Radiation Safety Plan for Operable Unit-1

1157-I-001

Prepared for:

WEST LAKE LANDFILL SUPERFUND SITE
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Contents

Abbreviations and Acronyms

ALARA	As Low as Reasonably Achievable
ALI	Annual Limit on Intake
Ameriphysics	Ameriphysics, LLC
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeters
DAC	Derived Air Concentration
dpm	Disintegration Per Minute
EPA	Environmental Protection Agency
ICRP	International Commission on Radiological Protection
µCi	microcurie
µCi/ml	microcurie per ml
MDNR	Missouri Department of Natural Resources
NRC	U.S. Nuclear Regulatory Commission
OU	Operable Unit
PPE	Personal Protective Equipment
RCA	Radiologically Controlled Area
RCM	Ameriphysics' Radiological Control Program Manual
RCP	Radiological Control Procedure
RCS	Radiological Control Supervisor
RIM	Radiologically Impacted Material
RSO	Radiation Safety Officer
RSP	Radiation Safety Plan
RWP	Radiation Work Permit
Site	West Lake Landfill Site
TEDE	Total Effective Dose Equivalent

1 PURPOSE

The West Lake Landfill Superfund Site (Site) currently consists of three operable units (OU). OU-1 primarily addresses two disposal areas at the West Lake Landfill, known as Areas 1 and 2, that have been identified as containing radiologically impacted material (RIM). OU-2 consists of portions of the Site that have not been identified as containing RIM. OU-3 addresses groundwater associated with the Site, including the groundwater immediately beneath Areas 1 and 2. The United States Environmental Protection Agency (USEPA) is the Site's lead regulatory agency for the remedial activities and investigations at the Site, with certain responsibilities deferred to the Missouri Department of Natural Resources (MDNR).

Areas 1 and 2 are specifically designated as radiologically controlled areas (RCAs) because of the potential for workers within their boundaries to contact or disturb RIM. Consequently, any access to, egress from, and work within these areas will be controlled according to a radiation protection program conforming to Title 10, Code of Federal Regulations (CFR), § 20.1101. On a case-by-case basis, areas outside of Areas 1 and 2, such as the Buffer Zone, Lot 2A2, and adjacent property(ies), may be designated RCAs and controlled accordingly when there is concern that work in such areas exhibits a reasonable potential to disturb RIM.

Ameriphysics, LLC (Ameriphysics) is a Nuclear Regulatory Commission (NRC) licensee, and it maintains an NRC approved and audited § 20.1101-based radiation protection program that will be used to control work within RCAs. Ameriphysics' program is described in its Radiological Control Program Manual (RCM) and implementing Radiological Control Procedures (RCPs).

The purpose of this Radiation Safety Plan (RSP) is to describe the site-specific controls that are necessary to implement the existing Ameriphysics radiation protection program at the Site. The Ameriphysics RCM and RCPs will be submitted to USEPA in their entirety under separate cover; however, they will be onsite and available for use and reference whenever work is accomplished according to this RSP.

2 SCOPE

This RSP is applicable to any activities requiring access to OU-1 Areas 1 and 2 or otherwise demonstrating a reasonable potential to disturb RIM such as near-surface disturbances of soil in the Buffer Zone and Lot 2A2 and borings near the Area 1 and 2 fence line. Specific activities requiring radiological controls include, but are not limited to:

- Work area visits and surveys;
- Work area preparations;
- Invasive subsurface activities such as sampling and drilling operations;
- Above-ground monitoring or sampling activities associated with air, stormwater, or other media;

- Maintenance/repair of the engineered cover within the Areas;
- Movement and storage of equipment that may be impacted by contact with RIM;
- Monitoring and decontamination of equipment; and
- General monitoring of radiological conditions and personnel.

This RSP is intended to be used with the most recent versions of any health and safety and other site-specific plans that describe Areas 1 and 2, work that will be conducted, and other organizational aspects. Consequently, the scope of this RSP is limited to the particular instructions that are needed to implement the Ameriphysics Radiation Protection Program at the Site.

3 RESPONSIBILITIES

All employees and visitors are responsible for working safely and acting in a manner that does not jeopardize their safety, the safety of others, or the quality of the environment. They are responsible to immediately report unsafe conditions to their supervisor or site contact whether radiological or due to general safety conditions. All persons have the right and obligation to pause work if unsafe conditions are suspected, and such stop-work authority is conveyed without fear of reprisal. Other job-specific responsibilities are described in the sections that follow.

