FINAL CONTAMINATION CONTROL PLAN

Niagara Falls Storage Site Remedial and Site Services - Balance of Plant, Lewiston, New York

Contract No: **W912P423D0010**

Task Order No: W912P423F0042

Date: **February 26, 2024**

Prepared for:

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ACRONYMS

AHA	Activity Hazard Analysis
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
APP	Accident Prevention Plan
BOP	Balance of Plant
Bq	becquerel
BZ	Breathing Zone
CCP	Contamination Control Plan
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeter
COR	Contracting Officer's Representative
cpm	counts per minute
CRZ	Contamination Reduction Zone
DAC	Derived Air Concentration
dpm	disintegrations per minute
EA	Exposure Assessment
EFS	Enviro-Fix Solutions, LLC
EM	Engineer Manual
EPA	U.S. Environmental Protection Agency
EU	Exposure Unit
EZ	Exclusion Zone
FSS	Final Status Survey
FUSRAP	Formerly Utilized Sites Remedial Action Program
g	gram
GA	General Area
HEPA	High-Efficiency Particulate Air
IH	Industrial Hygiene
lpm	liters per minute
µCi	microcurie
µSv	microsievert
m^3	cubic meter
MDC	Minimum Detectable Concentration
mg	milligram
ml	milliliter
mrem	millirem
NCRP	National Council on Radiation Protection
NEA	Negative Exposure Assessment
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFSS	Niagara Falls Storage Site
OSHA	Occupational Safety and Health Administration
Pb	Lead
pCi	picocurie

PM	Project Manager
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
Ra	Radium
RCF	Radiological Counting Facility
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SHM	Safety and Health Manager
SOP	Standard Operating Procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SZ	Support Zone
Th	Thorium
TSP	Total Suspended Particulate
U	Uranium
USACE	U.S. Army Corps of Engineers
WAC	Waste Acceptance Criteria
y	Year

SIGNATURES

This Final Contamination Control Plan (CCP) has been prepared by Enviro-Fix Solutions, LLC (EFS) for the Niagara Falls Storage Site (NFSS) Remediation Single Award Task Order Contract, Lewiston, New York Project. Work conducted under this contract will be performed in accordance with applicable federal, state, and local safety and occupational health laws and regulations including Occupational Safety and Health Administration (OSHA) standards, including 29 Code of Federal Regulations (CFR) 1910 and 1926, and the U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual (EM 385-1-1, 15 November 2014). The contents of the CCP are subject to review and revision as new information becomes available.

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1.0 INTRODUCTION

Enviro-Fix Solutions, LLC (EFS) has prepared this Final Contamination Control Plan (CCP) for the U.S. Army Corps of Engineers (USACE) Buffalo District under Contract Number W912P423D0010 to conduct remedial activities at the Niagara Falls Storage Site (NFSS) Balance of Plant (BOP) located in Lewiston, New York. The remediation is being completed under the USACE's Formerly Utilized Sites Remedial Action Program (FUSRAP), which was established to identify, investigate, and clean up or control sites previously used by the Atomic Energy Commission and its predecessor, the Manhattan Engineer District. This site has been identified as having materials contaminated with FUSRAP-related contaminants of concern, which include radionuclides and chemical constituents. The primary objective of this remedial action is the timely and effective cleanup of the site in accordance with the *Record of Decision for the Balance of Plan and Groundwater Operable Units Niagara Fall Storage Site* (USACE 2022). The planned remedial activities include removal and off-site disposal of radiological and/or chemical contaminated materials including soil, road bedding, building foundations, and groundwater.

This plan describes the overall contamination control approach to be implemented during remedial activities at the site, to include pre-mobilization, excavations, material handling, building foundation investigations, and demobilization and provides specific details on the means and methods EFS will apply to ensure contaminants are identified and controlled such that exposures from hazardous materials to the workforce, public, and the environment are maintained as low as reasonably achievable (ALARA).

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2.0 SCOPE AND PURPOSE

The scope of this CCP is specific to the remedial activities planned at the NFSS BOP with detailed guidance for controlling the potential spread of chemical and radiological contamination within the site and off-site areas. This CCP outlines the following methods used for controlling contamination on the site and preventing chemical and/or radiological cross-contamination to the site Support Zone (SZ) or outside the NFSS boundaries:

- Conspicuously posting hazardous work areas and Exclusion Zones (EZs) and controlling access/egress to those work zones from the EZ through the Contamination Reduction Zone (CRZ);
- Implementing a routine survey and inspection schedule to continually document site conditions and provide ongoing monitoring of contamination levels;
- Radiologically surveying and decontaminating as necessary prior to releasing equipment and materials;
- Appropriately packaging all waste materials prior to leaving the site;
- Maintaining positive housekeeping of work areas and SZs;
- Verifying compliance with housekeeping and release limits;
- Controlling airborne emissions of dust and radionuclides during site operations through engineering controls; and
- Quantifying limits for airborne emissions of dust and radionuclides;
- Summarizing the monitoring requirements and procedures for contamination control and for measuring airborne emissions on-site and from the site.

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3.0 RESPONSIBILITIES AND AUTHORITY

3.1 Project Manager (PM)

The PM is responsible for providing logistical and policy support to ensure the requirements within the CCP are properly implemented.

