Mt. Kisco WWTP Radiological Characterization Report

August, 2019

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1. INTRODUCTION

1.1. PURPOSE

A radiological characterization survey of the former Mt. Kisco Wastewater Treatment Plant (WWTP) was performed on various days from October 22, 2018 to June 5, 2019. The survey consisted of overland gamma radiation measurements and surface soil sampling of selected locations based on the magnitude of gamma radiation levels found. The survey was performed pursuant to Contract DEL-378CR on behalf of the New York City Department of Environmental Protection (DEP). The purpose of the investigation was to estimate the magnitude and areal extent of radium-contaminated soil on the property.

1.2. OVERVIEW

An overland, GPS-based gamma scan of the site was the main method of delineating the areal extent of radium soil contamination. Soil sampling with subsequent radioanalysis was also used to quantify the magnitude of radium concentrations existing at the site.

The "Initial Site Visit Work Plan for Radiological Impacts" located in Appendix A contains additional information regarding site preparation performed before this survey was conducted. Such preparation included brush cutting and fence installation with radiation safety support, and an initial scoping survey of the access road and "dogleg" portion of the property.

2. SCOPE AND DESCRIPTION OF CHARACTERIZATION

2.1. GENERAL AREA DESCRIPTION

The former Mt. Kisco Wastewater Treatment Plant (WWTP) is located on Morgan Drive in Mt. Kisco, NY. The Site, as defined by the September 2018 NYSDEC Order on Consent Order Index No. CO 3-20180709-131 is comprised of five deeded parcels and is approximately 21 acres in size (NYSDEC, 2018). From 1913 until 1964, the WWTP received sewage from the Village of Mt. Kisco including the Canadian Uranium and Radium Corporation facility located about 3 miles north of the plant. Three of the five parcels are undeveloped with one of the parcels still housing former WWTP structures as well as former drying beds and ponds. Two of the five parcels are developed and have active businesses (Frito-Lay and the US Post Office). Of these, only the Post Office parcel was surveyed during this project due to the lack of permission from the property owner to survey the Frito-Lay property. The existing structures on the undeveloped parcels were not surveyed due to safety considerations. Figure 1 depicts the proposed survey area and the underlying parcels.

2.2. PREVIOUS INVESTIGATIONS

In 2017, Great Lakes Environmental and Safety Consultants, Inc. (GLESC) conducted a limited radiological walkover survey and sampling of the 2 Morgan Drive parcel. A report titled

"Radiological Survey & Sampling Results Morgan Drive Lot 3, Mt. Kisco, NY" was issued in October 2017.

Of 14 samples collected, three (3) hot spot samples exhibited elevated levels of radium-226 ranging from 25.53 pCi/g to 65.04 pCi/g and six (6) other soil samples analyzed exhibited elevated levels of radium-226 ranging from 13.24 pCi/g to 21.05 pCi/g.

Two (2) water samples were collected from Pond #'s 1 and 2. Gross alpha activity from the Pond #1 sample (P1-W1) was 317 pCi/L and radium-226 at 11.3 pCi/L. The Pond #2 sample (P2-W1) did not exceed the established drinking water limits of 15 pCi/L gross alpha and 3 pCi/L Ra-226.

Gamma walkovers performed by GLESC of remaining structural components of the WWTP or other accessible land areas were not significantly greater than background levels. Significantly elevated activity levels were observed, however, in three hotspots taken from areas between the Primary Tank and Sprinkling Filter Bed (HS-1), an area on the northwestern edge of Pond #2 (HS-2) and an area along the northwestern boundary of the site between Pond #1 and Pond #2 (HS-3).

On April 9, 2018, both NYSDEC and Great Lakes collected groundwater samples from 4 existing wells located on the 6 Morgan Drive property. The May 9, 2018 Groundwater Sampling report from Great Lakes indicates that their sample results were below the NYS groundwater standard of 3 pCi/L for Ra-226.

On February 15, 2019, LiRO performed additional groundwater sampling from 3 existing wells on 2 Morgan Drive. The samples resulted in Ra-226 and Ra-228 concentrations below the NYS groundwater standard of 3 pCi/L.

On December 20, 2017 and April 9, 2018, NYSDEC performed limited gamma walkover surveys of areas of interest on and around the Morgan Drive properties. Additional readings above background were detected to the north of the access road between the 6 Morgan Drive property and the Kisco River. Elevated readings were also detected on 2 Morgan Drive near the edge of Morgan Drive.

Figure 1. Proposed Survey Area and Underlaying Parcels

3. DATA QUALITY OBJECTIVES

3.1. STATE THE PROBLEM

- The location, extent, identity and concentration of radiological contaminants must be determined to allow planning of future decommissioning and waste disposal efforts.

3.2. IDENTIFY THE DECISION

- Determine if data collected and process knowledge can adequately specify the locations,

type, and extent of contamination for decommissioning planning and waste characterization.

3.3. IDENTIFY INPUTS TO THE DECISION

- Newly collected data from this survey as well as prior characterization data obtained from other surveys.
- Facility and process knowledge germane to the construction, operation, and history of the site.
- New York State Department of Environmental Conservation (NYSDEC) regulatory guidance

3.4. DEFINE BOUNDARIES OF THE STUDY

The proposed survey area consisted of portions of the following parcels:

Tax Map/Parcel No.: 80.55-1-2.1/1
1 Morgan Drive, Mt. Kisco, NY
Owner: AKT One Realty (not surveyed; access not gained from owner)

Tax Map/Parcel No.: 80.55-1 -2.1/2
3 Morgan Drive, Mt. Kisco, NY
Owner: United States Postal Service (surveyed)

Tax Map/Parcel No.: 80 .55-1 -2.1/3
6 Morgan Drive
Owner: Creme de la Crème (surveyed)

Tax Map/Parcel No.: 80.55-1-2.1/4
2 Morgan Drive
Owner: Radio City Ventures, LLC (surveyed)

Tax Map/Parcel No.: 80.55-1-2.2
Portion of 1 Lexington Ave., including Access Road
Owner: Village of Mt. Kisco (surveyed)

The original proposed survey area is specified by the NYSDEC in the Consent Order as the gray area in Figure 1 above.

3.5. STATE THE DECISION RULES

The effectiveness of the characterization survey in localizing and quantifying contamination depends on two general considerations:

- The quantity and placement of sampling/measurement locations must be sufficient to spatially characterize the area. This was easily accomplished by the use of a GPS-based gamma radiation measurement system which collected over 30,000 data points.
- The quantity and types of measurements and analyses performed must be sufficient to radiologically characterize the contaminants. Soil sample locations were specified to encompass the entire range of gamma radiation levels found from background (7 uR/hr) to 830 uR/hr. Only one radionuclide of interest was suspected, radium-226, and was thus confirmed by soil analyses. However, an additional radionuclide of interest was detected during this survey: thorium-230. This will be discussed in later sections.

3.6. LIMITS ON DECISION ERRORS

- Statistical constraints on decision errors are not applicable to this survey because subjective rather than statistical techniques are used, i.e., this is a characterization survey not a final status survey.

3.7. OPTIMIZATION OF THE SURVEY DESIGN FOR COLLECTING DATA

There are a few alternatives for determining contaminant concentrations in soil. The options are summarized as follows:

- **Delineating areas of soil contamination on the surface:** In the past, the main method of performing a characterization survey of a land area was to overlay a grid over the area and manually record readings within each grid square. However, with the advent of GPS-based radiation data collection systems, the entire survey area can now be walked-over along transects or elevation contours with count rates and GPS coordinates being recorded approximately every 1-second. In this way, thousands of data points can be collected within a reasonable period of time allowing 2-dimensional plots of gamma activity to be created.
- **Obtaining contaminant data from soil:** After areas of elevated surface gamma activity were mapped using the GPS-based system, surface soil sampling with subsequent laboratory analysis was performed to determine the type and concentrations of radionuclides present at those spots. The radionuclide concentration data is useful for comparison to regulatory limits, for worker health / safety considerations, and for survey considerations which a correlation between gamma count rate and radium concentration may be calculated. As part of a later phase of assessment, core sampling and *in situ* measurement (i.e., gamma-logging) could be performed to measure the depth of contamination.
- **Analysis of surface soil samples:** For this survey, analysis of the Ac-228 gamma emission to estimate radium-228 (and thorium-232 and -228) and analysis of the Bi-214 gamma emission after at least 21 days of in-growth to estimate radium-226 were the key radioanalysis parameters. Gross alpha and beta counts were also performed to be consistent with prior surveys. The elevated gross alpha results obtained were cause to add isotopic thorium analysis of which only

thorium-230 was detected, at relatively high concentrations.

4. METHODS

4.1. GAMMA SCAN

The Former Mt. Kisco WWTP Radiological Site Characterization Work Plan (Appendix B) contains specifications of the gamma scan methodology. In summary, the scan consisted of performing 1-second gamma counts using a Ludlum 44-10 (2x2-inch) scintillation detector coupled to a Model 2221 ratemeter and GPS-based localization and recording system. The detector count rates were converted to a gamma exposure rate using the detector's calibration factor.

4.1.1. Background Area

The originally proposed background area was a portion of the Village of Mt. Kisco property beyond the bridge over the Kisco River. However, that area was found to be affected. Therefore, an alternative background area was chosen. The location is the southeastern-most portion of 2 Morgan Drive in a heavily-wooded area near the adjoining school (see Attachment 1). The large size of the trees and the elevated topography relative to the WWTP indicate that this area has been undisturbed for over 100 years. The distance from the contaminated areas and the consistent, low readings in the 6000 cpm (7 uR/hr) range indicate that this area is unaffected by the former WWTP.

4.2. SURFACE SOIL SAMPLING

Soil samples were collected from 16 locations exhibiting gamma emission from background to the maximum observed level (830 uR/hr).

5. RESULTS

5.1. GAMMA SCAN

5.1.1. Gamma Scan Results Summary

The results of the gamma scan are shown in Attachment 1. The following statistics summarize the gamma scan data collected:

Background Area:

Number of Readings: 395
Mean: 101.6 CPS 7.1 uR/hr
SD: 8.4 CPS 0.6 uR/hr
Max: 132 CPS 9.2 uR/hr
Min: 79 CPS 5.5 uR/hr

Survey Area:

Number of Readings: 30636
Mean: 187.2 CPS 13.1 uR/hr
SD: 280.6 CPS 19.6 uR/hr
Max: 11863 CPS 830 uR/hr
Min: 67 CPS 4.7 uR/hr

As can be observed from the Gamma Map shown in Attachment 1, most of the contaminated areas exist in the northern portion of the survey area in mainly marshy areas. The area of contamination north of the bridge is estimated at ¾ acres. The area of contamination shown as a "marsh" in the northwest portion of the site is also estimated at ¾ acre. While depth measurements have not yet been performed, if we estimate the depth of contamination from observation of the surrounding marsh depth to be 6 feet, then the total estimated volume of contaminated soil in marshy areas would be approximately 15,000 cubic yards.

The pile of contaminated soil just south of the marshy areas is estimated to be 100' x 80' x 30' high, or about 6000 cubic yards. Small isolated hotspots scattered throughout the remainder of the site may add approximately 1000 cubic yards.

Thus, the total rough estimate of the volume of contaminated soil is 22,000 cubic yards. Note that this is a very rough estimate given that depth measurements have not been performed and that additional contamination may exist beyond the presently surveyed areas.

5.2. SOIL SAMPLING

The results of soil analyses and the gamma readings associated with the soil sample locations are list in Table 5.1 below. Sample locations are shown in Attachment 2, laboratory results can be found in Attachment C.

Table 5.1 – Soil Sampling Results (0 to 6" Collection Depth)

	Laboratory Results					Field Readings		
	(pCi/g)							
Sample ID	Ra-226	Ra-228	Th-230	Gross Alpha	Gross Beta	GM Reading of Core (cpm)		Reading at Collection Pt. (uR/hr)
06051902-01	19.4 +-2.7	0.9+-0.5	381 +-61	713 +- 133	47.7 +- 12.7	200		32
06051902-02	37.3 +- 5.1	0.8 +- 0.8	580 +- 92	862 +- 160	49.0 +- 13.6	250		97
06051902-03	48.9 +- 6.6	1.8 +- 0.9	606 +- 95	893 +- 165	48.1 +- 13.3	200		73
06051902-04	54.4 +- 7.4	1.6 +- 1.2	891 +- 142	1446 +- 264	39.1 +- 13.7	200		150
06051902-05	29.7 +- 4.0	1.0 +- 0.7	582 +- 92	896 +- 166	28.0 +- 10.7	150		34
06051902-06	11.6 +- 1.7	1.4 +- 0.6	157 +- 25	267 +- 52	29.3 +- 7.6	150		20
06051902-07	0.7 + - 0.2	0.9 +- 0.3	2.7 +- 1.1	11.8 +- 5.9	12.4 +- 4.3	150		11
06051902-08	22.5 +- 3.2	1.4 +- 0.6	346 +- 57	687 +- 128	29.0 +- 10.3	200		33
06051902-09	14.2 +- 2.0	1.4 +- 0.6	231 +- 39	405 +- 78	10.7 +- 6.9	150		25
06051902-10	19.1 +- 2.7	1.4 +- 0.6	298 + - 48	504 +- 96	30.1 +- 9.4	200		35
06051902-11	55.8 +- 7.6	0.0 +- 0.6	222 +- 36	719 +- 134	224 +- 42	250		67
06051902-12	5.0 +- 0.8	1.4 +- 0.5	55 +- 10	118 +- 26	18.6 +- 5.2	200		24
06051902-13	22.6 +- 3.1	1.3 +- 0.6	266 +- 43	408 +- 78	42.5 +- 10.6	200		18
06051902-14	420 +- 56	10.4 +- 2.3	6738 +- 1059	11160 +- 2000	713 +- 132	1200		660
06051902-15	10.2 +- 1.5	1.5 +- 0.5	115 +- 20	330 +- 64	38 +- 10	100		22
06051902-16	1.3 +- 0.3	0.9 +- 0.6	4.6 +- 1.3	19.5 +- 7.8	16.1 +- 4.6	50		8

5.3. CORRELATION

The radium-226 concentration in soil and the associated gamma scan readings were plotted to estimate the conversion factor uR/hr per pCi/g (see Figure 5.1 below). Note: the highest reading (sample 14) was discarded from this analysis because the area of high activity was small (not uniform under the detector's field of view). The resulting conversion factor of 1.76 uR/hr per pCi/g is in fair agreement with the 2.5 uR/hr per pCi/g estimated by Schiager ("Analysis of Radiation Exposures on or Near Uranium Mill Tailings Piles" in Radiation Data and Reports, July, 1974). The main sources of deviation from the published conversion factor is the lack of uniformity of the contamination and differences in self-shielding due to varying soil density and moisture content throughout the WWTP area.

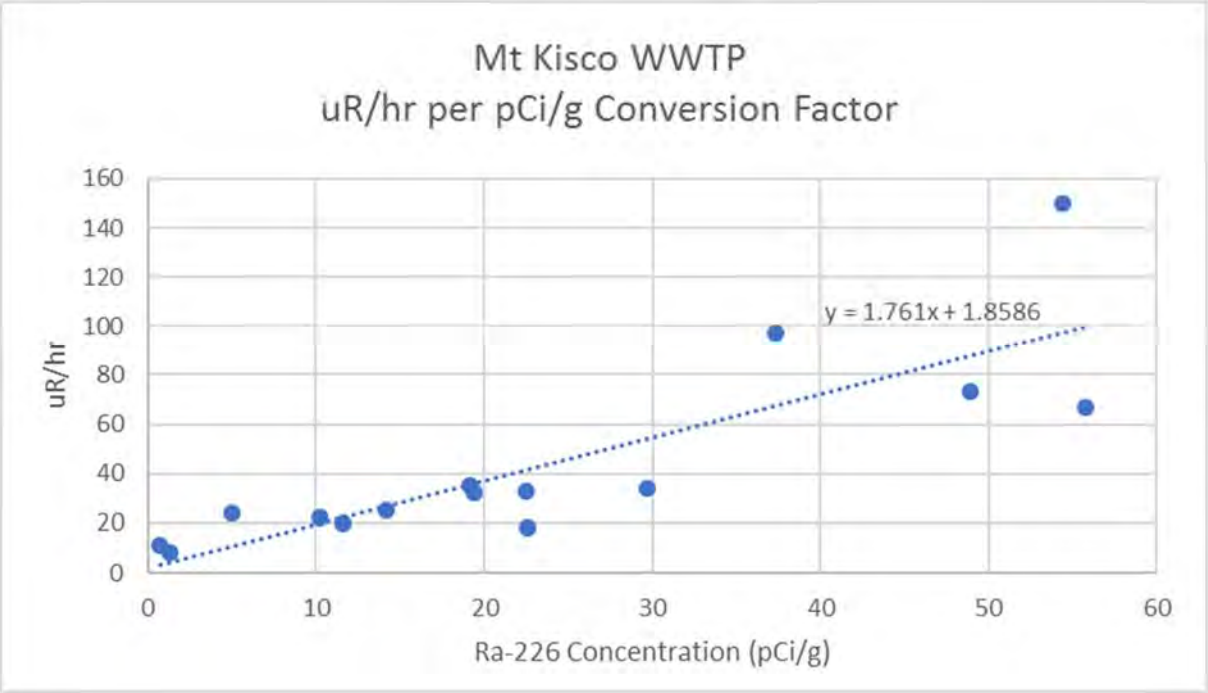


Figure 5.1 – uR/hr per pCi/g Conversion Factor

For the purposes of discussion, the following calculation assumes a cleanup guideline of 5 pCi/g Ra-226 as given in 40CFR192 for uranium mill tailings. However, in the future, the NYSDEC will have to provide site-specific guidance that may result in different cleanup criteria. For this site, the background exposure rate is 8 uR/hr and the background Ra-226 concentration is approximately 1.3 pCi/g. Given these data and after review of the above chart, we conclude that gamma exposure rates greater than 20 uR/hr (17,000 cpm with a 44-10 detector) most definitely indicate soil with greater than 5 pCi/g Ra-226. Exposure rates in the 15-20 uR/hr (13,000 to 17,000 cpm) would be suspect and could indicate greater than 5 pCi/g in the soil. Exposure rates less than 15 uR/hr (13,000 cpm) would have less than 5 pCi/g Ra-226 above background.

However, the recent discovery of high Th-230 levels in the soil may significantly affect the eventual release criteria. Dose-based release criteria would have to be developed during the remedial investigation phase of the project and further correlation study performed.

The Th-230 concentration versus Ra-226 concentration relationship is shown in Figure 5.2 below. On average, the Th-230 concentration was 12.6 times the Ra-226 concentration.

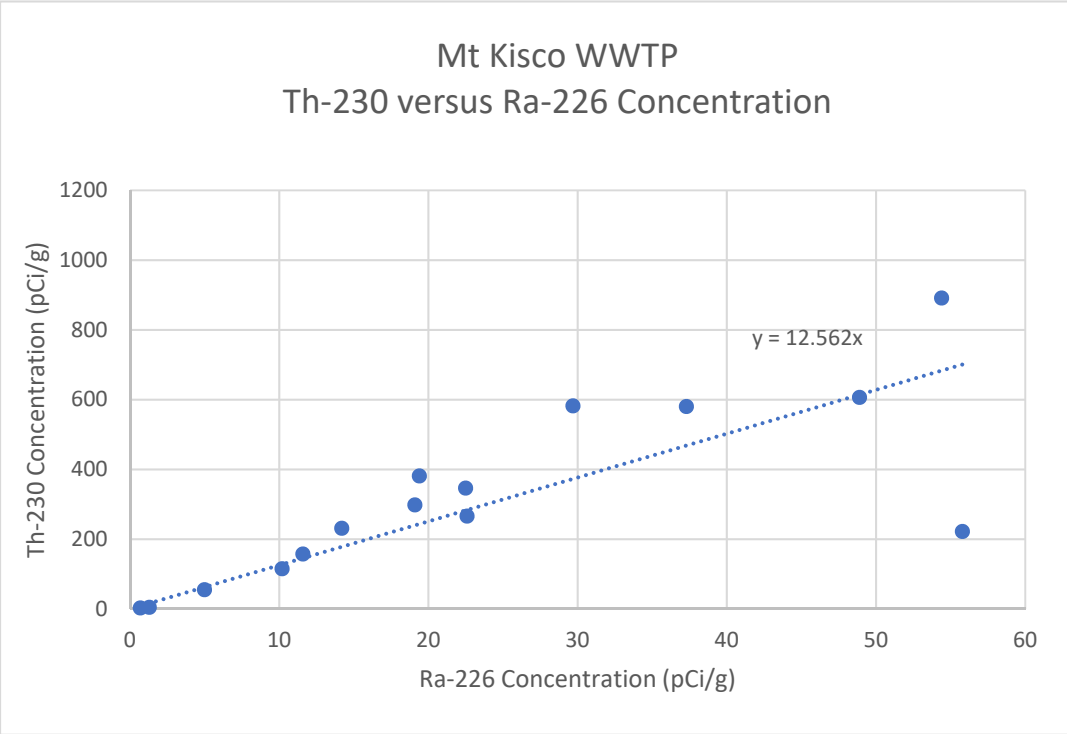


Figure 5.2 –Th-230 Concentration versus Ra-226 Concentration

6. DISCUSSION AND CONCLUSION

The characterization survey of the former Mt Kisco Wastewater Treatment Plant has shown that approximately 2 acres of the land area has radium-226 concentrations in surface soil that exceed typical release limits for the general public (i.e., exceed 5 pCi/g per 40 CFR192). The levels present are not immediately dangerous to health to casual visitors, but would preclude safe long-term occupancy or development.

Most of the contamination exists in the marshy areas north of the former treatment facilities. These areas apparently had been filled with processed sewage sludge that contained radium from the upstream radium processing plant. One pile of material existing above grade, measuring approximately 100' x 60' x 30' high, also exhibited elevated gamma levels and radium concentrations. Additionally, numerous small hotspot areas exist within the main processing area of the former WWTP. The total area of the contamination is estimated at 2 acres.