3.1 OU-1 Site Supervisor

The OU-1 Site Supervisor is responsible for providing access and egress to any person or organization requiring access to Areas 1 and 2, including the necessary monitoring and support required by this RSP.

3.2 Radiation Protection Personnel

Ameriphysics will provide radiological oversight and support for activities conducted in Areas 1 and 2 or deemed as potentially involving RIM. Ameriphysics will be responsible for assessing radiological conditions, specifying required controls, conducting radiological training, performing radiological surveys, specifying protective clothing requirements, determining personnel exposure monitoring requirements, and monitoring persons, vehicles and equipment for contamination.

Ameriphysics will provide radiological support to the project with the following organizational elements and required monitoring equipment.

3.2.1 Radiation Safety Officer

Ameriphysics' Radiation Safety Officer (RSO) is responsible for executive-level administration of the corporate radiological control program in accordance with prevailing procedures and industry practices. Specific responsibilities include the following:

- Establishing standards and guidelines for radiological operations;
- Limiting occupational radiation exposures to levels that are as low as reasonably achievable (ALARA);
- Suspending any operation that presents a radiological or safety threat to employees, the environment, or the general public;
- Ensuring the quality of protective equipment for personnel and prescribing usage standards;
- Establishing procedures for radiological protection and monitoring; and
- Overall responsibility for the radiation protection training program.

Tim Pratt is Ameriphysics' corporate RSO. Because he is an executive-level manager, he does not need to be present in the field, and his work will be conducted from Ameriphysics' corporate office in Knoxville, TN.

3.2.2 Heath Physicist

The project will be supported by a Certified Health Physicist (CHP) that is responsible for any professional-level validation that arises over the course of the project. The project Health Physicist is Tom Hansen, Jr., PhD. Support from the Health Physicist may be accomplished offsite.

3.2.3 Radiological Control Supervisor

A Radiological Control Supervisor (RCS) reports to the RSO and oversees field implementation of the radiological control and safety program at the project level. Such implementation is described in Sections 4, 5, 6, and 7 of this RSP and the current version of Ameriphysics RCM and implementing RCPs. The RCS has the authority to, and shall, order any operations suspended when such operations present an imminent radiological or safety threat or hazard to employees, the environment, or the public.

An RCS will be onsite any time work exhibiting a potential to disturb RIM is conducted. If the designated RCS must be away from the Site, his or her responsibilities will temporarily be assigned to an appropriately experienced Health-Physics Technician so that continuity of radiological supervision is always maintained. The designated RCS is only allowed to temporarily pass his or her responsibilities onto an individual that the RSO has approved to serve in such a capacity.

Because the complexity of the work may vary vastly as the project unfolds, and work occurring in multiple areas may reflect a need for more than one RCS, a specific person is not named by this RSP as the sole RCS representing the radiation protection organization. Instead, the RSO will propose and the Health Physicist will approve any person serving the project in the role of RCS. The proposal and approval will be in writing. This requirement does not preclude the RSO or project Health Physicist from serving as an RCS.

3.2.4 Health-Physics Technicians

Health-Physics Technicians are assigned by the RCS for specific day-to-day oversight of radiological workers and radiological operations. They act as the RCS's representative(s) in specifically implementing the radiological control and safety practices as assigned.

3.3 Radiation Workers

Radiation Workers are any persons, regardless of employer, who engage in work activities in RCAs and are not classified as visitors by the RCS according to Section 5.5 of this RSP. Radiation Workers will follow the instructions from Radiation Protection Personnel but do not perform the duties assigned to Radiation Protection Personnel unless specifically authorized to do so by the RCS.

4 RADIOLOGICAL CONTAMINANTS OF CONCERN

The occurrences of RIM have been identified to consist of radionuclides in the uranium (U-238), actinium (U-235), and thorium (Th-232) decay series. Important radionuclides comprising these decay series are listed in Table 1 of the September 2018 Record of Decision Amendment. These radionuclides and corresponding properties from International Commission on Radiological Protection (ICRP) Publication 107, *Nuclear Decay Data for Dosimetric Calculations*, are demonstrated on Table 1.

