41	09/30/19	Unfiltered	0.148	-0.0515	0.0251	-0.144	36.8	1.84	34.3
TLVP-WWA-42	10/01/19	Unfiltered	0.248	-0.268	0.00946	-0.156	38.5	0.647	40.6
TLVP-WWA-43	10/02/19	Unfiltered	1.29	-0.12	0.0686	0.0903	40.7	0.744	43.8
TLVP-WWA-44	10/03/19	Unfiltered	0.625	-0.277	0.105	-0.184	57.3	1.1	56.9
TLVP-WWA-45	10/04/19	Unfiltered	1.61	-0.102	0.27	-0.0892	10.7	0.297	12.3
TLVP-WWA-46	10/07/19	Unfiltered	1.24	-0.162	-0.06	0.115	43.3	1.83	47
TLVP-WWA-47	10/08/19	Unfiltered	0.465	-0.176	0.057	-0.102	39.8	1.94	39.4
TLVP-WWA-48	10/09/19	Filtered	1.06	-0.14	-0.0331	0.104	54.3	2.74	59.7
TLVP-WWA-49	10/10/19	Filtered	1.21	-0.114	0.413	0.0528	52.8	1.95	50.3
TLVP-WWA-50	10/11/19	Unfiltered	0.911	-0.11	0.0587	-0.097	44.5	2.14	48
TLVP-WWA-51	10/14/19	Unfiltered	0.406	-0.202	-0.0117	-0.126	65.1	0.868	67.7
TLVP-WWA-52	10/25/19	Unfiltered	0.621	-0.176	0.0991	-0.0931	54.8	3.42	56.8
TLVP-WWA-53	10/26/19	Unfiltered	0.596	-0.19	0.0546	0.158	51.8	3.63	51.5
TLVP-WWA-54	10/28/19	Unfiltered	0.609	-0.147	0.0267	-0.000975	47.9	2.44	52.3
TLVP-WWA-55	10/30/19	Unfiltered	0.433	-0.185	-0.00371	-0.115	45.6	2	44
TLVP-WWA-55-FD	10/30/19	Unfiltered	0.309	-0.0585	0.223	-0.106	49.3	2.68	48.4
TLVP-WWA-56	11/04/19	Unfiltered	0.39	-0.202	-0.0487	-0.215	50.8	1.97 J	54.1
TLVP-WWA-56-FD	11/04/19	Unfiltered	0.57	-0.117	-0.146	-0.0628	45.7	2.62 J	49.1
TLVP-WWA-57	11/05/19	Unfiltered	0.386	-0.214	-0.0245	-0.224	39.8	2.56	43.3
TLVP-WWA-58	11/06/19	Unfiltered	0.472	-0.0699	1.11	-0.0229	35.3	2.2	34.9
TLVP-WWA-59	11/07/19	Unfiltered	0.116	-0.192	-0.139	-0.0418	28.7	1.81	30.3
TLVP-WWA-60	11/18/19	Unfiltered	0.544	-0.0561	0.0997	-0.158	36	2.75	36.6
TLVP-WWA-61	11/19/19	Unfiltered	0.629	-0.174	0.591	-0.148	34.7	1.9	36.6

Table 5-2 - Treated Excavation Water Radionuclide Sampling Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

Sample ID	Sample Date	Filtered?	Radium-226 pCi/L	Thorium-228 pCi/L	Thorium-230 pCi/L	Thorium-232 pCi/L	Uranium-234 pCi/L	Uranium-235 pCi/L	Uranium-238 pCi/L
		PAL	**87**	**340**	**160**	**140**	**680**	**720**	**750**
		NYCRR[1]	**60**	**200**	**100**	**30**	**300**	**300**	**300**
TLVP-WWA-61-FD	11/19/19	Unfiltered	0.478	-0.126	-0.244	-0.133	27.8	1.37	28.4
TLVP-WWA-62	11/20/19	Unfiltered	1.87	-0.165	-0.285	-0.0806	29.8	1.52	31.1
TLVP-WWA-63	11/21/19	Unfiltered	0.342	-0.0872	-0.147	-0.0641	30.5	1.87	34.4
TLVP-WWA-64	12/10/19	Unfiltered	0.102	-0.249	-0.701	-0.178	19.6	0.813	20.3
TLVP-WWA-65	12/13/19	Unfiltered	0.322	-0.285	-0.216	-0.13	18.5	0.429	20.5

Notes:

Project Action Limit (PAL) Source = Department of Energy (DOE)

[1] = 6 New York Codes, Rules and Regulations (NYCRR) 380, Table III: Releases to Sewers

Abbreviation Key:

pCi/L = picocuries per liter

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
A	1	TLVP-EA-DU1-L1	06/17/19	0.827	1.23	0.724	1.05	0.056	-0.014	0.003	0.04	Pass
		TLVP-EA-DU1-L2	06/17/19	0.825	0.795	0.782	0.859	-0.010	-0.003	0.000	-0.01	Pass
		TLVP-EA-DU1-L3	06/17/19	0.999	1.25	1.32	1.06	0.020	0.010	0.001	0.03	Pass
		TLVP-EA-DU1-L4	06/17/19	0.671	0.311	1.39	0.774	-0.043	0.011	0.000	-0.03	Pass
		TLVP-EA-DU1-L5	06/17/19	0.784	0.885	1.36	0.732	-0.004	0.010	-0.001	0.01	Pass
		TLVP-EA-DU1-L6	06/24/19	-0.0724	0.908	1.17	0.783	-0.003	0.006	0.000	0.00	Pass
	2	TLVP-EA-DU2-L1	06/17/19	0.784	0.982	0.759	0.556	0.006	-0.012	-0.004	-0.01	Pass
		TLVP-EA-DU2-L2	06/17/19	0.687	1.34	1.16	0.447	0.026	0.006	-0.002	0.03	Pass
		TLVP-EA-DU2-L3	06/17/19	0.888	1.02	1.13	0.385	0.005	0.005	-0.002	0.01	Pass
		TLVP-EA-DU2-L4	06/17/19	0.662	1.37	0.83	1.7	0.028	-0.002	0.004	0.03	Pass
		TLVP-EA-DU2-L5	06/17/19	0.716	-0.22	0.76	0.755	-0.078	-0.004	0.000	-0.08	Pass
		TLVP-EA-DU2-L6	06/24/19	1.34	1.11	1.08	0.36	0.011	0.004	-0.002	0.01	Pass
	3	TLVP-EA-DU3-L1	06/21/19	0.283	0.718	0.985	0.454	-0.046	0.005	-0.005	-0.05	Pass
		TLVP-EA-DU3-L2	06/21/19	0.673	0.345	0.802	0.648	-0.040	-0.003	-0.001	-0.04	Pass
		TLVP-EA-DU3-L3	06/21/19	0.559	0.615	0.652	0.223	-0.022	-0.006	-0.003	-0.03	Pass
		TLVP-EA-DU3-L4	06/21/19	0.507	0.494	0.678	0.361	-0.030	-0.006	-0.002	-0.04	Pass
		TLVP-EA-DU3-L5	06/21/19	0.797	1.06	0.898	0.438	0.007	-0.001	-0.002	0.00	Pass
		TLVP-EA-DU3-L6	06/21/19	0.192	0.714	0.511	0.531	-0.016	-0.010	-0.001	-0.03	Pass
B	1	TLVP-EB-DU1-L1	07/02/19	0.614	1.59	0.292	1.3	0.128	-0.045	0.006	0.09	Pass
		TLVP-EB-DU1-L2	07/02/19	0.65	0.93	0.691	1.14	-0.001	-0.005	0.001	-0.01	Pass
		TLVP-EB-DU1-L3	07/02/19	0.715	1.54	0.771	0.707	0.039	-0.004	-0.001	0.04	Pass
		TLVP-EB-DU1-L4	07/02/19	0.678	0.711	0.684	1.32	-0.016	-0.006	0.002	-0.02	Pass
		TLVP-EB-DU1-L5	07/02/19	0.657	1.05	0.637	0.703	0.007	-0.007	-0.001	0.00	Pass
		TLVP-EB-DU1-L6	07/02/19	0.743	1.87	1.17	0.837	0.061	0.006	0.000	0.07	Pass
	2	TLVP-EB-DU2-L1	07/02/19	0.638	1.1	1.28	1.33	0.030	0.026	0.006	0.06	Pass
		TLVP-EB-DU2-L2	07/02/19	0.696	1.13	0.491	0.0724	0.012	-0.010	-0.004	0.00	Pass
		TLVP-EB-DU2-L3	07/02/19	0.629	1.2	1.03	1.08	0.017	0.003	0.001	0.02	Pass
		TLVP-EB-DU2-L4	07/02/19	0.577	0.792	0.982	0.555	-0.011	0.001	-0.001	-0.01	Pass
		TLVP-EB-DU2-L5	07/02/19	0.692	1.57	0.959	0.659	0.041	0.001	-0.001	0.04	Pass
		TLVP-EB-DU2-L6	07/08/19	-0.095 J	-0.204	0.45	0.284	-0.077	-0.011	-0.003	-0.09	Pass
		TLVP-EB-DU2-L6	10/4/2019	0.714	1.08	0.0176	0.423	0.009	-0.021	-0.002	-0.01	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
B	3	TLVP-EB-DU3-L1	07/08/19	0.676	0.885 J	0.398	1.02	-0.013	-0.037	0.002	-0.05	Pass
		TLVP-EB-DU3-L2	07/08/19	0.658	1.57 J	0.564	1.22	0.041	-0.008	0.002	0.03	Pass
		TLVP-EB-DU3-L3	07/08/19	0.683	0.631 J	0.791	1.41	-0.021	-0.003	0.002	-0.02	Pass
		TLVP-EB-DU3-L4	07/08/19	0.933	0.999 J	0.755	0.526	0.003	-0.004	-0.001	0.00	Pass
		TLVP-EB-DU3-L5	07/08/19	1.32	1.44 J	0.947	1.41	0.033	0.001	0.002	0.04	Pass
		TLVP-EB-DU3-L6	07/08/19	1.54	1.99 J	0.937	1.09	0.069	0.000	0.001	0.07	Pass
		TLVP-EB-DU3-L6	10/4/2019	1.22	1.6	1.52	0.379	0.043	0.014	-0.002	0.06	Pass
C	1	TLVP-EC-DU1-L1	07/09/19	0.584	0.789	0.134	1.15	-0.032	-0.056	0.004	-0.08	Pass
		TLVP-EC-DU1-L2	07/09/19	0.603	0.346	0.473	0.918	-0.040	-0.011	0.000	-0.05	Pass
		TLVP-EC-DU1-L3	07/09/19	0.653	1.08	0.475	0.599	0.009	-0.011	-0.001	0.00	Pass
		TLVP-EC-DU1-L4	07/09/19	0.615	1.22	0.171	0.583	0.018	-0.018	-0.001	0.00	Pass
		TLVP-EC-DU1-L5	07/10/19	0.874	1.09	0.462	0.561	0.009	-0.011	-0.001	0.00	Pass
		TLVP-EC-DU1-L6	07/10/19	1.55	1.96	0.577	0.679	0.067	-0.008	-0.001	0.06	Pass
	2	TLVP-EC-DU2-L1	07/09/19	0.527	0.879	0.0135	0.807	-0.014	-0.065	-0.001	-0.08	Pass
		TLVP-EC-DU2-L2	07/09/19	0.73	1.1	0.679	0.275	0.010	-0.006	-0.003	0.00	Pass
		TLVP-EC-DU2-L3	07/09/19	0.604	0.939	0.354	0.52	-0.001	-0.013	-0.002	-0.02	Pass
		TLVP-EC-DU2-L4	07/09/19	0.68	0.723	0.136	0.196	-0.015	-0.019	-0.003	-0.04	Pass
		TLVP-EC-DU2-L5	07/09/19	0.589	1.03	0.0587	0.797	0.005	-0.021	0.000	-0.02	Pass
		TLVP-EC-DU2-L6	07/09/19	0.169	0.203	0.35	0.696	-0.050	-0.014	-0.001	-0.06	Pass
	3	TLVP-EC-DU3-L1	07/11/19	0.779	0.618	0.333	0.692	-0.066	-0.042	-0.002	-0.11	Pass
		TLVP-EC-DU3-L2	07/11/19	0.496	0.568	0.733	0.757	-0.025	-0.004	0.000	-0.03	Pass
		TLVP-EC-DU3-L3	07/11/19	-0.144	-0.418	0.561	0.132	-0.091	-0.009	-0.003	-0.10	Pass
		TLVP-EC-DU3-L4	07/11/19	0.756	0.604	1.22	1.05	-0.023	0.007	0.001	-0.02	Pass
		TLVP-EC-DU3-L5	07/11/19	0.778	1.51	0.337	1.21	0.037	-0.014	0.002	0.03	Pass
		TLVP-EC-DU3-L6	07/11/19	0.902	0.625	0.438	0.141	-0.022	-0.011	-0.003	-0.04	Pass
	4	TLVP-EC-DU4-L1	07/11/19	0.553	1.19	0.532	0.466	0.048	-0.028	-0.005	0.02	Pass
		TLVP-EC-DU4-L2	07/11/19	-0.153	-0.532	0.661	-0.606	-0.099	-0.006	-0.007	-0.11	Pass
		TLVP-EC-DU4-L3	07/11/19	0.897	-0.25	0.431	0.471	-0.080	-0.012	-0.002	-0.09	Pass
		TLVP-EC-DU4-L4	07/11/19	0.451	0.851	0.177	-0.302	-0.007	-0.018	-0.005	-0.03	Pass
		TLVP-EC-DU4-L5	07/11/19	0.813	0.886	0.504	0.866	-0.004	-0.010	0.000	-0.01	Pass
		TLVP-EC-DU4-L6	07/11/19	0.941	1.54	0.513	0.366	0.039	-0.010	-0.002	0.03	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
D	1	TLVP-ED-DU1-L1	07/16/19	0.884	5.28	0.466	3.64	0.866	-0.032	0.037	0.87	Pass
		TLVP-ED-DU1-L2	07/16/19	0.572	1.87	0.205	2.43	0.061	-0.017	0.007	0.05	Pass
		TLVP-ED-DU1-L3	07/16/19	0.853	2.2	0.127	2.75	0.083	-0.019	0.008	0.07	Pass
		TLVP-ED-DU1-L4	07/16/19	2.12	16.3	1.91	18.2	1.023	0.024	0.077	1.12	**Fail***
		TLVP-ED-DU1-L5	07/16/19	3.43	5.67	2.75	6.88	0.315	0.044	0.027	0.39	Pass
		TLVP-ED-DU1-L6	07/16/19	3.2	10.1	2.07	8.22	0.610	0.027	0.033	0.67	Pass
		TLVP-ED-DU1-L6	09/09/19	2.56	4.82	1.61	5.78	0.258	0.016	0.022	0.30	Pass
	2	TLVP-ED-DU2-L1	07/17/19	0.802	7.06	1.14	4	1.222	0.016	0.042	1.28	**Fail***
		TLVP-ED-DU2-L2	07/17/19	1.38	10.2	1.25	11.7	0.617	0.008	0.048	0.67	Pass
		TLVP-ED-DU2-L3	07/17/19	0.779	8.93	1.6	11.9	0.532	0.016	0.049	0.60	Pass
		TLVP-ED-DU2-L4	07/17/19	2.85	20.5	5.37	25.4	1.303	0.106	0.110	1.52	**Fail***
		TLVP-ED-DU2-L5	07/17/19	3.41	14.4	3.2	19.4	0.897	0.054	0.083	1.03	**Fail***
		TLVP-ED-DU2-L6	07/17/19	3.19	53.8	54.2	94	3.523	1.269	0.416	5.21	**Fail***
		TLVP-ED-DU2-ST1-L1	10/08/19	1.35	4.8	1.35	-0.223	0.770	0.031	-0.014	0.79	Pass
		TLVP-ED-DU2-ST1-L2	10/08/19	1.49	4.32	1.8	-0.378	0.225	0.021	-0.006	0.24	Pass
		TLVP-ED-DU2-ST1-L3	10/08/19	1.43	10.1	1.43	6.66	0.610	0.012	0.026	0.65	Pass
		TLVP-ED-DU2-ST1-L4	10/08/19	1.21	17.5	1.78	26.6	1.103	0.020	0.115	1.24	**Fail***
		TLVP-ED-DU2-ST1-L5	10/08/19	3.73	20.6	4.48	23.6	1.310	0.085	0.102	1.50	**Fail***
		TLVP-ED-DU2-ST1-L6	10/08/19	3.01	15	7.44	17.3	0.937	0.155	0.073	1.17	**Fail***
	3	TLVP-ED-DU3-L1	07/17/19	0.613	0.742	0.502	1.08	-0.042	-0.030	0.003	-0.07	Pass
		TLVP-ED-DU3-L2	07/17/19	0.769	1.08	0.614	1.69	0.009	-0.007	0.004	0.01	Pass
		TLVP-ED-DU3-L3	07/17/19	0.564	1.23	1.03	1.44	0.019	0.003	0.003	0.02	Pass
		TLVP-ED-DU3-L4	07/17/19	0.964	2.08	1.88	0.792	0.075	0.023	0.000	0.10	Pass
		TLVP-ED-DU3-L5	07/17/19	2.07	-0.264	2.12	2.27	-0.081	0.029	0.006	-0.05	Pass
		TLVP-ED-DU3-L6	07/17/19	2.7	0.329	3.16	2.24	-0.041	0.053	0.006	0.02	Pass
		TLVP-ED-DU3-L6	10/01/19	2.92	3.06	2.93	2.67	0.141	0.048	0.008	0.20	Pass
	4	TLVP-ED-DU4-L1	07/17/19	0.723	-0.617	0.585	1.99	-0.313	-0.024	0.015	-0.32	Pass
		TLVP-ED-DU4-L2	07/17/19	0.746	1.79	0.933	1.86	0.056	0.000	0.004	0.06	Pass
		TLVP-ED-DU4-L3	07/17/19	0.857	1.29	0.727	1.1	0.023	-0.005	0.001	0.02	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
D	4	TLVP-ED-DU4-L4	07/17/19	1.14	1.5	1.58	2.15	0.037	0.016	0.006	0.06	Pass
		TLVP-ED-DU4-L5	07/17/19	2.48	2.37	2.78	1.82	0.095	0.044	0.004	0.14	Pass
		TLVP-ED-DU4-L6	07/17/19	2.29	4.51	2.26	2.49	0.237	0.032	0.007	0.28	Pass
		TLVP-ED-DU4-L6	10/01/19	0.97	1.62	1.69	0.616	0.045	0.018	-0.001	0.06	Pass
	5	TLVP-ED-DU5-L1	09/06/19	1.21	3.86	0.774	3.67	0.582	-0.010	0.037	0.61	Pass
		TLVP-ED-DU5-L2	09/06/19	1.05	6.33	0.706	4.35	0.359	-0.005	0.016	0.37	Pass
		TLVP-ED-DU5-L3	09/06/19	1.47	16.5	0.302	26.3	1.037	-0.015	0.114	1.14	Fail*
		TLVP-ED-DU5-L4	09/06/19	3.02	17.2	2.93	8.66	1.083	0.048	0.035	1.17	Fail*
		TLVP-ED-DU5-L5	09/06/19	4.63	35.7	7.09	44.4	2.317	0.147	0.194	2.66	Fail*
		TLVP-ED-DU5-L6	09/06/19	4.19	10.4	4.64	8.16	0.630	0.089	0.033	0.75	Pass
		TLVP-ED-DU5-ST1-L1	10/08/19	1.4	2.27	1.73	3.02	0.264	0.058	0.029	0.35	Pass
		TLVP-ED-DU5-ST1-L2	10/08/19	1.71	4.36	0.759	0.35	0.227	-0.004	-0.002	0.22	Pass
		TLVP-ED-DU5-ST1-L3	10/08/19	1.37	7.57	0.918	6.15	0.441	0.000	0.024	0.46	Pass
		TLVP-ED-DU5-ST1-L4	10/08/19	2.01	4.67	2.74	6.24	0.248	0.043	0.024	0.32	Pass
		TLVP-ED-DU5-ST1-L5	10/08/19	2.49	9.24	4.13	13.6	0.553	0.076	0.057	0.69	Pass
		TLVP-ED-DU5-ST1-L6	10/08/19	3.33	10.2	3.53	2.57	0.617	0.062	0.008	0.69	Pass
	6	TLVP-ED-DU6-L1	10/09/19	0.811	3.08	2.1	2.25	0.426	0.084	0.019	0.53	Pass
		TLVP-ED-DU6-L2	10/09/19	0.85	1.75	0.611	1.48	0.053	-0.007	0.003	0.05	Pass
		TLVP-ED-DU6-L3	10/09/19	1.5	3.66	1.47	2.4	0.181	0.013	0.007	0.20	Pass
		TLVP-ED-DU6-L4	10/09/19	2.75	5.81	2.86	3.91	0.324	0.046	0.014	0.38	Pass
		TLVP-ED-DU6-L5	10/09/19	3.68	5.51	3.73	4.3	0.304	0.067	0.015	0.39	Pass
		TLVP-ED-DU6-L6	10/09/19	4.06	4.64	3.77	4.29	0.246	0.068	0.015	0.33	Pass
	7	TLVP-ED-DU7-L1	10/03/19	0.921	1.78	0.344	1.06	0.166	-0.041	0.003	0.13	Pass
		TLVP-ED-DU7-L2	10/03/19	0.749	1.52	1.06	1.93	0.038	0.003	0.005	0.05	Pass
		TLVP-ED-DU7-L3	10/03/19	1.92	2.82	1.76	3.19	0.125	0.020	0.010	0.16	Pass
		TLVP-ED-DU7-L4	10/03/19	2.46	2.86	1.84	0.671	0.127	0.022	-0.001	0.15	Pass
		TLVP-ED-DU7-L5	10/03/19	2.51	3.91	2.01	0.982	0.197	0.026	0.001	0.22	Pass
		TLVP-ED-DU7-L6	10/03/19	2.66	2.64	3.19	1.46	0.113	0.054	0.003	0.17	Pass
	8	TLVP-ED-DU8-L1	10/01/19	1.23	2	1.16	1.96	0.210	0.017	0.015	0.24	Pass
		TLVP-ED-DU8-L2	10/01/19	1.15	4.3	0.747	2.15	0.223	-0.004	0.006	0.22	Pass
		TLVP-ED-DU8-L3	10/01/19	1.39	2.32	1.05	1.33	0.091	0.003	0.002	0.10	Pass
		TLVP-ED-DU8-L4	10/01/19	2.81	5.1	3.05	3.39	0.277	0.051	0.011	0.34	Pass

