FORM X

RADIATION PROTECTION PLAN

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised
January 2023
DEP USE ONLY
Date Received

FORM X
RADIATION PROTECTION PLAN

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form X, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: 273.140a, 277.140, 279.110, 281.119, 283.113, 288.139, 289.138, 293.111, 295.120, 297.113 and Department's *"Guidance Document on Radioactive Monitoring at Solid Waste Processing and Disposal Facilities"* - Document Number 250-3100-001.

SECTION A. SITE IDENTIFIER

Applicant/permittee: ***North East Waste Systems LLC***

Site Name: ***North East Waste Transfer Facility***

Facility ID (as issued by DEP): ***TBD by PaDEP***

SECTION B. FACILITY INFORMATION

Municipal Waste landfill ..... ☐
Construction/demolition landfill ..... ☐
Municipal waste transfer facility ..... ☒
Municipal waste composting facility ..... ☐
Municipal waste demonstration facility ..... ☐
Municipal waste incinerator/resource recovery facility ..... ☐
Other municipal waste processing facility ..... ☐

Noncaptive residual waste landfill ..... ☐
Noncaptive residual waste disposal impoundment ..... ☐
Noncaptive residual waste transfer facility ..... ☐
Noncaptive residual waste composting facility ..... ☐
Noncaptive residual waste processing facility ..... ☐
Oil and Gas Wastewater Storage Impoundment ..... ☐

SECTION C. RADIATION PROTECTION ACTION PLAN

The radiation protection action and monitoring plan (Action Plan) must describe in detail the procedures that will be used by the operator of the facility for detecting, characterizing and further managing radioactive material in waste entering the permitted facility. This plan shall be used for both Solid Waste Facilities and Wastewater Treatment Facilities. The preparer should complete those sections designated as pertaining to their facilities. The Action Plan shall address the requirements set forth in the general references cited above. The Action Plan shall be prepared in accordance with the Department's "*Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities"* Document Number 250-3100-001, or in a manner at least as protective of the environment, facility staff and public health and safety. The Action Plan shall meet all of the statutory and regulatory requirements of this Commonwealth. The Action Plan should be prepared by a certified health physicist (CHP).

Provide information on qualification of persons preparing the Action Plan and the person(s) responsible for implementation of the Action Plan.

A facility site map shall be attached to the Action Plan that identifies the location of the Designated Area (DA) for vehicles or sludge found to contain radioactive material (RAM).

Once approved by the Department, the procedures in the Action Plan shall be implemented and used by the facility operating staff and the facility users for managing RAM in the waste streams entering the facility.

1. Any method of concentrating radioactivity, including filtration of oil/gas well water storage of liquids to allow settling of TENORM sludge requires evaluation of the processed waste:

   a. Processing methods shall be reviewed to determine staff radiation exposure. The exposure evaluation shall utilize the maximum expected concentrations.

SECTION C. RADIATION PROTECTION ACTION PLAN (Continued)

b. Staff exposure shall be maintained as low as reasonably achievable and below applicable public exposure limits. If processing TENORM, radon exposure shall be considered and evaluated separately.

c. Incoming TENORM concentrations will be limited so that resulting waste concentrations are within approved FORM U authorizations.

d. If discharging liquids, provide the limiting liquid discharge values, i.e. EPA MCL or 10 CFR 20, Appendix B and not readily dispersible that incoming TENORM concentrations will be limited to.

2. Radiation Monitoring and Detection. Disposal facilities shall monitor all influent material. Waste processing facilities shall verify radioactivity of the influent material and monitor all effluent waste. (Use Appendix C & D of the Guidance Document No. 250-3100-001):

a. Due to the self-shielding afforded by water, radiation monitoring of 100% of the incoming sewage, oil/gas well process water is not required by processors, however TENORM concentrations should be verified to be within the bounds of the above evaluation.

b. Radiation monitoring of effluent material by processors is required to verify conformance to Form U authorizations.

c. Identify the stationery RAM monitoring equipment (if used) that will be used for monitoring and detecting gamma radiation in waste entering or exiting the facility, the location of the monitoring equipment (entry portal, scales, etc.) and reasons for selecting the location. Provide information on why a particular type of radiation detector element or probe was selected for the facility, how the selected equipment will be installed and calibrated, and how the proper background for the location will be determined and used during equipment calibration.

d. Describe the types of hand-held radiological monitoring equipment that will be used at the facility and reasons for their selection including reasons for selecting a particular type of radiation detector element or probe in the hand-held detectors. The guidance document recommends hand-held (portable) detectors with multiple probes for contamination and a range of gamma dose rate measurements.

e. Describe the calibration procedures that will used for the fixed (if used) and portable detectors used at the facility.

f. Describe the evaluation equipment used at the facility that will be used to determine the validity of a radiation alarm and subsequent radioactive material characterization. Processors may use initial sample results and process knowledge to differentiate between licensed materials and TENORM.

g. What is the background radiation level and, given the facility background radiation level, describe the level at which the detectors at the facility will be set.

h. Describe step-by-step procedures that will be used in the event the radioactive material concentrations exceed limits in material incoming to the facility or, in the case of processors, outgoing.

i. Describe any procedures for attempting to determine the origin of the waste and describe the disposition and/or storage of rejected material.

j. Describe the on-site storage of waste.

SECTION C. RADIATION PROTECTION ACTION PLAN (Continued)

3. Operational Staff Training:

   Provide procedures describing how facility operational staff will be trained in proper use of all fixed and portable radiation monitoring equipment and also when to use which instrument. For Solid Waste Facilities, describe what training will be given to the operational staff in visually monitoring waste during transfer or unloading, for the potential presence of RAM including identifying the caution “radiation symbol” on containers.

4. Records and Reports:

   Describe the procedures that will be used to record each event of outgoing waste RAM detection incidents at the facility including description of the RAM involved. Provide a brief narrative of the occurrence, where the RAM originated, the final disposition of the material and how all the information will be made part of the facility's daily operational records.