Table 1. Radionuclides of Concern

Nuclide	Half-Life[1]	Decay Mode[2] (Fraction)	Energy Emitted (MeV/transformation)			
			Alpha	Electron	Photon	Total
Uranium Series						
U-238	4.468E+9 y	A (1.00) SF (5.5E-07)	4.2584	0.0092	0.0014	4.2691
Th-234	24.10 d	B- (1.00)	-	0.0622	0.0105	0.0728
Pa-234	6.70 h	B- (1.00)	-	0.4037	1.4718	1.8755
U-234	2.455E+5 y	A (1.00)	4.8430	0.0137	0.0020	4.8587
Th-230	7.538E+4 y	A (1.00)	4.7538	0.0146	0.0018	4.7702
Ra-226	1600 y	A (1.00)	4.8603	0.0039	0.0074	4.8716
Pb-214	26.8 m	B- (1.00)	-	0.2948	0.2533	0.5481
Bi-214	19.9 m	B- (1.00) A (2.1E-4)	0.0012	0.6631	1.4793	2.1436

Nuclide	Half-Life[1]	Decay Mode[2] (Fraction)	Energy Emitted (MeV/transformation)			
			Alpha	Electron	Photon	Total
Pb-210	22.20 y	B- (1.00) A (1.9E-8)	<0.0001	0.0404	0.0053	0.0457
Actinium Series						
U-235	7.04E+8 y	A (1.00)	4.4693	0.0530	0.1669	4.6891
Th-231	25.52 h	B- (1.00)	-	0.1622	0.0269	0.1891
Pa-231	3.276E+4 y	A (1.00)	5.0592	0.0538	0.0450	5.1580
Ac-227	21.772 y	B- (0.99) A (0.01)	0.0693	0.0150	0.0011	0.0853
Th-227	18.68 d	A (1.00)	5.9883	0.0755	0.1317	6.1955
Ra-223	11.43 d	A (1.00)	5.7702	0.0781	0.1413	5.9895
Pb-211	36.1 m	B- (1.00)	-	0.4543	0.0644	0.5187
Bi-211	2.14 m	A (1.00) B- (2.8E-3)	6.6757	0.0100	0.0473	6.7330
Thorium Series						
Th-232	1.405E+10 y	A (1.00)	4.0688	0.0126	0.0015	4.0829
Ra-228	5.75 y	B- (1.00)	-	0.0132	0.0031	0.0163
Ac-228	6.15 h	B- (1.00)	-	0.4495	0.8671	1.3166
Th-228	1.9116 y	A (1.00)	5.4956	0.0210	0.0036	5.5202
Ra-224	3.66 d	A (1.00)	5.7766	0.0023	0.0104	5.7893
Pb-212	10.64 h	B- (1.00)	-	0.1766	0.1450	0.3217
Bi-212	60.55 m	B- (0.64) A (0.36)	2.2164	0.5046	0.1038	2.8247
Tl-208	3.053 m	B- (1.00)	-	0.6113	3.3603	3.9716

[1] Key to half-life: h is hours, m is minutes, d is days, and y is years

[2] Key to decay mode: A is alpha, B- is beta minus, SF is spontaneous fission

5 RADIATION PROTECTION REQUIREMENTS

5.1 Training Requirements

Persons must possess the Radiation Safety Training required by Ameriphysics procedure RCP 2-1, *Radiation Safety Training Procedure*, in order to access RCAs unless designated as visitors according to Section 5.5 of this RSP and escorted. The training and a certificate of completion will be provided by Ameriphysics.

Workers who receive or are likely to receive an occupational effective dose equivalent in excess of 0.1 rem in one year are provided Radiation Worker Training. The approximately 1-day course familiarizes trainees with the following concepts:

- Radiation and its effects on the body;

- Federal dose limits and administrative controls;
- ALARA and personnel monitoring programs;
- Radiological postings;
- Contamination controls; and
- Federal and state regulations.

A worker who is not likely to receive an occupational effective dose equivalent in excess of 0.1 rem in one year is provided Radiation Awareness Training. This training familiarizes workers with site hazards and provides instructions for avoiding contact with radioactive material and for keeping individual doses less than 0.1 rem.