Table 5-4 - Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
D	8	TLVP-ED-DU8-L5	10/01/19	2.88	3.78	1.96	2.96	0.189	0.025	0.009	0.22	Pass
		TLVP-ED-DU8-L6	10/01/19	2.41	4.52	2.02	2.51	0.238	0.026	0.007	0.27	Pass
	9	TLVP-ED-DU9-L1	10/10/19	0.998	2.83	0.452	2.99	0.376	-0.033	0.028	0.37	Pass
		TLVP-ED-DU9-L2	10/10/19	1.31	4.49	1.28	3.73	0.236	0.009	0.013	0.26	Pass
		TLVP-ED-DU9-L3	10/10/19	1.99	7.54	2.35	3.38	0.439	0.034	0.011	0.48	Pass
		TLVP-ED-DU9-L4	10/10/19	4.36	19.7	5.02	13.4	1.250	0.098	0.056	1.40	**Fail***
		TLVP-ED-DU9-L5	10/10/19	4.18	8.63	3.78	7.67	0.512	0.068	0.030	0.61	Pass
		TLVP-ED-DU9-L6	10/10/19	3.93	13	3.78	5.36	0.803	0.068	0.020	0.89	Pass
	10	TLVP-ED-DU10-L1	10/11/19	0.712	2.05	0.63	3.23	0.220	-0.021	0.032	0.23	Pass
		TLVP-ED-DU10-L2	10/11/19	0.544	3.37	0.83	3.55	0.161	-0.002	0.012	0.17	Pass
		TLVP-ED-DU10-L3	10/11/19	0.707	2.54	0.7	5.57	0.106	-0.005	0.021	0.12	Pass
		TLVP-ED-DU10-L4	10/11/19	2.11	5.35	1.99	4.16	0.293	0.025	0.015	0.33	Pass
		TLVP-ED-DU10-L5	10/11/19	3.67	9.8	3.71	9.11	0.590	0.066	0.037	0.69	Pass
		TLVP-ED-DU10-L6	10/11/19	3.33	12.7	4.07	8.25	0.783	0.075	0.033	0.89	Pass
	11	TLVP-ED-DU111-L1	11/06/19	0.542	0.917	0.225	0.515	-0.007	-0.050	-0.005	-0.06	Pass
		TLVP-ED-DU111-L1-FD	11/06/19	0.71	0.896	0.545	0.547	-0.011	-0.027	-0.004	-0.04	Pass
		TLVP-ED-DU11-L2	11/06/19	0.606	-0.0779	0.253	0.0844	-0.069	-0.016	-0.003	-0.09	Pass
		TLVP-ED-DU11-L3	11/06/19	0.919	0.674	0.137	0.286	-0.018	-0.019	-0.003	-0.04	Pass
		TLVP-ED-DU11-L3-FD	11/06/19	1.45	2.71	1.1	1.27	0.117	0.004	0.002	0.12	Pass
		TLVP-ED-DU11-L4	11/06/19	2.08	2.91	0.973	2.34	0.131	0.001	0.007	0.14	Pass
		TLVP-ED-DU11-L5	11/06/19	2.06	3.66	2.65	1.52	0.181	0.041	0.003	0.22	Pass
		TLVP-ED-DU11-L6	11/06/19	3.88	4.8	2.79	3.39	0.257	0.045	0.011	0.31	Pass
	12	TLVP-ED-DU12-L1	10/09/19	1.24	1.85	1.36	0.734	0.180	0.031	-0.002	0.21	Pass
		TLVP-ED-DU12-L2	10/09/19	1.03	1.32	0.652	1.04	0.025	-0.006	0.001	0.02	Pass
		TLVP-ED-DU12-L3	10/09/19	1.05	1.46	0.448	1	0.034	-0.011	0.001	0.02	Pass
		TLVP-ED-DU12-L4	10/09/19	1.4	3.5	1.07	2.52	0.170	0.004	0.007	0.18	Pass
		TLVP-ED-DU12-L5	10/09/19	3.34	6.52	2.64	3.6	0.371	0.041	0.012	0.42	Pass
		TLVP-ED-DU12-L6	10/09/19	3.62	12.5	7.07	7.01	0.770	0.146	0.027	0.94	Pass
	13	TLVP-ED-DU13-L1	11/06/19	0.454	1.1	0.383	0.275	0.030	-0.038	-0.008	-0.02	Pass
		TLVP-ED-DU13-L1-FD	11/06/19	2.08	3.93	1.34	2.38	0.596	0.030	0.020	0.65	Pass
		TLVP-ED-DU13-L2	11/06/19	0.0212	-0.286	0.614	0.173	-0.082	-0.007	-0.003	-0.09	Pass
		TLVP-ED-DU13-L3	11/06/19	1.26	1.55 J	0.844 J	0.228	0.040	-0.002	-0.003	0.04	Pass