3.2 Safety and Health Manager (SHM)

The SHM reports to the EFS corporate health and safety manager. The SHM is responsible for the overall conduct of the safety program for the NFSS project, including the CCP as an integral component of worker and off-site receptor safety. The SHM provides technical support to the Site Safety and Health Officer (SSHO) and Radiation Safety Officer (RSO) as necessary when implementing this CCP. The SHM ensures that an independent review of work practices, engineering controls, and monitoring results is performed during remediation activities at the project site.

3.3 Site Safety and Health Officer (SSHO)

The project SSHO reports directly to the SHM. The SSHO works with the RSO to identify engineering controls and work practices that will improve the effectiveness of the CCP. The SSHO is responsible for ensuring that all elements of the approved Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) are implemented and enforced on-site. The SSHO ensures that a periodic review of engineering controls, work practices, and monitoring results is performed to assess program effectiveness for non-radiological contamination controls. In addition, the SSHO obtains a qualified Industrial Hygienist to periodically review the contamination control program, independently assess its effectiveness, and perform Negative Exposure Assessments (NEAs).

3.4 Radiation Safety Officer (RSO)

The RSO reports directly to the program Certified Health Physicist (CHP) and is responsible for implementing the Radiation Protection Plan (RPP) at the NFSS project. The RSO is responsible for ensuring that the contamination control and measurement requirements of the CCP are performed at the designated frequency and are of sufficient quality and quantity to identify the potential spread of contamination. The RSO ensures that a weekly review of engineering controls and work practices, and daily review of monitoring results is performed to assess program

effectiveness for radiological contamination control.

3.5 Site Superintendent

The Site Superintendent works with the RSO and SSHO to identify engineering controls and work practices that will improve the effectiveness of the CCP. Together they implement the engineering controls and work practices needed to ensure that the CCP is executed effectively. While either the RSO or SSHO may identify methods to improve contamination control practices, it is the site superintendent who ensures that project supervision and subcontractor management incorporate into project work plans the contamination control measures specified in this CCP.

3.6 USACE

The USACE Buffalo District is responsible for oversight of all aspects of the NFSS project, including but not limited to project management, project engineering, health and safety, cost, and schedule.

4.0 CONTAMINATION CONTROL PROGRAM

Hazard identification is the basis for implementing effective contamination controls. EFS will implement Standard Operating Procedures (SOPs) to effectively characterize areas and materials impacted with radiological/chemical/metals contamination, control access to these areas/materials, and use appropriate and practical engineering and administrative controls during excavation and soil handling activities. EFS implements work practices to prevent unnecessary contact with contamination, using properly trained and qualified staff, conducting routine monitoring for contamination, developing controlling work documents such as Activity Hazard Analyses (AHAs) and Radiation Work Permits (RWP), using Personal Protective Equipment (PPE), controlling movement of heavy equipment/vehicles, performing decontamination, and unconditional release surveys prior to site demobilization.

The primary concern for cross-contamination of the SZ and off-site areas is through movement of personnel, equipment, materials, and airborne emissions during remedial activities. The effectiveness of the contamination control program will be assessed through implementation of a routine radiological survey schedule outlined in the RPP, including surface wipe samples to determine contamination levels. Removable radioactivity surface wipe sampling will identify contamination in a timely manner to help minimize the spread of contamination and ensure potential contamination is addressed immediately. Surface wipe samples will be analyzed at the on-site Radiological Counting Facility (RCF).

4.1 Contamination Control Zones

The NFSS BOP will be delineated with applicable Occupational Safety and Health Administration (OSHA) defined zones including the SZ, CRZ, and EZ (see example layout on **Figure 4-1**). The SZ will contain USACE and EFS office trailers, an RCF trailer, wash stations, and vehicle parking and storage. In general, the SZ is considered to include all areas of the site that are not part of an EZ or a CRZ. The transition from SZ to CRZ will be through an access control point with changing areas for donning of PPE. The EZ will, in general, encompass excavation areas and investigation areas within the identified radiological and chemical impacted exposure units (EUs) as shown on **Figure 4-1**. All work which involves ground disturbance, including foundation disturbance, will occur within an EZ; this includes excavations as well as foundation, waste acceptance criteria (WAC), and final status survey (FSS) sampling activities. Exiting from the EZ into the CRZ will

be through an access control point for doffing PPE, radiological monitoring, and personnel decontamination, if necessary.

Within the EZ there will also be radiologically controlled areas. These areas will be conspicuously posted with appropriate signage (e.g., Radioactive Materials Area) and have additional controls for worker safety. Movement of contaminated equipment and waste from one zone to another (e.g., from the EZ to CRZ) must be coordinated with the SSHO and RSO. Personnel and equipment will transition from the CRZ to SZ through an access control point with a decontamination station.

Figure 4-1 is provided for illustrative purposes only; specific EZ, CRZ, and SZ boundaries will be established and adjusted as work progresses across the site. All control zone boundaries, including initial proposed boundaries, will require the preparation and submission of an Exposure Assessment (EA) report. Additionally, all downgrading of control zones or rezoning of support areas will be supported by an EA report to document justification for the downgrade/rezoning. These EA reports will be in a letter report format and include:

1. a narrative section to discuss the purpose and goal of the EA;
2. a summary of the supporting data results including air monitoring, contamination control, and soil sample results;
3. an evaluation of similar exposure scenarios, exposure control measures and environmental conditions during data collection, sampling and analytical methods;
4. a statistical analysis of the results, data summaries and conclusions;
5. an evaluation of the worst-case scenario exposure control measures and verification sampling requirements;
6. an attachment showing calculations, data tables, and maps of the current and/or proposed layout of the EZ, CRZ, and SZ; and
7. a description of proposed changes and/or the new EZ, CRZ, and SZ locations.

