UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
290 BROADWAY
NEW YORK, NY 1000701866

ACTION MEMORANDUM RV2

DATE:

SUBJECT: Request for a Ceiling Increase for the Holy Trinity Cemetery Site (Residential Properties), Lewiston, Niagara County, New York

FROM: Peter Lisichenko, On-Scene Coordinator
Removal Action Branch

PETER LISICHENKO
Digitally signed by PETER LISICHENKO
Date: 2020.09.29 16:14:05 -04'00'

THRU: Joseph D. Rotola, Chief
Removal Action Branch

JOSEPH ROTOLA
Digitally signed by JOSEPH ROTOLA
Date: 2020.10.01 13:00:58 -04'00'

TO: Pat Evangelista, Director
Superfund and Emergency Management Division

SITE ID No.: A23M

I. PURPOSE

The purpose of this Action Memorandum is to request approval for a ceiling increase to continue the removal activities described herein at the Holy Trinity Cemetery (HTC) Site (Site), located in Lewiston, Niagara County, New York (see Attachment A, Figure 1: Site Location Map). The U.S. Environmental Protection Agency (EPA) initiated removal activities at the Site in April 2016 pursuant to a March 24, 2016, verbal authorization (referred to herein as RV1). Additional funding is necessary to continue the removal activities at the Site by removing and disposing of radioactive-contaminated soil/slag identified at two residential properties comprising a portion of the Site (these activities are referred to as RV2 for the purposes of this Action Memorandum). Impacted areas on these two properties include a residential driveway and adjacent lawn area, as well as a residential garage. These impacted areas were identified during the investigations conducted by EPA at the Site in 2016.

The total extramural funding that has been authorized to date for the Site is $150,000, of which $130,000 is for mitigation contracting. This Action Memorandum requests authorization for an additional $420,000, of which $300,000 is for mitigation contracting. If approved, the Site ceiling would be raised to $570,000, of which $430,000 would be for mitigation contracting.

Conditions at the Site meet the criteria for a removal action under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601-9675, and Section 300.415(b)(2) of the National Contingency Plan (NCP).

This Site is not included on the National Priorities List (NPL) and there are no nationally significant or precedent setting issues associated with these removal activities.

II. SITE CONDITIONS AND BACKGROUND

The Superfund Enterprise Management System (SEMS) identification number for the Site is NYN000206698. The proposed removal activities are considered "time-critical."

In a 1978 U.S. Department of Energy aerial radiological survey, multiple properties throughout the Niagara County region were identified as having elevated levels of radiation above background levels. In February 1980, the New York State Department of Health (NYSDOH) Bureau of Radiological Health and the Niagara County Department of Health (NCDOH) conducted a radiological survey of a property known as the HTC (parcel #: 115.00-1-7), located in the Town of Lewiston, Niagara Falls County, New York. The survey identified areas on the HTC property where radiological slag material was used as subbase for roadways. Subsequent surveys and sampling events were conducted by New York State Department of Environmental Conservation (NYSDEC) and NCDOH in 2006, 2007, and 2013. This work identified the presence of Uranium-238 (U-238)/Uranium-234, Radium-226 (Ra-226), and Thorium-232 at the Site. Field radioactivity surveys using an Exploranium GR-135 were performed in areas of concentrated slag material, which indicated levels between 200 to 700 micro-Roentgen per hour (μR/hr).

The Site was referred to the EPA by the NYSDEC and NYSDOH on July 21, 2013. In 2013, 2015, 2016 and 2017, EPA conducted assessments of the HTC portion of the Site in an effort to better understand the horizontal and vertical extent of the radioactive contamination and implement physical controls to minimize exposure to HTC workers and patrons. It was during this time that the two adjacent residential properties were identified as containing radioactive material. The two residential properties were identified as Area 6 and Area 7 of the Site, and further investigations were conducted to define the extent of the contamination.

A. <u>Site Description</u>

1. Removal Site Evaluation (RSE)

An RSE was conducted for Area 6 and Area 7 to determine removal eligibility. The radionuclide of concern (ROC) was determined to be Ra-226, which was also present on the cemetery property and assumed to be in secular equilibrium. Both the U-238 chain and Ra-226 were analyzed individually to demonstrate that Ra-226 is the predominant ROC from within this decay series. As a result, risk estimates and preliminary remediation goals (PRGs) were selected based on Ra-226 only. Cancer risk was set at the 1×10^{-4} level, which is consistent with Removal Management Levels, and PRGs for Ra-226 were set in order to reduce the cancer risk to below this level. PRGs in an instance like this are calculated using the PRG calculator, which incorporates a methodology into which site-specific data is input. The PRG calculator has been used nationwide to determine cancer risk and set cleanup goals for both removal and remedial projects under CERCLA. The calculated area-specific exposure point concentrations (EPCs) included data from the top two feet of soil since the highest concentrations were detected in the top eighteen inches. This approach is consistent with chemical evaluations of residential soil exposures where EPA typically evaluates the top two feet.

For Area 6, the soil EPC was calculated at 85.8 picocuries per gram (pCi/g) for Ra-226. The RSE results assuming no shielding were: risk = 6.45E-04; PRG = 13.3 pCi/g. With shielding, the results were: risk = 3.6E-04; PRG = 23.8 pCi/g. For Area 7, the soil EPC was calculated at 25 pCi/g Ra-226. The results assuming a current use were: risk = 5.99E-04; PRG = 4.17 pCi/g. The results considering a potential future conversion of the garage to a living space were: risk = 1.39E-03; PRG = 1.79 pCi/g. (NOTE: These PRGs should be considered to the extent that they are in excess of background Ra-226 concentrations.) There remains the potential for unacceptable risk in both Area 6 and Area 7 for any reasonably anticipated use scenario, and therefore both areas are removal eligible.

See Attachment B, RSE.

2. Physical location

The HTC portion of the Site is located at 5401 Robert Avenue, Lewiston, Niagara County. The residential properties are located to the west of HTC, along the western side of Roberts Avenue, which runs north to south. The northern parcel, 5380 Roberts Avenue (referenced as Area 6), is identified by tax ID number 115.15-1-21. The southern parcel, 5382 Roberts Avenue (referenced as Area 7), is identified by tax ID number 115.15-1-22. The Site is located in a residential neighborhood south of Interstate 190, to the east of the Niagara Gorge and the United States/ Canada border, and to the north of the Gates of Heaven Cemetery.

See Attachment A, Figure 2: Site Map.

Sensitive areas identified around the Site include the following:

- Freshwater forested/shrub wetlands, which are located approximately 0.1 miles to the northeast; and

- The Niagara River, which serves as the border between the United States and Canada and is located 0.4 miles to the west of the Site.

3. Site characteristics

Area 6 is a 0.25-acre, rectangular-shaped parcel, with a long axis running east to west and 62 feet of roadway frontage along Roberts Avenue. A two-story residential structure, built in 1955, is located in the center of the parcel. A concrete driveway along the parcel's southeast corner extends 90 feet from Roberts Avenue to the south side of the residential structure and terminates at a concrete patio.

Area 7 is a 0.60-acre, "L" shaped parcel with 62 feet of frontage along Roberts Avenue to the east and 70 feet of frontage along Colt Avenue to the south. It contains a two-story residential structure with an attached two-car garage. The main structure, located in the northeast portion of Area 7, was built in 1950, while the garage was built later. The asphalt driveway extends 60 feet from the northeast corner of the property to the garage and was a replacement to the original concrete driveway. It is believed that the former concrete driveway had extended from

Roberts Avenue to the northside of the home. The footprint of the garage addition extended over the former driveway.

Radioactive slag material was identified at the Area 6 parcel under the entire length of the concrete driveway and within a patch of dirt and grass that separates the Area 6 and Area 7 driveways. For Area 7, elevated radioactive activity was identified in the garage and at an isolated location south of the driveway. It is understood that radioactive slag was used as a subbase for both the Area 6 and Area 7 concrete driveways. For Area 7, the concrete driveway and subbase was removed several years ago and replaced with an asphalt driveway; the final disposition of the removed material is presently unknown. The radioactive activity in the garage are assumed to be related to the former driveway subbase, as the garage was built over the driveway. The small pocket of elevated radioactive activity to the south of the driveway is assumed to be a single slag fragment that had been displaced from the subbase.

4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

Sampling and analysis conducted at the Site by EPA has identified the presence of CERCLA hazardous substances, as that term is defined in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), and 40 C.F.R. Table 302.4. The Site is a facility within the meaning of Section 101(9) of CERCLA, 42 U.S.C. § 9601(9), and the presence of hazardous substances in subsurface media constitutes a "release" as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

The release and threat of release of the contaminants Ra-226 into the environment may impact the health of the residents at the Site through a variety of pathways, including inhalation from dusts and gases, ingestion from dusts, soils, and water, and direct radiation from external doses of alpha, beta, and gamma radiation from a particulate radioactive material. Exposure to this material increases the cancer risk of an individual. Residents as well as passersby of the Site are exposed to contamination via routes of inhalation or dermal contact to soils and windblown dust in the driveway areas and indoors.

Hazardous Substances Under CERCLA:

Radionuclides Identified Maximum Concentration
Ra-226 – 53 pCi/g

The radionuclide listed above is included in 40 CFR 302.4, List of Hazardous Substances and Reportable Quantities, Appendix B – Radionuclides.

The statutory source for designating radionuclides as a hazardous substance under Section 102(a) of CERCLA, 42 U.S.C. § 9602(a), is Section 112 of the Clean Air Act, 42 U.S.C. § 7412.

EPA concluded, based on risk assessment calculations, that both Area 6 and Area 7 are removal eligible based on a risk calculation of 6.45E-04 and 1.39E-03, respectively. Conservative PRGs have been established at 13.3 pCi/g for Area 6 and 1.79 pCi/g for Area 7. These PRGs should be considered to the extent that they are in excess of background Ra-226 concentrations (see Attachment B).

5. NPL status

The Site was evaluated for listing on the NPL and determined to be ineligible.

6. Maps and pictures depicting Site location and conditions

See Attachment A, Figure 1: Site Location Map
Figure 2: Site Map

B. <u>Other Actions to Date</u>

1. Previous actions

In March 2016, RV1 activities were initiated at the Site as result of conditions identified during 2013/2014 site assessments. EPA determined that site conditions warranted immediate removal activities, which included installation of security fencing around areas of HTC where contaminated slag is stock piled and slag-stabilized roads exist. Additionally, a radon mitigation system was installed in a home where radon readings exceeded the action level of 4.0 pCi/L.

In October 2016, EPA mobilized its Removal Support Team contractor to the Site again to conduct a radiological assessment. An exterior radiological survey was conducted on both Area 6 and Area 7 utilizing a Ludlum 2241 gamma meter equipped with a 3x3 Sodium Iodine (NaI) scintillator. Areas of elevated activity were identified, and soil samples were collected at depth to delineate the vertical extent of the contamination. These samples were submitted to a laboratory for radiological analysis. Analytical results indicated exceedances of the Ra-226 radionuclide in the upper 12 inches of the properties in areas of elevated activity. In May 2017, air samples for radon were collected in both Area 6 and Area 7 residential structures. Results of this air sampling were found to be below the action level for the Site.

2. Current actions

Efforts are being made to plan and prepare for the upcoming RV2 work activities. Tasks include identifying suitable staging areas, developing project schedules, and providing updates to the property owners and local officials on the planned work.

C. <u>State and Local Authorities Roles</u>

1. State and local actions, to date

No actions have been conducted by State or local entities for Area 6 and Area 7 of the Site. However, the NYSDEC has been notified of the contamination at the two properties and has served as an advisor on the proposed removal activities.

2. Potential for continued State/local response

NYSDEC and NYSDOH will continue to act in an advisory/supporting role throughout the performance of the removal activities at the Site, but they are financially unable to take the lead in the response activities.

II. THREATS TO PUBLIC HEALTH, OR WELFARE, OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Hazardous substances present at Area 6 and Area 7 of the Site represent a threat to the public health and environment as defined by Section 300.415(b)(2) of the NCP as there is a high potential for direct contact to radiation from alpha, beta, and gamma radioactive material.

Factors that support conducting the removal activities at the Site are discussed below.

Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, or pollutants, or contaminants;

The Site includes two occupied residential structures. The occupants of these structures are the primary "receptors" with increased cancer risks because of internal and external exposure to Ra-226. The pathways of exposure for the occupants includes incidental ingestion of soil, external radiation from contamination in the soil, and inhalation of fugitive dust.

Actual or potential contamination of drinking water supplies or sensitive ecosystems;

Surficial overland and stormwater flow is discharged to the Niagara River, located 0.5 miles to the west, through a series of drainage ditches and culverts. Entrainment of contamination may result in adverse impacts to the Niagara River, a valued resource for both the United States and Canada.

High levels of hazardous substances, or pollutants, or contaminants in soils, largely at or near the surface that may migrate; and

Ra-226 has been detected in surface soils at levels as high as 42.63 pCi/g. Radium-contaminated soils may migrate through airborne dust, surface runoff, construction activities, and foot traffic into the existing buildings on-Site and/or into homes and residential areas. Since radium has a long half-life (approximately 1,600 years), it is highly probable that the Site will undergo physical changes before the radium on-Site will decay to background levels. Building demolition and/or construction may result in increased exposure to humans as it may cause the contamination to become suspended or airborne. Weathering and/or animal interaction may also cause contamination to migrate.

The availability of other appropriate federal or State response mechanisms to respond to the release.

The State of New York does not currently have the resources needed to take timely and appropriate action to respond to the threat posed by the presence of hazardous substances at the Site.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response activities selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Site conditions continue to meet the emergency exemption criteria specified in the RV1 Action Memorandum supporting the 12-month exemption, which was approved by the Region 2 Acting Division Director on August 29, 2019. The RV1 Action Memorandum is included as Attachment C.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The funding being requested in this RV2 Action Memorandum will allow EPA to remove and dispose of the radioactive material located at Area 6 and Area 7 of the Site and restore the impacted areas. For Area 6, the concrete driveway will be removed and excavated to native soil to attain the PRG of 13.3 pCI/g. For Area 7, the concrete garage floor will be removed and excavated to native soil to attain the PRG of 1.79 pCi/g. The single hotspot in the Area 7 front lawn will also be excavated. A gamma scan will be conducted of the base of the excavated areas to verify removal of slag material, and post-confirmation samples will be collected in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual. To expedite the processing time, post-confirmation samples will be processed at the on-Site laboratory via a high purity germanium (HPGe) radiation detector, providing confirmation results within hours as opposed to the days required for off-Site laboratory services. All excavated areas will be backfilled and compacted with crusher run limestone gravel with fines. This fill material will be scanned to ensure that radioactivity does not exceed background levels. The material will also be sent for laboratory analysis to ensure compliance with NYSDEC's Imported Fill Standards for Residential Use as set forth in the NYSDEC Technical Guidance for Site Investigation and Remediation (DER 10). Both the driveway and garage locations will be restored with new concrete. The single hotspot in Area 7 will be restored with NYSDEC-certified clean topsoil and grass seed.

All disposal activities will be conducted in compliance with the EPA Off-Site Rule.

2. Contribution to remedial performance

The removal activities at the Site are consistent with the requirement of Section 104(a)(2) of CERCLA, which states, "any removal action undertaken . . . should . . . to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or the threatened release concerned." The removal activities proposed in this Action Memorandum would not impede future response activities, should they be necessary, based on available information.

3. Engineering evaluation/cost analysis (EE/CA)

Because of the time-critical nature of the removal activities, an EE/CA was not prepared.

4. Applicable or relevant and appropriate requirements (ARARs)

It remains EPA's policy to operate under the assumption that ARARs, which in removal actions are to be attained to the extent practicable, are generally protective, absent multiple contaminants or pathways of exposure. However, in unusual circumstances, such as with radiological contamination, dose-based ARARs can result in EPA Regional offices having to establish risk-based PRGs that result in levels that are more protective than a level established with a dose-based approach under a given ARAR, even absent multiple pathways or contaminants. In such circumstances, reliance on the dose-based ARAR would not be sufficiently protective of human health or the environment. For the response action discussed in this Action Memorandum, it was determined that site-specific PRG numbers were required because potential, dose-based ARARs were determined to not be sufficiently protective of human health or the environment. See OSWER Directive 9285.6-20 (June 13, 2014) ("ARARs [at levels] that are greater than 12 [millirem per year] effective dose equivalent (EDE) are generally not considered sufficiently protective for developing cleanup levels under CERCLA. . . ."). Site-specific PRG numbers were calculated based on the highest risk receptor to determine the most conservative value for cleanup levels at the Site.