Table 5-4 - Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
D	13	TLVP-ED-DU13-L3-FD	11/06/19	3.48	8.82 J	4.56 J	10.1	0.525	0.087	0.041	0.65	Pass
		TLVP-ED-DU13-L4	11/06/19	2.83	6.48	2.9	3.56	0.369	0.047	0.012	0.43	Pass
		TLVP-ED-DU13-L5	11/06/19	3.49	9.82 J	3.4 J	11.1	0.591	0.059	0.046	0.70	Pass
		TLVP-ED-DU13-L5-FD	11/06/19	1.6	2.24 J	0.415 J	1.04	0.086	-0.012	0.001	0.07	Pass
		TLVP-ED-DU13-L6	11/06/19	2.43	4.46	2.06	2.12	0.234	0.027	0.006	0.27	Pass
	14	TLVP-ED-DU14-L1	10/28/19	0.601	0.72	0.403	0.231	-0.046	-0.037	-0.008	-0.09	Pass
		TLVP-ED-DU14-L2	10/28/19	0.577	0.533	0.0382	-0.0231	-0.028	-0.021	-0.004	-0.05	Pass
		TLVP-ED-DU14-L3	10/28/19	1.02	0.575	0.545	0.682	-0.025	-0.009	-0.001	-0.03	Pass
		TLVP-ED-DU14-L4	10/28/19	1.6	4.34	1.37	3.39	0.226	0.011	0.011	0.25	Pass
		TLVP-ED-DU14-L5	10/28/19	2.24	2.86	1.05	4.74	0.127	0.003	0.017	0.15	Pass
		TLVP-ED-DU14-L6	10/28/19	4.11	10.5	4.52	6.7	0.637	0.086	0.026	0.75	Pass
	15	TLVP-ED-DU15-L1	11/06/19	0.276	0.705	0.42 J	0.643	-0.049	-0.036	-0.003	-0.09	Pass
		TLVP-ED-DU15-L1-FD	11/06/19	3.58	4.71	2.78 J	3.33	0.752	0.133	0.033	0.92	Pass
		TLVP-ED-DU15-L2	11/06/19	0.476	0.739	0.77	0.774	-0.014	-0.004	0.000	-0.02	Pass
		TLVP-ED-DU15-L3	11/06/19	1.13	2.87	1.04	1.53	0.128	0.003	0.003	0.13	Pass
		TLVP-ED-DU15-L3-FD	11/06/19	0.848	2.38	1.21	1.06	0.095	0.007	0.001	0.10	Pass
		TLVP-ED-DU15-L4	11/06/19	2.07	3.52	3.06	2.11	0.171	0.051	0.006	0.23	Pass
		TLVP-ED-DU15-L5	11/06/19	3.61	6.52	2.54	4.84	0.371	0.039	0.018	0.43	Pass
		TLVP-ED-DU15-L5-FD	11/06/19	2.79	4.34	3.05	4.51	0.226	0.051	0.016	0.29	Pass
		TLVP-ED-DU15-L6	11/06/19	3.58	5.67	2.87	6.93	0.315	0.046	0.027	0.39	Pass
E	1	TLVP-EE-DU1-L1	07/23/19	0.985	2.32	0.557	3.38	0.274	-0.026	0.034	0.28	Pass
		TLVP-EE-DU1-L1	10/17/19	0.593	1.05	0.63	0.451	0.020	-0.021	-0.005	-0.01	Pass
		TLVP-EE-DU1-L2	07/23/19	1.55	4.81	0.987	5.66	0.257	0.002	0.021	0.28	Pass
		TLVP-EE-DU1-L2	10/17/19	0.624	0.995	0.292	1.02	0.003	-0.015	0.001	-0.01	Pass
		TLVP-EE-DU1-L3	07/23/19	1.06	-9.77	0.395	-3.48	-0.715	-0.013	-0.019	-0.75	Pass
		TLVP-EE-DU1-L3	10/17/19	0.773	4.34	0.562	1.21	0.226	-0.009	0.002	0.22	Pass
		TLVP-EE-DU1-L4	07/23/19	3.61	14.4	2.39	16.7	0.897	0.035	0.071	1.00	Fail*
		TLVP-EE-DU1-L4	10/17/19	1.47	5.33	2	4.51	0.292	0.026	0.016	0.33	Pass
		TLVP-EE-DU1-L5	07/23/19	3.5	8.07	3.04	8.75	0.475	0.050	0.035	0.56	Pass
		TLVP-EE-DU1-L5	10/17/19	2.15	5.32	1.81	4.93	0.291	0.021	0.018	0.33	Pass
		TLVP-EE-DU1-L6	07/23/19	2.99	7.4	2.64	10	0.430	0.041	0.041	0.51	Pass
		TLVP-EE-DU1-L6	10/17/19	2.75	6.42	2.67	4.83	0.365	0.042	0.018	0.42	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
E	2	TLVP-EE-DU2-L1	10/17/19	0.734	5.21	1.23	5.97	0.852	0.022	0.068	0.94	Pass
		TLVP-EE-DU2-L2	10/17/19	0.733	2.31	1.74	2.98	0.091	0.020	0.009	0.12	Pass
		TLVP-EE-DU2-L3	10/17/19	1.45	12.6	0.827	13.2	0.777	-0.002	0.055	0.83	Pass
		TLVP-EE-DU2-L4	10/17/19	1.3	5.45	1.23	2.86	0.300	0.007	0.009	0.32	Pass
		TLVP-EE-DU2-L5	10/17/19	2.74	4.61	1.79	5.89	0.244	0.021	0.022	0.29	Pass
		TLVP-EE-DU2-L6	10/17/19	3.38	13.3	3.54	14.2	0.823	0.062	0.060	0.95	Pass
	3	TLVP-EE-DU3-L1	10/17/19	1.45	9.43	0.309	7.67	1.696	-0.044	0.091	1.74	**Fail***
		TLVP-EE-DU3-L2	10/17/19	0.804	10.4	0.848	10.2	0.630	-0.002	0.042	0.67	Pass
		TLVP-EE-DU3-L3	10/17/19	1.3	5.12	0.9	8.82	0.278	0.000	0.036	0.31	Pass
		TLVP-EE-DU3-L4	10/17/19	1.69	10.4	1.2	11.7	0.630	0.007	0.048	0.69	Pass
		TLVP-EE-DU3-L5	10/17/19	1.57	9.04	1.79	9.95	0.539	0.021	0.041	0.60	Pass
		TLVP-EE-DU3-L6	10/17/19	2.34	5.83	2.71	10	0.325	0.043	0.041	0.41	Pass
	4	TLVP-EE-DU4-L1	10/17/19	6.04	19.8	7.78	26.4	3.770	0.490	0.341	4.60	**Fail***
		TLVP-EE-DU4-L1-ST1	10/28/19	1.62	2.7	1.26	3.75	0.350	0.024	0.039	0.41	Pass
		TLVP-EE-DU4-L2	10/17/19	0.414	20.1	6.92	-3.88	1.277	0.143	-0.021	1.40	**Fail***
		TLVP-EE-DU4-L3	10/17/19	3.23	12.8	4.42	16.5	0.790	0.083	0.070	0.94	Pass
		TLVP-EE-DU4-L4	10/17/19	1.7	17.9	2.64	16.8	1.130	0.041	0.071	1.24	**Fail***
		TLVP-EE-DU4-L5	10/17/19	2.72	13.6	2.49	20.2	0.843	0.037	0.086	0.97	Pass
		TLVP-EE-DU4-L6	10/17/19	2.56	14.1	3.92	10.6	0.877	0.071	0.043	0.99	Pass
	5	TLVP-EE-DU5-L1	10/17/19	1.1	4.35	0.915	2.86	0.680	0.000	0.027	0.71	Pass
		TLVP-EE-DU5-L2	10/17/19	1.24	2.38	1.57	2.55	0.095	0.015	0.008	0.12	Pass
		TLVP-EE-DU5-L3	10/17/19	1.84	4.72	1.23	3.6	0.251	0.007	0.012	0.27	Pass
		TLVP-EE-DU5-L4	10/17/19	2.05	11	3.69	12.3	0.670	0.066	0.051	0.79	Pass
		TLVP-EE-DU5-L5	10/17/19	1.63	9.5	2.36	10	0.570	0.034	0.041	0.65	Pass
		TLVP-EE-DU5-L6	10/17/19	2.58	6.96	2.39	6.98	0.401	0.035	0.027	0.46	Pass
	6	TLVP-EE-DU6-L1	10/17/19	0.724	0.966	0.582	0.635	0.003	-0.024	-0.003	-0.02	Pass
		TLVP-EE-DU6-L2	10/17/19	0.58	2.29	0.387	1.78	0.089	-0.013	0.004	0.08	Pass
		TLVP-EE-DU6-L3	10/17/19	0.854	2	0.638	2.21	0.070	-0.007	0.006	0.07	Pass
		TLVP-EE-DU6-L4	10/17/19	0.995	11.3	11.2	6.84	0.690	0.245	0.027	0.96	Pass
		TLVP-EE-DU6-L5	10/17/19	2.63	9.34	3.91	15	0.559	0.071	0.063	0.69	Pass
		TLVP-EE-DU6-L6	10/17/19	2.74	6.06	1.47	9.71	0.341	0.013	0.040	0.39	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
E	7	TLVP-EE-DU7-L1	10/17/19	0.769	1.73	0.973	0.879	0.156	0.004	0.000	0.16	Pass
		TLVP-EE-DU7-L2	10/17/19	0.86	3.32	0.562	1.7	0.158	-0.009	0.004	0.15	Pass
		TLVP-EE-DU7-L3	10/17/19	0.691	3.37	0.742	2.17	0.161	-0.004	0.006	0.16	Pass
		TLVP-EE-DU7-L4	10/17/19	0.495	2.64	0.452	3.52	0.113	-0.011	0.012	0.11	Pass
		TLVP-EE-DU7-L5	10/17/19	0.491	2.19	0.333	4.12	0.083	-0.014	0.015	0.08	Pass
		TLVP-EE-DU7-L6	10/17/19	1.07	2.72	0.92	2.99	0.118	0.000	0.010	0.13	Pass
F	1	TLVP-EF-DU1-L1	07/22/19	0.571	-0.609	0.267	0.739	-0.312	-0.047	-0.002	-0.36	Pass
		TLVP-EF-DU1-L2	07/22/19	1.08	1.2	0.106	0.954	0.017	-0.019	0.000	0.00	Pass
		TLVP-EF-DU1-L3	07/22/19	0.961	1.19	0.391	0.511	0.016	-0.013	-0.002	0.00	Pass
		TLVP-EF-DU1-L4	07/22/19	0.713	0.977	0.292	0.106	0.002	-0.015	-0.003	-0.02	Pass
		TLVP-EF-DU1-L5	07/22/19	0.69	0.958	0.428	0.433	0.001	-0.012	-0.002	-0.01	Pass
		TLVP-EF-DU1-L6	07/22/19	0.784	1.19	0.416	0.0516	0.016	-0.012	-0.004	0.00	Pass
	2	TLVP-EF-DU2-L1	07/23/19	0.657	1.23	0.293	0.286	0.056	-0.045	-0.008	0.00	Pass
		TLVP-EF-DU2-L2	07/23/19	0.861	1.37	0.233	0.719	0.028	-0.016	-0.001	0.01	Pass
		TLVP-EF-DU2-L3	07/23/19	0.726	0.84	0.282	0.511	-0.007	-0.015	-0.002	-0.02	Pass
		TLVP-EF-DU2-L4	07/23/19	1.04	0.777	0.335	0.235	-0.012	-0.014	-0.003	-0.03	Pass
		TLVP-EF-DU2-L5	07/23/19	0.786	1.27	0.279	-0.726	0.021	-0.015	-0.007	0.00	Pass
		TLVP-EF-DU2-L6	07/23/19	1.34	2.41	0.527	0.934	0.097	-0.009	0.000	0.09	Pass
	3	TLVP-EF-DU3-L1	07/23/19	1.12	1.35	0.611	0.731	0.080	-0.022	-0.002	0.06	Pass
		TLVP-EF-DU3-L2	07/23/19	1.13	0.579	0.896	1.03	-0.025	-0.001	0.001	-0.02	Pass
		TLVP-EF-DU3-L3	07/23/19	1.12	0.512	0.806	0.398	-0.029	-0.003	-0.002	-0.03	Pass
		TLVP-EF-DU3-L4	07/23/19	1.05	0.876	0.919	0.604	-0.005	0.000	-0.001	-0.01	Pass
		TLVP-EF-DU3-L5	07/23/19	1.15	1.3	0.341	0.733	0.023	-0.014	-0.001	0.01	Pass
		TLVP-EF-DU3-L6	07/23/19	1.82	3.09	0.978	1.85	0.143	0.001	0.004	0.15	Pass
G	1	TLVP-EG-DU01-L1	11/15/19	0.896	2.88	0.298	1.05	0.386	-0.044	0.003	0.34	Pass
		TLVP-EG-DU01-L2	11/15/19	1.29	2.54	4.6	2.02	0.106	0.088	0.005	0.20	Pass
		TLVP-EG-DU01-L2-FD	11/15/19	3.27	5.91	6.68	4.95	0.331	0.137	0.018	0.49	Pass
		TLVP-EG-DU01-L3	11/15/19	0.97	2.16	1.05	1.34	0.081	0.003	0.002	0.09	Pass
		TLVP-EG-DU01-L3-FD	11/15/19	1.92	2.85	5.84	3.11	0.127	0.117	0.010	0.25	Pass
		TLVP-EG-DU01-L4	11/15/19	0.859	0.759	0.0218	1.55	-0.013	-0.021	0.003	-0.03	Pass
		TLVP-EG-DU01-L4-FD	11/15/19	1.13	1.98	2.04	1.75	0.069	0.027	0.004	0.10	Pass
		TLVP-EG-DU01-L5	11/15/19	0.944	1.09	0.943	0.494	0.009	0.001	-0.002	0.01	Pass