5. Plan Revision:

   Identify the situations and scenarios in which the Action Plan will be updated and submitted to the Department for approval.

6. Additional Requirements:

   a. Describe how waste, that exceeds DOT limits, will be transported on public highways. See DEP Fact Sheet on DOT Shipping Compliance for oil/gas sludge. http://www.elibrary.dep.state.pa.us/dsweb/get/Document-89853/2900-FS-DEP4374.pdf .

   b. Sludge sent for disposal in a Pennsylvania landfill will be authorized by an approved Form U only.

   c. Provide the disposition of any outgoing solid waste exceeding radiation limits, that will not be landfilled in Pennsylvania.

   d. Describe radioactivity limits on land farmed/spreading sludge, if applicable.

Refer to Attachment X-1 for Radiation Protection Action Plan.

ATTACHMENT X-1

RADIATION PROTECTION ACTION PLAN

Radiation Protection Action Plan

North East Waste Systems, LLC

North East Waste Systems Transfer Facility

January 2023

Radiation Protection Action Plan
North East Waste Systems, LLC
North East Waste Systems Transfer Facility

Table of Contents

Attachments

List of Abbreviations and Acronyms

APS	Action Plan Supervisor
GMSM	Geiger-Mueller Survey Meter
hr	hour
NEWT	North East Waste Systems Transfer Facility
PA BRP	Pennsylvania Bureau of Radiation Protection
PA DEP	Pennsylvania Department of Environmental Protection
PA DOT	Pennsylvania Department of Transportation
RPAP	Radiation Protection Action Plan
urem	microrem
mrem	millirem
R	roentgen
mR	milliroentgen
uR	microroentgen
Sv	sievert
mSv	millisievert
uSv	microsievert (1 uSv = 100 urem = 0.1 mrem)
DOT	US Department of Transportation

References

Guidance Document of Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities, Document Number 250-3100-001, June 11, 2022 (Accessed December 2022)
https://www.dep.pa.gov/Business/Land/Waste/SolidWaste/Residual/Permitting/Documents/250-3100-001.pdf
NUREG 1717 Systematic Radiological Assessment of Exemptions for Source and Byproduct Materials
https://www.nrc.gov/docs/ML0119/ML011980333.pdf
Regulatory Guide 8.39 Release of Patients Administered Radioactive Materials (Rev 0)
https://www.nrc.gov/docs/ML0833/ML083300045.pdf
Transporting Radioactive Solid Waste
https://www.dep.pa.gov/Business/RadiationProtection/RadiationControl/Radioactive-Material-In-Solid-Waste-Monitoring/Pages/Transporting-Radioactive-Solid-Waste.aspx

Emergency Notification List
North East Waste Systems, LLC
North East Waste Systems Transfer Facility

Agency	Telephone Number
Fire, Police, Ambulance	911
PA State Police, Hazleton, PA	570-459-3890
Pennsylvania DEP Bureau of Radiation Protection	
Northeast Region Manager (Area Health Physicist)	484-250-5900
Northeast Region after hours	570-826-2511
Director, Harrisburg, PA	717-787-2480
PA DEP	
Northeast Regional Office (Wilkes-Barre, PA)	570-826-2511
Non-Business Hours	800-373-3398
Radiation Safety Consultant, Applied Health Physics	tmobley@ahprad.com
Office	412-835-9555
Fax	412-835-9559
Radiation Safety Consultant, Roman Consulting, Inc.	romanconsultinginc@gmail.com
Mobile	610-587-9240
Luzerne County Emergency Management Agency	570-820-4400
Pennsylvania Emergency Response Center	717-783-8150
National Response Center	800-424-8802

Site Contacts

Name Position, Position	TBD prior to startup
Radiation Safety Officer	TBD prior to startup
Alternate Radiation Safety Officer	TBD prior to startup

Radiation Protection Action Plan
North East Waste Systems, LLC
North East Waste Systems Transfer Facility

1.0 Introduction

This Radiation Protection Action Plan (RPAP) has been prepared for North East Waste Systems, LLC's (NEWS) North East Waste Systems Transfer Facility (NEWT). The NEWT is located at 40°57'19.63" N, 75°57'30.86" W, Hazelton, Pennsylvania. A Radiation Protection Action Plan is required by 25 PA Code §279.110a for municipal solid waste transfer stations. This regulation directs facilities to monitor waste material entering a facility for gamma radiation and prescribes Action Levels for the monitoring. This document describes the monitoring system that will be used by the NEWT and the response for radiation levels that exceed the Action Level. The Pennsylvania Department of Environmental Protection (PA DEP) "*Guidance Document of Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities*," Document Number 250-3100-001, 2022, was used as a guide in preparing this Action Plan.

2.0 Administration

The person responsible for administration of the NEWT Radiation Protection Action Plan is the Site Manager. The NEWT Site Manager's responsibilities include the following:

- Conduct of facility operations according to the ALARA Program.
- Determine the facility personnel that shall receive the required training.
- Designate and make determinations if the equipment to operate the plan is operational and calibrated.
- Designate the persons responsible for responding to radiation monitoring equipment alarms.
- Shall ensure that the required records are maintained of responses to alarms.
- Shall ensure that the required postings and notifications are completed.
- Shall ensure that radioactive material found in the waste is processed or transferred according to the Plan.
- Review the plan, make any necessary changes and notify PA DEP when any modifications are made to the plan.

2.1 Action Plan Supervisors

An Action Plan Supervisor (APS) will implement the Radiation Protection Action Plan when radioactive material is detected in a load of waste. The APS is responsible for determining the Action Level, notifying the Pennsylvania Bureau of Radiation Protection (PA BRP) when required, approving the disposition of the waste and completing the record of the event. An APS will be available to respond to alarms any time the facility is receiving waste. Each APS will receive training according to the requirements in section 9 of the Radiation Protection Action Plan. The Site Manager and any additional persons directed by the Site Manager, as needed, will be trained as Action Plan Supervisors.