In general, EZs and CRZs will be established for each remedial area as the first step in the remedial process prior to ground disturbance and will be of sufficient size to encompass the Class 1 and Class 2 areas as well as to allow for the movement of heavy equipment. Following successful remediation, as determined by FSSs that demonstrate satisfaction of Remedial Goals, areas will be down-posted to allow for backfilling operations to continue without EZ/CRZ restrictions.

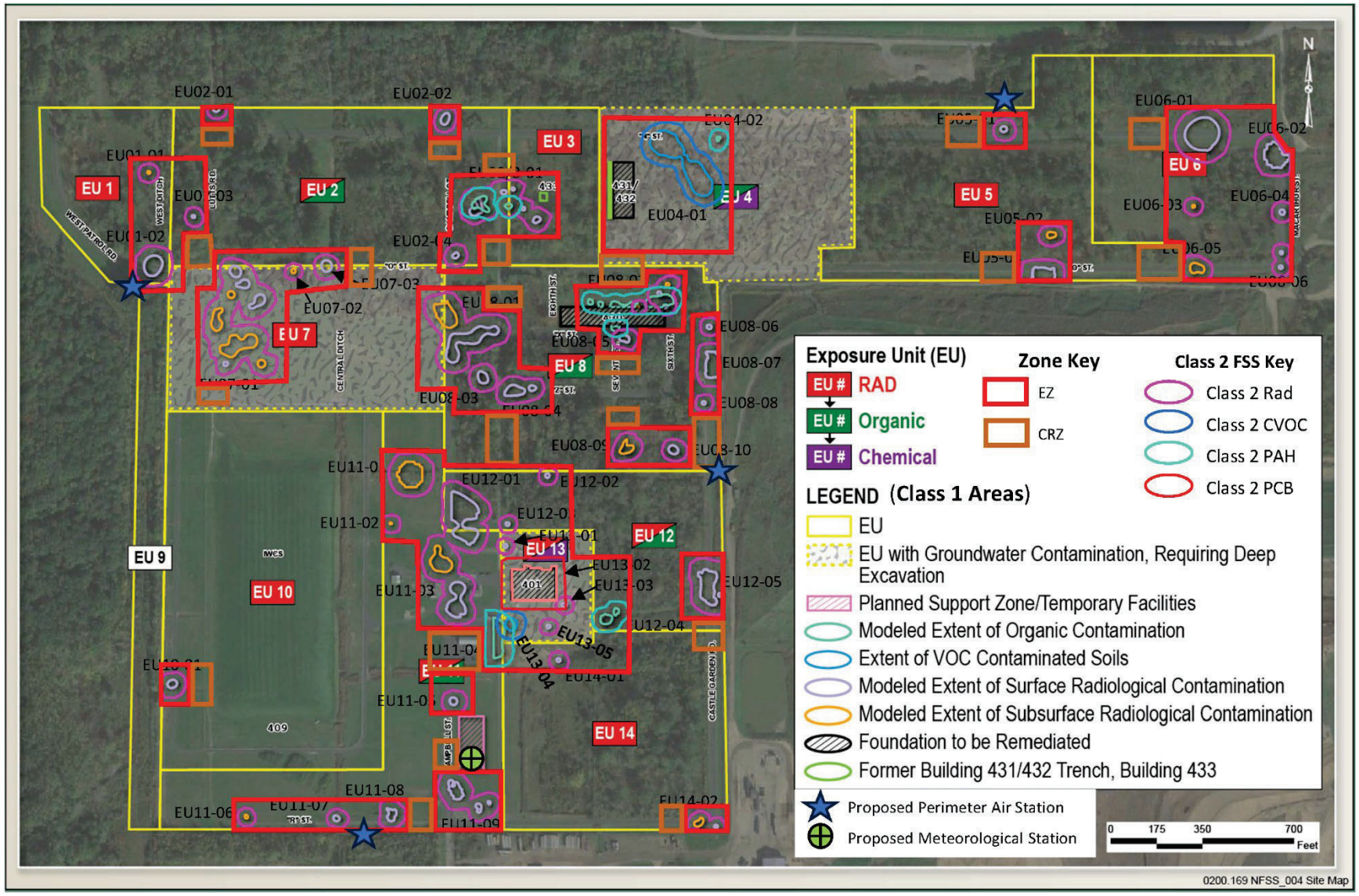

Figure 4-1. Example Layout of Contamination Control Zones and Perimeter Air Monitoring Stations

Refer to the NFSS FUSRAP Project SOP #3, *Exposure Assessment Report to Establish Control Zones* (USACE 2022a), for additional details along with data and reporting requirements.

4.2 Housekeeping

Routine cleaning of surfaces within the CRZ and EZ will be necessary to reduce the potential for contamination spread, since these areas are the most likely places from which contamination can spread. Routine monitoring for contamination will be performed (see Section 5.0) for all areas of the site (EZ, CRZ and SZ) and if action levels are exceeded (see Section 7.0) then decontamination and a follow-up survey to confirm the area or equipment is below criteria, are required.