5. Project schedule

These RV2 removal activities are planned to begin in October 2020.

Estimated Costs

The estimated costs for the completion of this project are summarized below.

Direct Extramural Costs:	Current Project Ceiling	Ceiling Increase Requested in This Action Memorandum	Proposed New Total Project Ceilings
Total Cleanup Contractor Cost (Includes 20% Contingency)	$130,000	$300,000	$430,000
Superfund Technical Assistance Response Team, Extramural Costs	$20,000	$120,000	$140,00
Subtotal, Extramural Costs	$150,000	$420,000	$570,000
Extramural Cost Contingency	$0	$0	$0
Total Project Ceiling	$150,000	$420,000	$570,000

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Given the Site conditions, the nature of the hazardous substances documented on-Site, and the potential exposure pathways to nearby populations described in Section III, actual or threatened releasees of hazardous substances from the Site, if not addressed by implementing the response activities described in this Action Memorandum, may present an imminent and substantial endangerment to public health or welfare or the environment.

VII. OUTSTANDING POLICY ISSUES

None.

VIII. ENFORCEMENT

EPA has conducted a preliminary potentially responsible party (PRP) search for the Site. The EPA Region 2 Removal Action Branch will continue to work with the Office of Regional Counsel in an attempt to identify and locate all viable PRPs to recover costs associated with the ongoing removal activities.

The total EPA removal costs that will be eligible for cost recovery are estimated to be $1,103,121. The following chart describes the costs that EPA estimates will be eligible for cost recovery.

Total Estimated Costs

COST CATEGORY	AMOUNT
Direct Extramural Cost	$570,000
Direct Intramural Cost	$175,000
Subtotal Direct Cost	$745,000
Indirect Costs (Indirect Regional Cost Rate 48.87%)	$358,121
Estimated EPA Costs Eligible for Cost Recovery	$1,103,121

Note:Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual costs from this estimate will affect the right of the United States to seek cost-recovery.

IX. RECOMMENDATION

This decision document describes selected removal activities for the ongoing removal action at the Holy Trinity Cemetery Site located in Lewiston, Niagara County, New York. This document was developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. These response activities are based on the Administrative Record for the removal response action at the Site.

Conditions at the Site meet the NCP Section 300.415(b)(2) criteria for a removal action. This Action Memorandum requests authorization of an additional $420,000, of which $300,000 is for mitigation contracting. If approved, the Site ceiling would be raised to $570,000, of which $430,000 would be for mitigation contracting.

Please indicate your formal approval for the proposed ceiling increase for the Holy Trinity Cemetery Site, as per the current delegation of authority, by signing below.

APPROVED: Evangelista, Pat Digitally signed by Evangelista, Pat Date: 2020.10.01 13:12:01 -04'00' **DATE:** _____

Pat Evangelista, Director
Superfund and Emergency Management Division

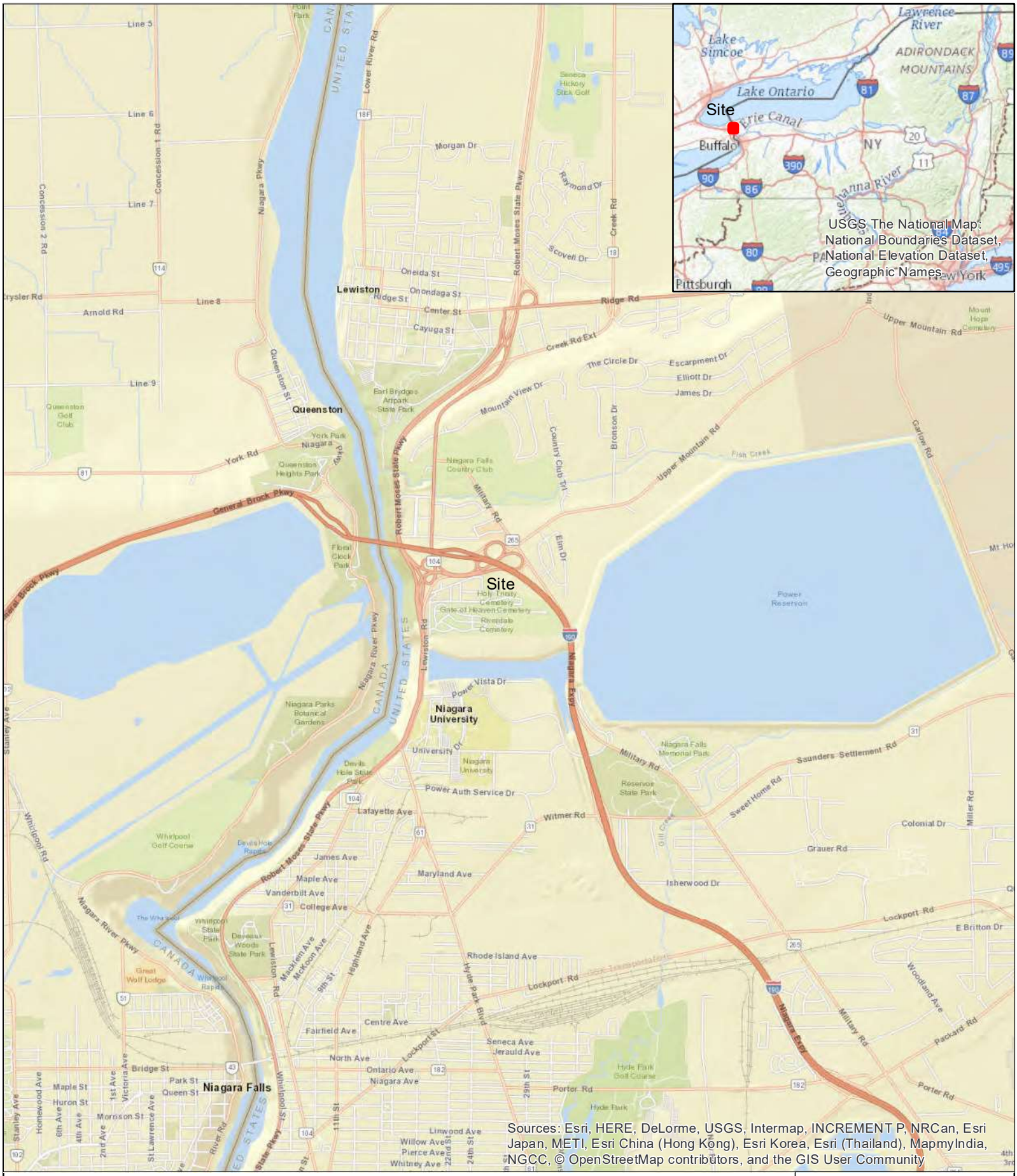
DISAPPROVED: _____ **DATE:** _____

Pat Evangelista, Director
Superfund and Emergency Management Division

cc: after approval
P. Evangelista, SEMD-D
J. Prince, SEMD-DD
J. Rotola, SEMD-RAB
D. Harkay, SEMD-RAB
B. Grealish, SEMD-RAB
T. Lieber, ORC-NYCSUP
M. Ludmer, ORC-NYCSUP
M. Mears, PAO
A. Rajkowski-Reyes, OPM-GCMB
B. Schlieger, 5104A
T. Benton, RST
M. Ryan, NYSDEC
M. Cruden, NYSDEC Albany
T. Rice, NYSDEC
M. Rubin, NYSDEC Region 9
S. Bates, NYSDOH
A. Raddant, USDOI
L. Rosman, NOAA

ATTACHMENT A

Figure 1: Site Location Map
Figure 2: Site Map



N

0 0.5 1 2 3 4 Miles

Figure 1: Site Location Map

HOLY TRINITY CEMETERY
LEWISTON, NEW YORK

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II: EMERGENCY RESPONSE AND REMEDIAL DIVISION
REMOVAL ACTION BRANCH

CREATED BY:	P. LISICHENKO
EPA OSC:	P. LISICHENKO
FILENAME:	HTC_Overview_190917.mxd

DATE MODIFIED: 9/18/2019

Legend

Radiological Hotspots

Investigation Areas

0 25 50 100 150 200 Feet

N

Figure 2: Site Map

HOLY TRINITY CEMETERY
LEWISTON, NEW YORK

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II: EMERGENCY RESPONSE AND REMEDIAL DIVISION
REMOVAL ACTION BRANCH

CREATED BY:	P. LISICHENKO
EPA OSC:	P. LISICHENKO
FILENAME:	HTC_ResidentialSiteMap_190918.mxd

DATE MODIFIED: 9/19/2019

ATTACHMENT B

REMOVAL SITE EVALUATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2890 WOODBRIDGE AVE.
EDISON, NJ 08837

March 19, 2020

MEMORANDUM

SUBJECT: Risk Assessment of Holy Trinity Cemetery Areas 6 and 7 for Removal Action

FROM: Lora Smith-Staines
Human Health Risk Assessor, EPA Region 2

TO: Holy Trinity Cemetery (Site) Files
Attn: Pete Lisichenko, On-Scene Coordinator (OSC), Region 02

Risk Determination Process

An evaluation of two residential properties adjacent to the Holy Trinity Cemetery Site (i.e., Areas 6 and 7) was conducted to determine if the risk due to radioactive waste on the properties warranted the need for USEPA to perform a removal action. The USEPA's Preliminary Remediation Goal (PRG) Calculator is used to assess risk at the site as the site currently stands, as well as provides site-specific clean-up values (i.e. PRG values) equal to designated risk. The input parameters must represent the site as the site is currently used as well as future use scenarios. Example of input parameters include, but not limited to:

- Contaminant of concern (i.e. radionuclides of interest such as Thorium-232, or "Th-232")
- Concentrations of the contaminants (i.e. how radioactive is the contaminant—usually expressed in picoCuries per gram, or "pCi/g")
- Area of contamination (i.e. how far does the contamination extend)
- Depth of contamination (i.e. how deep does the contaminant extend), and the
- Scenario for the property usage (e.g. is the property residential, worker/construction site, recreational use site, etc.)

Once the site-specific parameters have been identified, the parameters are entered into the EPA Preliminary Remediation Goal (PRG) for Radionuclides calculator which results in two outputs:

1. "Risk"—The risk output represents the risk to the site "as is" before any cleanup has been conducted. The risk result determines if the site is above the acceptable risk range for removal eligibility. The health endpoint of concern for radionuclides is cancer. For USEPA, the acceptable cancer risk range is 10^{-6} to 10^{-4} and removal eligibility is typically above 10^{-4} risk.
2. "PRG"—The PRG output is the maximum soil concentration of each radionuclide to meet the designated risk value set for the site (e.g. $1x10^{-4}$). In general, the site specific PRG output tends to be the cleanup value.

The two outputs of risk and PRG should be evaluated jointly to determine if removal action is warranted.

Site Risk Determination

To begin the PRG Calculations for Areas 6 and 7 adjacent to the Holy Trinity Cemetery, input parameters for the properties were needed. Assessment of these residential properties was conducted. Figure 1 shows the qualitative measurements performed using 3"x3" Sodium Iodide (NaI) detector scanning over the area of concern. This is commonly referred to as a "gamma scan" since the NaI probe only detects gamma radiation emanating from the source of contamination. The qualitative gamma scan is used to obtain a big-picture idea of the overall contamination on site and determines areas of concern for sampling. Qualitative measurements were taken to show the extent of contamination (i.e. how far the contamination extends) and the intensity of radiation (i.e. where the highest concentrations are located). See Figure 2 for specifics on the areas designated for the site boundary and area of contamination.

To quantify the contamination, soil samples were collected from test pits in 2016 from the surface to a 2-foot depth (i.e. in 6-inch increments) and in 2017 from the surface to a 4-foot depth (i.e. in 6-inch increments). Soil sampling provides two benefits: provides more accurate data for quantifying contamination concentrations and thus, the ability to estimate risk and determines the extent/depth of contamination below the surface. Soil sampling results are given in units of pCi/g. Figure 3 is a map depicting the test pit soil sampling locations for the whole site, including Areas 6 and 7, based on the gamma scan and Table 1 includes the soil data from both sampling events.

Qualitative and quantitative measurements must be performed in correlation with each other. A site cannot have only qualitative measurements without ground-truthing the measurements with quantitative soil samples. In addition, the location of quantitative soil samples cannot be determined prior to a qualitative gamma scan. The scan provides the various intensities of radiation throughout the area of concern. In general, risk assessments are performed conservatively using a 95% upper confidence level of total concentrations on the site, called an exposure point concentration (EPC). The ProUCL outputs which estimate soil Ra-226 EPCs for each property can be found in Attachment A.

Calculation Assumptions

The PRG Calculations were performed for Areas 6 and 7 of the Holy Trinity Cemetery site. The scenarios assessed were current uses: Area 6 as a residential driveway/grassy area and Area 7 as a residential garage. Both scenarios were assessed using information gained by the property owners, EPA visual observation and reasonable future use. Assumptions used in the calculations can be found below.

<u>General Assumptions</u>

Several assumptions applied to both properties since the source of contamination likely originated from the same source and the contaminated areas are adjacent to one another. The radionuclide of concern (ROC) was determined to be Radium-226 (Ra-226) which was also present on the cemetery property and assumed to be in secular equilibrium. Both the U-238 chain and Ra-226 were run individually to demonstrate that Ra-226 is the predominant ROC from within this decay series. As a result, risk estimates and PRGs were selected based on Ra-226 only.

Cancer risk was set at 10^{-4} which is consistent with Removal Management Levels (RMLs). Default soil intakes (100 mg/d for an adult; 200 mg/d for a child) and inhalation rates (20 m^3/d for an adult; 10 m^3/d for a child) were selected. Property size of 0.5 acres (minimum allowed) was selected as it is representative of the residential property size. The produce pathway was turned off as it is unlikely that a residential garden would be placed in either location.

The calculated area-specific exposure point concentrations (EPCs) included data from the top 2 feet of soil since the highest concentrations were detected in the top eighteen inches. Further, this is consistent with chemical evaluations of residential soil exposures where EPA typically evaluates the top 2 feet. There could be some additional gamma that is deeper within the soil column, but it would be shielded by the soil above. It is believed that this is a reasonably conservative estimate.

Area 6 Assessment

Area 6 is a residential driveway and grassy area. A current (with shielding) and potential future (without shielding) scenario were evaluated because the driveway could be removed or compromised with freeze/thaw or frost heaving and no longer serve as a cap in the future.

It was conservatively assumed that children up to age 18 (ED = 18 years; 6 child/12 adult) play outside (e.g., basketball, etc.) and/or wait for the school bus for 2 hours per day for the 40 week school year and 8 hours per day for the 10 week summer (average = 3 hours a day for 200 days per year). The area of contamination for Area 6 was estimated based on the hot spot size in the attached Figure 2: 1756 ft^2 = 163 m^2 (rounded up to 200 m^2). The outdoor gamma shielding factor for soil was set at 10 cm (assumed thickness of pavement).

The soil EPC was calculated at 85.8 pCi/g Ra-226. The results assuming no shielding were: risk = 6.45E-04; PRG = 13.3 pCi/g and with shielding: risk = 3.6E-04; PRG = 23.8 pCi/g.

Area 7 Assessment

Area 7 is a residential garage. A current (use as a garage) and potential future (use as a converted living space) scenario were evaluated. For either scenario, it was assumed the garage floor would be in place and there would, therefore, always be shielding present.

The area of contamination for Area 7 was estimated based on the hot spot size in the attached Figure 2: 527 ft^2 = 49 m^2 (rounded up to 50 m^2). For the present scenario, it was conservatively assumed that adults only (ED = 20 years adult) would work on a vehicle in the garage and/or spend time in a "man cave" for 4 hours a day on weekdays and 8 hours a day on the weekends (average = 3 hours a day for 200 days per year). For the future scenario, it was conservatively assumed that children and adults (ED = 26 years) could spend time in a living space for 5 hours a day for 350 days per year (default residential EF). The indoor gamma shielding factor (garage floor thickness) was assumed to be approximately 10 cm under both scenarios.