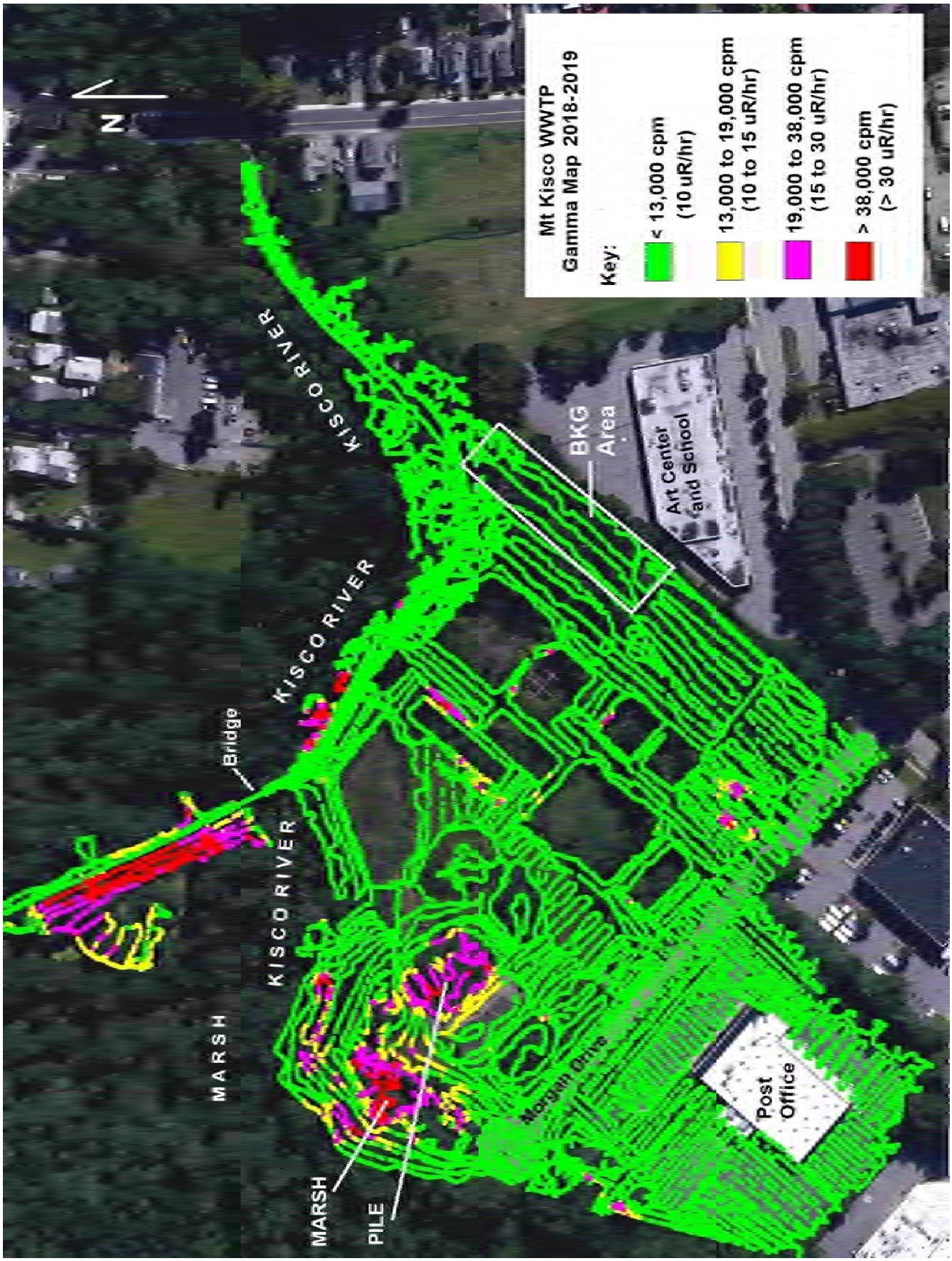
A rough estimate of the depth of contamination has been made by review of the topography and surrounding marsh lands. If one estimates the average depth of contamination to be 6 feet, then the resultant volume of contaminated soil would be approximately 22,000 cubic yards (including the pile). This estimate only considers the area surveyed presently.

The discovery of elevated Th-230 concentrations during this survey, averaging 12.6 times the Ra-226 concentration, may significantly affect dose-based release criteria. Such criteria should be developed with NYSDEC guidance during the remedial investigation phase of the project. This could also increase the contaminated volume estimate accordingly.

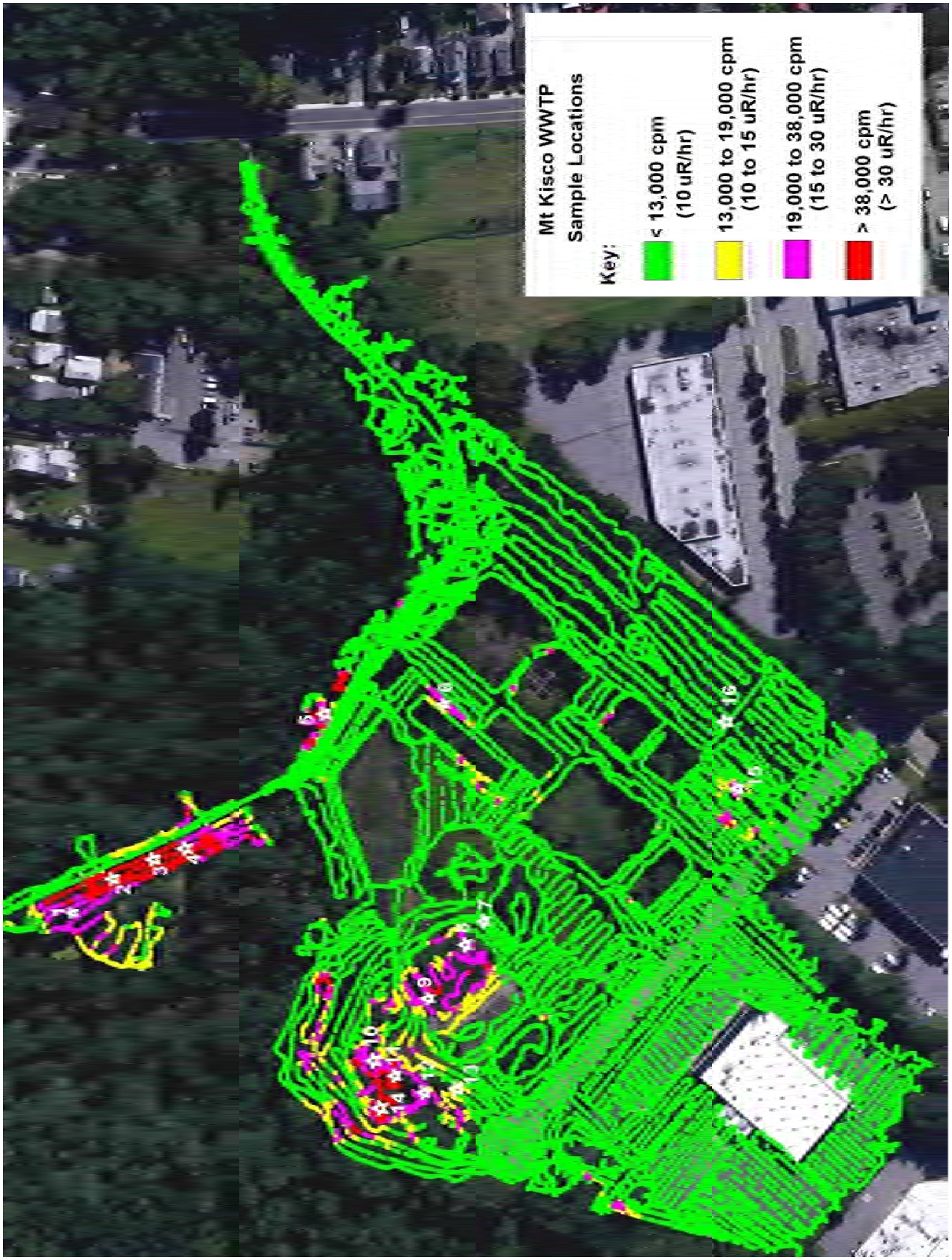
Recommended future work, which could be performed within the remedial investigation phase, includes:

- Development of dose-based release criteria, taking into account Th-230 and, potentially, other alpha emitters such as uranium;
- Further correlation between gamma levels and the chosen release criteria;
- Sub-surface measurements to determine more accurately the depth of contamination;
- Investigation of the area further north of the present survey area, including the underwater sediment in the wetlands, and areas further up the access road which may have received fill;
- Gamma survey within structures after being made safe for entry;
- Further investigation into the high gross alpha results including isotopic thorium and uranium analysis of soil, surface water, and groundwater in addition to the analysis of Ra-226, Ra-228, gross alpha, and gross beta.

Attachment 1 – Characterization Survey Gamma Map


Mt Kisco WWTP
Gamma Map 2018-2019
Key:
< 13,000 cpm
(10 uR/hr)
13,000 to 19,000 cpm
(10 to 15 uR/hr)
19,000 to 38,000 cpm
(15 to 30 uR/hr)
> 38,000 cpm
(> 30 uR/hr)
N
KISCO RIVER
KISCO RIVER
KISCO RIVER
Bridge
BKG
Area
Art Center
and School
MARSH
MARSH
PILE
Morgan Drive
Post
Office

Attachment 2 – Sample Locations


Mt Kisco WWTP
Sample Locations
Key:
< 13,000 cpm
(10 uR/hr)
13,000 to 19,000 cpm
(10 to 15 uR/hr)
19,000 to 38,000 cpm
(15 to 30 uR/hr)
> 38,000 cpm
(> 30 uR/hr)

Appendix A
Initial Site Visit Work Plan for Radiological Impacts

Initial Site Safety Work Plan (ISSWP)
for Site Investigation for Radiological Impacts
Former Mt. Kisco Wastewater Treatment Plant Site
Morgan Drive
Mt. Kisco, Westchester County, New York

Prepared for:

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A INITIAL SITE VISIT WORK PLAN
B BUILDING SPECIFIC RADON SAMPLING PLANS
C CONTAMINATION MONITORING AND DECONTAMINATION PROCEDURE

1.0 INTRODUCTION

LiRo Engineers Inc. (LiRo) has prepared this Initial Site Safety Work Plan (ISSWP) supporting the Site Investigation for Radiological Impacts pursuant to Task Order No. 12 of Contract DEL-378C on behalf of the New York City Department of Environmental Protection (DEP). The purpose of work described herein is to restrict access to undeveloped parcels within the site and to provide for the implementation of radon testing in buildings at or adjacent to the Former Mt. Kisco Wastewater Treatment Plant Site, located near the Kisco River (the Site). The Wastewater Treatment Plant (WWTP) operated from early 1913 until September 1964 when sewage was diverted to the Yonkers WWTP. The plant was maintained in standby mode from 1964 until at least 1976 for emergency use during high rainfalls and flood conditions. The property was sold to the Village of Mt. Kisco in 1985.

This work is being performed pursuant to Order on Consent No. 3-20180709-131, effective date September 15, 2018, between DEP and the New York State Department of Environmental Conservation (NYSDEC).

All work shall be monitored by CoPhysics Corporation, a firm licensed as a New York State Department of Health Decontamination and Decommissioning (D&D) consultant, experienced in the United States Environmental Protection Agency (EPA) Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM) process, with documented experience in conducting radiological site characterizations.

1.1 Background Information

The Former Mt. Kisco WWTP Site was located on the north and south sides of Morgan Drive and situated south of the Kisco River in the Village and Town of Mt. Kisco (Figure 1) on properties currently owned by Creme de la Creme (Mt Kisco), Radio City Ventures, LLC, Frito-Lay Sales, the United States Postal Service, and the Village of Mt. Kisco. The WWTP was owned by the City of New York until 1985 when the property was sold to the Village of Mt. Kisco. The Village of Mt. Kisco subdivided and sold approximately 15.6 acres of the property to a developer which was subsequently subdivided again and currently is four (4) separately owned parcels, two (2) of which are developed and two (2) that are undeveloped. The four separately owned parcels along with the parcel held by the Village establish the Site at listed below:

Parcel	Occupant/Owner
1 Morgan Drive	Frito-Lay Sales, LLP
2 Morgan Drive	Radio City Ventures
3 Morgan Drive	U.S. Postal Service
6 Morgan Drive	Crème de la Crème (Mt. Kisco)
Section of 1 Lexington Ave.	Village of Mt. Kisco

According to the Westchester County Geographical Information System (WCGIS), the two (2) adjoining undeveloped lots located north of Morgan Drive are identified as 2 Morgan Drive (Section 80.55, Block 1 and Lot 2.1/4) which is approximately 5.7 acres in size and 6 Morgan Drive (Section 80.55, Block 1 and Lot 2.1/3) which is approximately 3.8 acres in size (Figure 2).

Radio City Ventures is the current owner of 2 Morgan Drive and Crème de la Crème is the current owner of 6 Morgan Drive.

A historic site plan from 1960 and the available historical aerial photographs from WCGIS, indicate the 6 Morgan Drive parcel had numerous structures including filter beds, chlorination building, and chlorine contact tank/pump house. In June 2010, Crème de la Crème Inc. voluntarily entered into a Brownfield Cleanup Agreement (BCA) with NYSDEC to investigate and address residual soil contamination on the 6 Morgan Drive parcel. A Certificate of Completion was issued by NYSDEC on December 30, 2014. As part of the BCA, the property has an Environmental Easement and a Site Management Plan that addresses the means for implementing institutional controls and engineering controls required by the Environmental Easement.

The 2 Morgan Drive parcel also had numerous structures including filters beds, sludge drying beds, sprinkling filter beds, primary and secondary clarifiers, and storage building. In June 2015, Radio City Ventures entered into an Order on Consent with NYSDEC to complete a site characterization and implement remedial measures as related to residual hazardous substances. Implementation of remedial measures under the Order on Consent are on-hold pending the outcome of the site radiological characterization study.

The 1 Morgan Drive parcel is located on the south side of Morgan Drive. The parcel is owned by Frito-Lay Sales, LLP and is situated on the corner of Morgan Drive and Radio Circle Drive. The approximately 2-acre parcel is the site of an active food distributing facility and is substantially developed and paved. A historic site plan from 1961 and the available historical aerial photographs from WCGIS indicate that the 1 Morgan Drive parcel was historically utilized for sand filter beds.

The 3 Morgan Drive parcel is owned by the United States Postal Service and operated as a public post office. The parcel is located on the south side of Morgan Drive and is situated on approximately 3.5-acres of paved and developed land. A historic site plan from 1961 and the available historical aerial photographs from WCGIS indicate that the 3 Morgan Drive parcel was historically utilized for sand filter beds.

The section of 1 Lexington Avenue that is included in the site characterization study is approximately 5-acres in size. The undeveloped parcel was retained by the Village of Mt. Kisco after the subdivision of the WWTP property. The parcel is located north of the Crème de la Crème and Radio City Ventures properties and south of the Kisco River. A historic site plan from 1961 and the available historical aerial photographs from WCGIS indicate that the access road to the WWTP was located on the 1 Lexington Avenue parcel.

There are three (3) currently planned phases of data gathering at the Former Mt. Kisco Wastewater Treatment Site including:

1. Initial Site Visit,
2. Initial Site Safety Site Investigation (described by this work plan), and
3. Site Characterization.

Initial Site Visit

An Initial Site Visit (ISV) is tentatively scheduled for mid-October 2018. The ISV includes preliminary data gathering from the site and preparatory work for the activities to be performed under this ISSWP. The activities for the ISV are described in the Initial Site Visit Work Plan, which was approved by the NYSDEC in correspondence to the DEP dated September 7, 2018 and is attached as Appendix A.

The ISV activities includes:

≠ Conducting a site reconnaissance of physical conditions to develop the scope for full site brush cutting and potential select tree removals (size of trees needed to determine if permits are required), to determine material/equipment needs for brush cutting/tree removal and to identify staging area for materials;

≠ Evaluating site conditions to help formalize scope of work as related to radiological assessment of site structures, land areas, soils pile, and ponds and stormwater retention basins per MARSSIM, and to identify potential obstacles and/or concerns;

≠ Performing a plot survey and stake out of the property line for fence installation;

≠ Performing limited brush clearing at the property line to allow survey team access for survey/flagging;

≠ Performing a preliminary gamma scan and contamination monitoring of personnel and equipment as needed during plot survey and fence stake out;

≠ Performing a gamma scan where the fence will be placed to determine Health and Safety (H&S) considerations for fence installation;

≠ Performing preliminary gamma scans of the 2 Morgan Drive Extension and unpaved access road which is partially located on the 2 Morgan Drive parcel and partially located on the Village of Mt. Kisco parcel;

≠ Sampling three (3) 1" diameter monitoring wells on the 2 Morgan Drive property; and

≠ Performing data validation of collected samples and submitting the analytical results to the NYSDEC EQuIS database.

1.2 Initial Site Safety Site Investigation Scope of Work

The initial site safety site investigation for radiological impacts consists of:

≠ Developing this Initial Site Safety Work Plan (ISSWP) to define and control all site work;

≠ Securing the undeveloped parcels which includes erecting fencing in accessible areas;

≠ Evaluating the presence of Radon at three structures including the Karafin School (40-1 Radio Circle), Frito-Lay Incorporated (1 Morgan Drive), and the United States Postal Service building (3 Morgan Drive). The Karafin School is not part of the original WWTP site but is situated immediately adjacent to 2 Morgan Drive to the east-southeast;

≠ Performing a preliminary gamma scan;

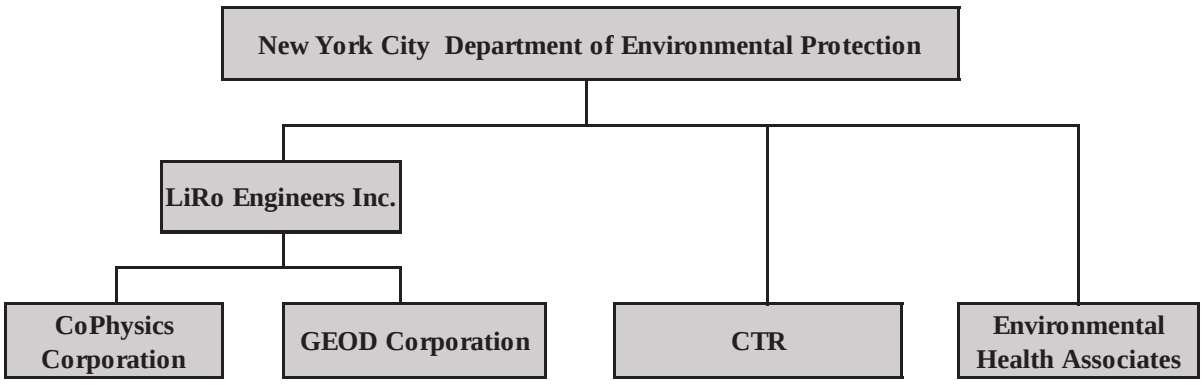
≠ Contamination monitoring of personnel and equipment as needed during field activities; and

≠ Reporting results.

The EPA MARSSIM will be followed to conduct the work at the site. All work shall be overseen by health physicist from CoPhysics Corporation (CPC).

1.3 Project Organization

An organizational chart for the contractors working at the Site for this project is presented below:



Firm	Relationship	Role
LiRo Engineers Inc.	Contracted to NYCDEP	Engineering / Environmental Sampling
CoPhysics	Subcontracted to LiRo	Radiological Monitoring
GEOD Corporation	Subcontracted to LiRo	Locational Surveying
CTR	Contracted to NYCDEP	Fence Installation, Brush Clearing
Environmental Health Associates	Contracted to NYCDEP	Building Radon Testing

Other subcontractors to LiRo Engineers performing work off-site include:

≠ Pace Analytical Laboratories (laboratory analysis)
≠ Vali-Data of WNY, LLC (laboratory data validation)

2.0 SITE LOCATION, DESCRIPTION, AND CURRENT USE

The area of interest for this ISSWP consists of the two (2) adjoining undeveloped lots north of Morgan Drive (2 and 6 Morgan Drive), a section of the Village of Mt. Kisco property (1 Lexington Avenue), the two developed properties on the south side of Morgan Drive (1 and 3 Morgan Drive), and the Karafin School property (40-1 Radio Circle) located south-southeast and adjacent to 2 Morgan Drive. The properties are shown on Figure 2.

The 2 Morgan Drive parcel consists of 5.7 acres with approximately 415 feet of frontage along Morgan Drive. The parcel also has access to Lexington Avenue north of Morgan Drive. This area can be referred to as the 2 Morgan Drive Extension area and is present between private residences and the Village of Mt. Kisco property. The parcel is generally flat; most of the property is an open field with brush and small trees. A portion of the site is overgrown and densely wooded. Several structures from the former WWTP remain on the property including numerous filters beds, sludge drying beds and sprinkling filter beds.

The 6 Morgan Drive parcel consists of 3.8 acres with approximately 256 feet of frontage that includes the terminus of Morgan Drive at a cul-de-sac. The parcel is generally flat, with a few areas of stockpiled material (i.e. several soil piles and one imported material stockpile). Much of the property is open field with brush and small trees; however, there are overgrown portions and densely wooded and seasonally wet areas near the Kisco River. The property is partially controlled with a fence along Morgan Drive.

The section of 1 Lexington Avenue that is included in the site characterization study is approximately 5-acres in size. The undeveloped parcel was retained by the Village of Mt. Kisco after the subdivision of the WWTP property. The parcel is located north of the Crème de la Crème and Radio City Ventures properties and south of the Kisco River. The historical access road to the WWTP is located on this parcel and appears to still be utilized by the Village to access a sewage pump station located near the Saw Mill River Parkway.

The 1 Morgan Drive parcel is owned by Frito-Lay Sales, LLP and is situated on the corner of Morgan Drive and Radio Circle Drive. The approximately 2-acre parcel is the site of an active food distributing facility and is substantially developed and paved.

The 3 Morgan Drive parcel is owned by the United States Postal Service and operated as a public post office. The parcel is situated on approximately 3.5-acres of paved and developed land.

2.1 Previous Investigations

In 2017, Great Lakes Environmental and Safety Consultants, Inc. (GLESC) conducted a radiological walkover survey and sampling of 2 Morgan Drive parcel. A report titled "Radiological Survey & Sampling Results Morgan Drive Lot 3, Mt. Kisco, NY" was issued in October 2017.

The purpose of the survey and sampling was to identify potential radioactivity hotspots associated with historical use of the site as a WWTP. The survey and sampling was completed on August 21st and 22nd, 2017.

GLESC used field measurement instruments to conduct a gamma walkover survey to detect the presence of gamma emitting radionuclides and their progeny at former Sludge Drying Bed #1, Sludge Drying Bed #2 and Sprinkling Bed.

A total of 14 surficial soil samples were collected from distributed locations onsite from the following locations:

- ≠ Sludge Drying Bed #1- four (4) samples of filter media
- ≠ Pond #1 - one (1) sediment sample from bottom of pond
- ≠ Pond #2 - two (2) sediment samples obtained from bottom of pond
- ≠ Sludge Drying Bed #2 - four (4) samples of filter media
- ≠ Hot spots - three (3) samples of three (3) hotspots identified during the gamma walkover

The soil cleanup objectives published in 40 CFR 192 Part B establish a threshold of 5 pCi/g average residual (above background) concentration. Background Radium-226 levels were estimated at approximately 2 pCi/g based on a United States Geological Survey, therefore a threshold of 7 pCi/g was used as a reporting level. The three (3) hot spot samples exhibited elevated levels of the isotope Radium-226 ranging from 25.53 pCi/g to 65.04 pCi/g. A total of six (6) of the 11 remaining soil samples analyzed exhibited elevated levels of the isotope Radium-226 ranging from 13.24 pCi/g to 21.05 pCi/g.

Two (2) water samples were collected from the following areas in which water accumulated:

- ≠ Pond #1 - one (1) composite aqueous sample from the pond
- ≠ Pond #2 - one (1) composite aqueous sample from the pond

Primary Tank #2 and Primary Tank #1 were inaccessible due to safety concerns and not sampled.

Gross alpha counts from the Pond #1 sample (P1-W1) were detected at 317 pCi/L, which exceeds the threshold of 15 pCi/L established in the New York Department of Environmental Conservation's Division of Water Technical and Operational Guidance Series (1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. The sample also exhibited elevated levels of the isotope Radium-226 (11.3 pCi/L), the threshold for which is established at 3 pCi/L in the same publication. The sample aliquots collected from Pond #1 were turbid because the pond water level was very low at the time of sampling. It was reported that suspended and/or dissolved solids present in the Radium-226 sample aliquot were filtered out during analysis and the results were not impacted by the turbidity. The analysis of the sample aliquot for gross alpha and gross beta, however, may have been affected by the presence of solids in the turbid sample, since filtering is not part of the method.

The Pond #2 sample (P2-W1) did not exceed the established threshold values.

Gamma walkovers of remaining structural components of the WWTP observed average activity levels not significantly greater than background levels. Samples were taken from Soil Drying Bed #1, Soil Drying Bed #2, and Sprinkling Filter Bed #2, the results of which indicated some activity greater than background.

The site wide gamma walkover of accessible areas observed average activity levels not significantly greater than background levels. Significantly elevated activity levels were observed, however, in three hotspots taken from areas between the Primary Tank and Sprinkling Filter Bed (HS-1), an area on the northwestern edge of Pond #2 (HS-2) and an area along the northwestern boundary of the site between Pond #1 and Pond #2 (HS-3). Biased samples obtained from these three hotspots confirmed significantly greater activity than background, specifically for the Radium-226 radionuclide.

GLESC recommended a remedial action plan be developed to address the removal and disposal of soil in areas identified with elevated radioactivity.

On December 20, 2017, the NYSDEC conducted a limited survey to confirm the results of the Great Lakes survey at 2 Morgan Drive and a limited gamma walkover of accessible areas on the adjacent property, 6 Morgan Drive to assess for impacts. The Great Lakes results were confirmed for 2 Morgan Drive and readings elevated above background were detected on 6 Morgan Drive property.