The initial Radiation Safety Training required by this section shall consist of instructor-led training and may be provided by personnel qualified at a minimum as a Health Physics Technician. This training may be administered at any location, provided additional training is administered covering any specific procedures in effect for jobsite operations. Qualification is good for one year and is attained by completing the required coursework and passing a written examination with a score of 70 percent or better. Requalification can be attained by completing the exam in lieu of classroom training, provided a passing score is attained on the first attempt, correct responses to missed questions are reviewed with the trainee, and any new rules or revisions to the radiation safety program are explained.

Position-specific training and qualifications required for persons described in Section 3.2 are described in Section 2 of Ameriphysics' RCM.

5.2 Occupational Exposure Limits

Occupational dose limits for adults are set forth in 10 CFR § 20.1201, and the dose limit for the embryo/fetus of a declared pregnant woman is specified in 10 CFR § 20.1208. As a measure to prevent exceeding these limits, Administrative Limits equal to 80% of the prescribed limits are used. These limits are tabulated in Table 2.

Table 2. Occupational Dose Limits

	Occupational Dose	Administrative Limit
Total effective dose equivalent (TEDE)	5 rem/yr	4 rem/yr
Sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye	50 rem/yr	40 rem/yr
Skin (shallow-dose equivalent)	50 rem/yr	40 rem/yr
Lens of the eye (shallow-dose equivalent)	15 rem/yr	12 rem/yr
Dose equivalent to the embryo/fetus	0.5 rem for entire pregnancy	0.4 rem for entire pregnancy

An ALARA goal of 0.1 rem/yr TEDE is initially established for the Site, meaning no person is allowed to exceed this goal without the consent of the RSO. The ALARA goal should be reviewed annually to make sure it is reasonable and adjusted according with concurrence from the RSO.

5.3 Airborne Exposure Limits

Airborne radioactive material means radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors or gases.

Airborne radioactivity area means a room, enclosure, or area in which airborne radioactive materials exist in concentrations:

1. In excess of the derived air concentrations (DAC) specified in Appendix B to 10 CFR § 20; or
2. To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

ALI means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems or a committed dose equivalent of 50 rems to any individual organ or tissue. The unit for ALI is the microcurie (µCi).

DAC means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work, results in an intake of one ALI. The unit for DAC is µCi per milliliter (µCi/ml).

DAC-hour is the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. Thus, 2,000 DAC-hours is one ALI, equivalent to a committed effective dose equivalent of 5 rems.

The most-restrictive stochastic inhalation ALIs and DACs from 10 CFR § 20, Appendix B, for site-specific radionuclides of concern from Table 1 are shown on Table 3.

Table 3. ALIs and DACs for Radionuclides of Concern

Uranium Series			Actinium Series			Thorium Series		
Nuclide	ALI (µCi)	DAC (µCi/ml)	Nuclide	ALI (µCi)	DAC (µCi/ml)	Nuclide	ALI (µCi)	DAC (µCi/ml)
U-238	1E+0	6E-10	U-235	1E+0	6E-10	Th-232	1E-3	5E-13
Th-234	2E+2	8E-8	Th-231	6E+3	3E-6	Ra-228	1E+0	5E-10
Pa-234	8E+3	3E-6	Pa-231	2E-3	6E-13	Ac-228	9E+0	4E-9
U-234	1E+0	5E-10	Ac-227	4E-4	2E-13	Th-228	1E-2	4E-12
Th-230	6E-3	3E-12	Th-227	3E-1	1E-10	Ra-224	2E+0	7E-10

Ra-226	6E-1	3E-10	Ra-223	7E-1	3E-10	Pb-212	3E+1	1E-8
Pb-214	8E+2	3E-7	Pb-211	6E+2	3E-7	Bi-212	2E+2	1E-7
Bi-214	8E+2	3E-7	Bi-211	4E-4	2E-13	Tl-208	2E+2	1E-7
Pb-210	2E-1	1E-10						

Thus, the most restrictive ALI (i.e., 4E-04 µCi) and DAC (i.e., 2E-13 µCi/ml) are for the radionuclides Ac-227 and Bi-211.

Personal protective equipment (PPE), i.e., Tyvek© clothing and respiratory protection, should be used only after the RCS is convinced that the organization responsible for the work activity has made a reasonable effort to control the hazard otherwise. The use of respiratory protection equipment is not anticipated for this project. The RSO will be consulted to establish appropriate controls and protections if airborne concentrations exceeding 10% of the DAC are encountered.