The soil EPC was calculated at 25 pCi/g Ra-226. The results assuming a current garage use were: risk = 5.99E-04; PRG = 4.17 pCi/g. The results considering a potential future conversion of the garage to a living space were: risk = 1.39E-03; PRG = 1.79 pCi/g.

Conclusions

There remains the potential for unacceptable risk in both Area 6 and Area 7 for any reasonable use scenario and therefore; both are Removal eligible. For Area 6, the more conservative PRG of 13.3 pCi/g and for Area 7, 1.79 pCi/g are recommended. These PRGs should be considered in excess of background Ra-226 concentrations. It is worth noting that the Area 6 removal eligible soils are deeper in the top two feet of the soil column so removing these and the contaminated soil above will result in residual contamination closer to the PRG for Area 7. This is consistent with other regional Removal Actions. Further, since these are intended to be one-time actions of small areas on residential properties, out of conservatism, the ALARA principle should be employed.

Figure 1: Gamma Survey Overview Map

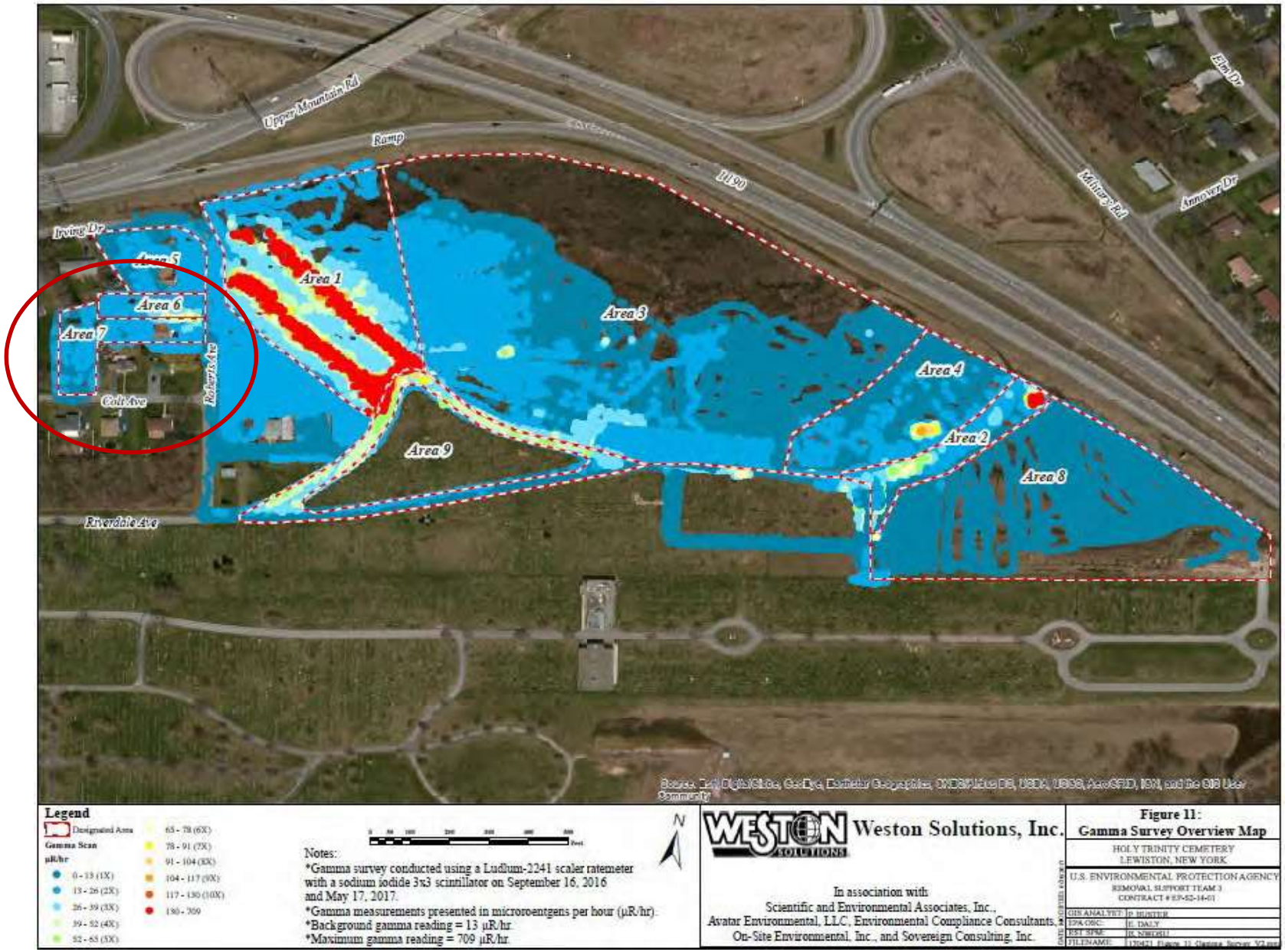


Figure 2: Residential Properties Map

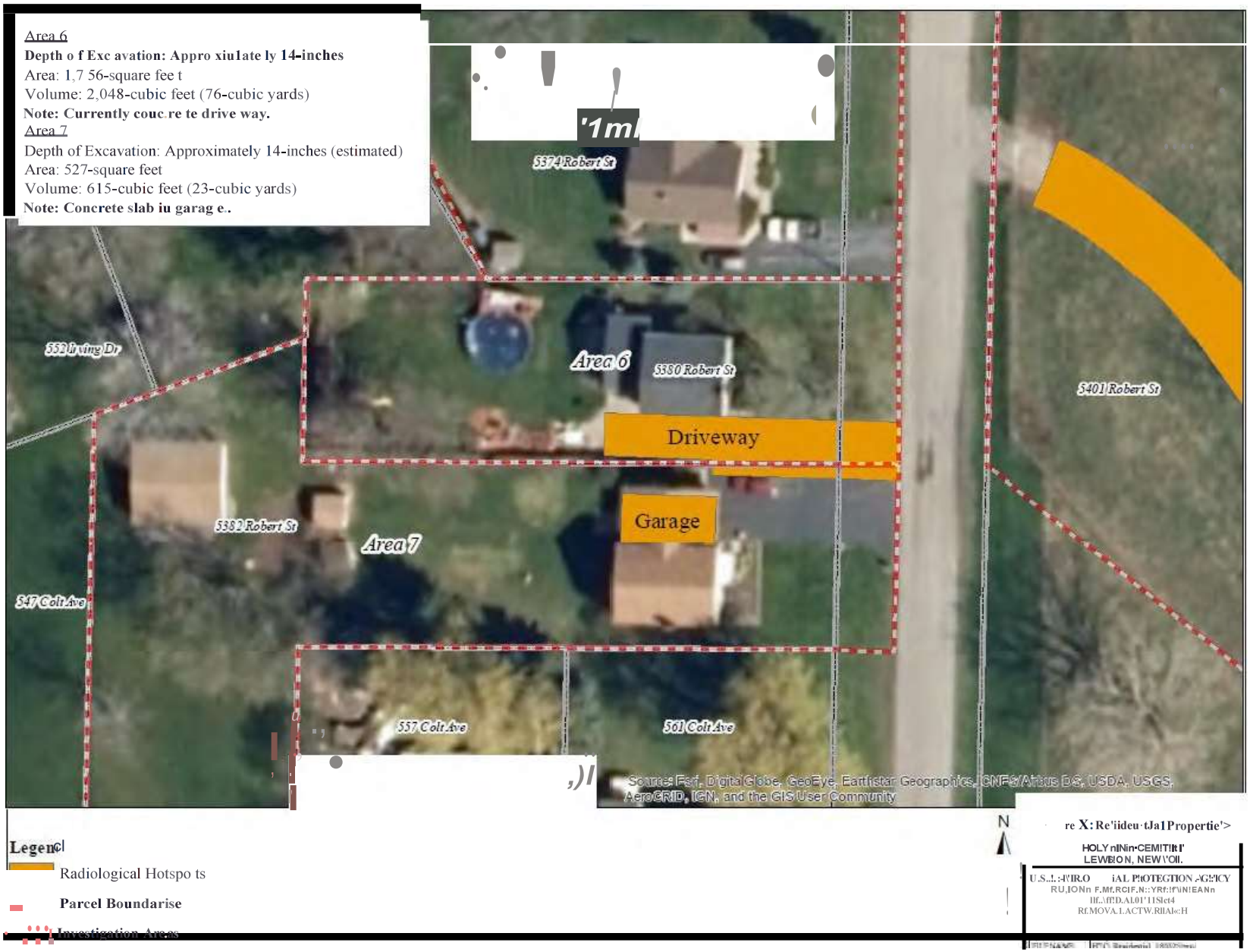

Area 6
Depth o f Exc avation: Appro xiu1ate ly 14-inches
Area: 1,7 56-square fee t
Volume: 2,048-cubic feet (76-cubic yards)
Note: Currently couc re te drive way.
Area 7
Depth of Excavation: Approximately 14-inches (estimated)
Area: 527-square feet
Volume: 615-cubic feet (23-cubic yards)
Note: Concrete slab iu garag e..
5374 Robert St
552 Irving Dr
Area 6
5380 Robert St
5401 Robert St
Driveway
Garage
5382 Robert St
Area 7
547 Colt Ave
557 Colt Ave
561 Colt Ave
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
N
Legend
Radiological Hotspo ts
Parcel Boundarise
Investigation Areas

Figure 3: Site Test Pit Location Map

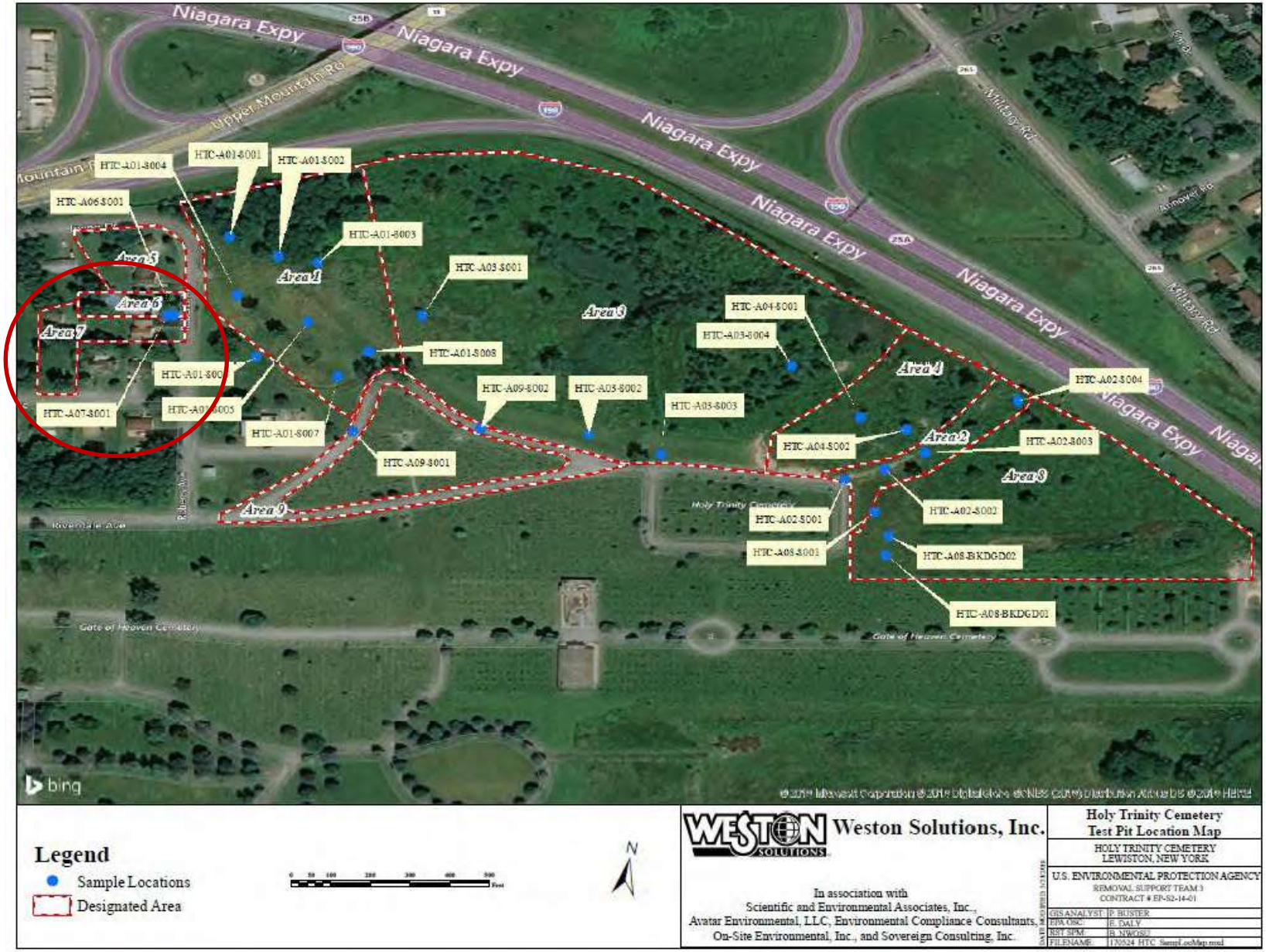


Table 1: Soil Test Pit Data

	Area 6		Area 7	
	depth (inches)	Ra-226 (pCi/g)	depth (inches)	Ra-226 (pCi/g)
2016	0-4	5.532	0-6	1.277
	4-12	47.967	6-12	1.294
	4-12 dup	53.885	12-18	1.647
	12-18	1.814	18-24	1.347
	18-24	1.451		
	0-4	3.696		
	4-12	59.018		
	12-18	1.819		
	18-24	1.338		
2017	0-6	42.63	0-6	37.018
	6-12	38.347	6-12	43.712
	12-18	1.822	6-12 dup	41.176
	18-24	1.14	12-18	28.431
	24-30	0.91	18-24	1.379
	30-36	1.011	24-30	1.573
	36-42	0.952	30-36	1.176
	42-48	1.084	36-42	1.245
			42-48	1.188

Notes:

Samples in red are below two feet in depth and were not included in the EPC calculations.