The contractor will clean equipment and materials using a combination of dry and wet methods, high-efficiency particulate air (HEPA) vacuuming, a tacky cloth, or other method that lessens the generation of airborne contaminants. All waste will be appropriately managed as contaminated waste, including waste generated from any dry decontamination methods. Contamination monitoring will take place after cleaning to ensure appropriate levels have been achieved, or additional cleaning/controls will be implemented.

4.3 Engineering Controls

To minimize exposure to contamination, engineering controls are designed into work activities whenever appropriate. Dust control (water) will be the primary means for controlling potential spread of airborne contamination. Options for engineering controls include but are not limited to:

- Use of decontamination pads,
- Use of cleaning stations,
- Decontamination of surfaces before disturbance,
- Use of wetting agents during activities that may produce dust,
- Use of surfactants/encapsulation, and
- Critical barriers to isolate sources of airborne contamination.

Dust control within excavation areas will be accomplished using a clean-water truck. A water truck will provide dust suppression for the haul roads and unpaved parking areas. EFS waste management personnel will monitor for free standing liquids and manage approved absorbent materials sufficient for the water generated during dust suppression.

4.4 Administrative Controls

Administrative controls will consist of:

- Training and qualifying personnel commensurate with their duties and the hazards they are likely to encounter;
- Setting up access control points with appropriate signage and postings to warn personnel of entry into hazardous areas; and ensuring entry/exit protocols (e.g., doffing PPE and performing frisking of personnel and equipment) are adhered to;
- Pre-Job briefings and daily toolbox meetings to discuss the authorized tasks for a given day;
- AHAs and RWPs that describe the safety controls and PPE requirements to be employed for a specific task;
- Identification and discussion of work practices to minimize contact with contaminants such as avoiding kneeling or sitting in contaminated areas; and
- Limiting the number of personnel in a work area to the minimum needed to complete the task safely.

4.5 Personal Protective Equipment (PPE)

PPE will be prescribed for use in areas where radiological and/or chemical contamination may contact workers' skin or eyes, including areas with airborne contamination. Both reuseable PPE such as hard hat and safety glasses and single use disposable PPE such as Tyvek coveralls and Nitrile gloves will be utilized when necessary. Donning and doffing of PPE will be in accordance with protocols established in the APP/SSHP and RPP.

Chemically contaminated or radiologically contaminated PPE and clothing is handled in a manner to prevent cross-contamination during doffing. Once removed, single use disposable PPE will be placed immediately into bags at the change area for disposal (no reuse or additional handling).

Downgrading of PPE is generally not anticipated for work activities; however, any downgrading of PPE must be approved by USACE and requires a NEA report be completed and submitted prior to PPE downgrades. The NEA report shall be prepared in accordance with the *NFSS FUSRAP Project SOP #2, Negative Exposure Assessment Report to Downgrade PPE for Specific Activity* (USACE, 2022a).

4.6 Emergencies

Guidance regarding responses to emergencies at the site is provided in the project APP/SSHP. Administrative and physical contamination controls will be suspended as necessary in the event emergency response personnel are deployed as a result of serious injury or weather-related

emergencies. After the immediate emergency situation has been addressed, follow-up investigations will be performed as necessary to determine if potential spread of contamination may have occurred, and to determine corrective actions as needed.

5.0 MONITORING

5.1 Surface Contamination Monitoring

Surface contamination control measurements will be performed on/for:

- Trucks when they leave the EZ and the CRZ;
- SZ trailers, including office trainers (routine surveys);
- Materials and equipment leaving the EZ and the CRZ;
- Waste containers exiting the EZ, CRZ, and SZ;
- Individuals exiting the EZ;
- EZ and CRZ egress locations, including access control point (routine surveys);
- Incoming construction equipment;
- Roadways and decontamination pads (routine surveys); and
- Office trailers and on-site RCF (routine surveys).

The primary means for surface contamination monitoring will be wipe samples to identify removable contamination. Direct radiation measurements will also be performed. The frequency of routine surveys will be daily/weekly/monthly based on the activities, potential for contamination, and frequency of housekeeping. Typical routine survey frequencies are listed below:

- Daily Routine Surveys: active work areas and access/egress points;
- Weekly Routine Surveys: offices and break areas, parking lots, RCF; and
- Monthly Routine Surveys: on-site haul routes/traffic patterns and site access point(s).

In addition, baseline radiological surveys for removable and fixed contamination will be performed on materials and equipment upon mobilization to the site. These surveys will be performed to demonstrate that such items have not been contaminated at another location before use. Conversely, all equipment being demobilized from the site will undergo an unrestricted release survey for removable and fixed contamination.

5.2 Air Monitoring

The air monitoring requirements are designed to provide early detection of potential emission of site contaminants. Air monitoring will be performed at the site perimeter (for radioactivity only) and within work areas to assess airborne contamination levels. Refer to the RPP and/or Quality Assurance Project Plan (QAPP) for air monitoring SOPs.

Air monitoring at the site perimeter will consist of low-volume radiological particulate collection and analysis. Radionuclides and on-site meteorological station data will be used to assess and establish baseline conditions (background) as well as to interpret/verify conditions during remedial activities. In addition to site perimeter air monitoring, EFS will also install and operate one off-site air monitoring station for background radiological particulate collection and analysis.