5.4 Site Monitoring

5.4.1 General Area Surveys

The purpose of a general area survey is to characterize the ambient radiation environment of the entire Site and not just the immediate work area. The frequency of these surveys will be determined by the RCS, but will include, at minimum, surveys at the beginning and the end of any major work activity and when substantive changes are made to the Site. These surveys will be made with a Ludlum Model 19 or equivalent that is setup and operated according to Ameriphysics Procedure RCP 4-3, *Survey Instrument Procedure*.

5.4.2 Personnel Exposures

In accordance with 10 CFR 20.1502(a), *Conditions requiring individual monitoring of external and internal occupational dose*, external exposure dosimetry shall be worn by:

1. Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 0.5 rem per year;
2. Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 0.1 rem; and
3. Individuals entering a high or very high radiation area as defined by 10 CFR § 20.1003, *Definitions*.

Minors are also required to wear external exposure dosimetry if they are likely to receive, in one year from radiation sources external to the body, a deep dose equivalent in excess of 0.1 rem, a lens dose equivalent in excess of 0.15 rem, or a shallow dose equivalent to the skin or to the extremities in excess of 0.5 rem; however, the presence of minors at the Site is not anticipated. Permanent-record dosimetry shall be issued by Ameriphysics to each individual that is required by this section to wear external exposure dosimetry. When a dosimeter is issued, the individual will be briefed on its proper use and care. A dosimeter can only be worn by the person to which

it is assigned. The dosimeters will be returned to Ameriphysics at the end of the work activity or at the end of the shift, as required by the RCS. If a dosimeter is lost, the individual shall immediately leave the area and notify the RCS so an investigation can be conducted.

The RSO will report individual monitoring results to workers annually and at the request of any individual formerly wearing dosimetry provided by Ameriphysics. These reports are provided directly to the monitored individuals and not their employers unless the worker directs the RSO otherwise in writing.

5.4.3 Portable Air Sampling

Airborne particulate surveys shall be performed by Radiation Protection Personnel daily in the vicinity of any work that exhibits a potential to disturb RIM. These surveys will be performed according to Ameriphysics procedure RCP 4-4, *Airborne Radioactivity Control Procedure*. The use of personnel air samplers is not anticipated.

The system used for counting air samples shall be capable of achieving a minimum detectable concentration not greater than 10% of the applicable DAC. Because the DAC values for radionuclides present in RIM are so low, it may be necessary to obtain samples for more than one shift or day to obtain sufficient volume.

6 HEALTH PHYSICS CONTROLS

Maintaining personnel exposures ALARA is the primary goal of this RSP. This is accomplished with a combination of engineering and administrative controls.

6.1 Exposure and Contamination Control

Work in areas where RIM is handled, used, or stored shall be performed in accordance with approved procedures and work instructions to ensure that the regulatory limits in Section 4.2 are maintained. Ameriphysics procedure RCP 4-1, *Exposure and Contamination Control Procedure*, describes in detail procedures for:

- Working in an RCA;
- Proper use of a radiation work permit (RWP);
- Access control point;
- Shielding;
- Administrative controls;
- Engineering controls; and
- Postings and labels.

A few of the engineering controls that may be implemented to ensure worker doses are ALARA include:

- Wetting of soil to minimize the suspension of contaminated material;
- Use of berms and coverings as appropriate during operations; and
- Using mechanical equipment to handle contaminated material rather than by hand.

The following lists administrative controls that will be implemented to ensure worker doses are ALARA.

- Any work activities conducted in Areas 1 or 2 or involving a potential to handle RIM will be defined and delineated using job-specific RWPs;
- All nonessential personnel will be restricted from RCAs;
- No eating, drinking or smoking will be allowed in RCAs; and
- Individuals will, to the extent practical, remain up-wind of surface preparation, sampling and material handling operations.

The RCS ensures that engineering and administrative controls are sufficient to maintain worker protection. In doing so, the RCS coordinates with the OU-1 Site Supervisor and other supervisory personnel to ensure that controls are understood, effective, and not unnecessarily impeding work.

6.2 Postings

Areas where radiation or the potential for radiation exist will be posted in accordance with 10 CFR § 20.1902, *Posting requirements*. The following postings are likely or possible based on known contaminants and concentrations.