Table 5-4 - Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
G	1	TLVP-EG-DU01-L6	11/15/19	1.22	2.04	1.13	1.62	0.073	0.005	0.003	0.08	Pass
		TLVP-EG-DU01-L6-FD	11/15/19	1.18	1.46	0.743	0.338	0.034	-0.004	-0.002	0.03	Pass
	2	TLVP-EG-DU02-L1	11/15/19	0.69	0.73	1.5	0.711	-0.044	0.041	-0.002	0.00	Pass
		TLVP-EG-DU02-L2	11/15/19	1.19	1.91	1.18	0.72	0.064	0.006	-0.001	0.07	Pass
		TLVP-EG-DU02-L3	11/15/19	1.15	2.33	0.76	0.771	0.092	-0.004	0.000	0.09	Pass
		TLVP-EG-DU02-L4	11/15/19	0.82	0.407	0.205	-3.07	-0.036	-0.017	-0.018	-0.07	Pass
		TLVP-EG-DU02-L4-FD	11/15/19	0.41	1.5	0.821	2.07	0.037	-0.002	0.005	0.04	Pass
		TLVP-EG-DU02-L5	11/15/19	0.546	0.831	0.716	0.669	-0.008	-0.005	-0.001	-0.01	Pass
		TLVP-EG-DU02-L5-FD	11/15/19	0.614	1.26	0.67	0.706	0.021	-0.006	-0.001	0.01	Pass
		TLVP-EG-DU02-L6	11/15/19	0.878	0.831	0.416	0.593	-0.008	-0.012	-0.001	-0.02	Pass
		TLVP-EG-DU02-L6-FD	11/15/19	0.679	1.34	0.72	0.117	0.026	-0.005	-0.003	0.02	Pass
	3	TLVP-EG-DU03-L1	11/15/19	1.24	3.18	0.812	3.24	0.446	-0.008	0.032	0.47	Pass
		TLVP-EG-DU03-L2	11/15/19	1.05	2.24	1.13	1.22	0.086	0.005	0.002	0.09	Pass
		TLVP-EG-DU03-L2-FD	11/15/19	1.04	1.74	1.2	1.32	0.053	0.007	0.002	0.06	Pass
		TLVP-EG-DU03-L3	11/15/19	0.713	1.08	0.822	0.619	0.009	-0.002	-0.001	0.01	Pass
		TLVP-EG-DU03-L3-FD	11/15/19	2.34	3.78	1.7	1.59	0.189	0.019	0.003	0.21	Pass
		TLVP-EG-DU03-L4	11/15/19	1.64	3.03	1.46	1.05	0.139	0.013	0.001	0.15	Pass
		TLVP-EG-DU03-L5	11/15/19	1.69	4.08	1.19	1.62	0.209	0.006	0.003	0.22	Pass
		TLVP-EG-DU03-L5-FD	11/15/19	0.809	1.73	1.15	0.931	0.052	0.005	0.000	0.06	Pass
		TLVP-EG-DU03-L6	11/15/19	0.616	0.544	0.325	0.368	-0.027	-0.014	-0.002	-0.04	Pass
		TLVP-EG-DU03-L6-FD	11/15/19	0.586	0.788	0.707	0.575	-0.011	-0.005	-0.001	-0.02	Pass
	4	TLVP-EG-DU4-L1	11/20/19	0.931	2.21	1.26	2.27	0.252	0.024	0.019	0.30	Pass
		TLVP-EG-DU4-L2	11/20/19	1.38	4.03	1.21	-3.42	0.205	0.007	-0.019	0.19	Pass
		TLVP-EG-DU4-L3	11/20/19	3.22	8.01	4.45	6.67	0.471	0.084	0.026	0.58	Pass
		TLVP-EG-DU4-L4	11/20/19	3.04	6.04	2.33	5.93	0.339	0.034	0.023	0.40	Pass
		TLVP-EG-DU4-L5	11/20/19	4.09	9.63	3.73	13.7	0.579	0.067	0.057	0.70	Pass
		TLVP-EG-DU4-L6	11/20/19	2.94	5.14	2.3	2.49	0.279	0.033	0.007	0.32	Pass
	5	TLVP-EG-DU5-L1	11/20/19	0.902	6.34	0.325	5.71	1.078	-0.043	0.065	1.10	Fail*
		TLVP-EG-DU5-L1-FD	11/20/19	1.19	5.35	0.309	5.31	0.880	-0.044	0.059	0.90	Pass
		TLVP-EG-DU5-L2	11/20/19	4.5	15.2 J	16.9	13.4 J	0.950	0.380	0.056	1.39	Fail*
		TLVP-EG-DU5-L2-FD	11/20/19	4.45	10.1 J	13.1	3.97 J	0.610	0.290	0.014	0.91	Pass
		TLVP-EG-DU5-L3	11/20/19	3.03	6.87	2.92	5.13	0.395	0.048	0.019	0.46	Pass