3.0 Radiation Monitoring Equipment

NEWT will procure and install a radiation monitoring system at the inbound scales of the facility. A detailed discussion on each of the NEWT's radiation monitoring components is presented within this section. In addition, this section includes discussion on the calibration and testing of the system components.

3.1 Stationary Radiation Monitoring Equipment

The NEWT will procure and install a certified truck scale located adjacent to the scale house. The scale will have a radiation monitoring system with readout in the scale house. The monitoring system will have a radiation detector mounted at each side of the scale entrance. Vehicles are required to pass slowly (<5 mph) between the detectors when entering the scale. The portal monitor system is designed to have a background radiation level of less than 10 uR/hr at the detectors and capable of seeing changes in the background radiation of less than 10 uR/hr. The monitor produces a visual and an audible alarm inside the scale house when the radiation detectors sense a radiation level above the alarm set point, which may not exceed 10 uR/hr above background. The radiation detectors are capable of detecting gamma rays with an energy of at least 50 keV. (Note: 60 keV gamma rays from an Am-241 source are used to test for the 50 keV sensitivity). See permit drawing 002D005A for the location of the radiation monitor.

In the event that the stationary monitoring equipment is out of service, the NEWT will use portable instruments to survey incoming vehicles for gamma exposure rates greater than 10 uR/hr at the surface of the vehicle. The NEWT may replace the planned monitoring system with an equivalent system meeting the requirements of the Guidance Document. If replacement equipment is less sensitive than described, the NEWT will notify the Department.

3.2 Portable Radiation Monitoring Equipment

The NEWT will acquire a portable radiation detector and/or an equivalent GMSM (Geiger-Mueller Survey Meter) with pancake probe with a range of at least 5 micro roentgens per hour to 100 milliroentgens per hour for ^{137}Cs gamma radiation. It can be used for radiation surveys of vehicles that alarm the stationary monitoring equipment. It is also suitable for checking wipes or smears for removable contamination. The GMSM meets the requirement for an instrument that can measure exposure rates as low as 10 microroentgens per hour (Action Level 1) and at least 50 milliroentgens per hour (Action Level 2).

The NEWT may replace the planned portable radiation survey equipment with an equivalent instrument(s) meeting the requirements of the Guidance Document. If replacement equipment is less sensitive than described, the NEWT will notify the Department.

3.3 Characterization Equipment

The NEWT will purchase or have access to (e.g., lease) a portable characterization instrument. Examples include Bicron Fieldspec, Flir identiFINDER, or similar instruments

with radioisotope identification capability, i.e., a multi-channel analyzer, (MCA). The characterization instruments should consist of a gamma ray scintillation detector or equivalent solid state detector and a multichannel analyzer (MCA) to collect and display the gamma ray spectrum. The system matches the spectrum collected with a library of stored spectrums to identify the radionuclide(s) in the radiation source. The characterization instrument is capable of storing gamma ray spectrums for later retrieval or transfer to a computer. Typical field characterization instruments are capable of dose rate measurements from background levels to greater than 1 rem/hr. Characterization instruments may also be provided by the radiation consultant or borrowed from other sites, if needed.

The NEWT may replace the present characterization equipment with equivalent instruments meeting the requirements of the Guidance Document. If replacement equipment performs other than described, the NEWT will notify the Department.

3.4 Instrument Calibration and Testing

The stationary radiation monitoring equipment alarm set point will be calibrated using a ^{137}Cs gamma ray source with NIST traceable activity or exposure rate. The detectors will be checked at or about the Action Level One alarm point as a minimum. The portable survey and characterization equipment will be sent to the manufacturer or another calibration facility approved to perform survey meter calibrations. Calibrations will be performed annually and after repair or replacement of parts that could affect the calibration.

In addition to the annual calibration, the stationary radiation monitoring equipment and the portable radiation monitoring instruments will be checked to verify that they are operating properly each day that the instrument is used. This test will be done with a radiation check source to produce a known reading on the instrument in a specific geometry. The check source(s) will be a commercial radioactive source designed for that purpose or a radioactive consumer item with a stable radiation emission suitable for checking the instrument. If the instrument has a built-in detector check source or signal, it may be used for the daily instrument response check instead of the radioactive source.

4.0 Background Radiation Level

Background radiation levels are determined during onsite annual calibration of the portal monitor and checked as part of daily checks. The instrument background shall be kept below 10 uR/hr using shielding if needed as evaluated by consultant radiation protection expert. If elevated background occurs during operation the area surrounding the detector should be evaluated in conjunction with a shielding evaluation.

5.0 Vehicle Scan and Survey Procedure

The following procedure will be used to scan and survey vehicles delivering waste to the NEWT.

5.1 Response Check

Each detector of the stationary radiation monitoring system will be checked before use each day with a check source to determine that the gamma ray response is within the acceptable range and that the alarm is operational. If the instrument has an internal check source and performs an automatic check, the response check with an external source is not necessary. If the instrument response to the check source or the background is not within the expected range or does not trigger the alarm, repeat the test. If the second test is within the specifications, the instrument may be used. Record the results of the test. If the instrument is not within the acceptable range for the second test, contact the APS for instructions. Do not use an instrument that does not respond within the acceptable range to the check source or background radiation. A portable survey instrument may be used to monitor vehicles until the stationary monitoring instrument is repaired. A typical acceptance range is about +/- 20% or 3 standard deviations of the response at the time of calibration or an average of the readings over a period of 10 or more days.

Each portable survey instrument must pass a response check each day before it is used. Turn the instrument on and check the battery and high voltage scale positions, as applicable. Check the response of the instrument to the check source and background. If the instrument has an internal check source and performs an automatic check, the response check with an external source is not necessary. If the instrument response is within the acceptable range for the check source and the background, the instrument may be used. If the battery response is low, replace the batteries and repeat the response check. If the instrument response to the check source or the background is not within the expected range, repeat the test. If the second test is within the specifications, the instrument may be used. If the instrument is not within the acceptable range for the second test, contact the APS for instructions. Do not conduct a survey with an instrument that does not respond within the acceptable range to the check source or background radiation. A typical acceptance range is about +/- 20% or 3 standard deviations of the response at the time of calibration or an average of the readings over a period of 10 or more days.