Attachment A:
ProUCL Outputs for Each Property

Area 6 ProUCL Output

UCL Statistics for Uncensored Full Data Sets			
User Selected Options			
Date/Time of Computation	9/19/2018 2:48:22 PM		
From File	WorkSheet.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Area6 Ra226			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1.14	Mean	20.04
Maximum	59.02	Median	3.696
SD	23.83	Std. Error of Mean	6.61
Coefficient of Variation	1.19	Skewness	0.671
Normal GOF Test			
Shapiro Wilk Test Statistic	0.737	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	31.82	95% Adjusted-CLT UCL (Chen-1995)	32.22
		95% Modified-t UCL (Johnson-1978)	32.02
Gamma GOF Test			
A-D Test Statistic	1.366	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.784	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.26	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.249	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.576	k star (bias corrected MLE)	0.494
Theta hat (MLE)	34.78	Theta star (bias corrected MLE)	40.52

nu hat (MLE)	14.98	nu star (bias corrected)	12.86
MLE Mean (bias corrected)	20.04	MLE Sd (bias corrected)	28.49
		Approximate Chi Square Value (0.05)	5.796
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	5.135
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	44.44	95% Adjusted Gamma UCL (use when n<50)	50.16
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.246	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.131	Mean of logged Data	1.918
Maximum of Logged Data	4.078	SD of logged Data	1.658
Assuming Lognormal Distribution			
95% H-UCL	188.7	90% Chebyshev (MVUE) UCL	55.85
95% Chebyshev (MVUE) UCL	71.19	97.5% Chebyshev (MVUE) UCL	92.47
99% Chebyshev (MVUE) UCL	134.3		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	30.91	95% Jackknife UCL	31.82
95% Standard Bootstrap UCL	30.51	95% Bootstrap-t UCL	35.22
95% Hall's Bootstrap UCL	28.98	95% Percentile Bootstrap UCL	30.74
95% BCA Bootstrap UCL	31.41		
90% Chebyshev(Mean, Sd) UCL	39.87	95% Chebyshev(Mean, Sd) UCL	48.85
97.5% Chebyshev(Mean, Sd) UCL	61.32	99% Chebyshev(Mean, Sd) UCL	85.81
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	85.81		
Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			

Area 7 ProUCL Output

UCL Statistics for Uncensored Full Data Sets			
User Selected Options			
Date/Time of Computation	9/19/2018 2:49:39 PM		
From File	WorkSheet.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Area7 Ra226			
General Statistics			
Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	1.277	Mean	17.48
Maximum	43.71	Median	1.647
SD	19.51	Std. Error of Mean	6.504
Coefficient of Variation	1.117	Skewness	0.418
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.347	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.295	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	29.57	95% Adjusted-CLT UCL (Chen-1995)	29.14
		95% Modified-t UCL (Johnson-1978)	29.72
Gamma GOF Test			
A-D Test Statistic	1.282	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.765	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.351	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.293	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics			
k hat (MLE)	0.578	k star (bias corrected MLE)	0.459
Theta hat (MLE)	30.23	Theta star (bias corrected MLE)	38.03
nu hat (MLE)	10.41	nu star (bias corrected)	8.271
MLE Mean (bias corrected)	17.48	MLE Sd (bias corrected)	25.78
		Approximate Chi Square Value (0.05)	2.893
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	2.265
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	49.97	95% Adjusted Gamma UCL (use when n<50)	63.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.71	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.326	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.295	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.245	Mean of logged Data	1.786
Maximum of Logged Data	3.778	SD of logged Data	1.739
Assuming Lognormal Distribution			
95% H-UCL	599.5	90% Chebyshev (MVUE) UCL	55.09
95% Chebyshev (MVUE) UCL	71.04	97.5% Chebyshev (MVUE) UCL	93.18
99% Chebyshev (MVUE) UCL	136.7		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	28.17	95% Jackknife UCL	29.57
95% Standard Bootstrap UCL	27.73	95% Bootstrap-t UCL	30.24
95% Hall's Bootstrap UCL	25.01	95% Percentile Bootstrap UCL	27.54
95% BCA Bootstrap UCL	27.88		
90% Chebyshev(Mean, Sd) UCL	36.99	95% Chebyshev(Mean, Sd) UCL	45.83
97.5% Chebyshev(Mean, Sd) UCL	58.09	99% Chebyshev(Mean, Sd) UCL	82.19
Suggested UCL to Use			
95% Hall's Bootstrap UCL	25.01		
In Case Bootstrap t and/or Hall's Bootstrap yields an unreasonably large UCL value, use 97.5% or 99% Chebyshev (Mean, Sd) UCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Attachment B:
Radiological PRG Calculator Outputs for Each Property

Area 6 Rad PRG Outputs

With Shielding

Site-Specific
Res id en t Equation Inputs for Soil - Secular Equilibrium

Vaniable	Value
TR target cancer risk.) 1..1n it l ess	(lOOOl
t_ (time - resi:dent) yr	78
ED_, (exposure durati on - rresident) yr	78
ET-· (exposuretime - resiid ent)hr/day	3
ET_ (exposu re lime - rresident cllild) hr/day	3
ET_· (exposure lime - reside11t ad..1lt) lilrfday	3
ET- .. (expost1re time - iM om resid ent) l1r/[lay	76.476
ET_ (exposure lime - outdoo:r resident) hr/day	7.752
ED_ (exposure dmati0n - resident clilild) yr	6
ED-• (exposure duration - resident ad1..110 yr	72
EF , (exposure frequency - resident) daylyr	200
EF; (exposure freqt1ency - resident child) day/yr	200
EF (exposure freqt1ency - resident adull) day/yr	200
IRS • (soil intakerate - resident adult) mgfday	700
IRS (soil intakerate - resident child) mg/clay	200
IRA,,,,.. (inhalalion irate - resident adult) rn ³/day	20
IRA,...., (inhalalion rate - resident cl1ild) lm '/day	70
IFS_ (age-adj,iisted soil inyesti0:n faotor - resident) mg	480000
IFA,.,.=i (age-adjusted so'ill inlla'lation factor - resident) m ³	7500
GSF, (gamma shielding factor - indo or) uniHes s	(]
Site area tor ACF {area correction tacto:r) m ²	200
Cover thickness for GSF• (i:iamma shieldin!l facto:r) cm	70
c over til1ickness for GSF• (gammashielding factor) cm	(]
TR ta getcancer risk.) unil less	0.0001
ED,_. (exposure dmation - resident cllilld) yr	6
ED (exposure dmaton - resident ad1..11t) yr	72
EF; (exposure fi'equency - resident clhilcJD day/yr	200
EF (exposure fi'equency - resident adu lt) day/yr	200
City (Climate Zone)	29
A._ (acres)	0.5
QIC ,,,.o (g1m²-s per lKg/rn')	93.77
PEF (parti01..1late emission factor) rn ³/ g	7359344438
A (PEF rnspersiion Constant)	76.2302
B (PEF DiSpersiion Constant)	78.7762
C (PEF Dispersion Constanl)	216.708
V (fraction of vegetalive cover) unitless	0.5
u_ (mean annual wind speedl) rnJs	4.69
u. (eq1..ivalent lhreshold va'lue)	7132
F(x) (fimcto n depend:ent on u .JU) uniHess	0794

Isotop e	Ingestion PRG TR= 0.000 1 (pCi/g)	Inhalatio n PRG TIR=0. 0 001 (pc ·.g)	E xtern al E xposure PRG TR=0.0001 pCi/g)	Prod u ce Co nsumption PRG TR=0.000 1 (pCi/g)	Total PR.G TR=0.0001 (pC i/g)
-Secular Equilibrium PRG tor Ra-226	3.66 E+01	3.06E+05	6.82E+01		2.38E+o1
-Secular Equilibrium PRG tor U -23 8	3.36 E+ 01	1.25E+05	6.74E+01		2.24E+o1

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
*Secular Equilibrium Risk for Ra-226	2.34E-04	2.80E-08	1.26E-04	-	**3.60E-04**
*Secular Equilibrium Risk for U-238	2.56E-04	6.85E-08	1.27E-04	-	**3.83E-04**
*Total Risk	4.90E-04	9.65E-08	2.53E-04	-	**7.43E-04**

Area 6 Rad PRG Outputs

Without Shielding

Site-Specific
Resident Equation Inputs for Soil - Secular Equilibrium

Vaniable	Value
TR t:ar;get cancer risk.) lllnit l ess	{100 (11
t_ (time - resi:delilt) yr	18
ED , (exposure duration - rresid ent) yir	18
E-T· (exposure time - resi delilt) lllr/1:la y	3
E-T (exposure time - resident clilild) hr/day	3
E-T· . (exposure time - residentadll!lt) ln /day	3
E-T ., (exposure time - im:door resid elilt) lllr/1:la y	1 6.4 16
ET_. (exposure time - cmtdoor resident) hr/day	1 .752
ED (exposure duration - resident clilild) yr	6
ED-• (exposure duration - resident a1:u lt) yr	1 2
EF . (exposure rrequ:ency - resi1:ent) 1:lay1yr	200
EF_• (exposure 1lreque11cy - resi1:le11t cll1il1:l0 d aytyr	200
EF (exposure lreque11cy - resi1:le11t a dUll) d aytyr	200
lIRS-• (soil in talke rate - resi1:ent ad11lt) mgt1:la y	100
IRS-, (soil in take rate - resi1:ent clilild) mg/day	200
IRA,... (inlilalation rate - resi:delilt adu lt) 111 ³/day	20
IRA,..., (inlilalation rate - resi:delilt cll1il(l) 1111 ³/day	10
IFS_· (ag e-adjusted soil ililgesti:on ractor - resident) mg	480000
IFA= (age-adjusted soil inlla'lati:on facior - resl:ent) m ³	7500
GSF, (giamma shieldi11g raoto:r - in door) mitless	0
Site area ror ACIF (area rn rrecti:on factor) m ²	200
Cover til1ickness for GSF (]!amma shi:eldilil raoto:r) cm	0
Cover til1ickness for GSF (giamma shi:eldililg raoto:r) cm	0
TR target cancer risk.) 11n i1 less	0.0001
ED,-· (exp osure durati:on - resident clilild) yr	6
E-D", (exp osure durati:on - resident adult) yr	12
EF_• (exposure 1Teq11elilcy - resident cll1il1:l0 daytyr	200
EF (exposure 1lreq11elilcy - resident adUll) daytyr	200
City (Cl'iimate Zone)	29
A. (acres)	0.5
$Q!C_{W.P}$ @/llll²-s per lkg/m)	93.77
PEF (palti:oulate emiission facior) m ³/lkig	135 9344438
A (PEF Dirspersi iOlil Constant)	16.2302
B (PEF Dirspersi iOlil Constant)	18 .7762
C (PEF Dispersio11 Gon stalilt)	216 .1 0 8
V (fracti:on of vegeitati ive cover) u11ii tless	0.5
U_ (mealil an11u al wiind speed) l ı s	4. 69
u. (equivalent ti11resholl va'11e)	113 2
F{x) (fimctiolil depem:ent on U JU) unitless	0.194

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TIR=0.0001 (pCtlg)	External Exposure PRG TR=0.0001 (pCifg)	Produce Consumption PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCifg)
5ecuJar EquililJ!tum PRG for Ra-226	*3.66 E-1;01*	*3 .(16£ + 05*	*2.09 E+01*		***1.33 E+o1***
5ecuJar EquililJfium PRG for U -238	*3.36E-1;01*	*1. 25£ +05*	*2.06E+01*		***1.2BE+o1***

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumpiton Risk	Total Risk
'Secular EquilibriumRisk tor Ra-226	2.34E-04	2.80E-08	4.77E- 04		- 6.45E-04
'Secular EquilibriumRisk tor U-238	2.56E-04	6.85E-08	4.77E-04		- 6.72E-04
'Total Risk	4.90E-04	9.65E-08	8.28E-04		- 1.32E-03

ATTACHMENT C

HOLY TRINITY CEMETARY ACTION MEMORANDUM - RV1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08837

ACTION MEMORANDUM-RV1

DATE: AUG 29 2019

SUBJECT: Approval and Funding for a Confirmation of Verbal Authorization and 12-Month Exemption for the CERCLA Removal Action at the Holy Trinity Cemetery Site, Lewiston, New York

FROM: Eric M. Daly, On-Scene Coordinator
Response and Prevention Branch

THRU: Eric Mosher, Chief
Response and Prevention Branch

TO: Pat Evangelista, Acting Division Director
Superfund and Emergency Management Division

Site ID: A23M

I. PURPOSE

The purpose of this Action Memorandum is to document the verbal authorization and 12-month exemption for a removal action by the U.S. Environmental Protection Agency (EPA) at the Holy Trinity Cemetery Site (Site) located at Robert Avenue, Lewiston, Niagara County, New York. A verbal authorization was granted on March 24, 2016, by the Director of the Emergency and Remedial Response Division (ERRD) (now known as the Superfund and Emergency Management Division (SEMD)) of EPA Region 2 to initiate a removal action with a project ceiling in the amount of $150,000, of which $130,000 was for mitigation contracting.

Removal activities performed pursuant to the March 2016 verbal authorization (RV1) were initiated at the Site on April 18, 2016 and continued until August 28, 2017. RV1 was performed as part of a removal action to address the release and threatened release of hazardous substances, radionuclides Thorium-232 (Th-232) and Uranium-238 (U-238), at or from the Site into the environment. The hazardous substances at the Site present a threat to public health through a variety of pathways, including inhalation from dusts and gases; ingestion from dusts, soils, and

584570

water; and direct radiation from external doses (external direct radiation exposure is primarily attributable to gamma radiation, with lesser internal exposures attributable to alpha and beta radiation from particulate radioactive material). The removal action to address Site contamination has not been completed, and additional removal activities at the Site are contemplated.

The Site meets the criteria for a removal action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9601-9675, as described in Section 300.415(b)(2) of the National Contingency Plan (NCP), 40 C.F.R. § 300.415(b)(2).

The Site is not listed on the National Priorities List (NPL), and there are no nationally significant, or precedent-setting issues associated with the Site.

II. SITE CONDITIONS AND BACKGROUND

The Superfund Enterprise Management System (SEMS) identification number for this Site is NYN000206698. The proposed removal action is considered "time-critical".

A. Site Description

The Site consists of multiple areas of observed radioactively contaminated soil and rock at property owned by Holy Trinity Cemetery, as well as a single-family residential home located west of the Holy Trinity Cemetery property (see Attachment A).

1. Removal Site Evaluation (RSE)

In 1978, a U.S. Department of Energy (DOE) aerial radiological survey identified multiple properties throughout Niagara Falls County with elevated levels of radiation above background amounts. In February 1980, the New York State Department of Health (NYSDOH) Bureau of Radiological Health and the Niagara County Department of Health (NCDOH) conducted a radiological survey of the Site to identify areas of elevated radioactivity because of the historic use of radioactive slag for fill at the property. The New York State Department of Environmental Conservation (NYSDEC) and NYSDOH referred the Site to EPA on July 21, 2013 for further assessment.

In December 2013, the EPA Region 2 Pre-Remedial Section (PRS) initiated a preliminary assessment (PA) and site inspection (SI) to assess whether the Site posed a threat to human health and the environment.

On December 12-13, 2013, personnel from EPA PRS and EPA's contractor (Weston Solutions, Inc.) conducted radiological surveys of the exterior of the Site and confirmed previous work performed by NYSDEC and NYSDOH. To quantify the contamination identified, a total of 14 soil samples (including one environmental duplicate sample) were collected from 13 boreholes throughout the main footprint of the Site using hollow-stem auger drilling methods. Two soil samples were collected on the property to document background conditions.

Per the PRS Pre-Remedial Assessment Report, the maximum concentrations for the radionuclides of interest were 358 picoCuries/gram (pCi/g) for Th-232 (Sample: SG01), 303 pCi/g for Radium-228 (Ra-228; Sample: SG01), 287 pCi/g for U-238 (Sample: SG01), and 360 pCi/g for Radium-226 (Ra-226; Sample: SG01) from slag samples (see Appendix A-Attachment C, Figure 1). For the radiological risk assessment, the EPA Emergency Response Team Health Physicist conservatively used the highest analytical results of the progenies within each decay chain (i.e., U-238 and Th-232) to assign the maximum concentration for the parent radionuclide. For example, the highest concentration value of U-238 for the risk assessment was represented by the progeny Thorium-230 (Th-230) result from the 2013 EPA PRS data (Th-230 at 461 pCi/g; Sample: SG01) (see Attachment C, Figure 1).

Based on the PA and SI results, a Hazardous Ranking System (HRS) score was calculated. The calculated HRS score for the Site was less than 28.5 and, as a result, the Site did not qualify for inclusion on the NPL. The Site was referred to the ERRD (now known as SEMD) Removal Action Branch (RAB) for a determination as to whether the Site warranted a CERCLA removal action.

The RAB and an EPA Region 2 risk assessor utilized the PRS data Site files, which included a Pre-Comprehensive Environmental Response, Compensation and Liability Information System Screening Form for the Site, as well as historic city directories, Sanborn maps, and analytical data collected for the Site, to conduct a preliminary Removal Site Evaluation. In addition, an internet search for historic articles, maps, and photographs was conducted, and historic aerial photographs and online Erie County property records were reviewed. In June 2015, RAB and the EPA Region 2 risk assessor determined that conditions at the Site appeared to meet the requirements of Section 300.425(b)(2) of the NCP for the undertaking of a CERCLA removal action. Further assessment of the Site was requested.

In August 2015, the EPA Region 2 ERRD (now known as SEMD) Response and Prevention Branch (RPB) On-Scene Coordinator (OSC), EPA Environmental Response Team (ERT) Health Physicist, and Weston Solutions (Removal Support Team) conducted further radiological assessment of the interior space of the only building on the HTC-owned parcel of the Site. This building contains a chapel, office, maintenance garage, and upstairs residential apartment (referred to as the chapel/maintenance building within this document). The perimeter of the property was also assessed. The goal for this assessment was to determine the extent of contamination outside of the previously assessed areas and to determine the interior impacts of the contamination. EPA verified the bounds of gamma-contaminated material and identified the perimeter of the contamination. (See Attachments B and C). There were no elevated gamma or radon levels detected in the chapel/maintenance building.

During the August 2015 assessment, EPA advanced eight boreholes using hollow-stem auger drilling methods and collected a total of nine soil samples, including one environmental duplicate sample (see Attachment C, Figure 1). One sampling point was from an area of the property with low gamma levels, which was used as a background location during the PRS Pre-Remedial Assessment. Although the primary goal of this soil sampling effort was to gain an understanding of the perimeter outside the previously

identified areas of contamination, samples were also obtained at depth from the known areas to determine depth of the contaminated areas as well as confirmation of the previous results.