Table 5-4 - Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
G	5	TLVP-EG-DU5-L4	11/20/19	3.92	5.31	3.27	3.6	0.291	0.056	0.012	0.36	Pass
		TLVP-EG-DU5-L4-FD	11/20/19	4.33	3.93	2.84	4.05	0.199	0.046	0.014	0.26	Pass
		TLVP-EG-DU5-L5	11/20/19	4.09	5.3	3.43	2.51	0.290	0.060	0.007	0.36	Pass
		TLVP-EG-DU5-L5-FD	11/20/19	2.85	3.66	3.13	3.37	0.181	0.053	0.011	0.24	Pass
		TLVP-EG-DU5-L6	11/20/19	3.63	7.78	2.51	2	0.455	0.038	0.005	0.50	Pass
	6	TLVP-EG-DU6-L1	11/20/19	1.41	6.42	-0.155	6.88	1.094	-0.077	0.080	1.10	**Fail***
		TLVP-EG-DU6-L1-FD	11/20/19	1.59	3.44	1.55	4.56	0.498	0.045	0.049	0.59	Pass
		TLVP-EG-DU6-L2	11/20/19	1.92	3.81	0.978	2.77	0.191	0.001	0.009	0.20	Pass
		TLVP-EG-DU6-L3	11/20/19	2.21	7.96	3.58	8.52	0.467	0.063	0.034	0.56	Pass
		TLVP-EG-DU6-L3-FD	11/20/19	1.99	7.16	2.66	4.37	0.414	0.041	0.016	0.47	Pass
		TLVP-EG-DU6-L4	11/20/19	2.25	4.39	1.22	4.6	0.229	0.007	0.017	0.25	Pass
		TLVP-EG-DU6-L4-FD	11/20/19	2.08	3.61	1.63	3.67	0.177	0.017	0.013	0.21	Pass
		TLVP-EG-DU6-L5	11/20/19	2.83	3.51	1.81	3.64	0.171	0.021	0.012	0.20	Pass
		TLVP-EG-DU6-L5-FD	11/20/19	2.39	3.63	2.11	3.81	0.179	0.028	0.013	0.22	Pass
		TLVP-EG-DU6-L6	11/20/19	2.41	2.98	1.62	0.745	0.135	0.017	-0.001	0.15	Pass
	7	TLVP-EG-DU7-L1	11/20/19	1.36	3.37	1.52	4	0.484	0.043	0.042	0.57	Pass
		TLVP-EG-DU7-L2	11/20/19	0.911	9.29	2.63	9.9	0.556	0.041	0.040	0.64	Pass
		TLVP-EG-DU7-L3	11/20/19	2.82	8.06	2.54	7.12	0.474	0.039	0.028	0.54	Pass
		TLVP-EG-DU7-L4	11/20/19	3.37	15	7.03	21.2	0.937	0.145	0.091	1.17	**Fail***
		TLVP-EG-DU7-L5	11/20/19	2.56	6.15	1.72	2.49	0.347	0.019	0.007	0.37	Pass
		TLVP-EG-DU7-L6	11/20/19	2.42	7.56	2.56	6.61	0.441	0.039	0.026	0.51	Pass
	8	TLVP-EG-DU8-L1	11/20/19	1.17	1.95	1.25	2.15	0.200	0.024	0.017	0.24	Pass
		TLVP-EG-DU8-L2	11/20/19	1.33	2.72	1.26	2.34	0.118	0.008	0.007	0.13	Pass
		TLVP-EG-DU8-L3	11/20/19	1.71	4.24	1.07	3.14	0.219	0.004	0.010	0.23	Pass
		TLVP-EG-DU8-L4	11/20/19	2.57	5.81	1.8	2.83	0.324	0.021	0.009	0.35	Pass
		TLVP-EG-DU8-L5	11/20/19	3.7	16.8	3.5	9.97	1.057	0.061	0.041	1.16	**Fail***
		TLVP-EG-DU8-L6	11/20/19	3.33	7.45	2.7	5.28	0.433	0.042	0.020	0.50	Pass