On April 9, 2018, both NYSDEC and Great Lakes collected groundwater samples from 4 existing wells located on the 6 Morgan Drive property. The May 9, 2018 Groundwater Sampling report from Great Lakes indicates that their sample results were below the NYS groundwater standard of 3 pCi/L for Ra-226. Also on April 9th, NYSDEC performed a limited gamma walkover survey of areas of interest on an around the Morgan Drive properties. Additional readings above background were detected to the north of the access road between the 6 Morgan Drive property and the Kisco River. Elevated readings were also detected on 2 Morgan Drive near the edge of Morgan Drive.

2.2 Site and Regional Topographic Setting

Based upon the United States Geological Survey (USGS) Mount Kisco Quadrangle 7.5 Minute Series from 2016, the elevation at the Site ranges from approximately 285 to 305 feet above mean sea level (Figure 1). The overall slope of the Site is generally toward the northwest and the Kisco River. The dominant topographic feature of the Site is a slight earthen rise that bisects the Site and is located to the east of the shared property line of the two (2) undeveloped parcels (Figure 2). The slope is gradual to the west of the aforementioned property line and a bit more steep to the east rising a total of 10 feet in elevation.

2.3 Site and Regional Geology

Inwood Marble runs through the center of Mt. Kisco, the Site located east of the center in the Fordham Gneiss Geologic Unit, which is a metamorphic rock of sedimentary and volcanic origin. Surficial geology of the site is predominately kame deposits of coarse to fine sand and/or gravel on the east side of the site and outwash sand and gravel on the west side of the Site. Based on the

Soil Conservation Service Soil Survey of Putnam and Westchester Counties, New York, the predominant soil type at the Site is reported to consist of Fredon silt loam, with a typical sequence of brown/gray silt loam from the surface to 13" below, followed by gray fine sandy loam to 24" below ground. The substratum from 24"-60" is typically gray very gravelly loamy sand.

Based on information provided in the "Remedial Investigation Report, Undeveloped Parcel Site, Site No. C360112", dated March 2014, as summarized in the Site Management Plan for 6 Morgan Drive (Carlin-Simpson & Associates, December 2014), the site geology consist of the following layering:

Topsoil - The surface layer in a few areas consists of brown topsoil that is approximately two (2) to four (4) inches in thickness.

Fill - Beneath the topsoil and at the surface in the remainder of the site is existing fill that is generally comprised of loose to medium dense brown or gray brown coarse to fine sand, trace (to some) silt, trace (to little) coarse to fine gravel with minor amounts of concrete, wood, coal, and brick in areas of the site. During the RI, the fill was encountered to depths ranging from 3'0" to 12'0" below the existing ground surface.

Sand - Beneath the fill in the sand filter bed areas is a sand layer that consists of loose to medium dense brown or gray coarse to fine sand, trace silt, trace medium to fine gravel and is approximately 1'0" to 4'0" in thickness.

Gravel - Below the sand layer in select locations is loose to medium dense coarse to fine gravel, trace (to little) coarse to fine sand. The gravel ranges from a few inches to approximately 1'0" in thickness.

Organic Silt and Peat - Underlying the existing fill, sand, and gravel in several locations is soft dark brown organic silt or organic silt with peat that varies from approximately 0'6" to 6'0" in thickness. In select locations, organic silt lenses or seams were also encountered within the underlying soil stratum.

Sandy Silt or Silty Sand - Beneath the sand, gravel, and organic silt and peat layers is medium dense brown, gray brown, or gray coarse to fine sand, little (to and) Silt, trace (to little) coarse to fine Gravel or medium stiff silt, trace (to and) coarse to fine Sand, trace coarse to fine Gravel. Most of the explorations from the Remedial Investigation were terminated in this stratum at final depths ranging from 12'0" to 16'0" beneath the ground surface.

Dense Till or Weathered Bedrock - Based on two borings extended to refusal, which was encountered at depths of 26'6" and 31'0", respectively, dense till material or weathered bedrock may underlie the sequence 25-35 feet beneath the ground surface.

2.4 Site and Regional Hydrogeology

The depth to the water table varies but generally follows topography. Based on the Site and surrounding topography, groundwater flow is expected to be to the north-northwest. Estimated

groundwater levels and/or flow direction(s) are likely controlled by the local topography and by the changing elevation of the Kisco River. The Remedial Investigation encountered groundwater in the 6 Morgan Drive parcel from 3 to 9 feet below the existing ground surface (Carlin-Simpson & Associates, December 2014).

2.5 Chemicals of Potential Concern and Investigation Focus

Based on the findings of the radiological survey (GLESC, 2017), radionuclide contaminated waste material appears to be present at elevated concentrations, likely in select "Hot Spot" areas of the Former Mt. Kisco Wastewater Treatment Site. Therefore, from the historical results, the contaminants of potential concern for the overall Site are ***Radium-226*** and ***Radium-228.*** In addition, the following parameters will investigated (under the ISV) per request by the NYSDEC: ***Per- and polyfluoroalkyl substances (PFAS)*** and ***1,4-dioxane.***

As related to occupied structures, the primary chemical of potential concern for this Initial Site Safety Site Investigation is ***Radon***. Radon occurs naturally in minute quantities as an intermediate step in the normal radioactive decay chains. Radon is the immediate decay product of radium and is gaseous under normal conditions. Radon contaminated air is the media of concern in the developed areas of the site.

3.0 WORK PROGRAM

The purpose of work described herein is to restrict access to undeveloped parcels within the site and to provide for the implementation of radon testing in buildings.

The fieldwork includes the following elements:

1. Installation of a perimeter security fence and gates in accessible areas of the undeveloped parcels;

2. Evaluating the presence of Radon at three structures including the Karafin School (40-1 Radio Circle), Frito-Lay Incorporated (1 Morgan Drive), and the United States Postal Service building (3 Morgan Drive); and

3. Performing a preliminary gamma scan and contamination monitoring of personnel and equipment as needed during field activities.

A Qualified Environmental Professional shall oversee these tasks and all radiological work shall be performed by CoPhysics, which is licensed as a NYSDOH D&D consultant.

Additional details on the above activities are included in the subsequent sections.

3.1 Perimeter Fence Installation

During the ISV, LiRo and GEOD Corporation will establish the property boundary of the perimeter of vacant Parcels 2 & 3 (2 and 6 Morgan Drive), or a modified shape that omits a portion of the parcels based on site conditions as directed by DEP. Field activities and personnel will be monitored for radiation by a technician from CoPhysics. Pending preliminary gamma scans by CoPhysics of the 2 Morgan Drive Extension planned for the ISV, the fence will be installed as depicted on Figure 3.

A 6-foot high galvanized steel chain link fence and gates will be installed, generally around the undeveloped portion of the site. The building code for the Village/Town of Mount Kisco limits fence height along road frontage to 4-feet high, however Mount Kisco has determined that a variance is not required for this project and a 6-foot high fence will be installed along Morgan Drive. A full determination has not been made regarding the need for other permits from the Village such as tree removal or work within a wetlands setback. An assessment will be made during the ISV.

In coordination with the NYSDEC, the perimeter fencing may be extended if radiation is detected in the 2 Morgan Drive Extension. Also, it is anticipated that the wetlands and the Kisco River will be used as the perimeter barrier on the northwest end of the site rather than fencing. Conditions in the northwest end of the site will be verified during the ISV. Snow fencing will be installed on Village of Mount Kisco property (1 Lexington Avenue) to restrict off-path traversing on the access path adjacent to the Former Mt. Kisco Wastewater Treatment Site. Fencing details are shown on Figures 4 and 5.

3.2 Radon Evaluation

Environmental Health Associates of 15 Weldon Way, Warwick, New York will perform radon testing of three buildings (shown on Figure 2) including:

- Frito-Lay Incorporated, 1 Morgan Drive
- United States Postal Service, 3 Morgan Drive
- Karafin School, 40-1 Radio Circle

Environmental Health Associates is listed by the NYSDOH as a Certified Radon Tester for Westchester County. The building specific radon sampling plans will be developed as access to the buildings are granted by the property owner. An ELAP certified lab will be utilized to perform radon sample analysis. The work will be performed in a manner consistent with *ANSI/AARST MALB 2014 Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings*. The DEC/DOH accepted sampling plan for the Karafin School is included in Appendix B; sampling was completed at the Karafin School on August 29, 2018. A report summarizing the results of the radon testing at the Karafin School is to be provided under separate cover.

3.3 Gamma Scan and Contamination Monitoring of Personnel and Equipment

Contamination monitoring and decontamination procedures are included as Appendix C. Radiation monitoring instruments are used both for area monitoring and for individual monitoring. The instruments used for measuring radiation levels are referred to as area survey meters (or area monitors) and the instruments used for recording the equivalent doses received by individuals working with radiation are referred to as personal dosimeters (or individual dosimeters). A technician from CoPhysics Corporation will conduct the radiological monitoring during all work on the undeveloped portion of the site:

- ≠ To assess workplace conditions and individual exposures,
- ≠ To ensure acceptably safe and satisfactory radiological conditions in the workplace, and
- ≠ To keep records of monitoring.

All monitoring results and meteorological data (e.g., temperature range, wind speed, wind direction, etc.) will be recorded in the field notebook and will be transferred to Instrument Reading Logs.

Instruments must be calibrated in terms of the appropriate quantities used in radiation protection. A Geiger–Müller (GM) counter will be utilized to perform the monitoring (Ludlum Model 3 or equivalent). GM counters exhibit strong energy dependence at low photon energies and are considered indicators of radiation, whereas ionization chambers are used for measurements that are more precise. The Model 3 is a portable radiation survey instrument with four linear ranges used with exposure rate or cpm (counts per minute) meter dials, or a combination of both exposure rate and count rate (referred to as “combo”) meter face dials. To assure proper operation of the instrument and detectors(s) between calibrations, an instrument operational check including battery test and instrument test will be performed at least daily or prior to use, whichever is less frequent.

Background (radiation) readings will be measured prior to initiating site activities. Background radiation may come from:

- ≠ Naturally occurring radioactive materials which have not been technologically enhanced,
- ≠ Cosmic sources,
- ≠ Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices),
- ≠ Radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities, and
- ≠ Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.

Radiation above background (0.01-0.02 mrem/hr.) signifies a possible presence, which must be monitored. For the purposes of establishing an action level for the project site activities it shall be defined as 0.01 mrem/hr. above background level. Radiation above 2 mrem/hr. indicates a potential hazard-evacuate site until controlled.

3.4 Proposed Work Schedule

Task	Target Timeline
Initial Site Visit (establish property boundary, gamma survey, well sampling).	Within 14 days of obtaining all needed access agreements (Radio City, Crème, and Village).
Radon Testing – submittal of building specific sampling plan to DEC/DOH for approval	Within 14 days of obtaining needed access agreement for a target building.
Radon Testing – site sampling	Within 14 days of DEC/DOH approval of building specific sampling plan.
Commencement of Securing of Site (procuring materials, site fence line clearing*, and installation).	Within 30 days of DEC approval of ISSWP including any needed modifications based on the ISV.
Reporting	Within 60 days of completion of work plan.

* - the need to obtain permits (i.e. tree removal or village wetlands) may slow process.

4.0 REPORTING

Environmental Health Associates will provide letter reports of results from the radon sampling at each of the three (3) subject buildings and DEP will provide these results to NYSDEC. The results will also be included as an appendix in the overall Site Characterization Report that will be completed following the third phase of data collection at the site.

5.0 REFERENCES

Carlin-Simpson & Associates, *Site Management Plan* for NYSDEC Site Number: C360112, dated December 16, 2014.

Great Lakes Environmental & Safety Consultants, Inc. (GLESC), *Radiological Survey & Sampling Results, Morgan Drive Lot 3, Mt Kisco, NY,* dated October 2017.

Great Lakes Environmental & Safety Consultants, Inc. (GLESC), *Groundwater Sampling, 6 Morgan Drive, Mt Kisco, NY*, dated May 2018.

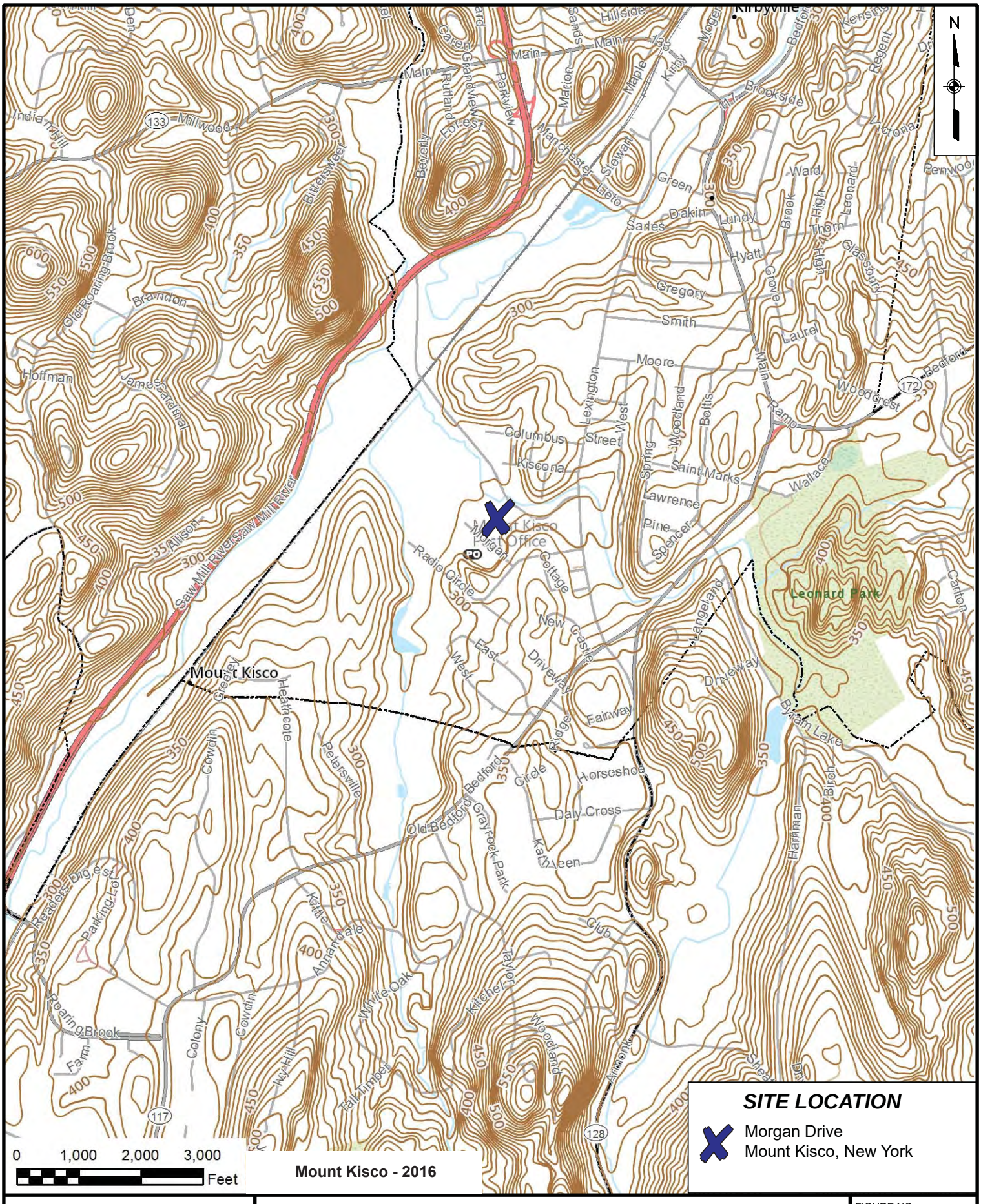
Mount Kisco Conservation Advisory Council, *Natural Resource Inventory Town/Village of Mount Kisco*, New York, prepared by, dated March 15, 2017.

Soil Conservation Service, *Soil Survey of Putnam and Westchester Counties, New York*, issued September 1994.

United States Geological Survey (USGS) *Mount Kisco Quadrangle* 7.5 Minute Series, 2016.

FIGURES

1 SITE LOCATION MAP
2 STUDY AREA PROPERTIES
3 PROPOSED PERIMETER FENCE
4 6 FOOT FENCE AND GATE DETAILS
5 SNOW FENCE DETAILS



J:\14-104-0267 NYCDEP Watershed\CAD\MT KISCO\Mt Kisco Location Map.AI

LiRo-Engineers, Inc.
3 Aerial Way
Syossett, New York

FORMER MOUNT KISCO WWTP SITE
SITE LOCATION MAP

FIGURE NO.

1

REV-1

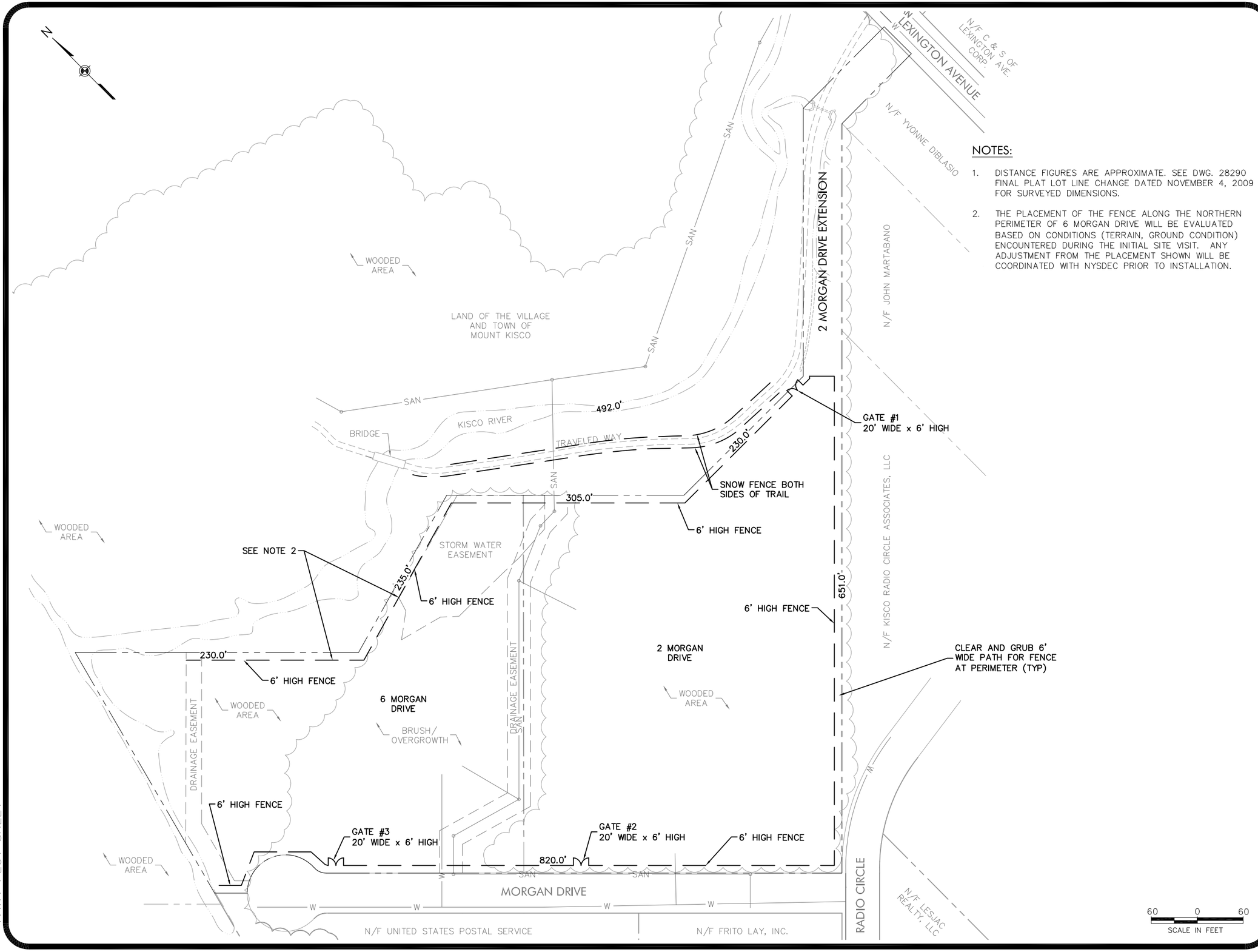
J:\14-104-0267 NYCDEP Watershed\CAD\MT KISCO\SITE SAFETY\Mt Kisco FIG 2.dwg 9/14/2016 3:38 PM

LiRo Engineers, Inc.
3 Aerial Way
Syosset, New York

FORMER MT. KISCO WASTEWATER TREATMENT PLANT SITE STUDY AREA PROPERTIES

FIGURE NO.

2



NOTES:

1. DISTANCE FIGURES ARE APPROXIMATE. SEE DWG. 28290 FINAL PLAT LOT LINE CHANGE DATED NOVEMBER 4, 2009 FOR SURVEYED DIMENSIONS.
2. THE PLACEMENT OF THE FENCE ALONG THE NORTHERN PERIMETER OF 6 MORGAN DRIVE WILL BE EVALUATED BASED ON CONDITIONS (TERRAIN, GROUND CONDITION) ENCOUNTERED DURING THE INITIAL SITE VISIT. ANY ADJUSTMENT FROM THE PLACEMENT SHOWN WILL BE COORDINATED WITH NYSDEC PRIOR TO INSTALLATION.

17x11 PLOT SHEET

NYC Environmental Protection

CONSULTANTS

LiRo Engineers, Inc.
3 Aerial Way, Syosset, New York

WARNING: THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR.