In Area 1, the maximum concentrations of the radionuclides of interest for this round of sampling (see Appendix A-Attachment C, Figure 1) were Th-232 at 31.6 pCi/g (Sample: H001-SS008-0012-01), Ra-228 at 65.3 pCi/g (Sample: H001-SS008-0012-01; Ac-228 lab results were used for quantifying Ra-228), U-238 at 13 pCi/g (Sample: H001-SS008-0012-01), and Ra-226 at 77.7 pCi/g (Sample: H001-SS003-0012-01). The maximum depth of the contamination was determined to be two feet. The majority of these elevated radiological concentrations were in the slag layer located in the first foot depth of the exterior surface.

The second area of elevated gamma levels that was sampled during the August 2015 event was referred to as Area 2 (see Attachment B). The maximum concentration of the radionuclides of concern for Area 2 were Th-232 at 0.801 pCi/g, Ra-228 at 0.55 pCi/g, U-238 at 21.6 pCi/g, and Ra-226 at 35.5 pCi/g (Sample: H001-SS002-0012-01) (see Attachment C, Figure 1).

In addition to exterior samples, interior swipe samples were collected inside the chapel/maintenance building to determine if there was any radiological contamination that had been tracked into the structure. No contamination was found inside the structure.

On March 08, 2016, an RPB OSC was assigned to the Site to collect additional field data and determine if contamination levels exceed the cancer risk of 10^{-4} (i.e., 1 excess cancer incidence in 10,000 of cancer). A risk assessment was performed to determine whether the Site was eligible for a removal action. The assessment of removal eligibility involved the use of EPA's Preliminary Remediation Goals (PRG) Calculator, and the calculations were performed by the EPA ERT Health Physicist. EPA's PRG Calculator was created to help calculate risk for various receptors at sites, taking into consideration exposures from all potential pathways and through all media (e.g., soil, ground water, surface water, sediment, air, structures, etc.).

Site-specific high concentration soil data (see Attachment D) was used to assess risk to both cemetery patrons and the cemetery outdoor worker (see Attachments E and F). Based on the risk calculations, equilibriums, and the high soil concentrations found at the Site, the contaminants of concern were identified as Th-232 and U-238. For HTC, the most conservative receptor used to calculate risk was an outdoor worker scenario performing daily duties including burial and lawn maintenance activities. The total risk of the site without removal of the contaminated material was determined to be 2.43×10^{-2} where the risk contribution of Th-232 is 1.26×10^{-2} and U-238 is 1.19×10^{-2}. A removal action was determined to be warranted since both Th-232 and U-238 values were outside of EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4}, with the greatest risk posed to the outdoor worker.

As a result of the assessment activities, risk calculations, and removal action determination, the ERRD (now known as SEMD) Director granted a verbal authorization for a $150,000 total project ceiling for a removal action at the Site on March 24, 2016.

The primary purpose of this verbal authorization was to stabilize the Site and further assess the extent of the contamination.

During this time, EPA was approached by a resident of Robert Avenue with property located at Tax Parcel # 115.15-1-20 (Area 5/Attachment B), directly across from the 2.91-acre area of concern at HTC cemetery (Area 1). The resident indicated that the slag road bed present in that area of concern continued across Robert Avenue onto his property and under his home. Based on this information, it was determined that the assessment of this property should be included as part of the removal work at the Site. A gamma survey of the interior of the home and external property was conducted; no elevated readings above background were observed. However, radon sampling was conducted throughout the home, and the radon laboratory results indicated that all radon levels in the residential home basement were above the EPA action level of 4.0 picoCuries per Liter (pCi/L). The highest result was 11.2 pCi/L (see Appendix G). Immediate mitigation activities were recommended as part of the response work.

2. Background information on radioactive contamination

Concepts

Elements within the periodic table are comprised of both unstable and stable forms. Unstable elements are known as "radionuclides," and they give off radiation in the form of a wave (i.e., gamma radiation) or particle (e.g., alpha radiation or beta radiation) to become more stable. The time it takes for radionuclides to become stable can range from seconds to billions of years. Long-lived radionuclides, such as Thorium and Uranium, have always been present within the Earth's crust and within the tissues of all living species. Material that contains radionuclides in their natural form is known as naturally occurring radioactive material, commonly referred to as "NORM," and these radionuclides contribute to background radiation levels. Examples of NORM include sands, clays, soils, rocks, coal, groundwater, oil and gas, as well as metal ores and non-metal minerals.

NORM may become concentrated or exposed to the accessible environment as a result of human activities such as manufacturing, mineral extraction, or water processing. The resulting material is known as Technically Enhanced Radioactive Material or "TENORM." EPA has defined "Technologically Enhanced" to mean that the "radiological, physical, and chemical properties of the radioactive material have been concentrated or further altered by having been processed, or beneficiated, or disturbed in a way that increases the potential for human and/or environmental exposures." The contamination found at the Site qualifies as TENORM.

The extraction of precious metal and/or rare earth material from ore can result in the presence of TENORM in waste and/or product. Historically, radioactive waste at mines and mineral processing or manufacturing facilities was often regarded as non-hazardous material and was disposed of improperly. Some facilities sold or disposed of such waste as fill for construction projects, including the construction of roads and parking lots. The

Site is one location where contaminated waste material was used as fill.

Terminology

To evaluate land and/or buildings that are potentially contaminated with radioactive materials, a variety of instrumentation must be used. When performing an initial scoping survey, the extent of the contamination (i.e., how widespread the contamination is at the Site), as well as the intensity of the radiation (i.e., which areas/locations contribute to the greatest risk or dose) must be identified. Hand-held and portable equipment such as sodium iodide detectors, Geiger Mueller counters, proportional detectors, and/or ion chambers may be used as field equipment to determine the extent of contamination and/or dose or exposure rates of gamma radiation. In general, most of these pieces of equipment are used qualitatively, and resulting data is compared to background readings to determine the extent and intensity of contamination and whether further investigation is needed. Examples of units used for qualitative measurements include counts per minute (cpm) for contamination, microroentgen per hour (μR/hr) for exposure rate, or millirem per hour (mrem/hr) for dose rate measurements.

In most cases, the equipment used to collect qualitative measurements may not provide an accurate or precise measurement of the quantity of contamination because of poor efficiencies for specific radionuclides, poor geometries because of the instrumentation setup, or fast counting time. Qualitative measurements should always be paired with quantitative data when characterizing a site that has been contaminated with radioactive materials. Quantitative data can be used to verify or correlate the qualitative instrumentation reading. This is commonly referred to as "ground truthing." To obtain quantitative measurements, air, water, sediment, soil, and/or vegetation samples are taken from areas of known or suspected contamination and analyzed by a laboratory. The units for quantitative measurements are pCi/g. For the Site cleanup, only quantitative measurements are used to provide more definitive results and to verify cleanup has been completed.

Risk Calculation

As per 40 CFR 300.430(e)(2)(i)(A)(2), remedial actions need to meet the risk requirements of 10^{-4} to 10^{-6}. Since removal actions are not a part of the Remedial Program, the Site does not need to meet this requirement for site cleanup. However, in recent years, EPA has encouraged removal cleanups to meet, at a minimum, the remedial cleanup values associated with the 10^{-4} carcinogenic risk based on the reasonable maximum exposure for an individual. To determine if contamination levels exceed the cancer risk of 10^{-4} (i.e. an increase of 1 additional person in 10,000 developing cancer), a risk assessment must be performed. EPA's PRG Calculator was created to help calculate risk versus cleanup levels for various receptors, taking into consideration exposures from all potential pathways and through all media (e.g., soil, groundwater, surface water, sediment, air, structures, etc.).

3. Physical location

The addresses associated with the Holy Trinity Cemetery Site are 5401 Robert Avenue, Lewiston, Niagara County, NY 14092 (Areas 1, 2, 3, 4 & 8), 43.149668°; Longitude: -79.032245° and 5374 Robert Avenue, Lewiston, Niagara County, New York 14092 (Area 5), Latitude: 43.149931°; Longitude: -79.032829° (see Attachment A). These two properties comprising the Site are identified on the Niagara County tax map as 115.00-1-7 and 115.15-1-20, respectively.

There are several active facilities within 0.5 mile of the Site, including the Our Lady of Peace Nursing Home, Mount St. Mary's Child Care Center, and Mount St. Mary's Hospital. Waterbodies located between 0.5-1.0 miles of the Site are the Niagara River to the West, Ontario Hydro Reservoir also to the West, Power Reservoir to the East, and Fish Creek to the North of the Site. The Lewiston, New York, population is approximately 15,964.

4. Site characteristics

The Site consists of two parcels. The first parcel, identified as tax parcel # 115.00-1-7, is approximately 39.2 acres in size and is the location of a cemetery. This property is owned by the Divine Mercy Roman Catholic Parish (formerly, the Holy Trinity Cemetery. Roman Catholic Church Society of Niagara Falls, New York). One area of observed contamination at the cemetery parcel is 4.21 acres in size and is located in the northernmost portion of the property. The contamination is located along two undeveloped roadways on a relatively flat and slightly elevated grassy field, which has been designated as Area 1 (see Appendix A-Attachment A). There are also piles of contaminated material and an undeveloped roadway in Area 2, a pile of contaminated material within Area 4, and contamination underneath the developed cemetery roadway designated as Area 9 (see Appendix A-Attachment A). There is one building on the cemetery property, which has been utilized as a residence, chapel, and cemetery maintenance facility (see Appendix A-Attachment A).

The second parcel at the Site, tax parcel #: 115.15-1-20, is located to the west of the cemetery on Robert Avenue and is a single-family residential property of approximately 0.59 acres in size. This parcel is designated as Area 5 (see Appendix A-Attachment B).

The Site is bordered to the north and east by Interstate 190, to the south by another cemetery, and to the west by Robert Avenue and a residential area.

The removal activities documented in this Action Memorandum (RV1) comprise a portion of the ongoing CERCLA removal action at the Site.

5. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

The release and threat of release of the contaminants Th-232 and U-238 at or from the Site

into the environment may impact the health of the public at the Site through a variety of pathways, including inhalation from dusts and gases; ingestion from dusts, soils, and water; and direct radiation from external doses (external direct radiation exposure is primarily attributable to gamma radiation, with lesser internal exposures attributable to alpha and beta radiation from particulate radioactive material). Workers at the cemetery, as well as adjacent neighbors, patrons, and other members of the public at or near the Site may be exposed to contamination via routes of inhalation or dermal contact to loose soils and windblown dust in the parking areas and indoors.

Hazardous Substances Statutory Source for Designation Under CERCLA:

Radiological Substances Identified	Maximum Concentration
Thorium 232 (Th-232)-Daughter: Ra-228	365 pCi/g
Uranium 238 (U-238)-Daughter: Ra-226	461 pCi/g

Each of the radiological substances listed above are included in 40 CFR 302.4, List of Hazardous Substances and Reportable Quantities, Appendix B – Radionuclides. The radionuclides are designated as a hazardous substance under Section 102(a) of CERCLA, 42 U.S.C. § 9602(a), and Section 112 of the Clean Air Act, 42 U.S.C. § 7412.

6. NPL status

The Site is not listed on the NPL, nor is it proposed for inclusion.

7. Maps, pictures, and other attached documents

Attachment A: Site Maps
Attachment B: Qualitative Gamma Scan Measurements
Attachment C: Soil Sample Locations
Attachment D: Highest Soil Concentrations
Attachment E: Outdoor Worker Preliminary Remediation Goals
Attachment F: Recreator Preliminary Remediation Goals
Attachment G: Indoor Radon Sample Results

B. Other Actions to Date

1. Previous actions

No previous actions have been taken by any federal, State, or local government entity or private party to address the hazardous substances located at the Site. All federal and New York State actions to date have been in the form of assessment activities.

2. Current actions

The activities taken by EPA thus far to mitigate the threats posed by the radioactive contamination at the Site are described in Section VI.A.1. These activities were initiated

on April 18, 2016 and continued until August 28, 2017. EPA expended approximately $83,000 in mitigation costs and $8,000 in technical support costs at the Site to address the radioactive contamination.

B. State and Local Authorities' Role

1. State and local actions, to date

In 1978, a USDOE aerial radiological survey identified multiple properties throughout the Niagara County region with elevated levels of radiation above background readings. In February 1980, the NYSDOH Bureau of Radiological Health and the NCDOH conducted a radiological survey of the Site to identify areas of elevated radioactivity because of the historic use of radioactive slag as fill on the property. During the survey, cemetery personnel showed NYSDOH a slag pile located near the caretaker's garage in the western portion of the cemetery property. Cemetery personnel stated that this slag was used as fill for the cemetery roads throughout the property.

Further inspection of the Site revealed that the slag was used as fill for the base of two proposed roadways that extended approximately 500 to 600 feet from the caretaker's garage northwest toward Robert Avenue. At the time of the 1980 survey, the construction of these roads had been abandoned. The underlying slag base was covered with an unknown amount of soil and was left as an open field. Using an Eberline PRM 7 radiation meter, radioactivity of the slag pile was measured at 250 μR/hr. Readings along the fully constructed cemetery roads ranged from 5 μR/hr (i.e., background concentration) to 30 μR/hr. Readings along the undeveloped roadways ranged from 200 μR/hr to 400 μR/hr. Samples of the slag were collected as part of the investigation, and laboratory analyses of these samples indicated detectable concentrations of Potassium-40, Uranium-235 and Uranium-238, Radium-226, and Thorium-232.

In October 2006, NYSDEC and the NCDOH conducted a Site visit. At that time, the slag pile that had previously been observed near the caretaker's garage was no longer present at the Site; the then-current caretaker did not have any knowledge of the slag pile or what had happened to it. The caretaker indicated that children living nearby used the cemetery area for recreation. Since the 1980 NYSDOH Site investigation, trees had grown through the undeveloped slag roadway in Area 1, pushing the slag to the surface. As part of the Site visit, NYSDEC conducted a radioactivity survey with an Exploranium GR-135. Readings taken while walking along the Area 1 undeveloped roadways indicated levels of 200–450 μR/hr at waist height and a surface contact reading of 450–570 μR/hr. A contact reading of 700 μR/hr at exposed slag near a tree was also documented. NYSDEC collected four samples of the slag, which were analyzed for isotopic Uranium and isotopic Thorium and underwent gamma-ray spectroscopy analysis. Laboratory analytical results indicated the presence of Uranium-238/234 ranging from 114 to 1,664 pCi/g and Thorium-232 ranging from 114 to 898 pCi/g.

In May 2007, NYSDEC visited the Site to identify contamination in an on-Site debris

pile using gamma-ray spectroscopy. A 5-minute static reading was taken, and Radium-226 was the only nuclide identified. An additional, similar analysis was conducted on one of the Area 1 undeveloped roadways, confirming the presence of Thorium-232.

During a July 2013 NYSDOH reconnaissance, screening activities showed elevated radiation levels at the Site along the Area 1 undeveloped roadways and along the Area 2 undeveloped roadway leading off-Site. In Area 1, the radiation levels were up to 51 μR/hr with the pressurized ion chamber and up to 50,000 cpm when tested with the sodium iodide (NaI) 2x2 detector.

The Site was referred to the EPA by the NYSDEC and NYSDOH on July 21, 2013. No other removal actions were taken by other government or private parties prior to this request.

2. Potential for continued State/local response

Neither NYSDEC, NYSDOH, nor the local government have resources available to conduct a removal action at the Site. NYSDEC and NYSDOH referred the Site to EPA on July 21, 2013. These entities have acted in a supporting role throughout the removal action.

III. THREATS TO PUBLIC HEALTH, OR WELFARE, OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Site met the requirements of Section 300.415(b)(2) of the NCP, 40 C.F.R. § 300.415(b)(2), for implementing a CERCLA removal action. Factors from Section 300.415(b)(2) of the NCP that supported conducting a removal action at the Site are discussed below.