Table 5-4 - Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
H	1	TLVP-EH-DU01-L1	11/28/19	0.728	0.936	0.55	0.599	-0.003	-0.026	-0.003	-0.03	Pass
		TLVP-EH-DU01-L2	11/28/19	0.671	0.818	0.397	0.0177	-0.009	-0.012	-0.004	-0.03	Pass
		TLVP-EH-DU01-L2-FD	11/28/19	0.589	0.927	0.588	0.255	-0.002	-0.008	-0.003	-0.01	Pass
		TLVP-EH-DU01-L3	11/28/19	0.988	1.72	0.546	0.43	0.051	-0.009	-0.002	0.04	Pass
		TLVP-EH-DU01-L4	11/28/19	1.63	2.74	1.48	1.38	0.119	0.013	0.002	0.13	Pass
		TLVP-EH-DU01-L4-FD	11/28/19	1.35	2.62	1.28	1.13	0.111	0.009	0.001	0.12	Pass
		TLVP-EH-DU01-L5	11/28/19	3.08	4.69	2.38	2.65	0.249	0.035	0.008	0.29	Pass
		TLVP-EH-DU01-L6	11/28/19	0.974	1.04	0.339	-0.0648	0.006	-0.014	-0.004	-0.01	Pass
	2	TLVP-EH-DU02-L1	11/26/19	0.731	1.49	0.573	0.351	0.108	-0.025	-0.007	0.08	Pass
		TLVP-EH-DU02-L2	11/26/19	0.708	0.712	0.508	0.802	-0.016	-0.010	0.000	-0.03	Pass
		TLVP-EH-DU02-L2-FD	11/26/19	0.605	1.64	0.381	0.552	0.046	-0.013	-0.001	0.03	Pass
		TLVP-EH-DU02-L3	11/26/19	0.671	1.06	0.671	-0.0366	0.007	-0.006	-0.004	0.00	Pass
		TLVP-EH-DU02-L4	11/26/19	0.828	1.81	0.43	0.397	0.057	-0.012	-0.002	0.04	Pass
		TLVP-EH-DU02-L4-FD	11/26/19	1.1	2.15	0.892	0.898	0.080	-0.001	0.000	0.08	Pass
		TLVP-EH-DU02-L5	11/26/19	2.66	3.65	2.61	0.815	0.180	0.040	0.000	0.22	Pass
		TLVP-EH-DU02-L6	11/26/19	1.63	2.14	1.25	0.716	0.079	0.008	-0.001	0.09	Pass
	3	TLVP-EH-DU03-L1	12/06/19	0.583	0.947	0.412	0.607	-0.001	-0.036	-0.003	-0.04	Pass
		TLVP-EH-DU03-L2	12/06/19	0.552	0.753	0.629	0.288	-0.013	-0.007	-0.003	-0.02	Pass
		TLVP-EH-DU03-L3	12/06/19	0.694	1.45	0.473	0.246	0.033	-0.011	-0.003	0.02	Pass
		TLVP-EH-DU03-L4	12/06/19	0.878	0.443	0.45	0.528	-0.034	-0.011	-0.001	-0.05	Pass
		TLVP-EH-DU03-L5	12/06/19	3.08	4.62	2.31	2.2	0.245	0.033	0.006	0.28	Pass
		TLVP-EH-DU03-L6	12/06/19	1.47	2.96	0.909	2.04	0.134	0.000	0.005	0.14	Pass
	4	TLVP-EH-DU04-L1	12/06/19	0.489	0.486	0.925	0.575	-0.093	0.000	-0.004	-0.10	Pass
		TLVP-EH-DU04-L2	12/06/19	0.644	0.715	0.599	0.543	-0.016	-0.008	-0.001	-0.02	Pass
		TLVP-EH-DU04-L3	12/06/19	0.784	1.14	0.21	0.891	0.013	-0.017	0.000	0.00	Pass
		TLVP-EH-DU04-L4	12/06/19	1.18	2.62	0.807	1.87	0.111	-0.003	0.005	0.11	Pass
		TLVP-EH-DU04-L5	12/06/19	2.32	5.74	2.54	6.35	0.319	0.039	0.025	0.38	Pass
		TLVP-EH-DU04-L6	12/06/19	2.33	3.49	2.4	2.86	0.169	0.035	0.009	0.21	Pass