SITE INVESTIGATION FOR RADIOLOGICAL IMPACTS
FORMER MT. KISCO WASTEWATER TREATMENT SITE

FORMER MT. KISCO WASTEWATER TREATMENT PLANT SITE
MORGAN DRIVE
MT. KISCO, WESTCHESTER COUNTY, NY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARK	DATE	DESCRIPTION

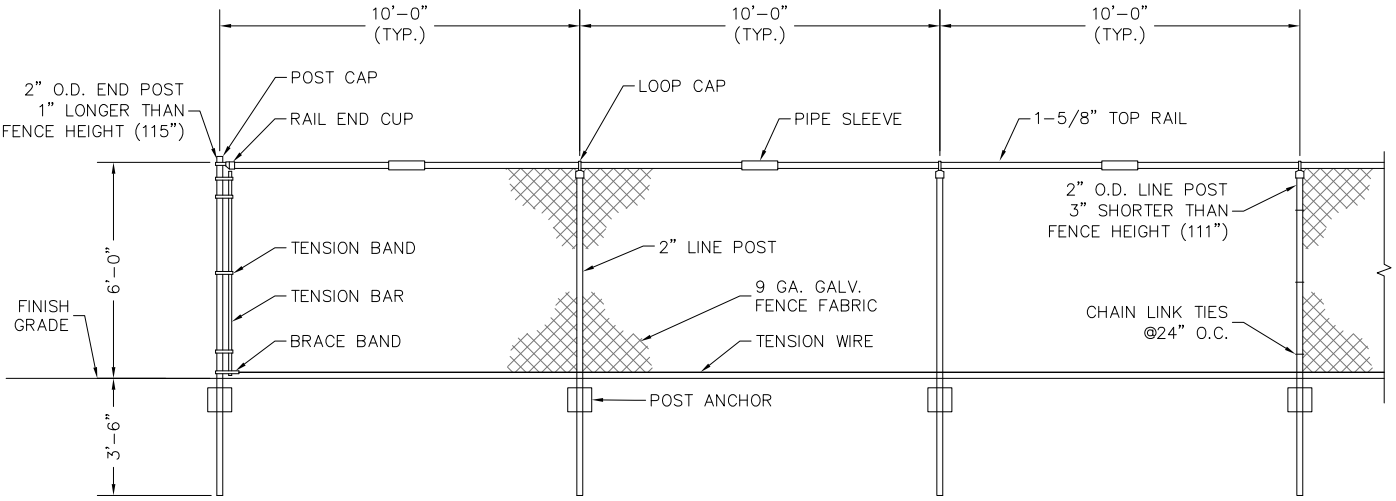
PROJECT NUMBER:	
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

SHEET TITLE

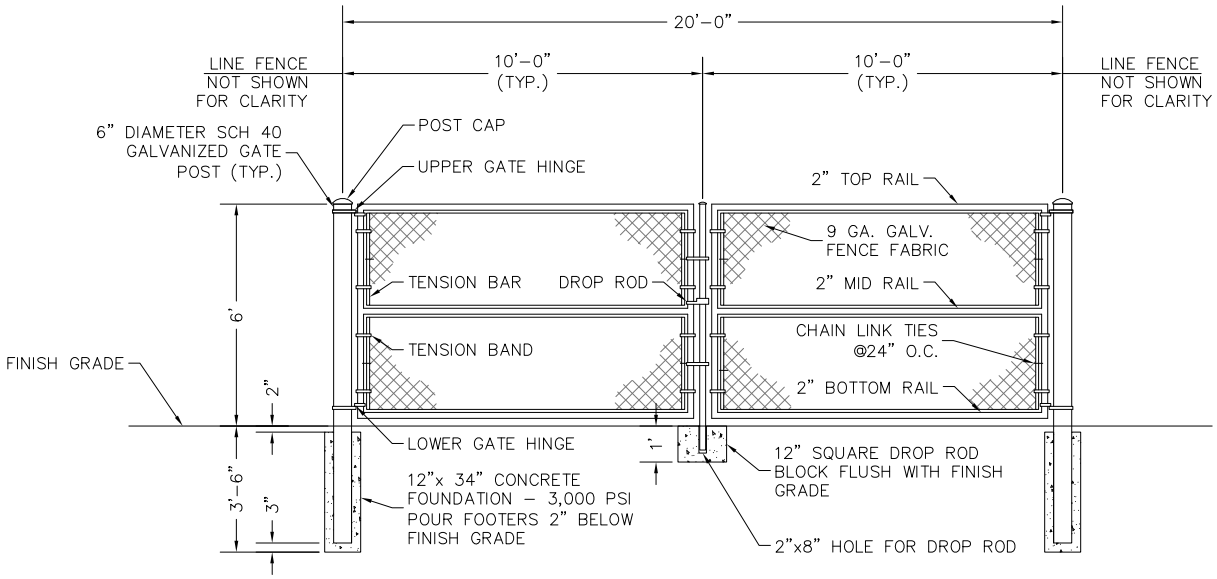
PROPOSED PERIMETER FENCE

FIGURE 3

REV-1



DETAIL 1 - 6 FOOT FENCE



DETAIL 2 - 6 FOOT GATE

0 2 4 8
SCALE IN FEET

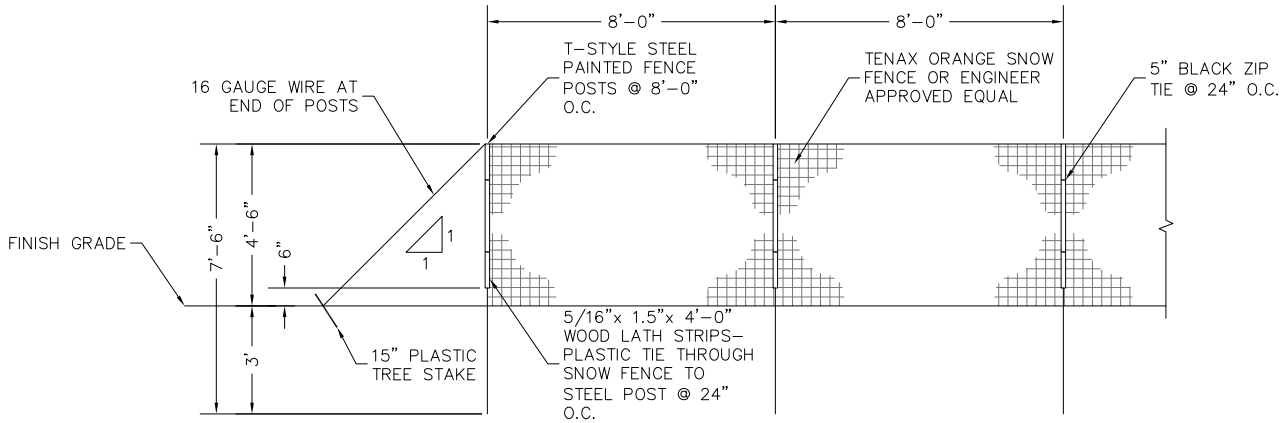
J:\14-104-0267 NYCDEP Watershed\CAD\MT KISCO\SITE SAFETY\Mt Kisco FIG 4.dwg 9/12/2018 9:56 AM

LiRo Engineers, Inc.
3 Aerial Way
Syosset, New York

FORMER MT. KISCO WASTEWATER TREATMENT PLANT SITE
6 FOOT FENCE AND GATE DETAILS

FIGURE NO.
4

REV-1



DETAIL 3 - SNOW FENCE

0 2 4 8

SCALE IN FEET

LiRo Engineers, Inc.
3 Aerial Way
Syosset, New York

FORMER MT. KISCO WASTEWATER TREATMENT PLANT SITE SNOW FENCE DETAILS

FIGURE NO.

5

J:\14-104-0267 NYCDEP Watershed\CAD\MT KISCO\SITE SAFETY\ARCHIVE\Mt Kisco FIG 5.dwg 8/22/2018 11:40 AM

APPENDIX A

INITIAL SITE VISIT WORK PLAN

(Text & Figures)

Initial Site Visit Work Plan (ISV)

For

Site Investigation for Radiological Impacts
Former Mt. Kisco Wastewater Treatment Site
Morgan Drive
Mt. Kisco, Westchester County, New York

Prepared for:

New York City Department of Environmental Protection
465 Columbus Avenue
Valhalla, New York 10595

Prepared by:

LiRo Engineers, Inc.
3 Aerial Way
Syosset, New York 11791

and

CoPhysics Corporation
1 Commercial Drive, Unit 1,
Florida, NY 10921

September 14, 2018

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FIGURES
1 Site Location Map
2 Proposed Perimeter Fence
3 Site Visit Scope

APPENDIX
A Procedure for Conducting a Scoping Survey of the 2 Morgan Drive Extension ("Dogleg"), Access Road, and Fence Line
B Contamination Monitoring and Decontamination Procedure
C Groundwater Well Sampling Procedure
D Field Forms

1.0 INTRODUCTION

LiRo Engineers Inc. (LiRo) has prepared this Initial Site Visit Work Plan (ISV) for Site Investigation for Radiological Impacts pursuant to Task Order No. 12 of Contract DEL-378C on behalf of the New York City Department of Environmental Protection (DEP). The purpose of this investigation is to become familiar with the site, assess conditions and obtain data to secure the site perimeter at the Former Mt. Kisco Wastewater Treatment Site, located near the Kisco River. The Wastewater Treatment Plant (WWTP) ceased operation in the mid-1980s.

All work shall be monitored by CoPhysics Corporation, a firm licensed as a New York State Department of Health Decontamination and Decommissioning (D&D) consultant, experienced in the EPA Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM) process, with documented experience in conducting radiological site characterizations.

1.1 Background Information

The Former Mt. Kisco WWTP Site is located on the north and south sides of Morgan Drive and situated south of the Kisco River in the Village and Town of Mt. Kisco (Figure 1) on properties owned by Creme de la Creme (Mt Kisco), Radio City Ventures, LLC, Rolling Frito-Lay Sales, the United States Post Office, and the Village of Mt. Kisco. The WWTP was initially built and operated by the City of New York until 1985 when it was sold to the Village of Mt. Kisco. The Village of Mt. Kisco sold approximately 15.6 acres of the property to a developer which was subsequently subdivided and currently is four (4) separately owned parcels, two (2) of which are developed and two (2) that are vacant and establish the Subject Site.

The area of interest for this ISV work plan are the two vacant parcels north of Morgan Drive as well as a portion of the property owned by the Village of Mt. Kisco. According to the Westchester County Geographical Information System (WCGIS), the two (2) adjoining lots located north of Morgan Drive are identified as 2 Morgan Drive (Section 80.55, Block 1 and Lot 2.1/4) which is approximately 5.7 acres in size and 6 Morgan Drive (Section 80.55, Block 1 and Lot 2.1/3) which is approximately 3.8 acres in size (Figure 2). A historic site plan from 1960 and the available historical aerial photographs from WCGIS, indicate the 6 Morgan Drive parcel had numerous structures including filter beds, chlorination building, and chlorine contact tank/pump house. The 2 Morgan Drive parcel also had/has numerous structures including filters beds, sludge drying beds, sprinkling filter beds, primary and secondary clarifiers, and storage building.

1.2 Scope of Work

The scope of the initial site visit consists of:

- Developing this Initial Site Visit Work Plan (ISV) and Health & Safety Plan (HASP);
- Providing training in radiation awareness and site conditions for LiRo, DEP, and any sub-contractors as appropriate for workers involved in intrusive or sampling activities;

- Pre-survey monitoring of the radiation levels of equipment and/or personnel during site activities;

- Conducting a site reconnaissance of physical conditions to develop scope for full site brush cutting and potential select tree removals (size of trees need to be noted to determine if permits are needed), to determine material/equipment needs for brush cutting/tree removal and to identify staging area for materials;

- Evaluating site conditions to help formalize scope of work as related to radiological assessment of site structures, land areas, soils pile, and ponds and stormwater retention basins per MARSSIM and to identify any potential obstacles and/or concerns;
- Performing a plot survey and stake out of the property line for fence installation;
- Performing limited brush clearing at property line to allow survey team access for survey/flagging;
- Performing a preliminary gamma scan and contamination monitoring of personnel and equipment as needed during plot survey and fence stake out;
- Performing a gamma scan where the fence will be placed to determine Health and Safety (H&S) considerations for fence installation;
- Performing preliminary gamma scans of the 2 Morgan Drive Extension (shown of Figure 2) and unpaved access road;
- Sampling three (3) 1" diameter wells on the 2 Morgan Drive property; and
- Performing data validation of collected samples and submitting the analytical results to the NYS Department of Environmental Conservation (NYSDEC) EQuIS database.

The United States Environmental Protection Agency (EPA) Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) will be followed to conduct the work at the site. All work shall be overseen by a health physicist from CoPhysics Corporation.

CoPhysics Corporation will provide a full time radiation technician to monitor radiation levels of equipment and/or personnel during preliminary site investigations including brush cutting and perimeter fence stake out.

2.0 SITE-SPECIFIC INFORMATION

2.1 Site Location, Description and Current Use

The area of interest for this ISV consists of the two (2) adjoining lots north of Morgan Drive and a portion of the Village of Mt. Kisco property. The 2 Morgan Drive parcel consists of 5.7 acres with approximately 415 feet of frontage along Morgan Drive. The parcel also has access to Lexington Avenue north of Morgan Drive. This area can be referred to as the 2 Morgan Drive Extension area and is present between private residences and the Village of Mt. Kisco property. The parcel is generally flat; most of the property is an open field with brush and small trees. A portion of the site is overgrown and densely wooded. Several structures from the former WWTP remain on the property including numerous filters beds, sludge drying beds and sprinkling filter beds.

The 6 Morgan Drive parcel consists of 3.8 acres with approximately 256 feet of frontage that includes the terminus of Morgan Drive at a cul-de-sac. The parcel is generally flat, with a few areas of stockpiled material (i.e. several soil piles and one imported material stockpile). Much of the property is open field with brush and small trees, however there are overgrown portions and densely wooded and seasonally wet areas near the Kisco River. The property is partially controlled with a fence along Morgan Drive.

The Site limits and survey map for the purposes of this ISVWP are shown on Figure 2.

2.2 Previous Investigations

In 2017, Great Lakes Environmental and Safety Consultants, Inc. (GLESC) conducted a radiological walkover survey and sampling of 2 Morgan Drive, the 5.7 acre parcel, titled "Radiological Survey & Sampling Results Morgan Drive Lot 3, Mt. Kisco, NY 10549".

The purpose of the survey and sampling was to identify potential radioactivity hotspots associated with historical use of the site as a WWTP. The survey and sampling was completed on August 21st and 22nd, 2017.

GLESC used field measurement instruments to conduct a gamma walkover survey to detect the presence of gamma emitting radionuclides and their progeny at former Sludge Drying Bed #1, Sludge Drying Bed #2 and Sprinkling Bed.

A total of 14 surficial soil samples were collected from distributed locations onsite from the following locations:

- Sludge Drying Bed #1- four (4) samples of filter media
- Pond #1 - one (1) sediment sample from bottom of pond
- Pond #2 - two (2) sediment samples obtained from bottom of pond
- Sludge Drying Bed #2 - four (4) samples of filter media
- Hot spots - three (3) samples of three (3) hotspots identified during the gamma walkover

The soil cleanup objectives published in 40 CFR 192 Part B establish a threshold of 5 pCi/g average residual (above background) concentration. Background Radium-226 levels were estimated at approximately 2 pCi/g based on a United States Geological Survey, therefore a threshold of 7 pCi/g was used as a reporting level. The three (3) hot spot samples exhibited elevated levels of the isotope Radium-226 ranging from 25.53 pCi/g to 65.04 pCi/g. A total of six (6) of the 11 remaining soil samples analyzed exhibited elevated levels of the isotope Radium-226 ranging from 13.24 pCi/g to 21.05 pCi/g.

Two (2) water samples were collected from the following areas in which water accumulated:

- Pond #1 - one (1) composite aqueous sample from the pond
- Pond #2 - one (1) composite aqueous sample from the pond

Primary Tank #2 and Primary Tank #1 were inaccessible due to safety concerns and not sampled.

Gross alpha counts from the Pond #1 sample (P1-W1) were detected at 317 pCi/L, which exceeds the threshold of 15 pCi/L established in the New York Department of Environmental Conservation's Division of Water Technical and Operational Guidance Series (1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. The sample also exhibited elevated levels of the isotope Radium-226, the threshold for which is established at 3 pCi/L in the same publication.

The Pond #2 sample (P2-W1) did not exceed the established threshold values.

Gamma walkovers of remaining structural components of the WWTP observed average activity levels not significantly greater than background levels. Samples were taken from Soil Drying Bed #1, Soil Drying Bed #2, and Sprinkling Filter Bed #2, the results of which indicated some activity greater than background.

The sitewide gamma walkover of accessible areas observed average activity levels not significantly greater than background levels. Significantly elevated activity levels were observed, however, in three hotspots taken from areas between the Primary Tank and Sprinkling Filter Bed (HS-1), an area on the northwestern edge of Pond #2 (HS-2) and an area along the northwestern boundary of the site between Pond #1 and Pond #2 (HS-3). Biased samples obtained from these three hotspots confirmed significantly greater activity than background, specifically for the Radium-226 radionuclide.

GLESC recommended a remedial action plan be developed to address the removal and disposal of soil in areas identified with elevated radioactivity.

On December 20, 2017, the NYSDEC conducted limited gamma walkover survey to verify the result of the Great Lakes survey. Readings elevated above background were detected on 6 Morgan Drive property. On April 9, 2018, the NYSDEC returned to perform a limited gamma walkover survey of areas of interest on an around the Morgan Drive properties. Additional readings above

background were detected to the north of the access road between the 6 Morgan Drive property and the Kisco River. Elevated readings were also detected along the edge of Morgan Drive.

2.3 Site and Regional Topographic Setting

Based upon the United States Geological Survey (USGS) Mount Kisco Quadrangle 7.5 Minute Series from 2016, the elevation at the Site ranges from approximately 285 to 305 feet above mean sea level (amsl). The overall slope of the Site is generally toward the northwest and the Kisco River. The dominant topographic feature of the Site is a slight earthen rise that bisects the Site and is located to the east of the shared property line of the two (2) parcels (Figure 2). The slope is gradual to the west of the aforementioned property line and a bit more steep to the east rising a total of 10 feet in elevation.

2.4 Site and Regional Geology

Inwood Marble runs through the center of Mt. Kisco, the Site located east of the center in the Fordham Gneiss Geologic Unit, which is a metamorphic rock of sedimentary and volcanic origin. Surficial geology of the site is predominately kame deposits of coarse to fine sand and/or gravel on the east side of the site and outwash sand and gravel on the west side of the Site. Based on the Soil Conservation Service Soil Survey of Putnam and Westchester Counties, New York, the predominant soil type at the Site is reported to consist of Fredon silt loam, with a typical sequence of brown/gray silt loam from the surface to 13" below, followed by gray fine sandy loam to 24" below ground. The substratum from 24"-60" is typically gray very gravelly loamy sand.

Based on information provided in the "Remedial Investigation Report, Undeveloped Parcel Site, Site No. C360112", dated March 2014, as summarized in the Site Management Plan for 6 Morgan Drive (Carlin-Simpson & Associates, December 2014), the site geology consist of the following layering. *Topsoil* - The surface layer in a few areas consists of brown topsoil that is approximately two (2) to four (4) inches in thickness. *Fill* - Beneath the topsoil and at the surface in the remainder of the site is existing fill that is generally comprised of loose to medium dense brown or gray brown coarse to fine sand, trace (to some) silt, trace (to little) coarse to fine gravel with minor amounts of concrete, wood, coal, and brick in areas of the site. During the RI, the fill was encountered to depths ranging from 3'0" to 12'0" below the existing ground surface. *Sand* - Beneath the fill in the sand filter bed areas is a sand layer that consists of loose to medium dense brown or gray coarse to fine sand, trace silt, trace medium to fine gravel and is approximately 1'0" to 4'0" in thickness. *Gravel* - Below the sand layer in select locations is loose to medium dense coarse to fine gravel, trace (to little) coarse to fine sand. The gravel ranges from a few inches to approximately 1'0" in thickness. *Organic Silt and Peat* - Underlying the existing fill, sand, and gravel in several locations is soft dark brown organic silt or organic silt with peat that varies from approximately 0'6" to 6'0" in thickness. In select locations, organic silt lenses or seams were also encountered within the underlying soil stratum. *Sandy Silt or Silty Sand* - Beneath the sand, gravel, and organic silt and peat layers is medium dense brown, gray brown, or gray coarse to fine sand, little (to and) Silt, trace (to little) coarse to fine Gravel or medium stiff silt, trace (to and) coarse to fine Sand, trace coarse to fine Gravel. Most of the explorations from the Remedial Investigation were terminated in this stratum at final depths ranging from 12'0" to 16'0" beneath the ground surface. *Dense Till or Weathered Bedrock* - Based on two borings extended to refusal, which was

encountered at depths of 26'6" and 31'0", respectively, dense till material or weathered bedrock may underlie the sequence 25-35 feet beneath the ground surface.

2.5 Site and Regional Hydrogeology

The depth to the water table varies but generally follows topography. Based on the Site and surrounding topography, groundwater flow is expected to be to the north-northwest. Estimated groundwater levels and/or flow direction(s) are likely controlled by the local topography and by the changing elevation of the Kisco River. The depth to groundwater is likely within a few feet of the surface near the western end of the Site, and possibly 20 – 30 feet or more below ground surface in the eastern portion of the Site. The Remedial Investigation encountered groundwater in the 6 Morgan Drive parcel from 3 to 9 feet below the existing ground surface (Carlin-Simpson & Associates, December 2014).

2.6 Chemicals of Potential Concern and Investigation Focus

Based on the findings of the radiological survey (GLESC, 2017), radionuclide contaminated waste material appears to be present at elevated concentrations, likely in select "Hot Spot" areas of the Site. Therefore from the historical results, the contaminants of potential concern for this investigation are: ***Radium-226*** and ***Radium-228*** In addition, the following parameters will investigated per request by the NYSDEC: ***Per- and polyfluoroalkyl substances (PFAS)*** and ***1,4-dioxane.***

3.0 INVESTIGATION PROGRAM

The nature and extent of radionuclide contaminated waste material on the Site was not adequately identified or delineated by the previous radiological and groundwater surveys. Significant areas of the site were inaccessible during the surveys due to the overgrowth of vegetation. Also, three wells were not sampled during the prior investigation because of their small diameter.

The present investigation program focuses primarily on both subject parcels (2 Morgan Drive and 6 Morgan Drive) and will be completed following the clearing of the overgrown vegetation at the Site. The goals of the ISV are to conduct preliminary gamma surveys to support perimeter fence design and installation, to gather logistical reconnaissance for the main investigation phases, and to collect groundwater data for the contaminants of concern.

3.1 Pre-Investigation Activities

All radiological work will be performed by CoPhysics Corporation, which possesses a NYSDOH radioactive materials license for D&D.

Additional details on the initial Site activities are included in the subsequent sections.

3.1.1 Radiation Safety Training

Site-Specific Radiation Awareness Training was provided to field personnel to by a Certified Health Physicist from CoPhysics Corporation on May 7, 2018. The following training topics were addressed:

- Atomic Structure and Radioactivity
- Type of Radiation (Demonstration)
- Sources of Radiation
- Radiation Health Risks and Biological Effects
- Radiation Limits
- Radiation Protection
- Measurement of Radiation
- Conducting Radiation Surveys
- Overview of the MARSSIM

At least one of the three personnel who attended the training session should be present for any LiRo field activity. Both the SHSP and PHSO received the training.

3.1.2 Pre-Survey

CoPhysics Corporation will provide a full time radiation technician to monitor radiation levels of equipment and/or personnel during preliminary site activities including brush cutting and perimeter fence stake out.

The radiation technician will monitor radiation levels emitted from equipment (in & out) and areas of soil disturbance during preliminary site activities including brush cutting and perimeter fence stake out using GM and gamma scintillation survey meters. The fence will be installed under the Initial Site Safety Work Plan (ISSWP) activities, installation plans will be finalized after this ISV.

The 2 Morgan Drive Extension (shown on Figure 2) may be less impacted that the main portions of 2 Morgan Drive and 6 Morgan Drive. Ideally, this narrow area would be excluded from the controlled and fenced portion of the site, but only if it can be demonstrated that it has not been significantly impacted. Therefore, a gamma survey will be conducted of this extension prior to the determination of the final fence configuration. The survey area is shown on Figure 3.

The 2 Morgan Drive Extension is present between private residences and Village property. The 2 Morgan Drive Extension survey area will be accessed from the path present partially on the subject parcel and partially on Village property.

A procedure for the Pre-Survey of the 2 Morgan Drive Extension, prepared by CoPhysics is included as Appendix A. The Pre-Survey of the 2 Morgan Drive Extension will be conducted by a qualified technician from CoPhysics and the results will be compiled into a letter report. DEP will coordinate with the DEC regarding the survey scheduling at least one (1) week prior to its execution. The survey will not be undertaken until an access agreement with the owner of the parcel has been secured.

Because NYSDEC has reported possible elevated radiation hot spots north of the unpaved access way on Town/Village property, the gamma Pre-Survey will include survey of the road (road and 5-feet on either side) from Lexington Avenue to its terminus at the Pump Station near the Saw Mill River Parkway.

3.1.3 Fence Survey and Stakeout

LiRo and it subcontractor, GEOD Corporation, will establish the property boundary of the perimeter of 2 Morgan Drive and 6 Morgan Drive. The surveyor may require two visits to the site, first to establish control locations and the basis for the legal boundaries then to stake/mark the boundary and fence line physically in the field. The preliminary fence plan is shown on Figure 2. A New York licensed surveyor will supervise the work. LiRo, GEOD, and DEP will agree to the frequency and nature of the markings prior to their establishment, mindful of any access agreements between the property owners and DEP. The fieldwork and field personnel will be monitored by a technician from CoPhysics Corporation. Brush clearing support, will be provided by CTR under contract directly to DEP. Contamination Monitoring and Decontamination Procedures are included as Appendix B.

3.1.4 Perimeter Security Fence

LiRo has prepared draft plans (plot plan and details) and specifications for a 6-foot high chain link security fence around the perimeter of the site and three vehicle gates. LiRo will modify the design documents as necessary to address DEP and Village/Town comments.