- Each radiation area will be posted with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA." Radiation area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.
- Each airborne radioactivity area (as defined in Section 5.3) will be posted with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."
- Unless already posted as a radiation area or airborne radioactivity area, each RCA will be posted with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

6.3 Surveys, Monitoring, Action Levels, and Decontamination

Radiological surveys are performed by Radiation Protection Personnel as necessary to ensure personnel do not exceed radiation exposure limits, to meet requirements for posting radiation areas, and to control the spread of contamination. These surveys shall be performed at prescribed locations and intervals according to approved procedures. These procedures are described in detailed in Ameriphysics procedure RCP 4-2, *Surveys and Monitoring Procedure*.

Area radiation surveys are performed by Radiation Protection Personnel:

1. Daily, at boundaries and access control points of radiation areas;
2. Weekly, in occupied radiation areas, areas where radioactive material and waste is stored, and at boundaries of work sites where the public could be exposed;
3. Whenever operations are performed that might be expected to change existing radiation levels;
4. When highly radioactive equipment (i.e., radiation level at 30 cm is greater than 0.1 rem per hour) is moved; and
5. When performing operations that could result in personnel being exposed to small intense beams of radiation.

Surface contamination surveys are performed by Radiation Protection Personnel:

1. Prior to initial entry to an area where contamination is possible;
2. In-process to verify appropriateness of contamination controls, control processes, direct remedial efforts, and free release items or areas.

Removable contamination surveys are performed by Radiation Protection Personnel:

1. Daily, in active work areas where contamination is possible and at access control points;
2. Weekly, in areas where handling of RIM occurs and areas where RIM is stored; and
3. In-Process, during any of the following:
    a. Decontamination and release of equipment;
    b. In areas where airborne radioactivity has exceeded the concentrations specified in Ameriphysics procedure RCP 4-4, *Airborne Radioactivity Control Procedure*; and
    c. When determining the need for anti-contamination clothing and to determine the extent of contamination in an area.

Removable contamination is evaluated by obtaining representative wipes and counting the contamination on the wipe using a Ludlum 3030E or equivalent.

All vehicles and equipment entering Areas 1 or 2 will be surveyed by a qualified Health Physics Technician for alpha and beta contamination before its initial entrance as well as when exiting the area. The survey will be conducted using a Ludlum Model 2360 coupled to a Model 43-93 (or equivalent). A removable contamination survey is also required for any vehicles or equipment leaving the Site.

Radiological surveys of any drilling or sampling equipment and cores, borehole cuttings, and other investigation-derived waste will be performed in the immediate vicinity of the work activity location (i.e., this material and equipment will be surveyed before it is moved).

Ameriphysics' surface contamination survey limits are based on Regulatory Guide 1.86, Table 1, *Acceptable Surface Contamination Limits*. These limits are commensurate with limits from Regulatory Guide 8.23, Table 3, *Acceptable Surface Contamination Levels for Uncontrolled Release of Equipment*. Of the known Site contaminants, the most restrictive limits for alpha-emitting nuclides are 100 disintegrations per minute (dpm)/100 cm^2 total activity and 20 dpm/100 cm^2 removable activity, and the most restrictive limits for beta-emitting nuclides are 1,000 dpm/100 cm^2 total activity and 200 dpm/100 cm^2 removable activity. These limits serve as the action levels at which decontamination of equipment is required. Radiation Protection Personnel will decide if decontamination can be accomplished or assisted by persons qualified as Radiation Workers. For example, it is reasonable to expect Radiation Workers to be able to clean equipment that is contaminated with materials they are already authorized to handle during their regular work. Nonetheless, Radiation Workers will not undertake decontamination on their own without authorization.

Surveys of personnel (i.e., "frisking") will be performed when exiting an RCA. The type of scan (i.e., whole body, hand and foot, etc.) will be designated on the RWP. Unlike surveys of equipment, the action level for contamination of skin or clothing is any detectable contamination. Radiation Workers will not attempt to decontaminate themselves; only Radiation Protection Personnel are allowed to decontaminate people.

Ameriphysics procedure RCP 4-9, *Decontamination Procedure*, describes general techniques for decontamination. Due to the nature of the work that is planned and the physical characteristics of the RIM, decontamination beyond basic tape-presses or cleaning with damp cloths and a mild over-the-counter detergent is not expected.