Work area monitoring consists of a combination of radiological particulate and total suspended particulate (TSP) dust monitoring. If there is an exceedance of TSP limits in a monitor upwind of operations, the exceedance and the wind direction will be logged and work will continue. If there is an exceedance in both the upwind and downwind samplers with similar concentrations, it will be noted and work will continue. If there is an exceedance of TSP limits at a downwind location but not in the upwind location and emission-generating activities are scheduled to continue, additional dust controls will be implemented.

5.2.1 Perimeter Air Monitoring

Perimeter air sampling will be performed at the site perimeter to measure airborne particulate concentrations resulting from excavation, soil-handling, and general site work activities.

A minimum of four fixed-perimeter air monitoring stations equipped with Hi-Q Model PSU-2 continuous flow samplers will be installed on stands and placed at breathing zone (BZ) height (approximately 5 feet above the ground surface) at the approximate locations illustrated as an example in **Figure 4-1** (specific locations to be determined). The locations will be selected based on the proximity of remediation activities to the site perimeter as well as meteorological and other practical considerations.

Perimeter air samples will be collected continuously 24 hours per day, 7 days per week during site remediation activities. Air samples will normally be changed out weekly; but the sampling period may be adjusted as needed in consideration of holidays or adverse weather conditions that prevent weekly sampling change-out. The filters collected for gross alpha/beta radionuclide analysis will be screened on-site for gross alpha and gross beta and will be compiled monthly and, if the gross alpha or gross beta limit values are exceeded, will be sent off-site for analysis of the individual radionuclide contaminants of concern, radium (Ra)-226, thorium (Th)-230, Th-232, and uranium (U)-238.

5.2.2 Work Area Air Monitoring

On-site monitoring of work areas will be performed during excavation and soil handling activities. The portable monitoring stations will consist of the following equipment:

- SKC Leland Legacy Air Sampling Pumps, or equivalent (alternatively, the project may use F&J Specialty Products, Inc., LV-1 Environmental Low-Volume Air Sampler, or equivalent) and
- DustTrak DRX 8533 aerosol monitor, or equivalent.

Each active EU identified in Figure 4-1 will be supported with a combination of dust monitoring for TSP; and low volume particulate monitoring for radiological constituents. Dust monitoring will be accomplished using three real-time DustTrak DRX 8533 aerosol monitors, or equivalent positioned upwind, downwind, and crosswind of the excavation. In addition, a minimum of one SKC Leland Legacy (or the F&J Model LV-1 alternative) or equivalent will be stationed within the EU to monitor radioactive particulate in order to confirm radiological posting requirements, PPE, and positive engineering controls.

The air filters from each low-volume air sampler will be changed daily. After a 72-hour waiting period for radon decay, the filters will be analyzed for gross alpha/beta radioactivity. These filters will be saved for potential analysis of individual radionuclides (Ra-226, Th-230, Th-232, and Total U), depending on the results of the gross alpha/beta analysis (i.e., any that are above screening limits).

The real-time TSP monitors will be equipped with data loggers to measure the maximum 15-minute air concentrations of TSP.

The locations of the portable monitors will be selected by the SSHO daily, using careful consideration of current and forecasted meteorological conditions and scheduled activities for the day. The location of each portable station, the work zone(s), and wind direction will be recorded for each day. Exceedances of response or action limits for any constituent of concern must be immediately reported to the SSHO, PM, and the USACE Contracting Officer's Representative (COR).

5.2.3 On-Site Air Sample Analysis

Collected air sample filters will be delivered to the on-site RCF for gross alpha/beta analysis in accordance with the RPP SOPs. Estimated detection sensitivities for the proposed instruments and

sample-collection methods have been calculated in accordance with the RPP SOPs and **Equation 1** as summarized below:

$$MDC = \frac{3 + 3.29\sqrt{B \cdot t_s \left(1 + \frac{t_s}{t_{bg}}\right)}}{t_s \cdot E \cdot V \cdot 2.22E6 \cdot SAF \cdot CE \cdot K} \qquad \text{(Equation 1)}$$

Where:

MDC	=	minimum detectable concentration in µCi/ml
B	=	background count rate, in cpm, of counting instrument
t_s	=	length of time, in minutes, that the sample was counted
t_{bg}	=	length of time, in minutes, that the background was counted
V	=	volume of air in ml
2.22E6	=	converts dpm to µCi
E	=	efficiency of counting instrument
CE	=	filter collection efficiency
SAF	=	self absorption factor
K	=	other modifying factors and unit conversions

For the *a priori* MDC estimate, the following assumptions were made:

B	=	0.2 cpm alpha; 40 cpm beta
t_s	=	10 minutes
t_{bg}	=	10 minutes
V	=	for permitter (PA) and General Area (GA) and BZ, as follows: PA = 7 days * 24 hours * 60 minutes * 60 lpm = 604,800 liters = 6.048E+8 ml GA = 8 hours * 60 minutes * 10 lpm = 4,800 liters = 4,800,000 ml BZ = 8 hours * 60 minutes * 5 lpm = 2,400 liters = 2,400,000 ml
E	=	33% alpha; 23% beta
CE	=	1
SAF	=	0.7 alpha; 1.0 beta
K	=	No other factors or conversions used in estimate

Plugging these values into **Equation 1** yields the following *a priori* MDCs (compared to **Table 7-1** action levels):