5.2. Vehicle Scan

Vehicles should proceed through the stationary radiation monitor at a speed slow enough to detect 10 microroentgens per hour (<5 mph). The monitor will be set to alarm at a radiation level equivalent to no greater than 10 microroentgens per hour of Cs-137 gamma radiation above background at either detector. The alarm will be indicated at the control panel in the scale house. If there is an alarm signal, instruct the driver to drive through the stationary radiation monitor again. If the second scan does not produce an alarm, the waste load may be accepted.

If the second scan also produces an alarm, isolate the vehicle and notify the APS to initiate the action plan response. If the scan indicates that the radiation level in the cab might exceed 2 mrem per hour or 50 mrem per hour at the surface or there is evidence of contamination on the surface of the vehicle notify the APS to initiate the Action Plan 2

Response Procedure and keep personnel away from the vehicle until radiation measurements have been made with the portable survey meter and the surface of the vehicle has been checked for contamination.

If the scan indicates that the cab radiation level is less than 50 mrem per hour and there is no visible evidence of contamination, the driver will be directed to move the vehicle to the Designated Area and the APS will be notified to initiate the Action Plan Response Procedure.

5.3 Vehicle Survey

If both scans of the vehicle produce an alarm, the APS will perform a radiation survey of the vehicle with one of the portable radiation survey instruments or the characterization instrument. *Note: All confirmed alarms will be characterized.*

The APS will check the background radiation level at sufficient distance from the vehicle that the radiation from the vehicle is not detected. If the instrument has manually adjustable scale factors, set the instrument on the lowest usable range with the audible indicator turned on. Switch the instrument to higher scale ranges, as needed, if the radiation level increases. The APS will slowly scan the accessible outside surfaces of the vehicle with the survey meter held close to the surface (within 5 cm, if possible), while listening to the audible indicator and watching the instrument readout for a response of 10 microroentgens per hour or greater above background. The APS will scan slowly enough that changes in radiation level from small areas of the surface can be detected. The time required to complete the scan will depend on the size of the vehicle and the type of survey instrument. If no areas with radiation levels in excess of 10 microroentgens per hour above background are found, the survey will be documented and evaluated by the APS and/or the radiation consultant. If the discrepancy with the stationary monitor is not resolved the PA BRP will be notified for direction.

The APS will make a diagram of the vehicle and record the location(s) of the highest radiation level(s) on the surface of the vehicle or container for later use. The APS will record a description of the waste, the generator and any other information that might help determine the source of the radiation. Also, the carrier and a description of the vehicle will be recorded.

If the radiation level exceeds 50 milliroentgens per hour on the surface of the vehicle or a waste container, the APS will initiate the Level Two response (Section 6.2). All personnel will be kept at a sufficient distance from the vehicle that exposure rates in occupied areas do not exceed 2 milliroentgens per hour and the Area Health Physicist will be notified immediately for further instructions.

5.4 Contamination Survey

If the radiation level on the exterior of the vehicle exceeds 10 microroentgens per hour above background and the load appears to be leaking or the exterior of the vehicle and container appears to be contaminated, the APS will check the exterior surface of the

vehicle with a wipe or smear to determine whether there is any removable contamination on the outside of the vehicle and whether radioactive material is leaking from it. Contamination is considered to be present if a wipe or smear from an area of 300 cm^2 on the exterior of the vehicle removes an activity in excess of Table 9 from 49 CFR 173.443 - Non-Fixed External Radioactive Contamination Limits for Packages. For a pancake GM detector with about a 10% detection efficiency for wipes or smears.

Table 9 "49CFR" - Non-Fixed External Radioactive Contamination Limits for Packages.

Contaminant	**Maximum Permissible Limits**		
	Bq/cm^2	uCi/cm^2	dpm/cm^2
1. Beta and gamma emitters and low toxicity alpha emitters	4	10^{-4}	240
2. All other alpha emitting radionuclides	0.4	10^{-5}	24

If the removable contamination exceeds Table 9 values, the APS will initiate the Level Two response (Section 6.2). All personnel shall be kept away from the vehicle and the Area Health Physicist will be notified immediately for further instructions.

5.5 Driver/Passenger Survey

If radiation is detected, the APS will verify that it is not originating from the driver or a passenger in the vehicle. If the scan indicates that the radiation source could be the driver or passenger, the radiation level will be checked close to the driver or passenger. If the driver/passenger is the source of the radiation, the APS will have that person move far enough away from the vehicle to not contribute to the radiation level and resurvey the vehicle or drive the vehicle through the stationary monitor with a different driver. If the survey of the vehicle without driver or passenger interference indicates no radiation levels on the surface of the vehicle in excess of 10 microroentgens per hour above background, the APS will record the event and the waste can be accepted.

6.0 Action Level Response Procedure

This section outlines the Action Level Response Procedure for the Action Levels specified in the PA DEP Technical Guidance Document 250-3100-001. This procedure will be available in the scale house for facility personnel responsible for monitoring vehicles. The procedure or a summary of it will be posted in view of drivers entering the facility to ensure their awareness of their responsibilities in the event of an alarm from the stationary radiation monitor. This will include a statement informing the drivers that police will be notified in the event that a driver leaves the site with a vehicle that has initiated an Action Level response without receiving a Department of Transportation (DOT) special permit or an approved exemption for household waste. The NEWT has notified their regular customers of the monitoring requirement and the Action Level Response Procedure. A flowchart showing the response to radiation alarms is attached to this Action Plan.