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, or pollutants, or contaminants;

The Site contains an active public cemetery with a chapel utilized by patrons and cemetery workers. Patrons and the public move freely throughout the property, including the identified contaminated areas. There are residences located directly across Robert Avenue to the west of the Holy Trinity Cemetery property. Cemetery personnel's daily duties included burial and lawn maintenance activities in and around the contaminated areas. These activities and operations expose specific populations to the

Th-232 and U-238 contamination. Populations with increased cancer risk due to internal or external exposure to contamination are known as "receptors." Based on the compiled EPA PRS Assessment and EPA RSE data, the receptors that were most likely to be exposed to the hazardous substance of radiation at the Site were:

Outdoor workers:

An outdoor worker who is employed full-time could come in contact with the hazardous

substances while working on-Site conducting outdoor maintenance activities throughout the day. The worker may be exposed long-term to the on-Site surface soil contamination during the work day while performing tasks such as moderate digging or landscaping. The outdoor worker could be exposed to the contamination via the following pathways: incidental ingestion of soil, external radiation from contamination in soil, and inhalation of fugitive dust. According to an occupancy survey submitted to EPA in 2016 by Holy Trinity Cemetery, there are multiple personnel that worked outdoors at the Site.

Indoor workers:

An indoor worker at the chapel building may come in contact with contamination through ingestion of contaminated soils that have been incorporated into indoor dust, external radiation from contamination in soil, and the inhalation of contamination present in indoor air. According to the 2016 HTC Occupancy Survey, there was one person that worked indoors in the chapel at the Site.

Recreators:

A recreator may spend time outside performing recreational activities on the Site. Recreators may come in contact with, or be exposed to, the contamination for short periods of time over a long term. A recreator would consist of any patrons of the cemetery or local residents that had free access to walk on the HTC property. There are also historical accounts and evidence of local residents walking their dogs and mowing cemetery grass in the contaminated locations (specifically, Area 1) consistently over a long period of time. This was also witnessed by EPA staff during the removal assessment (August 2015) until the fence was installed around Area 1 in April 2016. The HTC Occupancy Survey indicated that there is an apartment on top of the chapel that was a residence for the groundskeeper's family. The family maintained a garden in Area 1 of the property. The radiological sampling and survey results in this area showed some of the most elevated levels observed during the Site assessments.

Construction workers:

Construction workers may come in contact with or be exposed to contamination over the short-term, during the work day while working around vehicles that suspend dust in the air. Activities such as trenching and excavating typically involve on-site exposures to surface soils. Construction workers could be exposed to contamination via the following pathways: incidental ingestion of soil, external radiation from contamination in soil, and inhalation of fugitive dust.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

If the hazardous substances at the Site migrate, the potentially affected water bodies located between 0.5-1.0 miles of the Site are the Niagara River and Ontario Hydro Reservoir to the west, Power Reservoir to the east, and Fish Creek to the north of the Site. The radioactive rock/soil at the Site is located at the surface in many areas and may migrate to the local water bodies via overland pathways during heavy rains and

flooding.

(iv) High levels of hazardous substances, or pollutants, or contaminants in soils, largely at or near the surface that may migrate;

Th-232 (Daughter: Th-228) has been detected in surface soils at levels as high as 365 pCi/g, and U-238 (Daughter: Th-230) has been detected in surface soils at levels as high as 461 pCi/g. The radiologically contaminated soil may migrate through airborne dust, surface runoff, construction activities, and foot traffic into the existing buildings on-site and/or into homes and residential areas. Since Thorium-232 and Uranium-238, as well as their progenies, have a long half-life (i.e. billions of years), it is highly probable that the Site will undergo physical changes before the radiological contaminants on-Site will decay to background concentrations. Building demolition and/or construction may result in increased exposures to humans from the contamination becoming suspended or airborne. Specifically, the expansion of the cemetery into these contaminated areas would increase the exposure through excavation as well as patron visits. Residents surrounding the property have been witnessed mowing the lawn in the contaminated areas, as well as walking pets within the areas of concern. Weathering and/or animal interaction may also cause contamination to migrate. Public visitors, patrons, and/or trespassers at the Site could cause a fire that could result in widespread contamination and increased exposure to gamma, and alpha and beta emitting radionuclides.

(v) Weather conditions that may cause hazardous substances, or pollutants, or contaminants to migrate or be released; and

Due to weather conditions such as rain, flooding, and wind, the Site radioactive rock/soil located near the ground surface may migrate to other parts of the Site or to the neighboring residential properties.

(vii) The availability of other appropriate federal or State response mechanisms to respond to the release.

No other federal or State response mechanisms were available to respond in a timely manner to the significant threat presented by the Site.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response activities described in this Action Memorandum, presented an imminent and substantial endangerment to public health or welfare or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

The time necessary to implement the proposed response activities exceeded the 12-month statutory limit for removal actions and required an exemption. The threat to human health or the environment posed by the contamination existing at the Site warranted the continued action thereby requiring a 12-month exemption based on the following factors:

A. Emergency Exemption

1. There was an immediate risk to public health, or welfare, or the environment.

Continued response activities beyond 12 months were required to mitigate the threats posed by the Site. Conditions at the Site (described in Section III of this Action Memorandum) and the proposed actions meet the criteria for an emergency exemption as specified in Section 104(c) of CERCLA, 42 U.S.C. § 9604(c). The radiological contamination at the Site posed immediate risks to public health and the environment, and continued response activities were required to mitigate the release or threat of release of hazardous substances at the Site.

2. Future response actions were required to eliminate unwarranted risk.

The radioactive materials impacting the Site are Th-232 and U-238. The maximum concentrations of these materials are 365 pCi/g and 461 pCi/g, respectively. Current removal activities have limited access to the contaminated material, but the radionuclides still pose a risk to public health, welfare and the environment. As described above, to achieve the carcinogenic risk value of 1×10^{-4}, the removal action must continue until the cancer risk at the Site falls to a level within EPA's acceptable risk range. Should additional removal activities (i.e. excavation of contaminated material) not be conducted, the public will continue to be at risk of exposure to unacceptable radiation levels from the Site.

3. Assistance will not otherwise be provided on a timely basis.

Other federal, State, or local response mechanisms and resources were not available to respond to the release and/or threat of release of hazardous substances, contaminants, or pollutants from the Site in a timely manner. Both the New York State and local government lacked the necessary resources to perform a response at the Site.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

The purpose of the RV1 removal activities was to limit the threat of direct contact with the radioactive contaminated material that exists at the Site. To minimize these threats, EPA sampled and analyzed Site contamination and installed fencing.

The actions stated below were necessary to mitigate the actual and potential risks to

human health and the environment associated with the presence of radioactive material at the Site. EPA actions at the Site included the following activities:

1. Proposed action description

On July 21, 2013, the Site was referred to EPA by the NYSDEC and the NYSDOH. This referral was followed by further assessment of Site conditions by EPA PRS and EPA Removal Program. The data from this assessment was evaluated (see Section II, A., 1. of this Action Memorandum) and a PRG calculator was used to determine the risk to receptors at the Site. The risk was determined to exceed the established regional limits and therefore warranted a removal action at the Site (see Attachments E and F).

On March 24, 2016, the Director of the ERRD (now known as SEMD) verbally authorized funding to initiate a response action at the Site.

On April 25, 2016, the permanent fencing installation around Area 1 (see Attachment B) was completed. Area 1 contains most of the radiologically contaminated material at the Site and is located closest to the residential properties along Robert Avenue.

On June 15, 2016, a radon mitigation system was installed in Area 5 at the residential home (see Attachment B) due to levels of radon detected in the basement as high as 11.0 pCi/L (see Attachment G). Post-installation radon data indicated the system was working properly and radon readings were below the action level of 4.0 pCi/L (see Attachment G).

On August 28, 2017, the permanent fencing around Areas 2 & 4 (see Attachment B) was completed. Area 2 contained an unfinished road with radiologically contaminated material as well as individual piles of radiologically contaminated material. Area 4 contained individual piles of radiologically contaminated material.

2. Contribution to remedial performance

The removal activities undertaken at the Site were consistent with the requirement of Section 104(a)(2) of CERCLA, which states, "any removal action undertaken . . . should . . . to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or the threatened release concerned." Additional removal activities are contemplated as part of the ongoing removal action at the Site. There are no long-term remedial actions planned for the Site.

3. Engineering Evaluation/Cost Analysis (EE/CA)

Due to the time-critical nature of this removal action, an EE/CA was not prepared.

4. Applicable or Relevant and Appropriate Requirements (ARARs)

It remains EPA's policy that ARARs will generally be considered protective absent multiple contaminants or pathways of exposure. However, in rare situations, EPA Regional offices establish PRGs at levels more protective than required by a given

ARAR, even absent multiple pathways or contaminants, where application of the ARAR would not be protective of human health or the environment. It was determined that the Uranium Mill Tailings Radiation Control Act cleanup standard for radiological contamination, and its subsurface soil cleanup level of 5 pCi/g, was not sufficiently protective of public health. Site-specific PRG numbers were calculated. The highest risk receptor, a composite worker whose daily duties include indoor and outdoor activities, was used in determining the most conservative value for cleanup levels at the Site.

5. Project schedule

EPA and its contractors mobilized to the Site on April 18, 2016, and the removal activities addressed in RV1 were completed on August 28, 2017.

B. Estimated Costs

A summary of estimated total costs for the removal action is presented below.

Extramural Costs:	**Total Funding Verbally Authorized March 24, 2016**
Regional Allowance Costs: Total cleanup contractor costs include labor, equipment, materials and laboratory disposal analysis (includes 20% contingency)	$130,000
Other Extramural Costs Not Funded From the Regional Allowance: Technical support (RST)	$ 20,000
Subtotal, extramural costs	$150,000
Extramural Costs Contingency (10%)	$ 0
Total Removal Project Ceiling	$150,000

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Given the Site conditions, the nature of the hazardous substances documented on-Site, and the potential exposure pathways to nearby populations described in Section III.A., actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response activities described in this Action Memorandum, presented an imminent and substantial endangerment to public health or welfare or the environment.

VIII. OUTSTANDING POLICY ISSUES

There are no known outstanding policy issues associated with this Site at the present time. While there is a Headquarters consultation process in place for sites where radioactive contamination is present (Headquarters Consultation for Radioactively Contaminated Sites, OSWER No. 9200.1-33P, July 26, 2000), this consultation requirement applies only to sites where radioactive material will be managed on-Site (e.g., capping, disposal cells) or where there is a potential, national precedent-setting issue related to the radioactive materials. In this instance, the radioactive materials will not be managed in place, and there is no potential national precedent-setting issue related to the radioactive materials. Therefore, Headquarters consultation is not required.

IX. ENFORCEMENT

EPA has conducted a preliminary Potentially Responsible Party (PRP) search for the Site. The OSC will work with the RAB enforcement staff and the Office of Regional Counsel in an attempt to locate all viable PRPs to recover costs associated with the ongoing removal action.

Based on full cost accounting practices, the total EPA costs for the RV1 removal activities that will be eligible for cost recovery are estimated to be $150,000. The following chart describes the costs that EPA believes are eligible for cost recovery.

Cost Type	Total Funding Requested in this Memorandum
Direct Extramural Cost	$150,000
Direct Intramural Cost	$125,000
Subtotal, Direct Cost	$275,000
Indirect Costs (Regional Indirect Cost Rate 44.1%)	$121,275
Estimated EPA Costs Eligible for Cost Recovery	**$396,275**

Note: Direct Costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recovery.

X. RECOMMENDATION

This decision document confirms the selected removal activities that were performed at the Holy Trinity Cemetery Site located in Lewiston, Niagara County, New York. This document has been developed in accordance with CERCLA and is not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site met the NCP Section 300.415(b) criteria for a removal action, and I recommend your approval of the proposed removal action and waiver of the 12-month limitation. The verbal authorization was granted by the Director of ERRD (now known as SEMD) of EPA Region 2 on March 24, 2016, in the amount of a $150,000, of which

$130,000 was for mitigation contracting and $20,000 in RST contractor funding. The Site work under the March 2016 verbal authorization was initiated on April 18, 2016 and continued until August 28, 2017. There were sufficient monies in the Regional removal advice of allowance to fund this project. Future, additional removal activities as part of this removal action are contemplated.

Please indicate your formal approval of the verbal authorizations granted for the emergency removal action at the Holy Trinity Cemetery Site, as per current Delegation of Authority, by signing below.

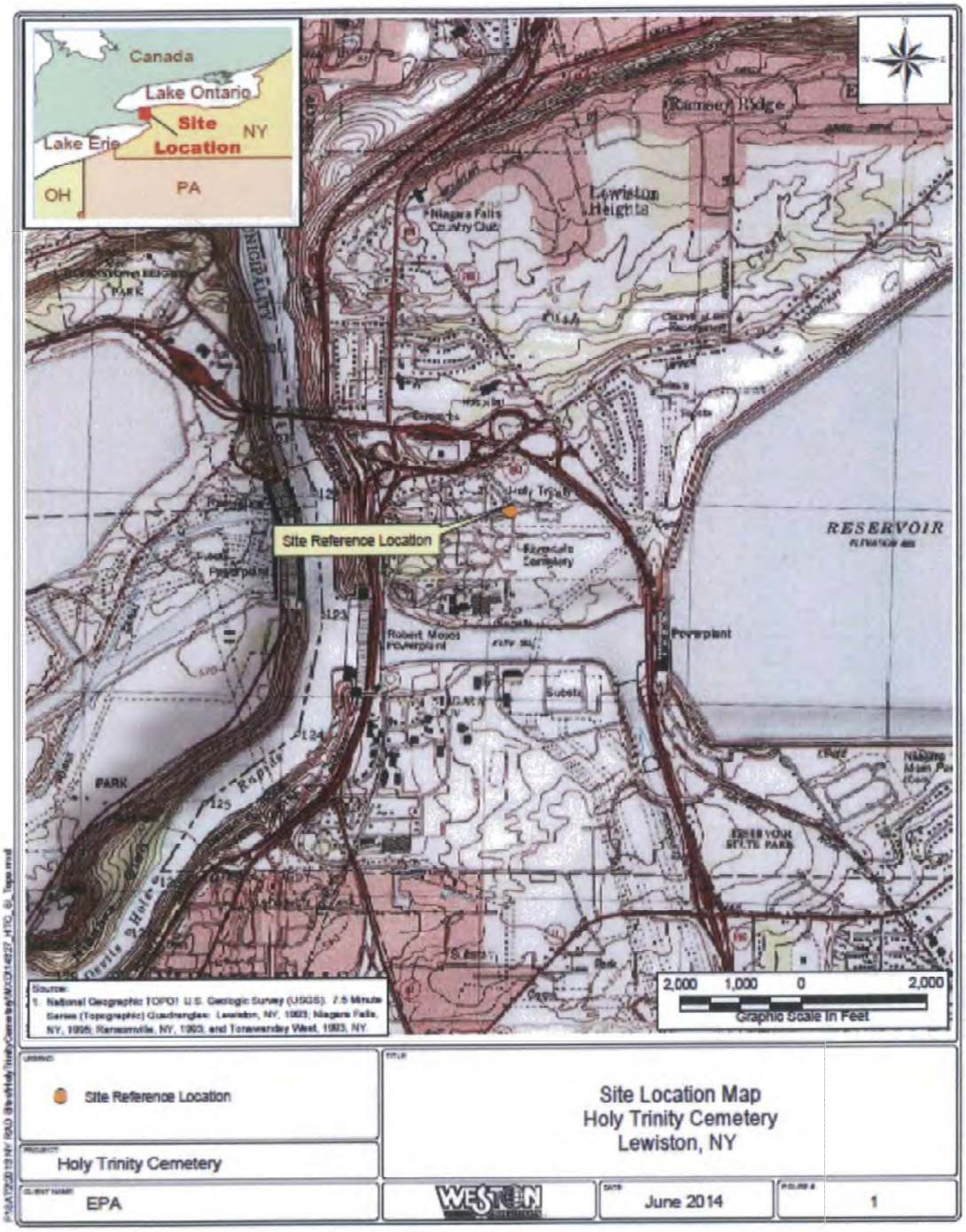
Approved: _____ **Date:** 8/29/19
Pat Evangelista, Acting Director
Superfund and Emergency Management Division