Table 5-4 - Confirmation Sample Results

Construction Completion Report for Soil Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)
Ra-226	5	15	0.95
Th-230	14	42	0.92
U-238	75	224	0.86

Excavation	Decision Unit	Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
H	5	TLVP-EH-DU05-L1	12/06/19	0.942	1.99	0.841	1.67	0.208	-0.006	0.011	0.21	Pass
		TLVP-EH-DU05-L2	12/06/19	0.562	0.888	0.607	0.626	-0.004	-0.007	-0.001	-0.01	Pass
		TLVP-EH-DU05-L3	12/06/19	0.776	1.03	0.708	0.481	0.005	-0.005	-0.002	0.00	Pass
		TLVP-EH-DU05-L4	12/06/19	2.15	4.91	1.97	3.84	0.264	0.025	0.013	0.30	Pass
		TLVP-EH-DU05-L5	12/06/19	1.71	4.06	1.69	2.52	0.207	0.018	0.007	0.23	Pass
		TLVP-EH-DU05-L6	12/06/19	3.1	3.75	2.39	3.27	0.187	0.035	0.011	0.23	Pass
	6	TLVP-EH-DU06-L1	12/06/19	0.61	0.869	0.265	0.257	-0.016	-0.047	-0.008	-0.07	Pass
		TLVP-EH-DU06-L2	12/06/19	0.689	0.813	0.231	0.311	-0.009	-0.016	-0.002	-0.03	Pass
		TLVP-EH-DU06-L3	12/06/19	0.985	2.82	1.46	0.467	0.125	0.013	-0.002	0.14	Pass
		TLVP-EH-DU06-L4	12/06/19	3.03	2.86	2.63	2.73	0.127	0.041	0.008	0.18	Pass
		TLVP-EH-DU06-L5	12/06/19	3.01	4.02	2.04	3.68	0.205	0.027	0.013	0.24	Pass
		TLVP-EH-DU06-L6	12/06/19	3	5.9	2.54	2.85	0.330	0.039	0.009	0.38	Pass

Notes:

Project Action Limit (PAL) Source = USACE, 2017. Record of Decision for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property, Tonawanda, New York. Buffalo District, September.

* - Required Tier II evaluation. See Tier II table below.

Abbreviation Key:

J = The positive result reported is a quantitative estimate.

KeV = kilo-electronvolts

pCi/g = picocuries per gram

SOR = Sum of Ratios

Table 5-4 - Tier II Confirmation Sample Results
Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

	Surface Goals (pCi/g)	Subsurface Goals (pCi/g)	Background (pCi/g)			Ingrowth Factors			
Ra-226	5	15	0.95	Day 1	0.165	Day 3	0.419	Day 6	0.662
Th-230	14	42	0.92	Day 2	0.304	Day 5	0.595	Day 12	0.886
U-238	75	224	0.86						

Ra-226 - Bi-214

Excavation	Decision Unit	Sample ID	Sample Date	In-Growth Time (Days)	In-Growth Factor	Ra-226 Contribution	Th-230 Contribution	U-238 Contribution	SOR	Pass/Fail
D	1	TLVP-ED-DU1-L4	07/16/19	1	0.165	0.793	0.024	0.077	0.89	Pass
	2	TLVP-ED-DU2-L1	07/17/19	1	0.165	0.782	0.016	0.042	0.84	Pass
		TLVP-ED-DU2-L4	07/17/19	1	0.165	1.088	0.106	0.110	1.30	Fail**
		TLVP-ED-DU2-L5	07/17/19	1	0.165	1.314	0.054	0.083	1.45	Fail**
		TLVP-ED-DU2-L6	07/17/19	1	0.165	1.226	1.269	0.416	2.91	Fail**
		TLVP-ED-DU2-ST1-L4	10/08/19	6	0.662	0.059	0.020	0.115	0.19	Pass
		TLVP-ED-DU2-ST1-L5	10/08/19	6	0.662	0.312	0.085	0.102	0.50	Pass
		TLVP-ED-DU2-ST1-L6	10/08/19	6	0.662	0.240	0.155	0.073	0.47	Pass
	5	TLVP-ED-DU5-L3	09/06/19	3	0.419	0.171	-0.015	0.114	0.27	Pass
		TLVP-ED-DU5-L4	09/06/19	3	0.419	0.417	0.048	0.035	0.50	Pass
		TLVP-ED-DU5-L5	09/06/19	3	0.419	0.673	0.147	0.194	1.01	Fail**
	9	TLVP-ED-DU9-L4	10/10/19	5	0.595	0.425	0.098	0.056	0.58	Pass
E	1	TLVP-EE-DU1-L4	07/23/19	1	0.165	1.395	0.035	0.071	1.50	Fail**
	3	TLVP-EE-DU3-L1	10/17/19	2	0.304	0.764	-0.044	0.091	0.81	Pass
	4	TLVP-EE-DU4-L1	10/17/19	2	0.304	3.784	0.490	0.341	4.61	Fail**
		TLVP-EE-DU4-L2	10/17/19	2	0.304	0.027	0.143	-0.021	0.15	Pass
		TLVP-EE-DU4-L4	10/17/19	2	0.304	0.309	0.041	0.071	0.42	Pass
G	5	TLVP-EG-DU5-L1	11/20/19	2	0.304	0.403	-0.043	0.065	0.43	Pass
		TLVP-EG-DU5-L2	11/20/19	12	0.886	0.275	0.380	0.056	0.71	Pass
	6	TLVP-EG-DU6-L1	11/20/19	3	0.419	0.483	-0.077	0.080	0.49	Pass
	7	TLVP-EG-DU7-L4	11/20/19	3	0.419	0.473	0.145	0.091	0.71	Pass
	8	TLVP-EG-DU8-L5	11/20/19	3	0.419	0.525	0.061	0.041	0.63	Pass

Notes:
Project Action Limit (PAL) Source = USACE, 2017. Record of Decision for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property, Tonawanda, New York. Buffalo District, September.
Ingrowth Factors obtained from Table 17.3, Method for the Determination of Radium-228 and Radium-226 in Drinking Water by Gamma-ray Spectrometry Using HPGE or Ge(Li) Detectors, Environmental Resource Center, Georgia Institute of Technology, December 2004
** - Decision unit required over excavation and was subsequently resampled.

Abbreviation Key:
KeV = kilo-electronvolts
pCi/g = picocuries per gram
SOR = Sum of Ratios

Table 5-5 - Backfill Sampling Results

Construction Completion Report for Soil Remediation
Landfill Operable Unit
Tonawanda Landfill Vicinity Property

Sample ID	Sample Date	Bismuth-214 (Ra-226) pCi/g	Radium-226 (186 KeV) pCi/g	Thorium-230 pCi/g	Thorium-234 (U-238) pCi/g
	PAL	**NA**	**5**	**14**	**75**
TLVP-BF-1	06/18/19	0.614	0.385	0.649	0.503
TLVP-BF-2	06/18/19	0.507	-0.739	0.235	0.448
TLVP-BF-3	07/23/19	1.01	0.91	-0.0046	-0.705
TLVP-BF-4	10/30/19	0.819	0.991	0.207	0.23

Notes:

Project Action Limit (PAL) Source = USACE, 2017. Record of Decision for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property, Tonawanda, New York. Buffalo District, September.

Abbreviation Key:

KeV = kilo-electronvolts
NA = no applicable value
pCi/g = picocuries per gram