6.1 Action Level One

An Action Level One response will be initiated if the stationary radiation monitor (See Section 5) indicates an exposure rate of 10 microroentgens per hour or greater above background. The following procedure will be followed for an Action Level One response:

6.1(a) Notify the Action Plan Supervisor. Move the vehicle to the Designated Area to complete the radiation and contamination survey and the characterization. The location of the Designated Area is shown on permit drawing 002D005A. If the radiation level in the cab of the vehicle exceeds 50 milliroentgens per hour, do not attempt to move the vehicle and notify the Area Health Physicist for instructions.

6.1(b) If the survey indicates an Action Level Two condition such as a reading greater than 50 milliroentgens per hour at the vehicle surface, greater than 2 milliroentgens in the cab of the vehicle or if removable contamination in excess of Table 9 is found on the exterior of the vehicle proceed to Section 6.2 (Action Level Two) of this Plan.

6.1(c) Use the portable multichannel analyzer to collect a gamma spectrum of the radiation for characterization. Use the library in the instrument to identify the radionuclide responsible for the radiation. Contact the radiation safety consultant for assistance, as needed. Refer to Section 8.0 (Characterization) for a discussion of the characterization procedure.

If the radioactive material in the waste meets the criteria for acceptance under one of the blanket authorizations described in Section 13, the waste may be accepted for processing or returned to the generator.

6.1(d) If NEWT decides not to accept the material for processing a DOT Special Permit or an exemption for household waste must be obtained from the PA BRP before the vehicle may leave the site.

6.1(e). If a vehicle that has caused an Action Level alarm leaves the site without receiving a DOT Special Permit or an exemption for household waste, notify the Pennsylvania State Police. Provide the Pennsylvania State Police with information on the vehicle make, color, carrier name, license plate number, time it departed the site, the direction of travel and the destination, if known. Also, notify the PA DEP Area Health Physicist. Refer to the notification sheet for contact information. A trailer or waste container, such as a rolloff, with waste may be left in the Designated Area and the tractor or vehicle released, if the tractor or vehicle has no removable surface contamination or surface gamma exposure rate in excess of 10 microroentgens per hour.

6.2 Action Level Two

If the radiation level on the exterior surface of the vehicle equals or exceeds 50 milliroentgens per hour, if the radiation level in the cab of the vehicle exceeds 2 milliroentgens per hour or if removable contamination is found on the exterior of the vehicle, then Action Level Two procedures as provided below will be followed.

6.2(a) If not completed as part of the radiation survey process, check for removable contamination on the exterior of the vehicle with a wipe or smear. If there is material leaking from the vehicle, which could spread radioactive contamination, stop the leakage

if possible. Try to catch material leaking from the vehicle in a container or absorbent material. Restrict access to the areas around the vehicle so that personnel are not exposed to removable contamination or to exposure rates in excess of 2 millirems per hour.

6.2(b) Notify the Area Health Physicist of the Action Level Two Alarm. Take no further action without approval of the Area Health Physicist.

6.2(c) Notify the radiation safety consultant, if needed, and provide him or her with all available information to assist in characterization of the radiation source.

6.2(d) A vehicle meeting the Action Level Two limits for radiation or contamination cannot be issued a DOT Special Permit or an exemption for household waste and cannot be rejected.

6.2(e). If a vehicle that has caused an Action Level Two alarm leaves the site, notify the Pennsylvania State Police. Provide the Pennsylvania State Police with information on the vehicle make, color, carrier name, license plate number, time it departed the site, the direction of travel and the destination, if known. Also, notify the PA DEP Area Health Physicist. Refer to the notification sheet for contact information. A trailer or waste container, such as a rolloff, with waste may be left in the Designated Area and the tractor or vehicle released, if the tractor or vehicle has no removable surface contamination or surface gamma exposure rate in excess of 10 microroentgens per hour.

7.0 Designated Area

The Designated Area is an area where vehicles will be placed while the radiation and contamination surveys are completed and characterization is performed. The location of the Designated Area is shown on permit drawing 002D005A. The location is close enough for easy access and visual monitoring and is large enough that access can be restricted to areas around vehicles with dose rates in excess of 2 millirems per hour.

8.0 Characterization

In the event of an Action Level One alarm the following steps are to be taken to determine as accurately as possible the origin and type of radioactive material in the vehicle. The characterization is to be under the direct supervision of the APS or the radiation safety consultant. In the event of an Action Level Two alarm do not proceed without the approval of the Area Health Physicist.

The waste generator, if known, may be able to supply information that could identify the radioactive material and the activity or concentration. Examples of items in waste that might contain enough radioactive material to alarm the stationary radiation monitor are:

- Waste or contaminated items from patients who have had nuclear medicine procedures.
- Waste containing minerals with low concentrations of the naturally occurring radioactive materials uranium, thorium or potassium.

- Material in which the concentration of naturally occurring radioactive material might have been increased above normal levels, such as brine or water treatment sludge, pipe scale, and filter media.
- Chemicals containing naturally occurring radioactive material, such as potassium permanganate
- Waste from institutions that use radioactive material for research or development, such as, universities, hospitals or commercial laboratories.
- Waste from industries that use radioactive sources for testing or gauging, such as, metal or glass melting facilities.

The NEWT will use the radiation survey data to determine the location of the radiation source and whether it is a small volume or uniformly distributed in the material. A radiation level that is confined to a small area on the surface of the vehicle indicates a discrete source. Uniform radiation levels on the outside of the vehicle indicate radioactive material that is dispersed throughout the load.

The radiation intensity can provide some indication of the type of source. A radiation level high enough to produce an Action Level Two alarm might be an unshielded sealed source of the type used for medical therapy, radiography or nuclear gauging.

Gamma ray spectroscopy will be used to identify the radionuclide producing the gamma radiation.

The results of the preliminary radiation survey data and the identification of the radioisotope will be used to determine whether waste is to be rejected, accepted as is, or whether the source of the radiation is to be removed from the waste.

If the radioactive material is determined to be a medical radionuclide, a consumer product, NORM, TENORM or ^{40}K, see Section 13 for the acceptance limits.