The fence line will be surveyed and staked out under this ISV. The fence will be installed under the Initial Site Safety Work Plan (ISSWP) fieldwork, installation plans will be finalized after this ISV has been completed.

3.1.5 Brush Cutting

Mechanical brush clearing will occur along the Property Line and 2 Morgan Drive Extension as needed to allow the Survey Team access for survey and stake out of the perimeter fence. The brush will be mechanically cleared with no or minimal disturbance of the soil surface. Substantial trees with a diameter greater than 9" will be avoided..

3.2 Gamma Scans

The following Gamma Scan is to be completed as part of Site investigative activities:

1. Site Exterior including the 2 Morgan Drive Extension, unpaved access road and fence line boundary

Radiological survey work shall be performed by CoPhysics Corporation.

CoPhysics personnel will conduct a gamma walkover survey with a gamma scintillation system (Ludlum 2221 meter with 44-10 probe or equivalent). The entire designated area will be surveyed, as access allows. Based on the results of the survey and in accordance with industry practice, fence post locations will be surveyed and staked out, with stake locations scanned and conditions recorded to assess Health and Safety considerations in effect during actual fence post foundation installation.

3.3 Environmental Sampling

Collection of groundwater samples from three (3) 1" dia. pre-existing wells will be performed by qualified experienced LiRo personnel. An SOP for Groundwater Sampling is included in this Initial Site Work Plan in Appendix C. Sampling for PFAS requires particular care to avoid contamination by sampling equipment and personnel. For example, all clothing worn by sampling personnel must have been laundered multiple times and the sampler must wear nitrile gloves while filling and sealing the sample bottles. For this sampling event, sampling personnel will follow all the requirements for PFAS sampling for sampling of all parameters. NYSDEC sample protocols for Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells is included in Appendix C.

The samples will be analyzed by Pace Analytical Laboratories, a NYSDOH Analytical Services Protocol (ASP) certified laboratory for analysis. The laboratory will provide Category B data deliverables. The sampling schedule is presented below:

Table 1 - Summary of Environmental Samples

Analyte	Primary Samples	Field Duplicate Samples	Matrix Spikes	Equipment Blanks	Total Analyses
Radium-226 (USEPA 903.1)	6*	1	1	0	8
PFAS (USEPA 537)	3	0	1	1	5
1,4-dioxane (USEPA 522)	3	0	1	1	5
Radium-228 (USEPA 904.0)	6*	1	1	0	8

* Includes filtered & unfiltered samples.

Analytical samples will be collected, cooled to 4ºC, preserved per the method requirements, packaged, and transmitted under chain-of-custody to Pace Analytical Laboratories. The samples will be dropped off at the nearest lab facility (in Long Island) each day of sampling for transmittal by the local lab to the certified testing laboratory. Pre-cleaned sampling containers will be supplied by the laboratory. Sampling containers supplied by the laboratory will contain preservatives appropriate to the analysis to be performed.

3.4 Equipment Decontamination Procedures

All equipment which comes into direct contact with potentially contaminated soil, sediment or groundwater shall be decontaminated prior to leaving the sampling location.

Sampling equipment decontamination procedures will consist of the following:

1. Physically remove packed dirt and debris with a stiff bristle long handle brush and water.
2. Clean all potentially contaminated surface areas.
3. Scrub all potentially contaminated surface areas with a water/industrial detergent soap solution.
4. Rinse with clean, potable water to remove any soap.
5. Apply a thorough final rinse of deionized water.
6. Allow to drip and air dry.

3.5 Sample Labeling

Each sample will be labeled with a unique sample identification number as described below:

Groundwater Samples:
Site - Matrix Code - Location Code [example: MK-WWTP-RAD 226-01]

Example: The Site (MK-WWTP) refers to Mt. Kisco – WWTP Site
The Matrix Code (RAD 226) refers to the matrix being sampled
Location Code (01) refers to the well location being sampled

Matrix Codes: RAD 226 - Radium 226 Groundwater
PFAS - PFAS Groundwater

1,4-d – 1,4-dioxane Groundwater
RAD 228 – Radium 228 Groundwater
Field Duplicate and samples will be designated with "DUP"

3.6 Investigation Derived Waste

Gloves, plastic sleeves, tubing and other disposable sampling equipment will be screened using a GM survey meter and visually examined. Any items exhibiting visual, olfactory, or radionuclide evidence of contamination will be drummed for off-site disposal. Otherwise, it will be collected in contractor grade plastic bags and properly disposed as municipal trash.

3.7 Sampling Point Location

LiRo will conduct a thorough site walkover at the beginning of the investigation to identify and mark the locations of the three Groundwater Monitoring Wells on-site. Groundwater wells are shown on Figure 3.

At the completion of activities, groundwater monitoring well locations will be surveyed in Global Positioning System (GPS) format. Horizontal accuracy will be within 1-foot. Vertical accuracy for the groundwater wells will be sufficient to enable the determination of site-specific groundwater flow direction.

3.8 Equipment Calibration

Portable field instruments shall be calibrated at a licensed calibration facility within the previous year using National Institute of Standards and Technology (NIST) traceable sources. Instrument functional checks will be performed at least daily when in use. Background and source check readings will be performed as part of the daily instrument check and compared with the normal QC acceptance range for each specific instrument and site conditions.

4.0 DOCUMENTATION

Gamma readings of boundary areas and selected ancillary areas of the 16-acre area Site will be performed with a gamma scintillation system. Tables and maps depicting the results will be produced.

A written record documenting daily activities during the Site Investigation shall be maintained in a logbook. Information in this logbook shall include summary of work in progress or work completed each day, quality control information, materials shipped and received, weather conditions, factors affecting productivity, and descriptions of field issues and solutions.

The field activities including the time of collection of each groundwater sample, the sample description, and other pertinent observations will also be documented in a field notebook. In addition, well purging logs will be prepared and provided as appropriate. These forms are presented in Appendix D.

Occupational Safety and Health Administration (OSHA) health and safety training records (e.g., 40-hour, 8-hour, and medical) shall be maintained onsite for personnel who potentially might be exposed to contaminated soil. Operator training and certification documentation for heavy equipment operators shall be verified and maintained onsite. DEP personnel shall be kept informed daily of the status of the investigation activity.

5.0 REPORTING

LiRo will prepare a draft completion report that is consistent with industry practice and MARSSIM terminology. Upon DEP acceptance, the completion report will be finalized. The Report will include the following items:

- ✓ Consistency of the data with the site history;
- ✓ Consistency of the data with regard to previous data rounds;
- ✓ Evaluation of blanks for potential field or laboratory contamination;
- ✓ Evaluation of duplicates for representativeness;
- ✓ Evaluation of the data characteristics (i.e., precision, accuracy, representativeness, comparability, completeness and defensibility) and justification for the use of both compliant and non-compliant data.

Laboratory records, including chain-of-custody documentation for all samples shipped to an offsite laboratory for analysis and test results, shall be reported. All investigation data will be presented in summary tables and shown graphically on scaled site plans as appropriate to the investigation.

The Pre-Survey of the 2 Morgan Drive Extension and unpaved access road will be conducted by a qualified technician from CoPhysics and the results will be compiled into a letter report.

6.0 REFERENCES

Carlin-Simpson & Associates, *Site Management Plan* for NYSDEC Site Number: C360112, dated December 16, 2014.

Great Lakes Environmental & Safety Consultants, Inc. (GLESC), *Radiological Survey & Sampling Results, Morgan Drive Lot 3, Mt Kisco, NY*, dated October 2017.

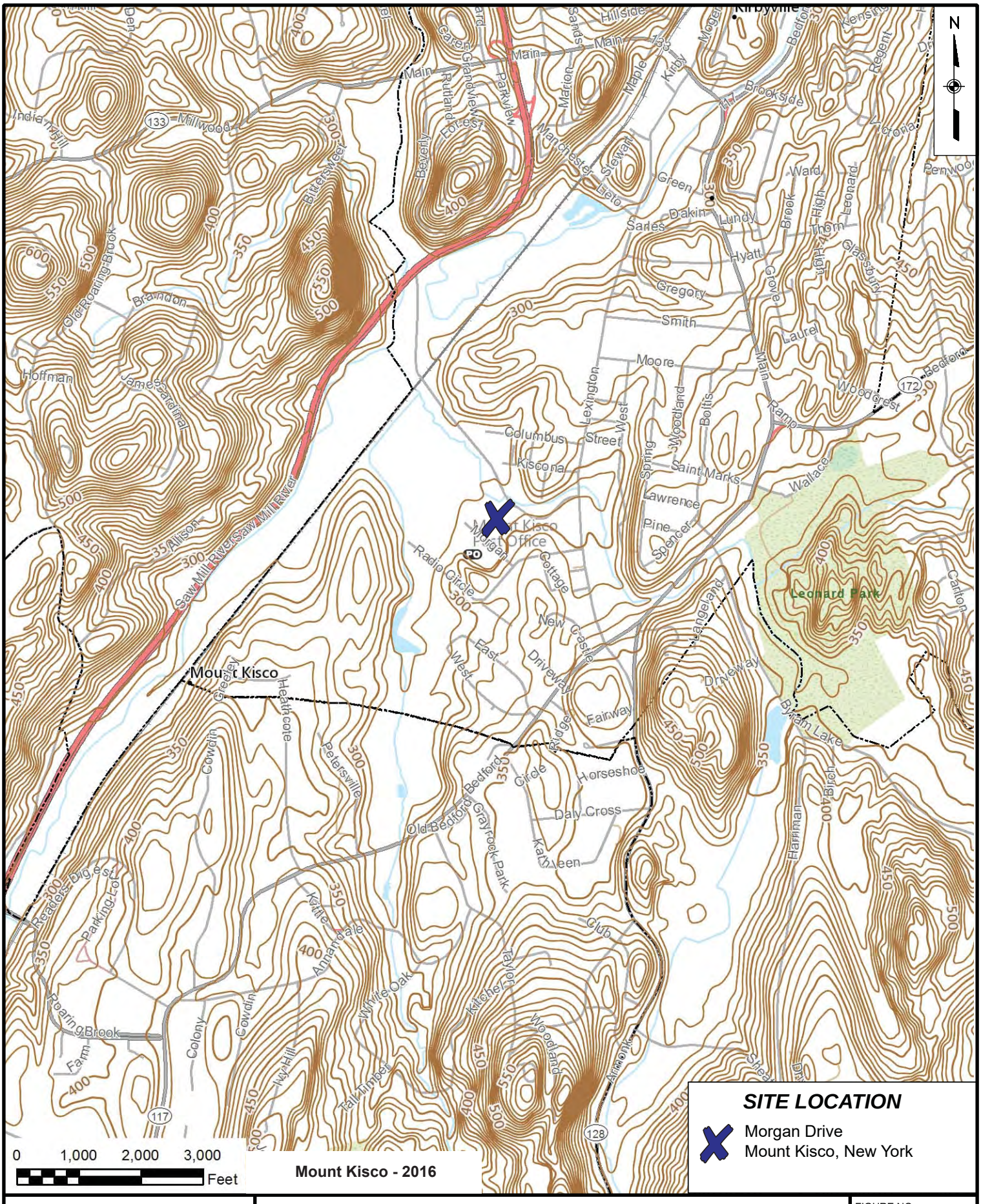
Mount Kisco Conservation Advisory Council, *Natural Resource Inventory Town/Village of Mount Kisco*, New York, prepared by, dated March 15, 2017.

Soil Conservation Service, *Soil Survey of Putnam and Westchester Counties, New York,* issued September 1994.

United States Geological Survey (USGS) *Mount Kisco Quadrangle* 7.5 Minute Series, dated 2016.

FIGURES

1 Site Location Map
2 Proposed Perimeter Fence
3 Site Visit Scope



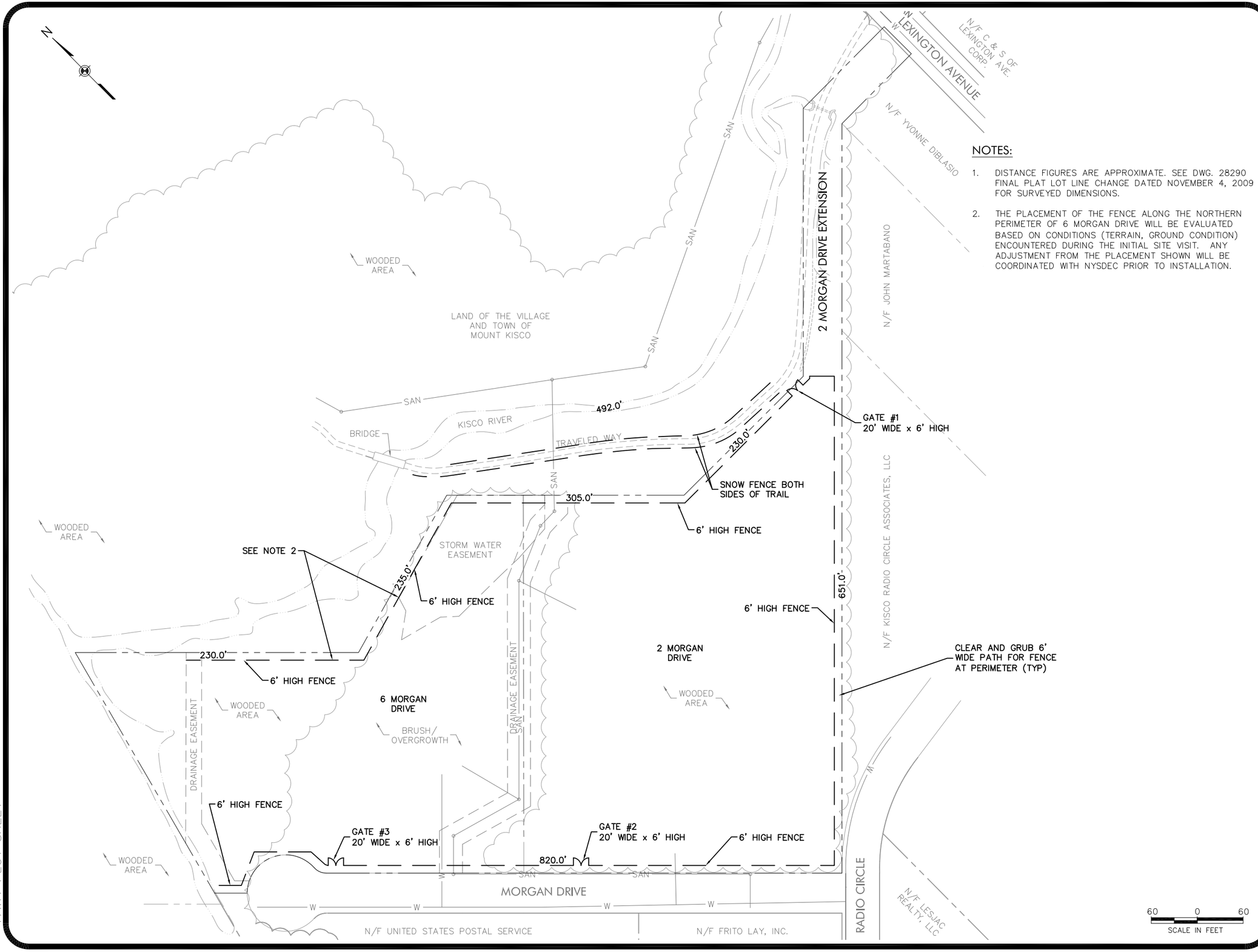
J:\14-104-0267 NYCDEP Watershed\CAD\MT KISCO\Mt Kisco Location Map.AI

LiRo-Engineers, Inc.
3 Aerial Way
Syossett, New York

FORMER MOUNT KISCO WWTP SITE
SITE LOCATION MAP

FIGURE NO.

1



NOTES:

1. DISTANCE FIGURES ARE APPROXIMATE. SEE DWG. 28290 FINAL PLAT LOT LINE CHANGE DATED NOVEMBER 4, 2009 FOR SURVEYED DIMENSIONS.
2. THE PLACEMENT OF THE FENCE ALONG THE NORTHERN PERIMETER OF 6 MORGAN DRIVE WILL BE EVALUATED BASED ON CONDITIONS (TERRAIN, GROUND CONDITION) ENCOUNTERED DURING THE INITIAL SITE VISIT. ANY ADJUSTMENT FROM THE PLACEMENT SHOWN WILL BE COORDINATED WITH NYSDEC PRIOR TO INSTALLATION.

17x11 PLOT SHEET

NYC Environmental Protection

CONSULTANTS

LiRo Engineers, Inc.
3 Aerial Way, Syosset, New York

WARNING: THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR.

SITE INVESTIGATION FOR RADIOLOGICAL IMPACTS
FORMER MT. KISCO WASTEWATER TREATMENT SITE

FORMER MT. KISCO WASTEWATER TREATMENT PLANT SITE
MORGAN DRIVE
MT. KISCO, WESTCHESTER COUNTY, NY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

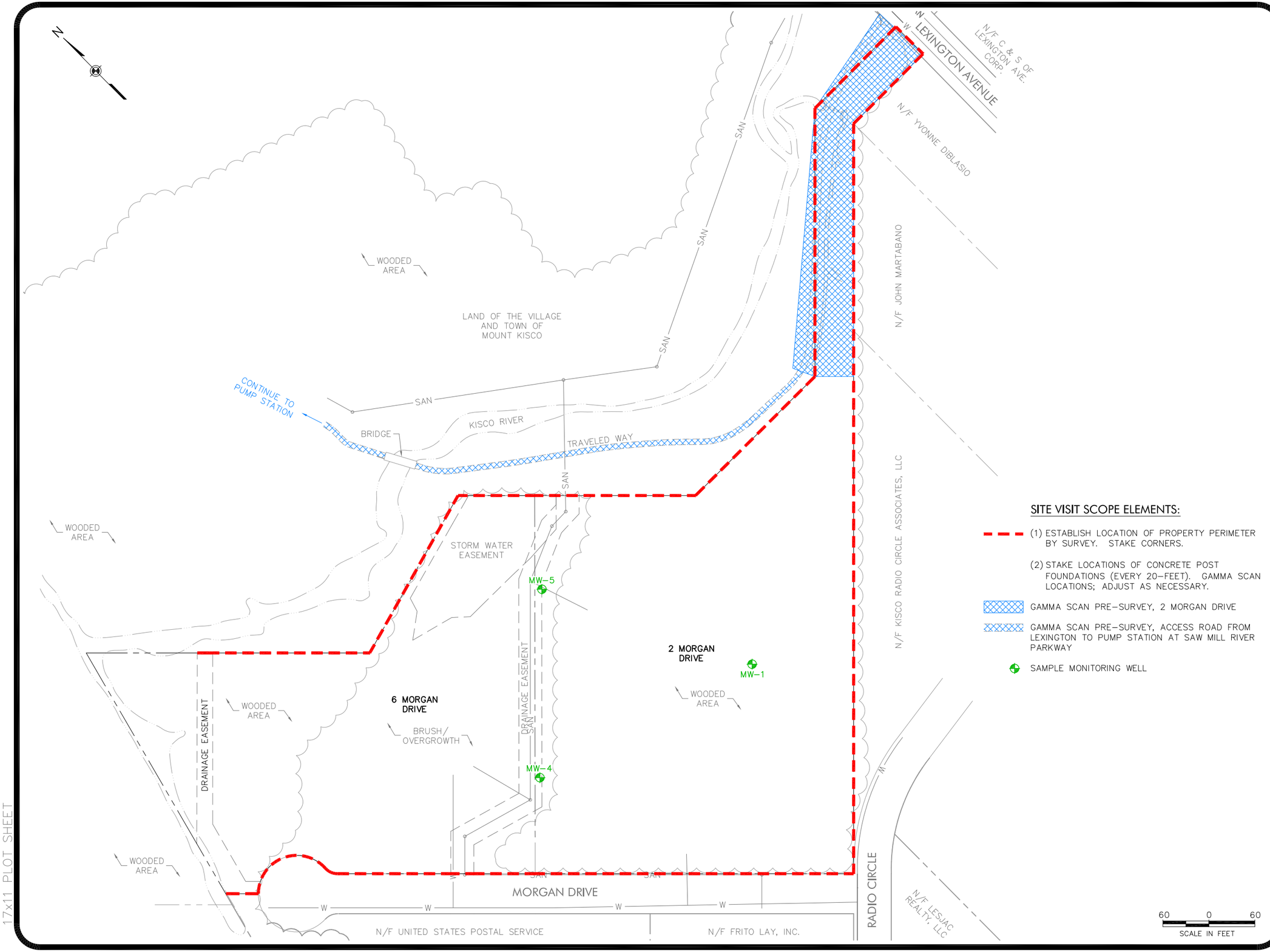
MARK	DATE	DESCRIPTION

PROJECT NUMBER:	
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

SHEET TITLE

PROPOSED PERIMETER FENCE

FIGURE 2



17x11 PLOT SHEET

Environmental Protection

CONSULTANTS

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SITE INVESTIGATION FOR RADIOLOGICAL IMPACTS
FORMER MT. KISCO WASTEWATER TREATMENT SITE

FORMER MT. KISCO WASTEWATER TREATMENT SITE
MORGAN DRIVE
MT. KISCO, WESTCHESTER COUNTY, NY

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARK	DATE	DESCRIPTION

PROJECT NUMBER:	
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

SHEET TITLE

SITE VISIT SCOPE

FIGURE 3

APPENDIX B

BUILDING SPECIFIC RADON SAMPLING PLANS

Environmental Health Associates, Inc.
15 Weldon Way Warwick, NY 10990 • 5187 Horry Drive, Murrells Inlet, SC 29576
(845) 670-5950

WOMEN OWNED
DUNS # 968977889
CAGE CODE # 6HS08
MWCERT #2017-657

8/22/2018

NYC DEP
465 Columbus Avenue
Valhalla, NY 10595

ATTN.: Sandra Klepacki, Chief, Environmental Projects
sklepacki@dep.nyc.gov
Tel.: 914-749-5322

SUBJECT: KARAFIN SCHOOL – 40-1 Radio Circle, Mt Kisco, NY
Radon Sampling Plan

Sampling Plan

The purpose of this sampling plan is to delineate the procedures necessary to conduct sampling at the referenced address. Sampling will be performed from 1300 Hours on 8/24/18 to 1300 Hours on 8/27/18. The method selected for this survey is a modified Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings (ANSI/AARST MALB 2014). The modification excludes building HVAC evaluation, as requested by DEC/DEP, and expedites sampling according to Section 4.4.2 of the ANSI method, Simultaneous Test Option. Due to the deviation from the ANSI standard of time allowed for building evaluation, the report will clearly state that consistent with the Standard 7.1 we could only assume that the HVAC is in proper working order.

The simultaneous test option provides for data of sufficient quality to allow for both an assessment as well as mitigation decisions, as necessary. Section 4.4.2.1.1 states that the number of blanks should be equal to 5% of the testing locations, thus we are placing 5 Blanks at the location as well as traveling with 2 "Trip" Blanks, which will not enter the testing location.

Sampling devices will be placed in the approximate locations identified in the attached sampling diagram by Certified Radon Measurement Technicians. Each device will be placed in accordance with the short term testing protocols of minimum location off of floor and away from windows, etc. Devices are each individually marked and numbered with a bar code that will be matched up to the room numbers and numbered dots on the floor plan provided. The devices will be secured with tamper evident tape. The devices will be analyzed by RTCA located in Elmsford NY - NY ELAP approved laboratory, lab certification # 10806 (NRSB ARL0001). Results will be verbally reported upon receipt, generally between 48 and 72 hours after receipt and analysis by the laboratory and then followed up by a hard copy report.

Section 3.1 states that Bathrooms and Hallways are generally not tested however, in this case also under Section 3.1, testing should be conducted in all areas in contact with the ground. In this scenario, the bathrooms contain perforations/drains that provide openings through the slab in contact with the

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CAGE CODE # 6HS08
MWCERT #2017-657

ground through which radon can infiltrate. Under Section 3.7 – When in doubt test the area. This is being applied to the rationale of the Hallway testing. Due to the urgency of this testing being performed, and the location being an educational facility, thorough testing is viewed as imperative as it will again alleviate the need for long term testing and allow for mitigation decisions to be made if necessary.