PA (alpha) = 3E-15 µCi/ml (< 4E-15 µCi/ml Action Level)
PA (beta) = 3E-14 µCi/ml (< 1.2E-13 µCi/ml Action Level)
GA (alpha) = 4E-13 µCi/ml (< 9E-13 µCi/ml Action Level)
GA (beta) = 4E-12 µCi/ml (< 3E-11 µCi/ml Action Level)
BZ (alpha) = 8E-13 µCi/ml (< 9E-13 µCi/ml Action Level)
BZ (beta) = 8E-12 µCi/ml (< 3E-11 µCi/ml Action Level)

5.2.4 Meteorological Monitoring

A meteorological station (Davis 6152 Vantage Pro2 or equivalent) equipped with wired AC power adapter and battery backup for remote operation is placed with the planned SZ (see example layout on **Figure 4-1**). The system measures wind speed, temperature, wind direction, relative humidity, and barometric pressure. The system will record 15-minute average values for each parameter (wind speed and direction, temperature, relative humidity, and barometric pressure) and the data will be maintained in an on-site database. Additionally, the station has a rain gauge to determine inches of rain in a 24-hour period. The station can operate without line power supply using battery backup, thereby supporting uninterrupted operation of the station. The station is also designed with wireless capability for data upload.

5.2.5 Sample Designation and Sample Identification Codes

Samples collected will be assigned unique sample identification numbers as established in the QAPP/Sampling and Analysis Plan (SAP). These numbers are necessary to identify and track each of the samples collected for analysis during completion of the project. In addition, the sample identification numbers will be used to identify and retrieve the analytical results received from the laboratory as well as other data related to the sample.

5.2.6 Instrument/Equipment Testing, Inspection, and Maintenance

Table 5-1 identifies the equipment and maintenance required to ensure system operability. Calibration and maintenance frequencies must be in accordance with manufacturer requirements and the QAPP/SAP (EFS 2023).

Table 5-1. Equipment Maintenance Schedule

System/Component	Maintenance Activity	Frequency	Responsibility
Personal sampling pumps (e.g., Gil-Air 5)	Flow rate calibration	Daily	Site
	Calibration	Annual	Vendor
Low-volume sampler flowmeter (SKC Leland Legacy or F&J Specialty Products, Inc., LV-1)	Flow rate verification	Daily	Site
	Calibration	Annual	Site
	Check sample heads for contamination	Quarterly	Site
Total suspended particulate monitor (TSI DustTrak DRX 8533)	Flow check (three points)	Monthly	Site
	Calibration	Annual	Vendor
Meteorological instruments (Davis 6152 Vantage Pro2)	Calibration	Semiannual	Vendor

System/Component	Maintenance Activity	Frequency	Responsibility
Personal aerosol monitor (TSI DustTrak DRX 8533)	Calibration	Annual	Vendor
	Zero Check	Weekly	Site
Air flow calibrator	Calibration	Annual	Vendor
Portable Ludlum ratemeters and scalers in RCF	Quality Control Checks	Daily	Site
	Calibration	Annual	Vendor

5.2.7 Response Actions to Elevated Results

In the event of an elevated air monitoring result that shows action levels or limits are approached or exceeded, field personnel will notify the SSHO at the time of the observation (i.e., real time). The SSHO will compare the sample results against the action levels and limits in **Table 7-1** for the appropriate sampling location. The meteorological data (e.g., wind direction/speed, temperature, humidity) should be evaluated as part of this response. In addition, adjacent off-site activities (e.g., agricultural, vehicle traffic) and where the site activities are occurring should also be considered as part of this response. If action levels or limits are exceeded, perform the following:

- Review the preliminary data and promptly suspend, or, for action level exceedance, modify operations;
- For limit exceedance, promptly review notification requirements to determine if notification of off-site personnel and organizations is required;
- Promptly investigate the cause of the event and determine if mitigation is required, ensuring that all potential on-site sources are adequately investigated;
- Document events caused by non-site-related sources, such as wildfire, high humidity affecting the instruments, exhaust emissions from operating equipment, or other factors unrelated to the site activity; and
- If the situation requires any mitigation, document the event and summarize the data, the cause of the measured value(s), and any corrective measures implemented as a result of the event. The PM shall perform these follow-up actions.

As the work progresses and more data are gathered to allow a full understanding of the relationship between site operations and contamination-producing activities, EFS may, in consultation with the USACE, revise these response actions, as appropriate. Refer to **Figure 5-1** for a decision-making flowchart regarding air sampling.

5.2.8 Documentation and Records

5.2.8.1 Field Log

Throughout the performance of the project, EFS will maintain field logs. Information to be recorded in these logs/forms include:

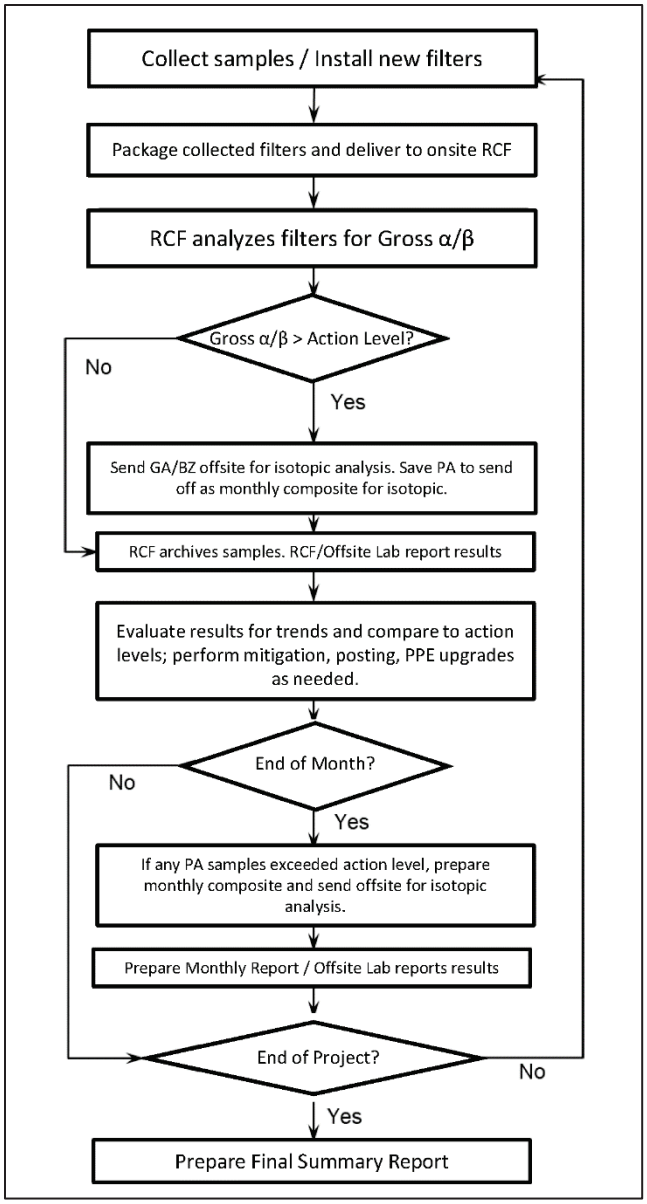

Figure 5-1. Air Sampling and Analysis Flowchart

- Radio-analytical sample throughput and quality control information related to operation of on-site RCF;
- A description of remediation activities associated with any elevated air monitoring measurements;
- Locations of each fixed and portable air monitoring station and handheld monitoring locations for the day;
- Any corrective actions conducted due to elevated real-time air monitoring concentrations;
- Sample media collection and receipt dates, conditions, and numbers;
- Sampling equipment installation, operation, and removal dates;
- Sampling equipment calibration dates and results;
- General weather conditions;

- Any unusual situations that may affect the samples or sampling; and
- Start and stop times.

5.2.8.2 Data Management

Air monitoring data will be obtained from a variety of sources, including real-time monitoring, handheld and observational monitoring, particulate sampling, and laboratory analyses. EFS will evaluate, verify, and submit to USACE these data at monthly intervals. The following measurements and information will be included air monitoring reports:

- Real-time particulate matter (TSP) at portable monitoring locations (datalogger);
- Filter samples for radionuclides (gross alpha/beta) at background, fixed, and portable monitoring locations;
- Filter samples for individual radionuclides (Ra-226, Th-230, and U-238) at background, fixed, and portable monitoring locations;
- Handheld real-time particulate matter at portable monitoring locations;
- Personal air monitors; and
- Real-time meteorological parameters at meteorological monitoring location (datalogger).

5.2.9 Reporting

5.2.9.1 Exceedances

Monitoring results will be immediately reported to the PM, RSO, SSHO, and the USACE (i.e., COR and resident engineer) when action levels and/or limits have been exceeded, to allow prompt evaluation and response to potential emissions.

The RSO, SSHO, and PM, in consultation with USACE, will decide when shutdown and startup criteria have been met.

5.2.9.2 Monthly Data Summaries

EFS will provide to USACE the following monthly data summaries as a letter report in electronic format for the fixed perimeter monitoring stations and portable monitoring stations:

- Narrative describing and discussing the data collection period, sampling methodology, analytical methods and laboratory qualifications along with an evaluation of work area results and perimeter results relative to their respective action level and limit values. The narrative should also address any exceedances, root cause evaluations, and corrective actions taken in response to exceedances;
- Data plots showing perimeter concentrations versus time and compared to action levels and limits;
- Data plots showing work area concentrations versus time and compared to action levels and limits;
- Results of personal air monitoring;

- Action level and limit summary tables;
- Figures showing the locations of monitoring stations (daily or as required to capture each unique location); and
- Meteorological data summary table.

In addition to monthly air data summaries, monthly data summaries of contamination control results (i.e., surface sample results) will also be provided.

5.2.9.3 Other Reports

EFS will provide USACE with an air monitoring report at the conclusion of the perimeter air monitoring program. The report shall provide:

- All filter sampling and analytical results in a database or spreadsheet (note that analytical data will also be entered into the USACE FEDMS data management system). These will include statistical summaries (tabulated mean, standard deviation, percentiles by monitor location and month) and graphical summaries;
- All meteorological data in a database or spreadsheet. These will include statistical summaries (tabulated mean, standard deviation, percentiles by monitor location and month) and graphical summaries (such as boxplots by monitor location and month);
- A summary of air monitoring results above the action levels and limits, corresponding site activities, and response actions taken; and
- Figures that identify fixed and portable air monitoring stations associated with each remediation area.

5.2.10 Training

The PM will ensure that the following instructions specific to this project have been presented to site project personnel implementing this plan:

- Overview of the air monitoring plan;
- Organization responsibilities, lines of communication, and authorities;
- Sample handling and chain of custody;
- Quality control considerations;
- Documentation requirements;
- Response actions; and
- Notification requirements.