It may be necessary to unload waste from the vehicle to remove a radiation source or to obtain a sample for characterization. This work is to be done under the direction of the APS, with assistance from the Area Health Physicist or the radiation safety consultant, if needed.

The waste should be carefully checked with a portable radiation detector as it is removed to detect any changes and to locate and identify the radiation source.

If a radiation source is to be kept for decay in storage or held prior to return to the generator or shipment to a licensed radioactive waste disposal site, the material must be secure and protected from the weather. Small sources should be transferred to a strong, tight container and kept it in a secure storage unit. The container and storage unit should be properly labeled and posted, as specified by the Area Health Physicist or the radiation safety consultant. If possible, the radiation levels from stored radioactive sources will be kept below 0.05 mrem/hr in occupied areas or off site areas.

If a radiation source or container is found with radiation levels greater than 50 mrem/hr, the response to an Action Level Two alarm will be initiated and the Area Health Physicist shall be contacted immediately for instructions on how to proceed. Also, the radiation safety consultant will be notified for assistance, if needed.

9.0 Records and Reports

9.1 Daily Records

The daily record of operations will include a notation of each incident for which an Action Level 1 or Action Level 2 response was required. The daily record and/or the response form for the incident will include:

- The date, time and location of the occurrence.
- A brief narrative description of the occurrence.
- Specific information on the origin of the material, if known.
- A description of the radioactive material involved, if known.
- The name, address and telephone numbers of the supplier or handler of the radioactive material and the name of the driver.
- The final disposition of the material.

9.2 Annual Operations Report

The annual operations report for the facility will include a record of the radioactive material detected in each instance in which an Action Level 1 or Action Level 2 response was required.

10.0 Training

The training required by the Guidance Document will be provided by a person(s) qualified to provide instruction in the requirements of the NEWT Radiation Protection Action Plan and familiar with the radiation instrumentation in use at the landfill.

10.1 Action Plan Supervisor Training

Action Plan Supervisors will complete a one-day training program. The training will include the PA DEP regulations that require a Radiation Protection Action Plan, the fundamentals of radiation safety and detection, the procedures and information contained in the Radiation Protection Action Plan, including survey procedures and sources of radioactive material that may be encountered in material to be tested or processed. The use of visual monitoring to detect radioactive material not detected by the radiation monitors will also be included. A practicum section of the training will include lessons on the use of survey equipment specific to the facility and trainees will demonstrate their ability to perform and document radiation and contamination surveys.

10.2 Other Facility Personnel

Other facility personnel will be informed of the Radiation Protection Action Plan as part of the normal employee safety training. This training will include information on dose limits,

posting of procedures, identification of the radiation symbol, visual monitoring for radioactive material, and a summary of the Radiation Protection Radiation Protection Action Plan. Personnel will be given the opportunity to ask questions and request additional information about the Radiation Protection Action Plan.

11.0 Radiation Protection Program

11.1 ALARA Program

The management of the NEWT is committed to the policy that exposure of facility personnel and the public to radiation and the release of radioactive material should be As Low As Reasonably Achievable (ALARA). Operations that involve radioactive material will be conducted in accordance with the ALARA principle.

11.2 Dose Limits

No significant radiation exposure of facility personnel is expected from operations under the Radiation Protection Action Plan. Facility personnel will be considered members of the public for routine operations. The following radiation dose limits, as listed in the Guidance Document, apply.

Annual Dose Limits for Workers and Members of the Public

Facility Staff	100 mrem	(if considered members of the public)
Vehicle drivers	100 mrem	(if considered members of the public)
General public	4 mrem	(for the drinking water pathway)
General public	10 mrem	(for the air pathway)
General public	25 mrem	(all pathways combined)

It is unlikely that any facility personnel will receive annual radiation doses in excess of 100 millirem. However, if operations indicate that any facility personnel are likely to exceed an annual Total Effective Dose Equivalent (TEDE) greater than 100 millirem from occupational exposure, the persons will be considered occupationally exposed and the following dose limits will apply.

Annual Dose Limits for Occupationally Exposed Persons

Total Effective Dose Limit (TEDE) ..... 5,000 millirem (50 millisievert)
Individual organs .....
Lens of the eye..... 15,000 millirem (150 millisievert
Skin or extremities.....50,000 millirem (500 millisievert)
Embryo/fetus of a declared pregnant woman.....500 millirem (5 millisievert)
Minors (workers under age 18) ..... 10% of the adult limits

Adults whose occupational dose exceeds or is likely to exceed 10% of the occupational dose limits or minors or pregnant women whose occupational dose exceeds or is likely to exceed 100 millirem (1 millisievert) will be monitored using one or more of the following options.

1. Calculation of personnel doses using radiation survey measurements and exposure time. This method will be used, if the frequency of alarm events is small and the doses are low so that individual personnel monitoring instruments are unnecessary or impractical.

2. Passive dosimeters, such as TLD, film, OSL or similar dosimeters, supplied by a vendor with NVLAP accreditation.

3. Electronic personnel dosimeters to supplement individual passive dosimeters or to be used alone, if the frequency of alarms does not justify a subscription to a passive dosimetry service. An annual calibration is required for these instruments.

12.0 Plan Revision

This plan will be reviewed and updated as a result of any of the following. The PA DEP will be notified of revisions.

- Applicable Department regulations or policies are revised.
- The Radiation Protection Action Plan fails during an incident.
- The facility operation changes in a manner that would interfere with implementation of the Radiation Protection Action Plan.
- The individual(s) responsible for implementing the plan changes.
- The monitoring equipment used is changed.
- The designated area for vehicles in which RAM has been detected changes.
- As otherwise required by the Department.

13.0 Acceptance of Radioactive Material

This section describes the radioactive material in waste that may be accepted for processing at the NEWT after it has been characterized. Radioactive material not listed below may not be accepted without prior approval of the PA BRP.