The HVAC will be left running during the weekend testing because we are trying to mimic the conditions which the building exhibits during its occupied times, which is while school is in session Monday through Friday.

If there are any questions regarding the placement or analysis of the sampling devices please contact us to discuss them.

Thank you,

Marco Pedone, DrPH, PE, CIH, CSP, CHMM
VP – Technical Director
Environmental Health Associates, Inc.

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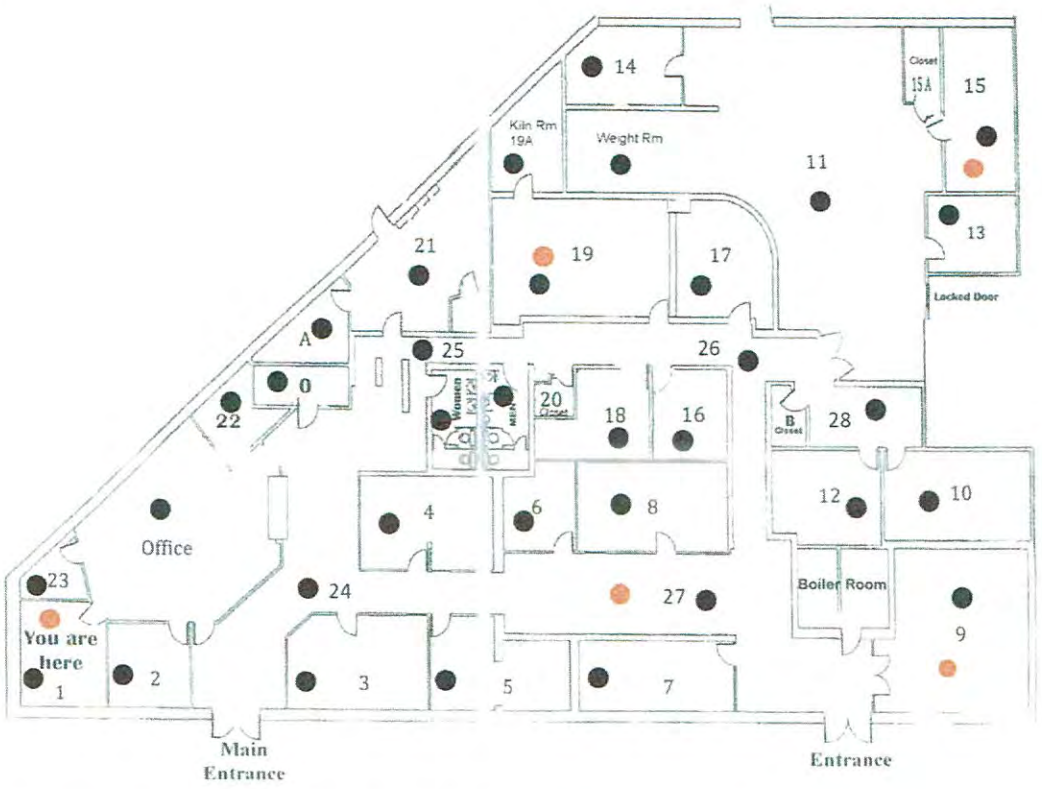
ATTACHMENT 1
SAMPLING DIAGRAM

KARAFIN SCHOOL
40-1 Radio Circle
Mt. Kisco, NY



● Dots indicate approximate location of **duplicate short term sample devices**

● Orange Dots indicate approximate location of Blanks which will correspond to the room number or Hallway area.

APPENDIX C

CONTAMINATION MONITORING AND DECONTAMINATION PROCEDURE

Contamination Monitoring and Decontamination Procedure

1. Introduction

The types of radiological decontamination to be addressed for this project are:

- *Equipment and Materials*. To remove contamination from equipment to ensure compliance with release criteria.
- *Vehicles.* To remove contamination from vehicles to prevent spread of contamination and ensure compliance with release criteria.
- *Personnel.* To remove contamination from clothing or personnel to prevent personnel exposure to radiation and prevent the spread of contamination.

Contamination limits to be used for unrestricted release of equipment and materials are provided in Table 5-1 - Acceptable Surface Contamination Limits. Contamination limits for personnel must be non-detectable. Personnel decontamination and evaluation are addressed in detail in the following subsections.

2. Definitions

1. **CPM**: Counts per minute
2. **DPM**: Disintegrations per minute
3. **Equipment and Material**: Any item used in a Restricted Area to support work activities (i.e., hand tools, heavy equipment, plastic, etc.).\
4. **LAW**: Large Area Wipe
5. **Unrestricted Release**: Release of equipment and / or material to the general public. The equipment and / or material is deemed to meet site release criteria for both total and removable contamination.
6. **Frisking**: Scanning of hands, feet and other parts of the body and clothing to ensure that no contamination resides on personnel upon exiting a controlled area. Frisking may also refer to a scan of tools and equipment upon being removed from a controlled area.
7. **MDA**: Minimum Detectable Activity
8. **MDC:** Minimum Detectable Concentration
9. **HP:** Health Physicist

3. Equipment and Supplies

1. Personal protective equipment (PPE) – including disposable gloves and eye protection. Refer to the Health and Safety Plan for PPE requirements.
2. GM Survey meter: Ludlum 44-9 probe and ratemeter reading in cpm (other instruments such as alpha scintillation detectors may be specified by the HP depending on project conditions and objectives)
3. Survey forms
4. Check Sources
5. Paper filter smears such as Whatman #1 or #2
6. Masslinn™ type cloths

4. General Instructions

1. Prior to conducting any release surveys consult with the HP or designee to ensure that the proper types of instrumentation are used and that the proper set of release criterion will be applied.
2. Ensure that all survey instrumentation has been response checked, is operating within control limits, and has not been removed from service.
3. Background readings are to be performed prior to use at the point of use.
4. Verify that that MDA has been calculated for the background at the point of use and is less than the applicable site release criteria. Refer to the MDA calculation later in this SOP.

5. Types of Measurements

5.1. Direct Scans

1. Surfaces shall be dry and cleaned, to the extent practicable, prior to performing direct alpha or beta measurements.

2. Alpha or beta detectors should be placed within ¼-inch of the surface to be surveyed. Use caution to not contaminate or damage the detector surface.

3. Perform a scanning survey of the item. Concentrate survey measurements on areas most likely to be contaminated. The fraction of the total area scanned is subjective, based on the surveyor's experience, or an item's use history. Typically, the scan frequency is a minimum of 10% of accessible surface areas, 100% in many cases.

4. Typically, a scan survey will suffice to free-release an item or to perform personnel frisking. Documentation of the scan may be an indication that the entire surfaced scanned was less than a certain instrument count rate (ensure that the maximum count rate corresponds to a surface contamination level less than the release criteria).

5. Record the measurement on the appropriate survey form(s). The use of diagrams or sketches is recommended. In simple cases, documentation could be a log notation that an item was checked and was < a certain reading.

6. Measurements results should be recorded in units of "dpm" (such as "dpm/100 cm^2" or "dpm/probe."). However, raw cpm may be recorded if the proper action levels are listed corresponding to the release criteria.

5.2. Static Measurements

1. Static measurements are those with the detector stationary over an area of interest either in scaler (count) mode or in rate mode held for time sufficient to obtain a stable meter reading.

2. Surfaces shall be dry and cleaned, to the extent practicable, prior to performing direct alpha or beta measurements.

3. Alpha or beta detectors should be placed within ¼-inch of the surface to be surveyed. Use caution to not contaminate or damage the detector surface.

4. Static measurements may be used at locations with the highest potential for contamination or to investigate elevated scan readings. The number of survey points selected is subjective, based on surveyor's experience or an item's use history.

5. Static measurement count times shall be appropriate for desired MDAs. Typical count times are 1-minute for digital scalers and until a meter reading stabilizes for analog ratemeters.

6. Record and identify all locations surveyed on the appropriate survey form(s). The use of diagrams or sketches is recommended.

7. Measurements results should be recorded in units of "dpm" (such as "dpm/100 cm^2" or "dpm/probe."). However, raw cpm may be recorded if the proper action levels are listed corresponding to the release criteria.

5.3. Removable Contamination Surveys

1. Cloth or filter paper smears or cotton swabs may be used for smear surveys depending on the nuclide, roughness of the surface to be surveyed, and instrument specifications. Do not use cloth smears for liquid scintillation analysis.

2. A notation (e.g., smear number, date, time, location, etc.) should be made on the smear envelopes to ensure tracking. Smears may also be numbered using a pen or marker prior to use.

3. Using moderate pressure, swipe an area of 100 cm^2 (4-inch square area or equivalent) of the surface at the selected location. Smear surveys should be performed at the same location that direct surveys were performed.

4. Large Area Wipes (LAW), also commonly referred to by the trade name "Masslinn," may be used to supplement smear surveys for removable contamination. The use of LAWs should be documented on the survey form with the notation "LAW" or equivalent.

5. Ensure each used swipe (i.e., smear or large area wipe) is handled, stored, and transferred in such a fashion as to prevent to loss of sampled material or cross-contamination with other personnel and other swipe samples.

6. Smear samples should be counted using available scintillation or gas flow proportional laboratory counters, when practicable. Field instruments may be used for smear counting as the discretion of the HP.

7. LAW samples should be assessed by holding them under the field instrument probe. The use of laboratory counters is inappropriate.

8. Removable contamination survey results shall be reported in units of "dpm" unless otherwise directed by the HP. Examples include "dpm/100cm²" and "dpm/LAW."

9. Ensure all results are documented on the appropriate survey form. Lab printouts may be attached and referenced on the survey form.

5.4. Performance of Release Surveys

5.4.1. Release of Equipment and Materials for Unrestricted Use

1. Surveys for both total and removable contamination shall be performed on all equipment, materials, debris slated for disposal to clean landfills, and vehicles which have either been in a Restricted Area or which may be potentially contaminated. However, removable contamination surveys may be disregarded, with HP approval, provided that direct survey measurements and instrument MDAs are below site removable contamination limits for release.

2. The HP may authorize the short-term relocation or staging of equipment / vehicles for direct measurements in any portion of the Controlled Area. This is provided that the item has been verified to be clean of removable contamination prior to removal from a Restricted Area and fixed contamination producing general area dose rates greater than 0.2 mrem/hr is not anticipated.

3. The HP or its designee will determine which items located outside a Restricted Area may be potentially contaminated based on their use, site history, or previous survey data. The potential for these objects to have become contaminated by airborne radioactivity or other pathways must be considered. This could include items that are used to support site activities, such as office equipment, cleaning devices, furniture, trailers, etc., even though direct contact may not have occurred.

4. Items that have a potential for internal contamination of inaccessible surfaces shall be evaluated by the HP or designee prior to release.

5. All items to be released shall be surveyed in such a manner as to fully demonstrate that accessible surfaces comply with surface contamination release per limits.

6. Items that do not meet release criteria shall be decontaminated until release criteria are met or shall be disposed of as radioactive waste.

7. Air intakes / filters on motorized equipment should be surveyed as an indicator of potential internal contamination.

8. To the extent practicable, visible dirt and mud or other material shall be removed from surfaces prior to survey taking care that the dirt itself is free of contamination.

9. The HP or designee, shall review all survey data prior to the release from the Controlled Area.

5.4.2. Personnel Monitoring Upon Leaving the Controlled Area (Frisking)

1. Personnel monitoring is normally performed by scanning the hands (both sides) and bottom of shoes (after PPE removal) using the GM detector. Other areas of the body that may have contacted contamination, such as the head, knees, etc., should also be scanned.
2. Any scan count rate above background is cause to perform a static measurement of the spot.
3. If the static measurement confirms an "above background" reading, the item of clothing shall be removed and decontaminated or disposed. If the elevated reading is of exposed skin, then the skin shall be washed with soap and water and then re-scanned. If contamination persists, contact the HP who will specify additional cleaning methods.

5.4.3. Application of Release Criteria

Materials, Equipment, and Vehicles

The release values presented in Table 5-1 below shall be used to determine eligibility for release of materials and equipment for unrestricted use (e.g. tools, trucks, and machinery coming out of the controlled zone, containers, etc.). The NYS values are similar to Regulatory Guide 1.86/USACE EM 385-1-80, Table 1 which are considered standard industry practice.

Table 5-1: Acceptable Surface Contamination Levels

From NYS Title 10 Part 16

APPENDIX 16-A

TABLE 7

RADIOACTIVE SURFACE CONTAMINATION LIMITS

Application	*Alpha (dpm/100cm²)*		*Beta/Gamma*[1]	
	Total	*Removable*	*Total (mR/hr)*	*Removable (dpm/100cm²)*
Controlled area				
Basic guide	25,000 Max. 5,000 Av.	500	1.0	5,000
Clean area	1,000	100	0.5	1,000
Non-controlled area				
Skin, personal clothing	500	N.D.[2]	0.1	N.D.[2]
Release of material or facilities	2,500 (Max.) 500 (Av.)	100	0.2	1,000

[1] Measured at 1 cm from the surface.
[2] N.D.—non-detectable.

Note: Skin, personal clothing limits to be used for Mt. Kisco WWTP are non-detecable

6. Decontamination

6.1. Personnel Decontamination

Contamination may be removed from personnel clothing by patting the affected area with tape and resurveying to determine if additional decontamination is necessary. If contamination cannot be reduced to levels below the applicable levels and ALARA, the clothing will be removed from service for disposal as low-level radioactive waste. Where radon progeny contamination is suspected, HP personnel may remove and secure the clothing to allow time to ventilate and decay, then re-survey at a later time to determine if contamination is below applicable levels and ALARA.

Only HP personnel and qualified medical personnel are permitted to decontaminate personnel with skin contamination. The following protocols will be adhered to when performing skin decontamination:

1. Survey the affected area and record the types and initial levels of contamination.
2. If possible, remove particles of contamination with tape and save the particles for evaluation.
3. Attempt localized washing with warm water and soap, ensuring the contamination is not spread to uncontaminated parts of the body. Resurvey the affected area to determine if the contamination has been reduced to levels below the applicable levels and ALARA.
4. If contamination persists, decontamination attempts and resurveys may be repeated multiple times but should stop if these methods are ineffective or skin irritation occurs.
5. Contaminated wounds of any kind will be decontaminated under the supervision of the project HP. Severe wounds will be decontaminated under the supervision of medical personnel.
6. Personnel skin contamination must be reported to the project HP to determine if a skin dose assessment must be performed.
7. The results of bodily contamination must be recorded on an Incident Report. At a minimum, the information provided in this report will consist of:
    - Employee name, date, employer, project number, project, supervisor,
    - When contamination occurred, description of the cause, where happened/what specific task,
    - How could contamination have been prevented/corrective actions,
    - Survey data – surveyor, instrument information, pre-decontamination, after each decontamination attempt, radionuclide/form, decontamination method(s), whole body results (if applicable),
    - A human figure (front and back views) to locate contamination,
    - Affected employees, Project Manager, and project HP signatures with signature dates
    - A comments/additional information section.

The information requested in this report must be provided as completely and accurately as possible for evaluation of subsequent actions, personnel dose, and for required documentation. This report shall be maintained in the employee's radiation exposure file.

Emergency medical care should be administered immediately for injuries affected by radioactive materials. Medical treatment of injuries shall take precedence over radiological considerations. The staff will provide medical personnel with any necessary radiological support in regards to contamination

control and monitoring of the patient and medical staff. The treatment of radiologically contaminated injuries should include:

- Treatment of contaminated wounds by medically qualified individuals,
- Monitoring of wounds, bandages, and medical instruments and equipment for contamination, and
- Radionuclide identification.

6.2. Equipment Decontamination

Contamination may be removed from equipment by simple soap and water cleaning as follows:

1. Upon detection of contamination on equipment, determine if simple cleaning with a hand scraper, spray soap and paper towels will suffice to clean a small object or area.
2. If a large object is contaminated (e.g., backhoe tracks or truck tires), use a bermed, lined spray down area and power washer for low level soil contamination. If high level surface contamination has occurred, do not use water as a cleaning agent due to possible spread of contamination – contact the HP for an elevated level of contamination control.
3. Clean and resurvey the affected area to determine if the contamination has been reduced to levels below the applicable levels and ALARA.
4. If contamination persists, decontamination attempts and resurveys may be repeated multiple times but should stop if these methods are ineffective – contact the HP for elevated level of decontamination methods.

- Minor cleaning need not be documented. However, the occurrence of significant contamination should be documented along with survey data, decontamination method used, radionuclide, surveyor name, equipment type and owner.

7. Documentation

1. Release surveys may be documented in wide range of degrees. Simple frisking of tools leaving a controlled area shall be noted in a log. A more in-depth survey form can be used including a sketch of the item with the locations of readings and the results shown. Any abnormal readings and decontaminations performed shall be noted.
2. Personnel frisking is usually documented by a log with the individual's name, the time of frisking and the result ("< XX" where XX is the background reading of the instrument). Any abnormal readings and decontaminations performed must be noted.
3. Documentation shall include an identification of the instrument used, and the initials or name of the person performing the measurements. Instrument identification may refer to the daily instrument check-in log containing pertinent serial number and calibration information.
4. If smears or LAW's are used, lab results, printouts, diagrams, or other supporting documentation shall be attached.
5. If a survey form is used, it shall be submitted to the HP or designee, for final review and approval signature.

6. Survey documentation shall be maintained according to established document control and retention requirements.

8. References

1. NYSDOH Sanitary Code Title 10 Part 16
2. 10 CFR 20, “Standards for Protection Against Radiation.”
3. EM 385-1-80 “Radiation Protection Manual,” United States Army Corps of Engineers (USACE).
4. NRC Regulatory Guide 1.86.

Appendix A – Calculations

A. **Sample Activity - for scaler count instruments**

$$DPM/100cm2 = \left(\frac{TotalSampleCounts}{SampleCountTime} \right) - \left(\frac{TotalBkgCounts}{BkgCountTime} \right)$$

$$(E)(A)$$

Where:

E = Instrument Efficiency
A = Area correction factor, if applicable equals actual divided by area used to generate efficiency.

B. **Minimum Detectable Activity (MDA) - for scaler count instruments**

The following MDA equation is to be used for a background count time equal to the sample count time:

$$\text{MDA} = \left(\frac{(3 + 4.65\sqrt{(B * T)}}{(E)(A)(Ts)} \right)$$

Where:

$T's$ = Sample count time
E = Instrument efficiency
A = Area correction factor, if applicable
B = Background cpm

The following equation is to be used for a background count time equal to 5 or more times the sample count time:

$$\text{MDA} = \left(\frac{(3 + 3.29\sqrt{(B * T)}}{(E)(A)(Ts)} \right)$$

C. **Minimum Detectable Concentration for Scanning Instruments (MDCscan)**

The following MDC equation is to be used for a count rate based scan:

$$MDC_{scan} = \left(\frac{MDCR}{\sqrt{p}EiEs(A/100cm2)} \right)$$

Where:

MDCR = Minimum Detectable Count Rate =*si x (60/i*)
si = *1.38 x* $\sqrt{bi}$
bi =bkg counts in the observation interval
i =observation interval-the time a source remains under the probe (~1or 2 sec)
Ei = Instrument efficiency
Es = Surface efficiency (re: self sbsorption)
P =Surveyor efficiency (assume 0.5)
A = Probe Area, if applicable

Appendix B
Former Mt. Kisco WWTP Radiological Site Characterization Work Plan

Mt. Kisco WWTP Radiological Characterization Work Plan

October 15, 2018

Prepared for:

New York City Department of Environmental Protection
465 Columbus Avenue
Valhalla, New York 10595

Prepared by:

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Syosset, New York 11791

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1. INTRODUCTION

1.1. PURPOSE

The purpose of this document is to specify procedures to characterize and determine the extent of any radioactive contamination at the former Mt Kisco Waste Water Treatment Plant in Mt. Kisco, NY. The work is being conducted in response to a concern regarding potential radiological impacts from the former Canadian Radium & Uranium (CRU) processing facility which was located within the Village of Mt. Kisco. It is believed that CRU discharged wastewater contaminated with radium into the sewer system between 1943 and February of 1958.

1.2. OVERVIEW

This Site Characterization Work Plan is designed as a MARSSIM-compliant characterization survey plan. The survey will be conducted in two phases:

- Phase 1: delineation of the areal extent of surface soil contamination
- Phase 2: measurement of the depth of contamination

Phase 1, outlined in this document, utilizes an overland, GPS-based gamma scan of the site as the main method of delineating the areal extent of radium soil contamination. Soil sampling with subsequent radioanalysis will also be used to quantify the magnitude of radium concentrations existing in surface soils.

Phase 2 will assess the depth of contamination via downhole gamma logging and soil core sampling with subsequent laboratory analysis.

Also see the "Initial Site Visit Work Plan for Radiological Impacts" for additional information regarding site preparation to be performed before this Plan is implemented. Such preparation will include brush cutting of the undeveloped parcels, fence installation, and scoping surveys of the access road and "dogleg" portion of the property. These preliminary tasks are necessary to facilitate the site characterization survey and to prevent public access to potentially contaminated areas.

1.3. REFERENCES

1. "Initial Site Visit Work Plan (ISV) For Site Investigation for Radiological Impacts Former Mt. Kisco Wastewater Treatment Site Morgan Drive, Mt. Kisco, Westchester County, NY", July 31, 2018. (includes Appendix A - Procedure for Conducting a Scoping Survey of the 2 Morgan Drive Extension ("Dogleg"), Access Road, and Fence Line; Appendix B - Contamination Monitoring and Decontamination Procedure; Appendix C - Groundwater Well Sampling Procedure; and

Appendix D - Field Forms

2. "Health and Safety Plan For Site Investigation for Radiological Impacts Former Mt. Kisco Wastewater Treatment Site Morgan Drive, Mt. Kisco, Westchester County, NY", July 24, 2018.

3. 6 NYCRR Part 380, "Prevention and Control of Environmental Pollution by Radioactive Materials", New York State Department of Environmental Conservation, May 10, 2018.

4. 10 CRR-NY Part 16, "State Sanitary Code Part 16 – Ionizing Radiation", New York State Department of Health, April 18, 2001.

2. SCOPE AND DESCRIPTION OF CHARACTERIZATION

2.1. GENERAL AREA DESCRIPTION

The former Waste Water Treatment Plant (WWTP) is located on Morgan Dr. in Mt. Kisco, NY. Its area is approximately 21 acres comprised of the following five (5) deeded parcels (NYSDEC, 2018);

Tax Map/Parcel No.: 80.55-1-2.1/1
1 Morgan Drive, Mt. Kisco, NY
Owner: Rolling Frito-Lay Sales, LLP

Tax Map/Parcel No.: 80.55-1 -2.1/2
3 Morgan Drive, Mt. Kisco, NY
Owner: United States Postal Service

Tax Map/Parcel No.: 80 .55-1 -2.1/3
6 Morgan Drive
Owner: Creme de la Creme

Tax Map/Parcel No.: 80.55-1-2.1/4
2 Morgan Drive
Owner: Radio City Ventures, LLC

Tax Map/Parcel No.: 80.55-1-2.2
Portion of 1 Lexington Ave., including Access Road
Owner: Village of Mt. Kisco

Two parcels, 2 and 6 Morgan Drive are currently undeveloped. The 2 Morgan Drive parcel had numerous WWTP structures including filters beds, sludge drying beds, sprinkling filter beds, primary and secondary clarifiers, and storage building. Many of the structures are still present and in a state of disrepair. The 6 Morgan Drive parcel also contained numerous structures

including filter beds, chlorination building, and chlorine contact tank/pump house. No structures appear to remain on the 6 Morgan Drive parcel. Two parcels are developed (Frito-Lay and the US Post Office). Only the exterior land areas of these two parcels will be surveyed. Also, interior portions of the former structures located on the 2 Morgan Drive parcel will not be surveyed due to safety considerations.

See the "Initial Site Safety Work Plan for Site Investigation" for a more in-depth description of the parcels and these businesses.