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6.0 SURVEYS, DECONTAMINATION, AND RELEASE

Detailed personnel decontamination procedures will be provided in the APP/SSHP. A decontamination line will be set up in the CRZ. Workers will exit the EZ through the CRZ and properly decontaminate themselves as specified in the APP/SSHP. Before exiting to the SZ, workers will survey for radiological contamination after removing outer PPE to assess the effectiveness of contamination control measures.

Vehicles and large equipment used in the EZ will be decontaminated on a decontamination pad. Tools and small equipment may be decontaminated in the EZ prior to transfer to the CRZ. Surveys will be performed on tools and equipment prior to transfer from the EZ or CRZ into the SZ to ensure release limits have been met.

Before release from the EZ, waste containers will be visually inspected and surveyed for contamination. If contamination is detected during release survey, then additional decontamination will be performed before a new release survey is conducted. All waste containers will be verified to ensure release limits have been met before they are released from the EZ.

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7.0 LIMITS

Air monitoring limits are tiered based on the location, as shown in **Table 7-1**.

Table 7-1. Air Monitoring Limits

Contaminant of Concern	Location	Action Level	Limit	Units	Reference
Respirable particles not otherwise specified (TSP)	Work area/BZ	1.5	3	mg/m^3	1
Radioactivity, gross alpha	Work area/BZ	9.0E-13	3.0E-12	µCi/ml	2
Radioactivity, gross alpha	Perimeter	4.0E-15	2.0E-14	µCi/ml	2
Radioactivity, gross beta	Work area/BZ	3.0E-11	1.0E-10	µCi/ml	3
Radioactivity, gross beta	Perimeter	1.2E-13	6.0E-13	µCi/ml	3
Ra-226 derived air concentration (DAC)	Work area/BZ	9.0E-11	3.0E-10	µCi/ml	4
Ra-226	Perimeter	1.8E-13	9.0E-13	µCi/ml	4
Th-230 (DAC)	Work area/BZ	9.0E-13	3.0E-12	µCi/ml	2
Th-230	Perimeter	4.0E-15	2.0E-14	µCi/ml	2
Total U (DAC)	Work area/BZ	6.0E-12	2.0E-11	µCi/ml	4
Total U	Perimeter	1.2E-14	6.0E-14	µCi/ml	4

References:

1. 40 Code of Federal Regulations (CFR) 50, Limit set to the national primary and secondary PM-10 air quality standard; action level set to 66% of the limit.
2. 10 CFR 20, Appendix B, values for Th-230, Class W used as most conservative surrogate for alpha activity. DAC, occupational value for inhalation, assumes exposure limited to 2,000 hours/year. Most conservative inhalation properties assumed of radionuclide, controls dose to the public, annual average. DAC Action level set to 30% of limit; effluent action level set to 20% of limit.
3. 10 CFR 20, Appendix B, values for lead (Pb)-210, Class W used because it is the long-lived beta-emitting radionuclide with the most restrictive occupational and effluent limits. DAC, occupational value for inhalation, assumes exposure limited to 2,000 hours/year. Most conservative inhalation properties assumed of radionuclide, controls dose to the public, annual average. DAC Action level set to 30% of limit; effluent action level set to 20% of limit.
4. 10 CFR 20, Appendix B, limiting values for individual radionuclides, effluent limit for annual dose to the public, annual average, action level at 20% (ALARA requirement). DAC Action level set to 30% of limit. For Total U, values based on U-235 Class Y as most conservative among U isotopes.

Radiological limits for acceptable levels of surface contamination are presented in **Table** 7-2 and are applied to equipment and material release.

Table 7-2. Radiological Screening Levels for Clearance

Nuclide[a]	Average dpm/100 cm^2	Maximum dpm/100 cm^2	Removable dpm/100 cm^2
U-nat, U-235, U-238 and associated decay products	5,000	15,000	1,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th^{232}, Sr^{90}, Ra^{223}, Ra^{224}, U^{232}, I^{126}, I^{131}, I^{133}	1,000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr^{90} and others noted above.	5,000	15,000	1,000

Note: All values represent allowable increment above background.

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8.0 REFERENCES

29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, Office of the Federal Register.

29 CFR 1926, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, Office of the Federal Register.

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Enviro-Fix Solutions, LLC 2023. *Radiation Protection Plan – Niagara Falls Storage Site Remedial and Site Services – Balance of Plant, Lewiston, New York.*

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Engineer Manual (EM) 385-1-1 2014, *Safety and Health Requirements Manual*, U.S. Army Corps of Engineers, November 30, 2014.

U.S. Environmental Protection Agency (EPA) 1991, "Guidance on Implementing the Radionuclide NESHAPs," U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, D.C., July 1991.

NCRP 1996, *Screening Models for Releases of Radionuclides to the Atmosphere, Surface Water, and Ground, NCRP Report No. 123, National Council on Radiation Protection and Measurements,* Bethesda, Maryland.

U.S. Army 2015. *The Army Radiation Safety Program*, Pamphlet DA PAM 385-24, U.S. Army, November 30, 2015.

USACE 2022. *Record of Decision for the Balance of Plant and Groundwater Operable Units Niagara Falls Storage Site Lewiston, New York.*

USACE 2022a. *Niagara Falls Storage Site Remedial and Site Services Scope of Work*, U.S. Army Corps of Engineers, October 2022.

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