The Nuclear Regulatory Commission and the Pennsylvania Bureau of Radiation Protection have regulatory limits for the concentration of radioactive material in water and air that can be released to unrestricted areas, for the activity in consumer products, and for the activity in patients released from medical facilities. These values can be used to arrive at limits for activity in the waste received at the NEWT for processing. The NEWT will use these guidelines to determine the maximum activity that will be acceptable in material that is received. However, no waste which exceeds the Action Level One radiation level will be accepted for processing until the material has been characterized. The radioactive material listed in the Guidance Document that the NEWT may accept for processing under a blanket authorization is listed below. Only the radioactive material in the waste is addressed here. The presence of other hazardous material may make the material unacceptable.

13.1 Medical Radionuclides

Radioactive material that has been identified as a radionuclide used for medical or veterinary procedures and with a half-life of 65 days or less may be accepted for immediate processing. Some of the radionuclides currently used for medical procedures are listed in Table 1 “Medical Radioisotopes.”

13.2 NORM

NORM is Naturally Occurring Radioactive Material in its natural physical state, such as soil or rocks that have not been processed to increase the concentration of radioactive material and which does not meet the definition of TENORM. This material can be accepted without restrictions.

13.3 TENORM

TENORM is Technologically Enhanced Naturally Occurring Radioactive Material. It is naturally occurring radioactive material in which the concentration of radionuclides or the potential for human exposure has been increased above the levels encountered in the natural environment undisturbed by human activities. TENORM in items such as ceramics, refractory materials, welding rods, metal alloys, lamps, etc., that were not anticipated and are not included in the consumer items in section 13.5 may be accepted on a case by case basis with approval of the PA BRP.

TENORM from oil and natural gas well drilling activities is not normally sent to transfer facilities. If it is sent to a transfer facility, it may be processed under an approved Form U or other specific blanket authorizations from the PA BRP. Characterization of this material is not required beyond the requirements of the Form U. Radioactive tracers are sometimes added to the fracking fluid to evaluate the fracking operation. These radioisotopes, which can be present in the flowback, are licensed material and may not be processed for landfill disposal. Sealed radioisotope sources are used for well logging, but there is very little probability of these radioisotopes being present in the material sent to transfer facilities. Table 3 lists the major tracer and well logging radioisotopes. If any of these radioisotopes are found in material from well drilling activities, the PA BRP should be notified immediately for direction.

13.4 Potassium-40

Material in which the radiation source is ^{40}K can be accepted without restrictions. This radionuclide is naturally occurring and is a small fraction of all potassium atoms. It is normally present in the body in the normal equilibrium concentration of potassium and is a normal part of the diet. The presence of potassium in some materials might cause an Action Level One alarm, but, the concentration of ^{40}K, even in pure potassium, is too low to produce a significant external radiation hazard to personnel. Ingestion or inhalation of additional amounts will not significantly change the normal equilibrium concentration of potassium and will have little effect on the dose normally received by the body from this isotope.

13.5 Consumer Products

Radioactive material in license exempt consumer products, such as smoke detectors, lamps, watches, gun sights, tableware, welding rods, etc., may be accepted in quantities normally found in household waste. Larger quantities must be returned to the generator or manufacturer or disposed at a licensed radioactive disposal facility. Tritium signs may not be accepted and must be returned to the manufacturer or disposed at a licensed radioactive waste disposal site.

14.0 Rejection of Radioactive Material

The NEWT may decide not to process a load that has caused an Action Level 1 alarm and send it directly to a landfill for disposal or return it to the consignor. Interstate transportation of radioactive material is regulated by the Hazardous Material Regulations of the United States Department of Transportation (DOT). Pennsylvania has adopted the same regulations for intrastate transportation. These regulations contain requirements for packages, vehicles, and the training of drivers and persons authorizing shipments. The DOT has issued a Special Permit to exempt radioactive material that has been discovered in waste shipments from these requirements. The PA BRP is authorized to issue this Special Permit for waste shipments that have caused an alarm at a waste processing facility and must be returned to the place of origin or transferred to another site. The exemption may **not** be issued for waste loads for which any of the following conditions apply (Action Level 2):

The dose rate at the surface of the vehicle or on individual waste containers exceeds 50 mrem/hr.

The dose rate in the driver's compartment of the vehicle exceeds 2 mrem/hr.

There is removable contamination on the outside of the vehicle exceeding Table 9.

14.1 DOT Special Permit

If a DOT Special Permit is required, the form will be completed by the NEWT and submitted to the PA BRP regional office for approval. Upon receipt of an approved copy of the exemption, the NEWT will provide a copy of the permit to the driver with instructions on the destination for the shipment. According to Section 10 of the permit a current copy of the shipment approval document and special permit must be carried in the cab of the motor vehicle. The special permit number and “Radioactive” must be conspicuously marked on two opposing sides of the conveyance. The NEWT will keep a copy of the permit for its records for a reasonable period. A web address of the current DOT Special Permit DOT-SP 10656 approval form is included in the references. This form is subject to revision by the DOT and the current version, available on the PA BRP website, should be used.

14.2 Household Waste

The DOT Hazardous Material Regulations do not apply to household waste, so a DOT Special Permit is not required for loads of household waste. However, the PA DEP must approve such shipments. The PA DEP/PA BRP Exempt Material Transportation Approval Form for Household Municipal Waste must be submitted to the PA BRP and approved before the load of waste can be transported. The NEWT will provide a copy of the approved form to the driver with instructions on the destination for the shipment. The NEWT will keep a copy of the approved form its records.

14.3 Police Notification

If a driver leaves the NEWT with a load of waste that has initiated an Emergency Response without an approved DOT Special Permit or a PA DEP/PA BRP Exempt Material Transportation Approval Form for Household Municipal Waste the NEWT will notify the Pennsylvania State Police of the violation with a description of the vehicle and any additional information that would assist the police.

15.0 Qualifications

This Plan was prepared by Eric S. Krage in accordance with the PA DEP Technical Guidance Document, Document 250-3100-001 (R2004). His qualifications meet the requirements for persons preparing a Radiation Protection Action Plan as specified in Appendix D of the technical guidance document. Dr. Krage has been certified in comprehensive health physics practice by the American Board of Health Physics since 2018.