2.2. PREVIOUS INVESTIGATIONS

In 2017, Great Lakes Environmental and Safety Consultants, Inc. (GLESC) conducted a radiological walkover survey and sampling of 2 Morgan Drive parcel. A report titled "Radiological Survey & Sampling Results Morgan Drive Lot 3, Mt. Kisco, NY" was issued in October 2017.

GLESC conducted a gamma walkover survey of former Sludge Drying Bed #1, Sludge Drying Bed #2 and Sprinkling Bed.

Also, 14 surficial soil samples were collected from the following locations:

- Sludge Drying Bed #1- four (4) samples of filter media
- Pond #1 - one (1) sediment sample from bottom of pond
- Pond #2 - two (2) sediment samples obtained from bottom of pond
- Sludge Drying Bed #2 - four (4) samples of filter media
- Hot spots - three (3) samples of three (3) hotspots identified during the gamma walkover

Three (3) hot spot samples exhibited elevated levels of Radium-226 ranging from 25.53 pCi/g to 65.04 pCi/g. A total of six (6) of the 11 other soil samples analyzed exhibited elevated levels of Radium-226 ranging from 13.24 pCi/g to 21.05 pCi/g.

Two (2) water samples were collected from the following areas in which water accumulated:

- Pond #1 - one (1) composite aqueous sample from the pond
- Pond #2 - one (1) composite aqueous sample from the pond

Primary Tank #2 and Primary Tank #1 were inaccessible due to safety concerns and not sampled.

Gross alpha counts from the Pond #1 sample (P1-W1) were detected at 317 pCi/L and Radium-226 at 11.3 pCi/L.

The Pond #2 sample (P2-W1) did not exceed the established drinking water limits of 15 pCi/L gross alpha and 3 pCi/L Ra-226.

Gamma walkovers of remaining structural components of the WWTP or other accessible land

areas were not significantly greater than background levels. Significantly elevated activity levels were observed, however, in three hotspots taken from areas between the Primary Tank and Sprinkling Filter Bed (HS-1), an area on the northwestern edge of Pond #2 (HS-2) and an area along the northwestern boundary of the site between Pond #1 and Pond #2 (HS-3). Biased samples obtained from these three hotspots confirmed significantly greater activity than background, specifically Radium-226.

GLESC recommended a remedial action plan be developed to address the removal and disposal of soil in areas identified with elevated radioactivity. On December 20, 2017, the NYSDEC conducted a limited survey to confirm the results of the Great Lakes survey at 2 Morgan Drive and a limited gamma walkover of accessible areas on the adjacent property, 6 Morgan Drive to assess for impacts. The Great Lakes results were confirmed for 2 Morgan Drive and readings elevated above background were detected on 6 Morgan Drive property.

On April 9, 2018, both NYSDEC and Great Lakes collected groundwater samples from 4 existing wells located on the 6 Morgan Drive property. The May 9, 2018 Groundwater Sampling report from Great Lakes indicates that their sample results were below the NYS groundwater standard of 3 pCi/L for Ra-226. Also on April 9th, NYSDEC performed a limited gamma walkover survey of areas of interest on an around the Morgan Drive properties. Additional readings above background were detected to the north of the access road between the 6 Morgan Drive property and the Kisco River. Elevated readings were also detected on 2 Morgan Drive near the edge of Morgan Drive.

Figure 1. Survey Area and Underlaying Parcels

3. DATA QUALITY OBJECTIVES

The following data quality objectives are based on MARSSIM principles as applicable to this site:

3.1. STATE THE PROBLEM

- The location, extent, identity and concentration of radiological contaminants must be determined to allow planning of future decommissioning and waste disposal efforts.

3.2. IDENTIFY THE DECISION

- Determine if existing data, process knowledge, and newly performed measurements can adequately specify the locations, type, and extent of contamination for decommissioning planning and waste characterization.

3.3. IDENTIFY INPUTS TO THE DECISION

- Existing characterization data obtained during prior surveys.
- Facility and process knowledge germane to the construction, operation, and history of the site.
- New survey and analysis information collected in selected areas to determine the presence or indicate the absence of radiological contaminants.
- New York State Department of Environmental Conservation (NYSDEC) regulatory guidance
- New York State Department of Health (NYSDOH) radiological health and safety guidance

3.4. DEFINE BOUNDARIES OF THE STUDY

The survey area consists of portions of the following parcels:

Tax Map/Parcel No.: 80.55-1-2.1/1
1 Morgan Drive, Mt. Kisco, NY (exterior land areas only)
Owner: Rolling Frito-Lay Sales, LLP

Tax Map/Parcel No.: 80.55-1 -2.1/2
3 Morgan Drive, Mt. Kisco, NY (exterior land areas only)
Owner: United States Postal Service

Tax Map/Parcel No.: 80 .55-1 -2.1/3
6 Morgan Drive
Owner: Creme de la Creme

Tax Map/Parcel No.: 80.55-1-2.1/4
2 Morgan Drive
Owner: Radio City Ventures, LLC

Tax Map/Parcel No.: 80.55-1-2.2
Portion of 1 Lexington Ave., including Access Road
Owner: Village of Mt. Kisco

The survey area is specified by the NYSDEC in the Consent Order as the gray area in Figure 1 above.

3.5. STATE THE DECISION RULES

- The effectiveness of the characterization survey in localizing and quantifying contamination depends on two general considerations:
    - the quantity and placement of sampling/measurement locations must be sufficient to spatially characterize the area
    - the quantity and types of measurements and analyses performed must be sufficient to radiologically characterize the contaminants

3.6. LIMITS ON DECISION ERRORS

- Constraints on decision errors are not applicable to this survey because subjective rather than statistical techniques are used, i.e., this is a characterization survey not a final status survey.

3.7. OPTIMIZATION OF THE SURVEY DESIGN FOR COLLECTING DATA

There are a few alternatives for determining contaminant concentrations in soil. The options are summarized as follows:

- **Delineating areas of soil contamination on the surface:** In the past, the main method of performing a characterization survey of a land area was to overlay a grid over the area and manually record readings within each grid square. However, with the advent of GPS-based radiation data collection systems, the entire survey area can now be walked-over along transects with count rates and GPS coordinates being recorded approximately every 1-second. In this way, thousands of data points can be collected within a reasonable period of time allowing 2-dimensional plots of gamma activity to be created.
- **Obtaining contaminant data from soil:** After areas of elevated surface gamma activity have been mapped using the GPS-based system, surface soil sampling

with subsequent laboratory analysis will be performed to determine the type and concentrations of radionuclides present at those spots. The radionuclide concentration data will be useful for comparison to regulatory limits, for worker health / safety considerations, and for survey considerations which a correlation between gamma count rate and radium concentration may be calculated. As part of a later phase of assessment, core sampling and *in situ* measurement (i.e., gamma-logging) could be performed to estimate the depth of contamination.

- **Analysis of surface soil samples:** Options include a wide range of radioanalytical and chemical analysis techniques with a wide range of associated costs. For this survey, analysis of the Bi-214 gamma emission after at least 21 days of in-growth will provide the most accurate and cost-effect analysis of radium in soil. This will be performed by a NYS-approved ELAP laboratory.

4. METHODS

4.1. GAMMA SCAN PROCEDURE

4.1.1. Introduction

This procedure provides guidance for recording gamma radiation levels emitted by surface soils while walking over the targeted area with a global positioning system (GPS)-based gamma radiation detection system.

4.1.2. Equipment and Supplies

1. Global Positioning System (GPS) unit (Trimble Model Pro6H or R2)
2. Ludlum Model 44-10 gamma scintillation probe and Model 2221 or 3000 ratemeter or equivalent.
3. Tablet computer running Trimble Terrasync software
4. Flags or stakes and tape measure.
5. Field maps of site and target locations.
6. Personal Protective Equipment (PPE) – including disposable gloves and safety glasses. Refer to the "Health and Safety Plan for Site Characterization" for specific requirements .
7. Miscellaneous supplies – Paper towels, field logbooks, writing instrument, and digital camera or phone

4.1.3. Background Area

A background area will be chosen in the Mt. Kisco vicinity. A GPS-based gamma scan must be conducted of the background area before conducting the survey of the main site. This is to establish the average background reading for real time comparison to site readings. Conduct the background scan using the same procedure as the site scan for at least 15 minutes (approximately

900 readings). After background scan, calculate the mean and standard deviation of the background readings. The investigation level for the site survey will be 1.5 times the background mean.

To establish background radionuclide concentration data, eight (8) soil samples will be collected from the background area at the depths expected to be collected during the actual survey (i.e., 0 to 6" deep). These samples will be sent for analysis along with samples collected from the main site.

4.1.4. Procedure for GPS-based Gamma Scan in Open Area

1. Review the site map and observe the terrain. Using marking flags and tape measure, layout 10-foot wide transects parallel to one side of the property. Plan to walk back and forth in straight lines along the transects. However, deviation from the transect lines are acceptable if obstacles are present or hotspots are detected in between transect that should be more closely delineated.

2. Perform and record a daily instrument check by visually inspecting the unit and noting that the calibration date is within 1-year of use; perform source and background counts to ensure that gamma detection is properly operating; allow the GPS antenna to acquire satellites for a few minutes and ensure that the positional and count rate data are being received by the Terrasync computer. Don the system using a backpack, shoulder straps, etc.

3. Maneuver to the starting point of the first transect. Confirm the location by examining the site map and landmarks. Open a new survey file in the GPS unit; this process begins data acquisition starting with the present coordinates.

4. Perform the survey by walking in a straight line parallel to the fence line or any adjacent survey transects at a rate of approximately 0.5 meters per second. Transect passes are to be approximately 10 feet apart.

5. The scintillation probe is to be held steady at a consistent elevation from the ground surface (approximately 1 to 3 inches).

6. Data are sent automatically into the GPS from the ratemeter at a rate of one count period per second although there could be an occasional skipped second due to non-syncing of the GPS and ratemeter. Use the audible feedback from the ratemeter and computer to ensure proper system operation and to reveal hotspots that should be more closely delineated.

7. If elevated readings greater than 1.5 x background are encountered, walk over and around the hotspot to better investigate the area.

8. After completion of the survey, close the survey file. Ensure that the data file is uploaded to a desktop computer for processing at the end of the day.

4.1.5. Procedure for Manual Gamma Scan in Wooded Area

Since some areas of the site may have substantive tree cover, thus limiting the number of available satellites "seen" by the GPS, manual data collection may have to be performed.

1. In the wooded area, set up 30' x 30' squares parallel to adjacent GPS transect lines. The goal is to set up 30' x 30' grid squares to be added onto the GPS-scanned areas. Use flags or stakes to mark the squares. (Leave flagging in place for potential future surveying by a land surveyor.)

2. Scan each grid square noting the approximate average count rate and the maximum. Mark any significant hotspots exceeding 1.5 x background. If an area is found exhibiting elevated count rates (> 1.5 x bkg), draw the outline of the elevated area on the site map.

The resultant manually-collected data will be added to the GPS-collected gamma map during data processing after the survey is complete.

4.2. SURFACE SOIL SAMPLING

Procedure for the Manual Collection and Processing of Soil Samples

After the gamma map is produced, soil samples will be collected from areas exhibiting gamma emission greater than 1.5 times background. A closely spaced cluster of hotspots may be considered to be a single elevated area per the discretion of the survey manager.

4.2.1. Introduction

This procedure describes the equipment and methods to manually collect a soil sample with a hand auger or shovel.

4.2.2. Equipment and Supplies

1. Hand auger and cross handle or shovel.
2. Sample containers, cooler (no ice is necessary for radiological samples)
3. Global Positioning System (GPS) unit
4. Personnel protective equipment (PPE) - including disposable gloves and safety glasses. Refer to the Health and Safety Plan for PPE requirements.

5. Miscellaneous Supplies: Decontaminated sampling equipment, field books, writing instrument, and digital camera or phone, 4- or 6-mil plastic sheeting.

4.2.3. Soil Collection with Hand Auger or Shovel

Note that for holes dug on this site, excess investigation-derived soil will be placed back in the hole.

1. Data from soil collection will be recorded in the field logbook at the time of collection. All recorded data will be transcribed into an electronic spreadsheet at the end of the sampling program.
2. Using a GPS, maneuver to the target coordinates for each sample location, assuming that sufficient satellite signal is available. Confirm the location by examining the site map, landmarks and the radiation reading. Record and save actual coordinates in the GPS unit. (If satellite signal is not available, maneuver to target sample location using site features and a measuring tape. Record all radiation and localization measurements in the field logbook.)
3. Position the clean (decontaminated) hand auger on the soil surface (perpendicular to the ground). Turn the cross handle for about three revolutions, or until the auger head is full (collecting a sample from 0" to 6" deep. Or, use a shovel and collect a 0" to 6" deep sample. Place the collected material on polyethylene plastic (use a decontaminated spoon if necessary to assist in removal).
4. If a deeper sample is warranted (not prescribed for this phase of the characterization survey), repeat step #3 until the borehole reaches the targeted depth or hits refusal (which is defined as the depth at which no additional penetration can be achieved in a one-minute period). All soil cuttings will be placed on plastic sheeting in the order of excavation.

4.2.4. Soil Processing

1. Check the collected soil with a GM beta-gamma probe. Note the reading in the logbook.

2. Transfer the collected soil to a decontaminated bowl or pan using a decontaminated spoon.

3. Thoroughly homogenize the sample using the following steps:
    a. Scrape soil from the sides, corner, and bottom of the pan into the center and mix.
    b. Separate the sample into quarters and push to separate parts of the pan.
    c. Mix each quarter thoroughly and return to the center of the pan.
    d. Thoroughly mix the quarters together.

4. Place homogenized material into a labeled sample jar. Label the jar with the Sample ID number, date and time of collection, the name of the collector, and site name.

5. Decontaminate equipment with soap and water prior to moving to the next sampling location.

4.2.5. Sample Analyses

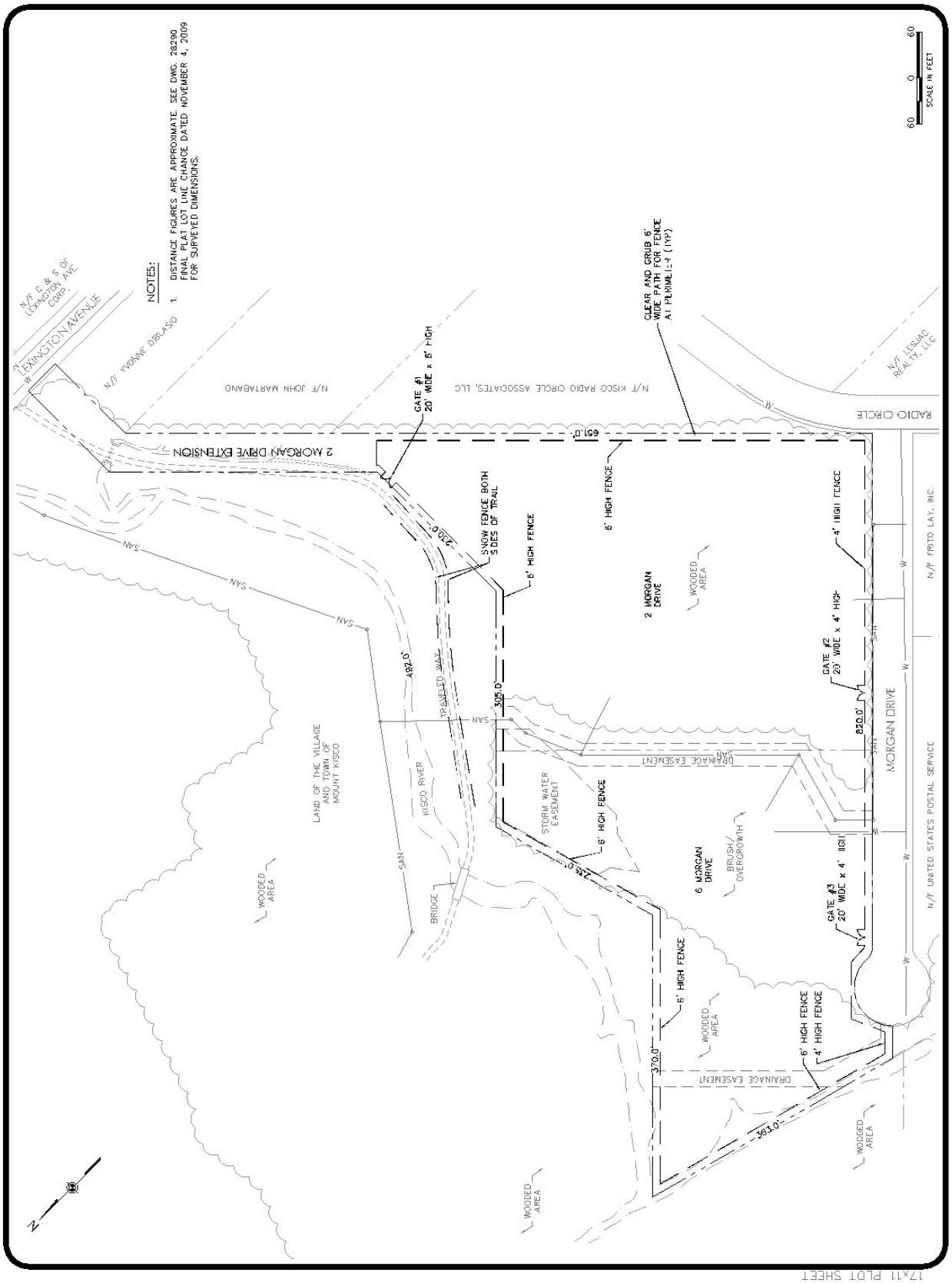
The site and background area samples will be sent to a NYSDEC-approved ELAP-certified laboratory. The analysis shall be gamma spectroscopy with at least 21-day radon ingrowth for specific radium-226 quantitation.

5. PHASE 2 SAMPLING PLAN AND REPORTING

Data from the Phase 1 Characterization Survey will be utilized to develop a sampling plan for Phase 2. The sampling plan will be shared with NYSDEC prior to implementation and will include recommendations for the locations of depth profile contamination measurements.

A Site Characterization Report summarizing the results of both Phase 1 and Phase 2 will be issued within 60 days of receipt of all analytical results. The report will include the gamma map generated from the surface gamma scan, a sample location map, laboratory analytical reports with the results summarized in tabular form, and recommendations for next steps.

Attachment A – Site Map


NOTES:
1. DISTANCE FIGURES ARE APPROXIMATE. SEE DWG. 28290 FINAL PLAT LOT LINE CHANGE DATED NOVEMBER 4, 2009 FOR SURVEYED DIMENSIONS.
N/F C & S OF LEXINGTON AVE. CORP.
LEXINGTON AVENUE
N/F YVONNE DIBLASIO
N/F JOHN MARTABANO
N/F KISCO RADIO CIRCLE ASSOCIATES, LLC
N/F LESMAC REALTY, LLC
RADIO CIRCLE
GATE #1 20' WIDE x 6' HIGH
CLEAR AND GRUB 6' WIDE PATH FOR FENCE AT PLUMBERS (TYP)
651.0'
2 MORGAN DRIVE EXTENSION
SNOW FENCE BOTH SIDES OF TRAIL
6' HIGH FENCE
4' HIGH FENCE
2 MORGAN DRIVE
WOODED AREA
GATE #2 20' WIDE x 4' HIGH
820.0'
MORGAN DRIVE
N/F FRITO LAY, INC.
N/F UNITED STATES POSTAL SERVICE
492.0'
305.0'
TRAVELED WAY
DRAINAGE EASEMENT
STORM WATER EASEMENT
LAND OF THE VILLAGE AND TOWN OF MOUNT KISCO
KISCO RIVER
BRIDGE
6 MORGAN DRIVE
BRUSH / OVERGROWTH
GATE #3 20' WIDE x 4' HIGH
235.0'
370.0'
363.0'
SAN
W
0
60
SCALE IN FEET
17x11 PLOT SHEET

Appendix C
Soil Sample Results

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

August 08, 2019

Anthony Purchia
NYC - DEP
465 Columbus Avenue
Valhalla, NY 10595

RE: Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Dear Anthony Purchia:
Enclosed are the analytical results for sample(s) received by the laboratory on June 07, 2019. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Revision 1 - This report replaces the July 18, 2019 report. This project was revised on August 8, 2019 to report additional analyses as per client request. (Greensburg, PA)

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jacquelyn Collins
jacquelyn.collins@pacelabs.com
(724)850-5612
Project Manager

Enclosures

cc: Patricia Daye, NYC-DEP

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CERTIFICATIONS

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Florida: Cert E871149 SEKS WET
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30298744001	**06051902-01**	Solid	06/05/19 09:20	06/07/19 10:15
30298744002	**06051902-02**	Solid	06/05/19 09:30	06/07/19 10:15
30298744003	**06051902-03**	Solid	06/05/19 09:40	06/07/19 10:15
30298744004	**06051902-04**	Solid	06/05/19 09:55	06/07/19 10:15
30298744005	**06051902-05**	Solid	06/05/19 10:15	06/07/19 10:15
30298744006	**06051902-06**	Solid	06/05/19 10:30	06/07/19 10:15
30298744007	**06051902-07**	Solid	06/05/19 11:05	06/07/19 10:15
30298744008	**06051902-08**	Solid	06/05/19 11:25	06/07/19 10:15
30298744009	**06051902-09**	Solid	06/05/19 11:35	06/07/19 10:15
30298744010	**06051902-10**	Solid	06/05/19 11:50	06/07/19 10:15
30298744011	**06051902-11**	Solid	06/05/19 11:55	06/07/19 10:15
30298744012	**06051902-12**	Solid	06/05/19 12:05	06/07/19 10:15
30298744013	**06051902-13**	Solid	06/05/19 12:10	06/07/19 10:15
30298744014	**06051902-14**	Solid	06/05/19 12:15	06/07/19 10:15
30298744015	**06051902-15**	Solid	06/05/19 12:25	06/07/19 10:15
30298744016	**06051902-16**	Solid	06/05/19 12:30	06/07/19 10:15

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SAMPLE ANALYTE COUNT

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30298744001	**06051902-01**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744002	**06051902-02**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744003	**06051902-03**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744004	**06051902-04**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744005	**06051902-05**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744006	**06051902-06**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744007	**06051902-07**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744008	**06051902-08**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744009	**06051902-09**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744010	**06051902-10**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744011	**06051902-11**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744012	**06051902-12**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744013	**06051902-13**	EPA 901.1	MAH	2

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Lab ID	Sample ID	Method	Analysts	Analytes Reported
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744014	**06051902-14**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744015	**06051902-15**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1
30298744016	**06051902-16**	EPA 901.1	MAH	2
		EPA 9310	NEG	2
		HSL-300	LAL	1

REPORT OF LABORATORY ANALYSIS

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PROJECT NARRATIVE

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Method: **EPA 901.1**
Description: 901.1 Gamma Spec INGROWTH
Client: NYC - DEP
Date: August 08, 2019

General Information:
16 samples were analyzed for EPA 901.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Method: **EPA 9310**
Description: 9310 Gross Alpha/Beta
Client: NYC - DEP
Date: August 08, 2019

General Information:
16 samples were analyzed for EPA 9310. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Method: **HSL-300**
Description: HSL300(AS) Actinides
Client: NYC - DEP
Date: August 08, 2019

General Information:
16 samples were analyzed for HSL-300. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 353298

N2: The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

- 06051902-01 (Lab ID: 30298744001)
  - Thorium-230
- 06051902-02 (Lab ID: 30298744002)
  - Thorium-230
- 06051902-03 (Lab ID: 30298744003)
  - Thorium-230
- 06051902-04 (Lab ID: 30298744004)
  - Thorium-230
- 06051902-05 (Lab ID: 30298744005)
  - Thorium-230
- 06051902-06 (Lab ID: 30298744006)
  - Thorium-230
- 06051902-07 (Lab ID: 30298744007)
  - Thorium-230
- 06051902-08 (Lab ID: 30298744008)
  - Thorium-230
- 06051902-09 (Lab ID: 30298744009)
  - Thorium-230
- 06051902-10 (Lab ID: 30298744010)
  - Thorium-230
- 06051902-11 (Lab ID: 30298744011)
  - Thorium-230

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Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Method: **HSL-300**
Description: HSL300(AS) Actinides
Client: NYC - DEP
Date: August 08, 2019

Analyte Comments:

QC Batch: 353298

N2: The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

- 06051902-12 (Lab ID: 30298744012)
  - Thorium-230
- 06051902-13 (Lab ID: 30298744013)
  - Thorium-230
- 06051902-14 (Lab ID: 30298744014)
  - Thorium-230
- 06051902-15 (Lab ID: 30298744015)
  - Thorium-230
- 06051902-16 (Lab ID: 30298744016)
  - Thorium-230
- BLANK (Lab ID: 1716220)
  - Thorium-230

This data package has been reviewed for quality and completeness and is approved for release.