Disapproved: _____ **Date:** _____
Pat Evangelista, Acting Director
Superfund and Emergency Management Division

cc: P. Evangelista, SEMD-AD
J. Prince, SEMD-DD
E. Mosher, SEMD-RPB
J. Rotola, SEMD-RAB
S. Hoppe, SEMD-RPB
B. Grealish, SEMD-RAB
T. Lieber, ORC-NYCSFB
M. Ludmer, ORC-NYCSFB
M. Mears, PAD
H. Freeman, OPM-GCMB
M. Fiore, OIG
B. Schlieger, 5104A
T. Benton, RST
M. Franklin, NYSDEC
A. Raddant, USDOI
L. Rosman, NOAA

Attachment A

Site Location Map



Site Reference Location

Site Location Map
Holy Trinity Cemetery
Lewiston, NY

Holy Trinity Cemetery

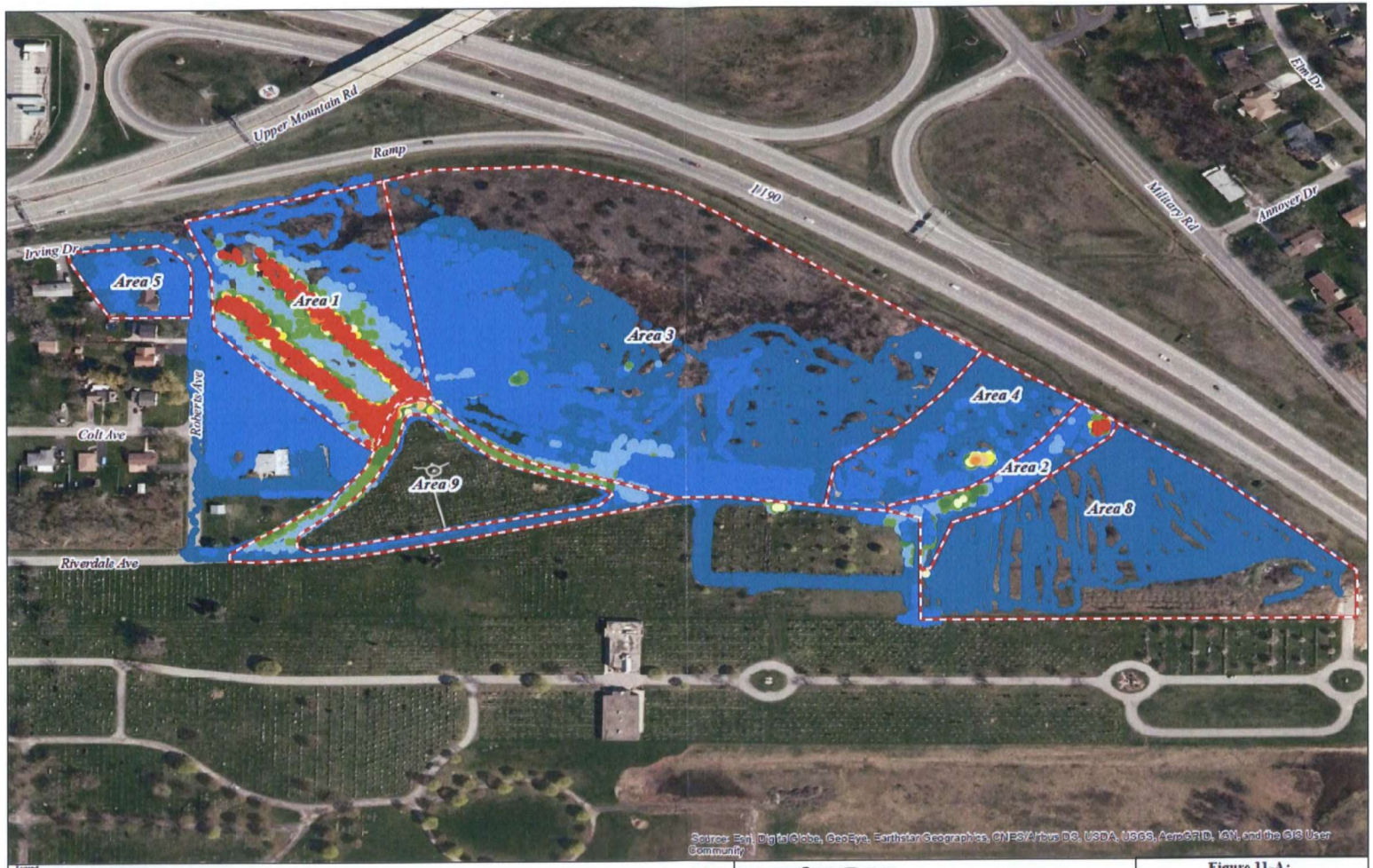
EPA

June 2014

1

Attachment B

Qualitative Gamma Scan Measurements using 3" x 3" Sodium Iodide (NaI) Detector



Legend
Designated Area
Gamma Scan Results
µR/hr
0 - 13 (1X)
13 - 26 (2X)
26 - 39 (3X)
39 - 52 (4X)
52 - 65 (5X)
65 - 78 (6X)
78 - 91 (7X)
91 - 104 (8X)
104 - 117 (9X)
117 - 130 (10X)
130 - 709

Master Viper Data - Copy.csv Events
SensorReading
0 - 13 (1X)
13 - 26 (2X)
26 - 39 (3X)
39 - 52 (4X)
52 - 65 (5X)
65 - 78 (6X)
78 - 91 (7X)
91 - 104 (8X)
104 - 117 (9X)
117 - 130 (10X)
130 - 709

Notes:
*Gamma survey conducted using a Ludlum-2241 scaler ratemeter with a sodium iodide 3x3 scintillator on September 16, 2016 and May 17, 2017.
*Gamma measurements presented in microroentgens per hour (µR/hr).
*Background gamma reading = 13 µR/hr.
*Maximum gamma reading = 709 µR/hr.

N

WESTON SOLUTIONS Weston Solutions, Inc.

In association with
Scientific and Environmental Associates, Inc.,
Avatar Environmental, LLC, Environmental Compliance Consultants,
On-Site Environmental, Inc., and Sovereign Consulting, Inc.

Figure 11-A:
Gamma Survey Overview Map

HOLY TRINITY CEMETERY
LEWISTON, NEW YORK

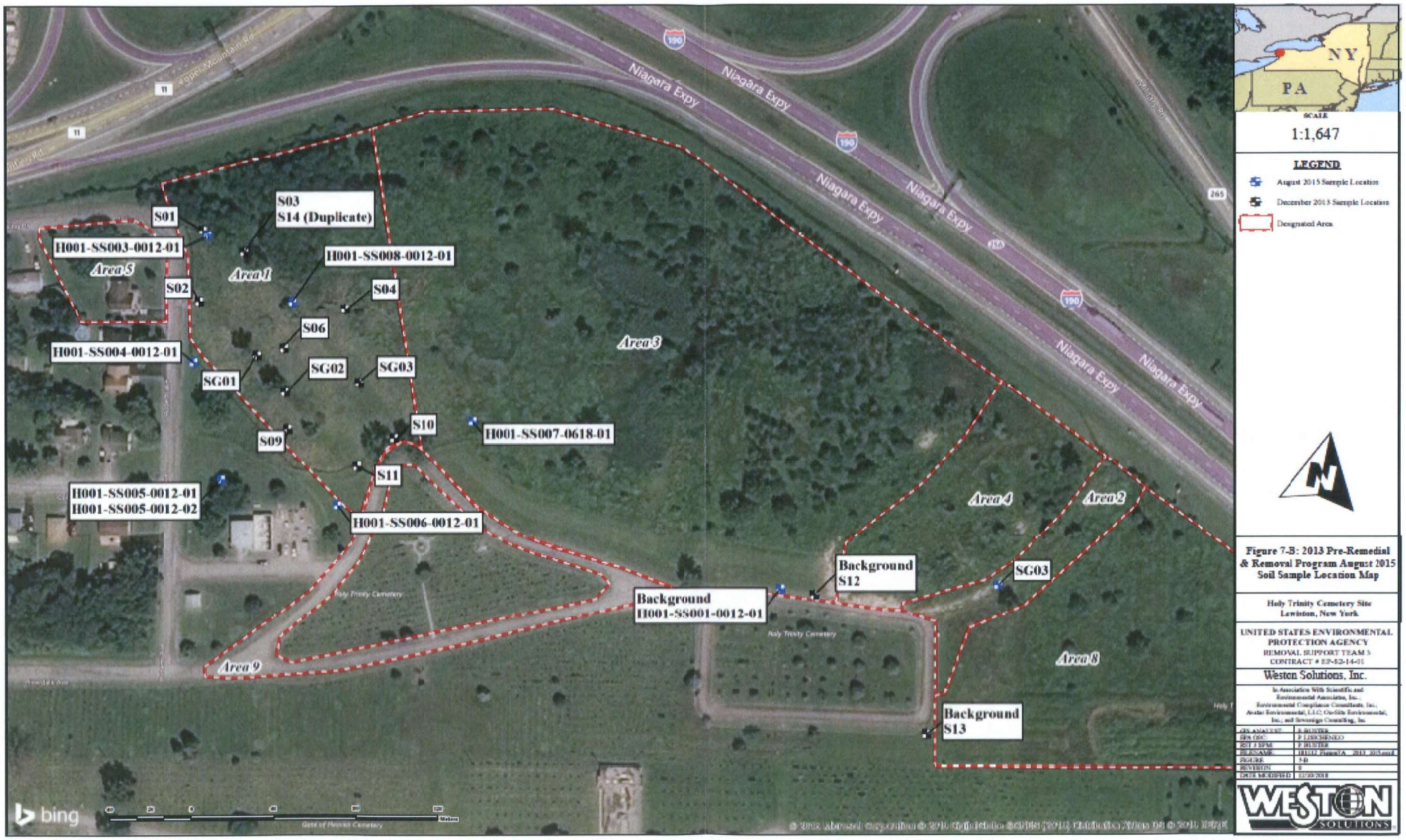
U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM 3
CONTRACT # EP-S2-14-01

GIS ANALYST:	P. BUSTER
EPA OSC:	P. LISICHENKO
KST SPM:	P. BUSTER
FILENAME:	181112_Fig 11-A_GammaSurvey.mxd

DATE MODIFIED: 12/13/2018

Attachment C

Figure 1-Soil Sample Locations from 2013 & 2015



Site Perimeter with Area

Contaminant Perimeter

Attachment D

Highest Soil Sample Concentrations

Radioisotope	Analytical Data pCi/g
Actinium-228 (Ac-228)	65.3
Bismuth-210 (Bi-210)	20
Bismuth-212 (Bi-212)	72.4
Bismuth-214 (Bi-214)	78.1
Cesium-137 (Cs-137)	0.31
Lead-210 (Pb-210)	25
Lead-212 (Pb-212)	66.9
Lead-214 (Pb-214)	79
Potassium-40 (K-40)	19.9
Protactinium (Pa-234)	0
Radium-224 (Ra-224)	0
Radium-226* (Ra-226)	360
Radium-228 (Ra-228)	303
Thallium-208 (Tl-208)	23.2
Thorium-228 (Th-228)	365.0
Thorium-230 (Th-230)	461
Thorium-232 Th-232)	358
Thorium-234 (Th-234)	62.9
Uranium-233/234 (U-233/234)	288
Uranium-235/236 (U-235/236)	14.2
Uranium-235 (U-235)	0
Uranium-238 (U-238)	287

Ra-226* (21 days ingrowth)
Yellow Highlight indicates the highest concentration in the Th-232 decay chain
Pink Highlight indicates the highest concentration in the U-238 decay chain

Attachment E

PRG Outdoor Worker Input Parameters and Output Values Specific to Holy Trinity Cemetery Site

PRG Outdoor Worker Input Parameters Specific to Holy Trinity Cemetery Site

Variable	Outdoor Worker Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	15.5169
B (PEF Dispersion Constant)	18.7762	18.4248
City (Climate Zone)	Default	Harrisburg, PA (7)
C (PEF Dispersion Constant)	216.108	211.7679
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0086
PEF (particulate emission factor) m^3/kg	1359344438	1.79771E+11
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	43.38639428
A_s (acres)	0.5	39.2
ED_{ow} (exposure duration - outdoor worker) yr	25	25
EF_{ow} (exposure frequency - outdoor worker) day/yr	225	70
ET_{ow} (exposure time - outdoor worker) hr/day	8	16
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60	23.04
IRS_{ow} (soil intake rate - outdoor worker) mg/day	100	100
t_{ow} (time - outdoor worker) yr	25	25
TR (target cancer risk) unitless	0.000001	0.0001
U_m (mean annual wind speed) m/s	4.69	3.44
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.9

Output PRG values for Outdoor Worker Scenario Specific to Holy Trinity Cemetery Site

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
**Secular Equilibrium PRG for Th-232*	*6.23E+02*	*2.89E+06*	*2.89E+00*	***2.88E+00***
**Secular Equilibrium PRG for U-238*	*2.27E+02*	*4.62E+06*	*3.92E+00*	***3.85E+00***

Output Risk values for Outdoor Worker Scenario Specific to Holy Trinity Cemetery Site

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
**Secular Equilibrium Risk for Th-232*	*5.86E-05*	*1.26E-08*	*1.25E-02*	***1.26E-02***
Ac-228	5.48E-08	2.69E-12	4.44E-03	**4.44E-03**
Bi-212	2.84E-08	6.17E-12	5.40E-04	**5.40E-04**
Pb-212	8.39E-07	3.43E-11	4.88E-04	**4.89E-04**
Po-212	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Po-216	0.00E+00	0.00E+00	7.75E-08	**7.75E-08**
Ra-224	5.41E-06	6.18E-10	3.70E-05	**4.24E-05**
Ra-228	4.28E-05	2.38E-09	4.00E-08	**4.28E-05**
Rn-220	0.00E+00	6.28E-14	3.01E-06	**3.01E-06**
Th-228	4.09E-06	7.23E-09	6.33E-06	**1.04E-05**
Th-232	5.41E-06	2.36E-09	4.18E-07	**5.83E-06**
Tl-208	0.00E+00	0.00E+00	7.11E-03	**7.11E-03**

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
**Secular Equilibrium Risk for U-238*	*2.03E-04*	*9.98E-09*	*1.17E-02*	***1.19E-02***
At-218	0.00E+00	0.00E+00	7.28E-12	**7.28E-12**
Bi-210	3.01E-07	3.14E-11	3.54E-06	**3.84E-06**
Bi-214	1.19E-08	4.26E-12	1.01E-02	**1.01E-02**
Hg-206	0.00E+00	0.00E+00	1.21E-11	**1.21E-11**
Pa-234	1.25E-10	1.32E-16	1.46E-05	**1.46E-05**
Pa-234m	0.00E+00	0.00E+00	1.27E-04	**1.27E-04**
Pb-210	4.84E-05	1.09E-09	2.07E-06	**5.04E-05**
Pb-214	1.78E-08	5.35E-12	1.35E-03	**1.35E-03**
Po-210	1.16E-04	1.00E-09	6.22E-08	**1.16E-04**
Po-214	0.00E+00	0.00E+00	5.30E-07	**5.30E-07**
Po-218	0.00E+00	9.58E-13	9.07E-12	**1.00E-11**
Ra-226	2.38E-05	1.94E-09	3.05E-05	**5.42E-05**
Rn-218	0.00E+00	0.00E+00	9.11E-13	**9.11E-13**
Rn-222	0.00E+00	1.57E-13	2.35E-06	**2.35E-06**
Th-230	6.24E-06	2.35E-09	1.25E-06	**7.49E-06**
Th-234	7.67E-07	2.12E-12	2.62E-05	**2.69E-05**
Tl-206	0.00E+00	0.00E+00	1.17E-11	**1.17E-11**
Tl-210	0.00E+00	0.00E+00	3.90E-06	**3.90E-06**
U-234	4.12E-06	1.92E-09	3.73E-07	**4.49E-06**
U-238	3.76E-06	1.63E-09	1.82E-07	**3.95E-06**

Site-Specific
Outdoor Worker Risk for Soil - Secular Equilibrium

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
*Secular Equilibrium Risk for Th-232	5.86E-05	1.26E-08	1.25E-02	**1.26E-02**
*Secular Equilibrium Risk for U-238	2.03E-04	9.98E-09	1.17E-02	**1.19E-02**
*Total Risk	2.62E-04	2.26E-08	2.41E-02	**2.43E-02**

Attachment F

PRG Recreator Input Parameters and Output Values Specific to Holy Trinity Cemetery Site