6.4 Survey Instrumentation

Radiation Protection Personnel will make an adequate number of calibrated radiation detection and measurement instruments available. Instruments shall be calibrated at least annually or after each repair. Instruments will be checked before use according to Ameriphysics procedure RCP 4-3, *Survey Instrument Procedure*.

6.5 Access Control Points

An access control point is a location on the perimeter of an RCA through which all entries and exits are made and where precautions are taken to prevent unnecessary exposure or the spread of radioactive contamination to adjacent uncontaminated areas.

The following items outline the basic considerations for establishing an access control point:

1. Determine the extent of the area to be isolated and the location where entry and exit shall be controlled;
2. Plan for physical boundaries to prevent inadvertent or unauthorized access. Boundaries shall be conspicuously marked and posted;
3. Cover the floor of the control point using paper or plastic sheet or other material provided for this purpose (optional in outdoor areas). The intent is to provide an easily removable walking surface within the control point to prevent tracking of contamination from the area. Maintain a supply of the material to replace floor covering as necessary;
4. Provide a "step-off pad" at the exit from the control point (optional in outdoor locations). This is to be used when removing clothing during exit from the area;
5. Provide easily accessible receptacles for used PPE, respirators, and equipment at the control point. A supply of plastic bags shall be available as necessary for receiving contaminated equipment and tools. Radiation tags or labels shall be available to identify contaminated items being removed from the area;
6. Provide radiation detection instruments for monitoring personnel and equipment. Frisking should be performed in a low radiation background and where the audible response of the frisker can be heard;
7. Provide means of recording stay times, as may be required, at the entrance of the areas for personnel. It may be necessary to provide a record of previous radiation exposures received by personnel entering an RCA so that maximum allowable time in the RCA can be determined;
8. At the entrance to the access control point, information shall be posted concerning radiation and contamination conditions, precautions for entry, precautions for exit, step-off points, clothing and waste receptacles, and personnel survey. A copy of the applicable RWP shall be posted at the access control point;
9. Radiological Protection Personnel shall designate, stock, staff, and otherwise maintain the control point;
10. Only personnel in assigned PPE should enter RCAs;
11. Adequately trained personnel may be permitted to assist in frisking other personnel and themselves; and
12. Contaminated individuals shall be processed in accordance with Ameriphysics procedure RCP 4-9, *Decontamination Procedure*.

6.6 Visitors

Management, technical, and other personnel who require occasional access to RCAs and areas where RIM is stored and who enter these for observation or similar purposes, or to perform work not involving RIM, shall have the radiological control training necessary for the radiological conditions expected to be encountered or shall be escorted by appropriately qualified personnel at all times. The RCS or designee will be required to escort all visitors, and these personnel are not allowed to receive an exposure exceeding the 10 CFR § 20.1301, *Radiation Dose Limits for Individual Members of the Public*, of 0.1 rem per year or 0.002 rem in any one hour.

7 RECORD KEEPING

Ameriphysics is required to maintain and retain records of the radiation protection program and to make certain notifications. The RSO is responsible for administering the program, and the RCS is responsible for maintaining radiation protection project records generated during the project. Records shall be maintained in accordance with Ameriphysics' Quality Assurance Manual Section 17.

Radiological records are retained according to Table 4.

Table 4. Project Records Retention

Record	Retention Period
Characterization Records	7 years
Background Data	7 years
Calibration Records	Permanent
Instrument Setup Sheets	Permanent
Daily Instrument Checks	Permanent
Survey Logs	Permanent
Survey Raw Data	7 years
Surveys	Permanent
Field Log Books	Permanent
Chain of Custody Forms	Permanent
Laboratory Reports	Permanent
Radiation Work Permit Logs	Permanent
Radiation Work Permits	Permanent
Air Sample Logs	Permanent
Air Sample Results	Permanent
Dosimetry Records	Permanent
Exposure Reports	Permanent
Pathway Models	Permanent

8 EMERGENCY RESPONSE

The Site operates according to an Emergency Response Plan that describes the procedures that will be used in the event of an accident or emergency at OU-1. In the event of a medical emergency, fire, explosion, or other emergency event potentially involving RIM, priority shall always be given to injured personnel and personnel safety, then to combating of the fire or other emergency. Radiological controls shall be given secondary importance to these tasks.