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-01 **Lab ID: 30298744001** Collected: 06/05/19 09:20 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**19.372 ± 2.660 (0.388) C:NA T:NA**	pCi/g	07/18/19 09:14	13982-63-3	Ra
Radium-228	EPA 901.1	**0.884 ± 0.521 (0.505) C:NA T:NA**	pCi/g	07/18/19 09:14	15262-20-1	
Gross Alpha	EPA 9310	**713 ± 133 (7.31) C:NA T:NA**	pCi/g	06/26/19 08:23	12587-46-1	
Gross Beta	EPA 9310	**47.7 ± 12.7 (5.02) C:NA T:NA**	pCi/g	06/26/19 08:23	12587-47-2	
Thorium-230	HSL-300	**381 ± 61.1 (0.554) C:NA T:86%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-02 **Lab ID: 30298744002** Collected: 06/05/19 09:30 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**37.257 ± 5.111 (0.616) C:NA T:NA**	pCi/g	07/18/19 09:15	13982-63-3	Ra
Radium-228	EPA 901.1	**0.765 ± 0.803 (1.218) C:NA T:NA**	pCi/g	07/18/19 09:15	15262-20-1	
Gross Alpha	EPA 9310	**862 ± 160 (5.05) C:NA T:NA**	pCi/g	06/26/19 08:23	12587-46-1	
Gross Beta	EPA 9310	**49.0 ± 13.6 (5.50) C:NA T:NA**	pCi/g	06/26/19 08:23	12587-47-2	
Thorium-230	HSL-300	**580 ± 92.0 (0.389) C:NA T:93%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-03 **Lab ID: 30298744003** Collected: 06/05/19 09:40 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**48.943 ± 6.604 (0.604) C:NA T:NA**	pCi/g	07/18/19 09:30	13982-63-3	Ra
Radium-228	EPA 901.1	**1.820 ± 0.877 (0.803) C:NA T:NA**	pCi/g	07/18/19 09:30	15262-20-1	
Gross Alpha	EPA 9310	**893 ± 165 (6.32) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**48.1 ± 13.3 (5.02) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**606 ± 94.7 (0.425) C:NA T:106%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-04 **Lab ID: 30298744004** Collected: 06/05/19 09:55 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**54.429 ± 7.366 (0.727) C:NA T:NA**	pCi/g	07/18/19 09:31	13982-63-3	Ra
Radium-228	EPA 901.1	**1.636 ± 1.166 (1.331) C:NA T:NA**	pCi/g	07/18/19 09:31	15262-20-1	
Gross Alpha	EPA 9310	**1,446 ± 264 (6.69) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**39.1 ± 13.7 (4.62) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**891 ± 142 (0.482) C:NA T:87%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-05 **Lab ID: 30298744005** Collected: 06/05/19 10:15 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**29.698 ± 4.032 (0.538) C:NA T:NA**	pCi/g	07/18/19 09:46	13982-63-3	Ra
Radium-228	EPA 901.1	**1.048 ± 0.721 (0.762) C:NA T:NA**	pCi/g	07/18/19 09:46	15262-20-1	
Gross Alpha	EPA 9310	**896 ± 166 (6.34) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**28.0 ± 10.7 (4.99) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**582 ± 91.8 (0.412) C:NA T:97%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-06 **Lab ID: 30298744006** Collected: 06/05/19 10:30 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**11.590 ± 1.736 (0.307) C:NA T:NA**	pCi/g	07/18/19 09:47	13982-63-3	Ra
Radium-228	EPA 901.1	**1.402 ± 0.640 (1.087) C:NA T:NA**	pCi/g	07/18/19 09:47	15262-20-1	
Gross Alpha	EPA 9310	**267 ± 52.3 (6.62) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**29.3 ± 7.56 (4.16) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**157 ± 25.2 (0.309) C:NA T:91%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-07 **Lab ID: 30298744007** Collected: 06/05/19 11:05 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**0.698 ± 0.170 (0.139) C:NA T:NA**	pCi/g	07/18/19 10:03	13982-63-3	Ra
Radium-228	EPA 901.1	**0.931 ± 0.274 (0.148) C:NA T:NA**	pCi/g	07/18/19 10:03	15262-20-1	
Gross Alpha	EPA 9310	**11.8 ± 5.91 (6.73) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**12.4 ± 4.29 (5.73) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**2.74 ± 1.10 (0.622) C:NA T:79%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-08 **Lab ID: 30298744008** Collected: 06/05/19 11:25 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**22.482 ± 3.168 (0.514) C:NA T:NA**	pCi/g	07/18/19 10:04	13982-63-3	Ra
Radium-228	EPA 901.1	**1.367 ± 0.632 (0.629) C:NA T:NA**	pCi/g	07/18/19 10:04	15262-20-1	
Gross Alpha	EPA 9310	**687 ± 128 (5.28) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**29.0 ± 10.3 (5.10) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**346 ± 57.0 (0.540) C:NA T:88%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-09 **Lab ID: 30298744009** Collected: 06/05/19 11:35 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**14.166 ± 1.999 (0.341) C:NA T:NA**	pCi/g	07/18/19 10:19	13982-63-3	Ra
Radium-228	EPA 901.1	**1.361 ± 0.588 (0.530) C:NA T:NA**	pCi/g	07/18/19 10:19	15262-20-1	
Gross Alpha	EPA 9310	**405 ± 77.8 (4.96) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-46-1	
Gross Beta	EPA 9310	**10.7 ± 6.87 (5.40) C:NA T:NA**	pCi/g	06/26/19 08:10	12587-47-2	
Thorium-230	HSL-300	**231 ± 39.0 (0.578) C:NA T:81%**	pCi/g	07/29/19 07:26	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-10 **Lab ID: 30298744010** Collected: 06/05/19 11:50 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**19.112 ± 2.677 (0.411) C:NA T:NA**	pCi/g	07/18/19 10:20	13982-63-3	Ra
Radium-228	EPA 901.1	**1.441 ± 0.593 (0.685) C:NA T:NA**	pCi/g	07/18/19 10:20	15262-20-1	
Gross Alpha	EPA 9310	**504 ± 95.5 (6.87) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-46-1	
Gross Beta	EPA 9310	**30.1 ± 9.42 (5.34) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-47-2	
Thorium-230	HSL-300	**298 ± 48.4 (0.373) C:NA T:82%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-11 **Lab ID: 30298744011** Collected: 06/05/19 11:55 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**55.770 ± 7.568 (0.775) C:NA T:NA**	pCi/g	07/18/19 10:36	13982-63-3	Ra
Radium-228	EPA 901.1	**0.000 ± 0.647 (1.585) C:NA T:NA**	pCi/g	07/18/19 10:36	15262-20-1	
Gross Alpha	EPA 9310	**719 ± 134 (6.57) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-46-1	
Gross Beta	EPA 9310	**224 ± 42.3 (5.29) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-47-2	
Thorium-230	HSL-300	**222 ± 35.9 (0.364) C:NA T:89%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-12 **Lab ID: 30298744012** Collected: 06/05/19 12:05 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**5.005 ± 0.816 (0.292) C:NA T:NA**	pCi/g	07/18/19 10:37	13982-63-3	Ra
Radium-228	EPA 901.1	**1.443 ± 0.492 (0.484) C:NA T:NA**	pCi/g	07/18/19 10:37	15262-20-1	
Gross Alpha	EPA 9310	**118 ± 25.6 (5.27) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-46-1	
Gross Beta	EPA 9310	**18.6 ± 5.17 (3.36) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-47-2	
Thorium-230	HSL-300	**55.3 ± 9.74 (0.561) C:NA T:80%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-13 **Lab ID: 30298744013** Collected: 06/05/19 12:10 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**22.610 ± 3.120 (0.428) C:NA T:NA**	pCi/g	07/18/19 10:53	13982-63-3	Ra
Radium-228	EPA 901.1	**1.329 ± 0.647 (0.600) C:NA T:NA**	pCi/g	07/18/19 10:53	15262-20-1	
Gross Alpha	EPA 9310	**408 ± 77.8 (5.93) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-46-1	
Gross Beta	EPA 9310	**42.5 ± 10.6 (4.69) C:NA T:NA**	pCi/g	06/26/19 08:11	12587-47-2	
Thorium-230	HSL-300	**266 ± 43.4 (0.437) C:NA T:83%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-14 **Lab ID: 30298744014** Collected: 06/05/19 12:15 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**420.250 ± 55.885 (3.024) C:NA T:NA**	pCi/g	07/18/19 10:54	13982-63-3	Ra
Radium-228	EPA 901.1	**10.443 ± 2.284 (3.751) C:NA T:NA**	pCi/g	07/18/19 10:54	15262-20-1	
Gross Alpha	EPA 9310	**11,160 ± 2,000 (9.58) C:NA T:NA**	pCi/g	06/27/19 07:49	12587-46-1	
Gross Beta	EPA 9310	**713 ± 132 (5.70) C:NA T:NA**	pCi/g	06/27/19 07:49	12587-47-2	
Thorium-230	HSL-300	**6,738 ± 1,059 (0.507) C:NA T:93%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-15 **Lab ID: 30298744015** Collected: 06/05/19 12:25 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**10.162 ± 1.474 (0.378) C:NA T:NA**	pCi/g	07/18/19 12:13	13982-63-3	Ra
Radium-228	EPA 901.1	**1.533 ± 0.503 (0.363) C:NA T:NA**	pCi/g	07/18/19 12:13	15262-20-1	
Gross Alpha	EPA 9310	**330 ± 64.0 (10.3) C:NA T:NA**	pCi/g	06/27/19 07:49	12587-46-1	
Gross Beta	EPA 9310	**37.5 ± 9.99 (8.07) C:NA T:NA**	pCi/g	06/27/19 07:49	12587-47-2	
Thorium-230	HSL-300	**115 ± 19.6 (0.688) C:NA T:77%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

Sample: 06051902-16 **Lab ID: 30298744016** Collected: 06/05/19 12:30 Received: 06/07/19 10:15 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**1.253 ± 0.335 (0.246) C:NA T:NA**	pCi/g	07/18/19 12:31	13982-63-3	Ra
Radium-228	EPA 901.1	**0.877 ± 0.611 (0.680) C:NA T:NA**	pCi/g	07/18/19 12:31	15262-20-1	
Gross Alpha	EPA 9310	**19.5 ± 7.79 (10.1) C:NA T:NA**	pCi/g	06/27/19 07:50	12587-46-1	
Gross Beta	EPA 9310	**16.1 ± 4.59 (4.93) C:NA T:NA**	pCi/g	06/27/19 07:50	12587-47-2	
Thorium-230	HSL-300	**4.59 ± 1.33 (0.416) C:NA T:97%**	pCi/g	07/29/19 11:32	14269-63-7	N2

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QUALITY CONTROL - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

QC Batch: 353298 Analysis Method: HSL-300
QC Batch Method: HSL-300 Analysis Description: HSL300(AS) Actinides
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013, 30298744014, 30298744015, 30298744016

METHOD BLANK: 1716220 Matrix: Solid
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013, 30298744014, 30298744015, 30298744016

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Thorium-230	0.937 ± 0.497 (0.436) C:NA T:81%	pCi/g	07/28/19 09:14	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

QC Batch: 348669 Analysis Method: EPA 9310
QC Batch Method: EPA 9310 Analysis Description: 9310 Gross Alpha/Beta
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013

METHOD BLANK: 1695727 Matrix: Solid
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	0.050 ± 0.0657 (0.128) C:NA T:NA	pCi/g	06/26/19 08:23	
Gross Beta	-0.054 ± 0.0814 (0.203) C:NA T:NA	pCi/g	06/26/19 08:23	

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Greensburg, PA 15601
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QUALITY CONTROL - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

QC Batch: 350162 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec Ingrowth
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013

METHOD BLANK: 1702107 Matrix: Solid
Associated Lab Samples: 30298744001, 30298744002, 30298744003, 30298744004, 30298744005, 30298744006, 30298744007, 30298744008, 30298744009, 30298744010, 30298744011, 30298744012, 30298744013, 30298744014, 30298744015, 30298744016

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.063 ± 0.116 (0.203) C:NA T:NA	pCi/g	07/18/19 08:57	Ra
Radium-228	0.000 ± 0.044 (0.389) C:NA T:NA	pCi/g	07/18/19 08:57	

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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

QC Batch: 348928 Analysis Method: EPA 9310
QC Batch Method: EPA 9310 Analysis Description: 9310 Gross Alpha/Beta
Associated Lab Samples: 30298744014, 30298744015, 30298744016

METHOD BLANK: 1696620 Matrix: Solid
Associated Lab Samples: 30298744014, 30298744015, 30298744016

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	-0.011 ± 0.0487 (0.143) C:NA T:NA	pCi/g	06/27/19 07:49	
Gross Beta	-0.011 ± 0.101 (0.240) C:NA T:NA	pCi/g	06/27/19 07:49	

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REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: Former Mt. Kisco WWTP
Pace Project No.: 30298744

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: For Safe Drinking Water Act (SDWA) analyses, the reported Unc. Is the calculated Count Uncertainty (95% confidence interval) using a coverage factor of 1.96. For all other matrices (non-SDWA), the reported Unc. is the calculated Expanded Uncertainty (aka Combined Standard Uncertainty, CSU), reported at the 95% confidence interval using a coverage factor of 1.96.

Gamma Spec: The Unc. reported for all gamma-spectroscopy analyses (EPA 901.1), is the calculated Expanded Uncertainty (CSU) at the 95.4% confidence interval, using a coverage factor of 2.0.

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.
Ra	The reported Ra-226 results were determined by hermetically sealing the dried, processed sample in an appropriate-sized can. Each sample was stored for a minimum of 21 days to ensure that equilibrium between Ra-226 and daughters Bi-214 and Pb-214 was achieved. Reported Ra-226 results were inferred from gamma peaks attributable to Bi-214 and Pb-214.

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CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

WO# : 30298744

30298744

1 of 2

Company: NYC-DEP	Billing Information: Proposal # 20190506JRH-1
Address: 465 Columbus Ave, Valhalla, NY	
Report To: Anthony Purchia	Email To: APurchia@dep.nyc.gov
Copy To: Patty Daye	Site Collection Info/Address: Mt. Kisco
Customer Project Name/Number: Former Mt. Kisco WWTP	State: NY / Mt Kisco. County/City: Time Zone Collected: [ ]PT [ ]MT [ ]CT [X]ET
Phone: 914-749-5400 Email:	Site/Facility ID #:
Collected By (print): Anthony Purchia	Purchase Order #: Quote #: 20190506JRH-1
Collected By (signature):	Turnaround Date Required: 5x D
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:	Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
	Compliance Monitoring? [ ] Yes [X] No
	DW PWS ID #: DW Location Code:
	Immediately Packed on Ice: [ ] Yes [X] No
	Field Filtered (if applicable): [ ] Yes [ ] No Analysis:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

LAB USE ONLY — Container Preservative Type ** — Lab Project Manager:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	Analyses: Gross Alpha / Be-7 & K-40 EPA 900.0	Ra-226 / Ra-228 EPA 903.1	Lab Profile/Line:
06051902-01	SL	G	6/5	0920				1	✓	✓	001
06051902-02	SL	G	6/5	0930				1	✓	✓	002
06051902-03	SL	G	6/5	0940				1	✓	✓	003
06051902-04	SL	G	6/5	0955				1	✓	✓	004
06051902-05	SL	G	6/5	1015				1	✓	✓	005
06051902-06	SL	G	6/5	1030				1	✓	✓	010
06051902-07	SL	G	6/5	1105				1	✓	✓	007
06051902-08	SL	G	6/5	1125				1	✓	✓	008
06051902-09	SL	G	6/5	1135				1	✓	✓	009
06051902-10	SL	G	6/5	1150				1	✓	✓	010

Lab Profile/Line:

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	(Y)	N	NA
Custody Signatures Present	(Y)	N	NA
Collector Signature Present	(Y)	N	NA
Bottles Intact	(Y)	N	NA
Correct Bottles	(Y)	N	NA
Sufficient Volume	(Y)	N	NA
Samples Received on Ice	Y	N	(NA)
VOA - Headspace Acceptable	Y	N	(NA)
USDA Regulated Soils	Y	(N)	NA
Samples in Holding Time	(Y)	N	NA
Residual Chlorine Present	Y	N	(NA)
Cl Strips:			
Sample pH Acceptable	Y	N	(NA)
pH Strips:			
Sulfide Present	Y	N	(NA)
Lead Acetate Strips:			

LAB USE ONLY:
Lab Sample # / Comments:
CT/ET

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry (None)

Packing Material Used: Nothing

Radchem sample(s) screened (<500 cpm): (Y) N NA

SHORT HOLDS PRESENT (<72 hours): Y N (N/A)

Lab Tracking #: 2348076

Samples received via: (USPS) FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N (NA)
Therm ID#: N/A
Cooler 1 Temp Upon Receipt: — oC
Cooler 1 Therm Corr. Factor: — oC
Cooler 1 Corrected Temp: — oC
Comments: CTN-W-19

Trip Blank Received: Y N (NA)
HCL MeOH TSP Other

Non Conformance(s): YES / (NO)

Page: of:

	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	6/6/19 0930		6-7-19 1015
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Pc 2 of 2

WO#: 30298744

PM: JAC Due Date: 07/07/19
CLIENT: NYC-DEP

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CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

Company: NYC-DEP
Address: 465 Columbus Ave. Valhalla, NY
Report To: Anthony Purchio
Copy To: Patty Daye
Customer Project Name/Number: Former Mt Kisco WWTP
Phone: 914-749-5400
Email:
Collected By (print): Anthony Purchio
Collected By (signature):
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:

Billing Information: Proposal #20190536 JRH-1
Email To: APurchio@dep.nyc.gov
Site Collection Info/Address: Mt Kisco
State: NY | County/City: Mt Kisco | Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET
Site/Facility ID #:
Purchase Order #:
Quote #: 20190506JRH-1
Turnaround Date Required: 5 x D
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Compliance Monitoring? [ ] Yes [ ] No
DW PWS ID #:
DW Location Code:
Immediately Packed on Ice: [ ] Yes [ ] No
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis:

LAB USE / Container Preservative Type

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Time	Composite End Date	Time	Res Cl	# of Ctns	Gross Alpha/Beta; EPA 900.0	Ra226/228; EPA 901.1m	Lab Sample # / Comments
06051902-11	SL	G	6/5	1155				1	✓	✓	See Page 1 — 011
06051902-12	SL	G	6/5	1205				1	✓	✓	012
06051902-13	SL	G	6/5	1210				1	✓	✓	013
06051902-14	SL	G	6/5	1215				1	✓	✓	014
06051902-15	SL	G	6/5	1225				1	✓	✓	015
06051902-16	SL	G	6/5	1270				1	✓	✓	016

Lab Profile/Line:
Lab Sample Receipt Checklist:
Custody Seals Present/Intact Y N NA
Custody Signatures Present Y N NA
Collector Signature Present Y N NA
Bottles Intact Y N NA
Correct Bottles Y N NA
Sufficient Volume Y N NA
Samples Received on Ice Y N NA
VOA - Headspace Acceptable Y N NA
USDA Regulated Soils Y N NA
Samples in Holding Time Y N NA
Residual Chlorine Present Y N NA
Cl Strips:
Sample pH Acceptable Y N NA
pH Strips:
Sulfide Present Y N NA
Lead Acetate Strips:

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None
Packing Material Used:
Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A
Lab Tracking #: 2348076
Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#:
Cooler 1 Temp Upon Receipt: ____oC
Cooler 1 Therm Corr. Factor: ____oC
Cooler 1 Corrected Temp: ____oC
Comments:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	MTJL LAB USE ONLY
[signature]	6/6/19 0930	[signature] ET 6/6/19	~~6/6/19~~ 1015	Table #:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time: 6-7-19	Acctnum: Template: Prelogin:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	PM: PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO
Page: ____ of: ____

NYC
Environmental Protection

Vincent Sapienza
Commissioner

Paul V. Rush, P.E.
Deputy Commissioner
prush@dep.nyc.gov

465 Columbus Ave.
Valhalla, New York 10595

Tel. (845) 340-7800
Fax (914) 741-0348

30298744

Date: June 6, 2019

To: Ms. Jacquelyn Collins, PACE Analytical Services

From: Anthony Purchia, Division of Environmental Health and Safety

RE: Soil Samples

I have enclosed (16) sixteen soil samples to be analyzed for the following analytes as per the attached Price Quotation #20190506JRH-1;

Gross Alpha/Beta (EPA 900.0M)
Ra-226/228 (EPA901.1M)

Please contact our Procurement Officer, Ms. Patty Daye at 914-749-5398 to confirm receipt and to process payment.

If you have any questions concerning the samples or analyses, please contact me at 914-749-5400.

Thank You

Anthony Purchia

Pace Analytical®
Pittsburgh Laboratory

30298744

PRICE QUOTATION

Proposal No.:	20190506JRH-1	Initiator:	Justin Hensley
Contact:	Patricia Daye	Initiation Date:	
Company:	NYC Environmental Protection	Project No.:	
Address:		Pace Project Mgr.:	Jackie Collins
City/State/Zip:		Scheduled Start:	
Phone:	914-749-5398	Duration:	
Fax:		Proj. Description:	Solid NORM
Email:	pdaye@dep.nyc.gov	Industry Type:	
		Field Services:	○ Yes ◉ No

Hardcopy Deliverable: Pace Level = ◉ A ○ B ○ C ○ D ○ E Notes:

Electronic Deliverable: ○ Yes ◉ No

QAPP / Certification / QC / Special Requirements:

X if Needed: ☐ Bailers ☐ Trip Blanks ☐ Coolers ☐ Blue Ice ☐ COC / Seals

Qty	Matrix	Analysis/Method		Unit Price	TAT	Volume	Preservative	Total Price
1	Solid	Gross Alpha/Beta	EPA 900.0M	$50.00	20 BD	8 oz	None	$50.00
1	Solid	Ra-226/Ra-228 *	EPA 901.1M	$85.00	20 BD	16 oz	None	$85.00
1		3% radiological sample disposal fee		per invoice				$4.05
							Estimated Total/Sample	**$139.05**

* Samples are sealed to prevent the escape of radon gas and stored for a minimum of 21 days to ensure that Ra-226 and progeny achieve secular equilibrium. Once equilibrium is established following the in-growth period, the Ra-226 concentration is determined by measuring the Bi-214 and Pb-214 daughters.

**** Pricing is valid for Pace standard MDCs and reporting.**

Radiation Multipliers

Level 1 (environmental level sample with <5.0 mR/hr. beta/gamma radiation) = No Surcharge
Level 2 (moderate level sample with 5-100 mR/hr. beta/gamma radiation) = 1.50X
Level 3 (high level sample with >100 mR/hr. beta/gamma radiation) = 2.50X

- Pace reserves the right to return highly hazardous, toxic, or radioactive samples to you.
- Quoted prices include standard Pace QA/QC, detection limits, and terms and conditions unless specifically indictated otherwise.
- Payment terms are Net-30.
- **Please include proposal number on chain-of-custody to ensure proper billing.**

Authorized Signature: Justin Hensley Date: 6-May-19

Justin Hensley