PRG Recreator Input Parameters Specific to Holy Trinity Cemetery Site

Variable	Recreator Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	15.5169
B (PEF Dispersion Constant)	18.7762	18.4248
City (Climate Zone)	Default	Harrisburg, PA (7)
C (PEF Dispersion Constant)	216.108	211.7679
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0086
PEF (particulate emission factor) m^3/kg	1359344438	1.79771E+11
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	43.38639428
A_s (acres)	0.5	39.2
ED_{rec} (exposure duration - recreator) yr	0	26
ED_{rec-a} (exposure duration - recreator adult) yr	0	20
ED_{resc-c} (exposure duration - recreator child) yr	0	6
EF_{rec} (exposure frequency - recreator) day/yr	0	182
EF_{rec-a} (exposure frequency - recreator adult) day/yr	0	182
EF_{rec-c} (exposure frequency - recreator child) day/yr	0	182
ET_{rec} (exposure time - recreator) hr/day	0	4
ET_{rec-a} (exposure time - recreator) hr/day	0	4
ET_{rec-c} (exposure time - recreator) hr/day	0	4
$IFA_{rec-adj}$ (age-adjusted inhalation rate - recreator) m^3	0	13953.333
$IFS_{rec-adj}$ (age-adjusted soil intake rate - recreator) mg	0	582400
IRA_{rec-a} (inhalation rate - recreator adult) m^3/day	20	20
IRA_{rec-c} (inhalation rate - recreator child) m^3/day	10	10
IRS_{rec-a} (soil intake rate - recreator adult) mg/day	100	100
IRS_{rec-c} (soil intake rate - recreator child) mg/day	200	200
t_{rec} (time - recreator) yr	0	26
TR (target cancer risk) unitless	0.000001	0.0001
U_m (mean annual wind speed) m/s	4.69	3.44
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.9

PRG Recreator Input Parameters Specific to Holy Trinity Cemetery Site

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
**Secular Equilibrium PRG for Th-232*	*5.92E+01*	*5.56E+06*	*4.28E+00*	***3.99E+00***
**Secular Equilibrium PRG for U-238*	*2.77E+01*	*8.90E+06*	*5.80E+00*	***4.79E+00***

PRG Recreator Input Parameters Specific to Holy Trinity Cemetery Site

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
**Secular Equilibrium Risk for Th-232*	*6.17E-04*	*6.56E-09*	*8.53E-03*	***9.15E-03***
Ac-228	1.05E-06	1.39E-12	3.00E-03	**3.00E-03**
Bi-212	3.57E-07	3.20E-12	3.65E-04	**3.65E-04**
Pb-212	1.34E-05	1.78E-11	3.30E-04	**3.43E-04**
Po-212	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Po-216	0.00E+00	0.00E+00	5.24E-08	**5.24E-08**
Ra-224	9.05E-05	3.21E-10	2.50E-05	**1.15E-04**
Ra-228	4.21E-04	1.24E-09	2.71E-08	**4.21E-04**
Rn-220	0.00E+00	3.26E-14	2.03E-06	**2.03E-06**
Th-228	5.17E-05	3.75E-09	4.28E-06	**5.60E-05**
Th-232	3.91E-05	1.23E-09	2.83E-07	**3.94E-05**
Tl-208	0.00E+00	0.00E+00	4.80E-03	**4.80E-03**

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
**Secular Equilibrium Risk for U-238*	*1.67E-03*	*5.18E-09*	*7.95E-03*	***9.62E-03***
At-218	0.00E+00	0.00E+00	4.92E-12	**4.92E-12**
Bi-210	6.45E-06	1.63E-11	2.39E-06	**8.84E-06**
Bi-214	1.08E-07	2.21E-12	6.89E-03	**6.89E-03**
Hg-206	0.00E+00	0.00E+00	8.18E-12	**8.18E-12**
Pa-234	2.30E-09	6.86E-17	9.89E-06	**9.89E-06**
Pa-234m	0.00E+00	0.00E+00	8.56E-05	**8.56E-05**
Pb-210	4.61E-04	5.68E-10	1.40E-06	**4.62E-04**
Pb-214	2.13E-07	2.78E-12	9.15E-04	**9.15E-04**
Po-210	8.79E-04	5.19E-10	4.20E-08	**8.79E-04**
Po-214	0.00E+00	0.00E+00	3.58E-07	**3.58E-07**
Po-218	0.00E+00	4.97E-13	6.13E-12	**6.63E-12**
Ra-226	1.82E-04	1.01E-09	2.06E-05	**2.02E-04**
Rn-218	0.00E+00	0.00E+00	6.16E-13	**6.16E-13**
Rn-222	0.00E+00	8.16E-14	1.59E-06	**1.59E-06**
Th-230	4.46E-05	1.22E-09	8.42E-07	**4.54E-05**
Th-234	1.68E-05	1.10E-12	1.77E-05	**3.45E-05**
Tl-206	0.00E+00	0.00E+00	7.88E-12	**7.88E-12**
Tl-210	0.00E+00	0.00E+00	2.64E-06	**2.64E-06**
U-234	3.98E-05	9.96E-10	2.52E-07	**4.01E-05**
U-238	3.61E-05	8.46E-10	1.23E-07	**3.62E-05**

Site-Specific
Recreator Risk for Soil - Secular Equilibrium

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
**Secular Equilibrium Risk for Th-232*	*6.17E-04*	*6.56E-09*	*8.53E-03*	***9.15E-03***
**Secular Equilibrium Risk for U-238*	*1.67E-03*	*5.18E-09*	*7.95E-03*	***9.62E-03***
**Total Risk*	*2.28E-03*	*1.17E-08*	*1.64E-02*	***1.86E-02***

Attachment G

HTC Area 5 Residential Home Radon Sampling Results

April 2016 HTC Area 5 Residential Home Radon Sampling Results Prior To Radon Mitigation System Installation

RTCA RADON TESTING CORPORATION OF AMERICA

PC1604260021

Site Radon Inspection Report

Date : 04/26/2016

Mr. Rick Pezzino
ACCU-VIEW PROPERTY INSP.
P.O. Box 641
Buffalo, NY 14051-

Client: Unknown
Test Location: 5374 Robert Avenue
Lewiston, NY 14092-

Individual Canister Results

Canister ID# :	2474800	Test Start :	04/22/2016 @ 12:27
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:32
Location :	Basement--Sump--#5374-03	Received:	04/26/2016 @ 11:22
Radon Level :	11.2 pCi/L	Analyzed:	04/28/2016 @ 10:48
Error for Measurement is: ±	0.5 pCi/L		

Canister ID# :	2474807	Test Start :	04/22/2016 @ 12:23
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:29
Location :	Basement--East--#5374-02	Received:	04/26/2016 @ 11:22
Radon Level :	4.6 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474826	Test Start :	04/22/2016 @ 12:41
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:39
Location :	1st Fl--Above Crawl--Foyer--#5	Received:	04/26/2016 @ 11:22
Radon Level :	1.0 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.2 pCi/L		

Canister ID# :	2474833	Test Start :	04/22/2016 @ 12:39
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:36
Location :	1st Fl--Office/Bed--#5374-06	Received:	04/26/2016 @ 11:22
Radon Level :	1.0 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474843	Test Start :	04/22/2016 @ 12:30
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:35
Location :	Basement--NW--#5374-05	Received:	04/26/2016 @ 11:22
Radon Level :	4.0 pCi/L	Analyzed:	04/28/2016 @ 10:49
Error for Measurement is: ±	0.4 pCi/L		

Canister ID# :	2474851	Test Start :	04/22/2016 @ 12:19
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:26
Location :	Basement--West--#5374-01	Received:	04/26/2016 @ 11:22
Radon Level :	4.1 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.3 pCi/L		

National Radon Safety Board NRSB Certified Radon Professionals

Andreas C. George
Radon Measurement Specialist
NJ MES 11089

Dante Galan
Laboratory Director

NRSB ARL0001
NYS ELAP ID: 10806
PADEP ID: 0346
NJDEP ID: NY933
NJ MEB 90036
FL DOH RB1609
IL RNL2000201

(914)345-3380

2 Hayes Street Elmsford NY 10523

RTCA RADON TESTING CORPORATION OF AMERICA

PC1604260021

Site Radon Inspection Report

Date : 04/26/2016

Mr. Rick Pezzino
ACCU-VIEW PROPERTY INSP.
P.O. Box 641
Buffalo, NY 14051-

Client: Unknown
Test Location: 5374 Robert Avenue
Lewiston, NY 14092-
Individual Canister Results

Canister ID# :	2474873	Test Start :	04/22/2016 @ 12:45
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:40
Location :	1st Fl--Above Crawl--Family Rm	Received:	04/26/2016 @ 11:22
Radon Level :	0.9 pCi/L	Analyzed:	04/28/2016 @ 11:57
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474887	Test Start :	04/22/2016 @ 12:19
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:26
Location :	BLANK--Basement--West #FB1	Received:	04/26/2016 @ 11:22
Radon Level :	0.1 pCi/L	Analyzed:	04/28/2016 @ 10:49
Error for Measurement is: ±	0.6 pCi/L		

Canister ID# :	2474896	Test Start :	04/22/2016 @ 12:40
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:38
Location :	1st Fl--Mast Bedroom--#5374-0	Received:	04/26/2016 @ 11:22
Radon Level :	1.1 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.2 pCi/L		

Canister ID# :	2474918	Test Start :	04/22/2016 @ 12:30
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:35
Location :	Basement--NW--#5374-04	Received:	04/26/2016 @ 11:22
Radon Level :	4.5 pCi/L	Analyzed:	04/28/2016 @ 10:48
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474924	Test Start :	04/22/2016 @ 12:47
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:41
Location :	2nd Fl--W-Bedroom--#5374-10	Received:	04/26/2016 @ 11:22
Radon Level :	1.8 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474929	Test Start :	04/22/2016 @ 12:49
Canister Type :	Charcoal Canister 3 inch	Test Stop :	04/25/2016 @ 12:42
Location :	2nd Fl--E-Bedroom--#5374-11	Received:	04/26/2016 @ 11:22
Radon Level :	1.1 pCi/L	Analyzed:	04/28/2016 @ 11:37
Error for Measurement is: ±	0.2 pCi/L		

National Radon Safety Board NRSB Certified Radon Professionals

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RTCA RADON TESTING CORPORATION OF AMERICA

PC1604260021

Site Radon Inspection Report

Date : 04/26/2016

Mr. Rick Pezzino
ACCU-VIEW PROPERTY INSP.
P.O. Box 641
Buffalo, NY 14051-

Client: Unknown

Test Location: 5374 Robert Avenue
Lewiston, NY 14092-

Individual Canister Results

The results indicate that at least one testing device registered at or above the United States Environmental Protection Agency (EPA) action level of 4.0 picoCuries per liter of air (pCi/L). The EPA recommends mitigation if the average of two short-term tests taken in the lowest level of the building suitable for occupancy show radon levels that are equal to or greater than 4.0 pCi/L.

For information on how to reduce radon levels in your home, please review the EPA booklet: Consumer's Guide to Radon Reduction (www.epa.gov/radon/pdfs/consguid.pdf) and contact your state health department. The EPA maintains a radon information website, including copies of its publications, at www.epa.gov/iaq/radon.

For New Jersey clients: Please see the attached guidance document entitled Radon Testing and Mitigation: The Basics for further information.

For New York clients: If the radon level of one or more testing devices is equal to or exceeds 20 pCi/L please contact the New York State Department of Health, Bureau of Environmental Radiation Protection, for technical advice and assistance at 518-402-7556 or toll free1-800-458-1158.

PLEDGE OF ASSURED QUALITY

All procedures used for generating this report are in complete accordance with the current EPA protocols for the analysis of radon in air (EPA 402-R-92-004). The analytical results relate only to the samples tested, in the condition received by the lab, and that calculations were based upon the information supplied by client. RTCA and its personnel do not assume responsibility or liability, collectively and individually, for analysis results when detectors have been improperly handled or placed by the consumer, nor does RTCA and its personnel accept responsibility for any financial or health consequences of subsequent action or lack of action, taken by the customer or its consultants based on RTCA-provided results.

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August 2016 HTC Area 5 Residential Home Radon Sampling Results Post Radon Mitigation System Installation

RTCA RADON TESTING CORPORATION OF AMERICA

PC1608050104

Site Radon Inspection Report

Date : 08/05/2016

Mr. Rick Pezzino
ACCU-VIEW PROPERTY INSP.
P.O. Box 641
Buffalo, NY 14051-

Client: Unknown

Test Location: 5374 Roberts Avenue
Lewiston, NY 14092-

Individual Canister Results

Canister ID# :	2474818	Test Start :	08/01/2016 @ 12:09
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:41
Location :	BLANK-Office	Received:	08/05/2016 @ 12:04
Radon Level :	**0.1 pCi/L**	Analyzed:	08/05/2016 @ 17:36
Error for Measurement is: ±	0.6 pCi/L		

Canister ID# :	2474890	Test Start :	08/01/2016 @ 11:58
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:36
Location :	Basement-SE/Laundry	Received:	08/05/2016 @ 12:04
Radon Level :	**1.8 pCi/L**	Analyzed:	08/05/2016 @ 17:36
Error for Measurement is: ±	0.2 pCi/L		

Canister ID# :	2474895	Test Start :	08/01/2016 @ 11:50
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:31
Location :	Basement-Sump Pump	Received:	08/05/2016 @ 12:04
Radon Level :	**2.0 pCi/L**	Analyzed:	08/05/2016 @ 17:36
Error for Measurement is: ±	0.3 pCi/L		

Canister ID# :	2474902	Test Start :	08/01/2016 @ 12:06
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:39
Location :	1st Fl-Foyer	Received:	08/05/2016 @ 12:04
Radon Level :	**0.2 pCi/L**	Analyzed:	08/05/2016 @ 17:36
Error for Measurement is: ±	0.2 pCi/L		

Canister ID# :	2474912	Test Start :	08/01/2016 @ 12:07
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:39
Location :	1st Fl-East/TV	Received:	08/05/2016 @ 12:04
Radon Level :	**0.2 pCi/L**	Analyzed:	08/05/2016 @ 17:36
Error for Measurement is: ±	0.2 pCi/L		

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RTCA RADON TESTING CORPORATION OF AMERICA

Site Radon Inspection Report

Date : 08/05/2016

Canister ID# :	2482386	Test Start :	08/01/2016 @ 12:01
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:36
Location :	Basement-NW-Storage	Received:	08/05/2016 @ 12:04
Radon Level :	**1.6 pCi/L**	Analyzed:	08/05/2016 @ 17:54

Error for Measurement is: ± 0.2 pCi/L

Canister ID# :	2482442	Test Start :	08/01/2016 @ 12:09
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:41
Location :	1st Fl-Office	Received:	08/05/2016 @ 12:04
Radon Level :	**0.2 pCi/L**	Analyzed:	08/05/2016 @ 17:54

Error for Measurement is: ± 0.2 pCi/L

Canister ID# :	2474914	Test Start :	08/01/2016 @ 11:54
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:33
Location :	Basement-West/Chimney	Received:	08/05/2016 @ 12:04
Radon Level :	**1.7 pCi/L**	Analyzed:	08/05/2016 @ 17:36

Error for Measurement is: ± 0.2 pCi/L

Canister ID# :	2474927	Test Start :	08/01/2016 @ 12:11
Canister Type :	Charcoal Canister 3 inch	Test Stop :	08/04/2016 @ 11:42
Location :	1st Fl-Bedroom/TV	Received:	08/05/2016 @ 12:04
Radon Level :	**0.2 pCi/L**	Analyzed:	08/05/2016 @ 17:36

Error for Measurement is: ± 0.3 pCi/L

The reported results indicate that radon levels in the building are below the United States Environmental Protection Agency (EPA) action level of 4.0 picoCuries per liter of air (pCi/L). The EPA recommends retesting if your living patterns change and you begin occupying a lower level of the building, such as a basement or if major remodeling is done.

General radon information may be obtained by consulting the EPA booklet: A Citizen's Guide to Radon (www.epa.gov/radon/pubs/citguide.html). To request a copy or for further information, please contact your state health department. The EPA maintains a radon information website, including copies of its publications, at www.epa.gov/iaq/radon.

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DO NOT PLACE IN ADMINISTRATIVE RECORD
DO NOT RELEASE TO THE PUBLIC

Confidential Enforcement Addendum