Table 1

RADIOACTIVE ISOTOPE INFORMATION

Radioactive Material*	Half-life Days	Release Limit* mCi	Gamma Factor** mSv/hr 1 MBq @ 1 m	Gamma Factor** R/hr 1 mCi @ 1 cm	Major Gamma Ray Energies keV (emission fraction)
Radioisotopes used for nuclear medicine with half-lives less than 65 days					
Ag-111	7.45	520	5.33E-06	0.15	245 (0.012), 342 (0.067)
Au-198	2.696	93	7.88E-05	2.30	412 (0.955)
At-211	0.30		6.12E-05		77-79 (0.34), 90 (0.095), 687 (0.0025)
Bi-213	0.03		3.14E-05		440 (0.28), 77-79 (0.033)
Ca-47	4.53		1.58E-04	5.70	489 (0.067),808 (.069), 1,297(0.749)
Fe-59	44.63		1.79E-04	6.40	143 (0.01), 192 (0.03), 1,099 (0.565) , 1,292 (0.432)
Cr-51	27.7	130	6.32E-06	0.16	320 (0.0983)
Cu-64	0.53	230	3.57E-05	1.20	511 (0.357), 1346 (0.0049)
Cu-67	2.58	390.00	2.36E-05	0.58	93 (0.161), 185 (0.487)
Ga-67	3.26	240.00	3.00E-05	0.75	93 (0.357), 185 (0.197), 300 (0.16)
Hg-197	2.67		1.87E-05	0.40	67 (0.207, 69 (0.354), 77 (0.185), 78 (0.155)
Hg-203	46.60		6.84E-05	1.30	70.8 (0.047), 72.9 (0.084), 82.6 (0.036), 279 (0.773)
I-123	0.55	160	7.48E-05	1.61	31 (0.16), 159 (0.834),
I-125	60.14	7	7.43E-05	1.42	27-35 (1.44)
I-131	8.04	33	7.65E-05	2.20	284 (0.061), 364 (0.812), 637 (0.073)
In-111	2.83	64	1.36E-04	3.21	171 (0.902), 245 (0.94)
In-113m	0.07		6.57E-05		24-27 (0.24), 392 (0.649)
K-42	0.52		3.87E-05	1.40	1,525 (0.179)
K-43	0.94		1.81E-04	5.60	221 (0.041), 373 (0.873), 397 (0.114), 593 (0.11), 617 (0.805)
Lu-177	6.71		7.64E-06	0.09	208 (0.11), 113 (0.064), 55-63 (0.057)
Na-24	0.63		5.24E-04	18.40	1,369 (1.0), 2.754 (0.999)
Pd-103 implant	16.96	40	6.22E-05	0.87	20-23 (0.69), 360 (0.0003)
Re-186	3.78	770	4.91E-06	0.20	61-63 (0.032), 137 (0.095)
Re-188	0.71	790	1.09E-05	0.26	155 (0.15)
Sc-47	3.42	310	2.17E-05	0.56	159 (0.68)
Sm-153	1.95	700	2.44E-05		41-47 (0.61), 70 (0.052), 103 (0.283)
Sn-117m	13.61	29	6.80E-05	1.48	159 (0.864)
Sr-87m	0.12		8.01E-05		388 (0.823)
Tc-99m	0.25	760	3.32E-05	0.76	141 (0.891)
Tl-201	3.04	430	2.37E-05	0.45	69-70 (0.74), 80 (0.205), 135 (0.0265)
Xe-127	36.41		9.33E-05		58 (0.014), 145 (0.042), 172 (0.22), 203 (0.65), 375 (0.20)
Xe-133	5.25		2.78E-05	0.10	30.6 (0.136), 31.0 (0.253), 35 (0.09), 81 (0.365)
Yb-169	31.97	10	8.84E-05	1.83	110 (0.174), 131 (0.11), 177 (0.214), 198 (0.349), 308 (0.108)
Other radioactive isotopes					
Am-241	432.2 yr	N.A.	8.48E-05		60 (0.40)
Ba-133	10.5 yr	N.A.	1.23E-04	2.40	360 (0.74), 292 (0.26), 81 (0.32)
Co-57	270.9 day	N.A.	4.09E-05	0.90	14.4 (0.095), 122 (0.855), 136 (0.106)
Co-58	70.8 days	N.A.	1.66E-04	5.50	811 (0.994), 511 (0.299)
Co-60	5.3 yr	N.A.	3.70E-04	13.20	1173 (1.0), 1333 (1.0)
Cs-137/Ba-137	30.17 yr	N.A.	1.03E-04	3.30	662 (1.0)
Gd-153	241.6 day		4.66E-05		69.6 (0.08), 97.5 (1), 103.2 (0.75)
Ir-192 implant	74.02 day	2	1.60E-04	4.59	218 (0.019), 230 (0.018), 238 (0.045), 303 (0.019)
K-40	1.28E9 yr	N.A.	2.21E-05		1460 (0.11)
Kr-85	10.7 yr	N.A.	4.23E-07	0.04	517 (0.004)
Mo-99	2.80 day	N.A.	3.05E-05	1.80	141 (1.0), 181 (0.11), 741 (0.11)
Na-22	2.6 yr	N.A.	3.62E-04	12.00	1,276 (0.99), 512, 1,787 (sum)
Pb-210	22.3 yr	N.A.	6.80E-05		10.8 (0.243), 46.5 (0.041)
Ra-226/Pb/Bi-214	1600 yr	N.A.	3.17E-04	8.25	186 (1.0), 242 (0.20), 295 (0.55), 352 (1.0), 609 (1.0), 1120 (0.77)
Ru-106/Rh106	1.020 yr		3.73E-05	1.70	512 (0.206), 622 (0.098), 1,051 (0.017)
Se-75	120 day	2	2.32E-04	2.00	121 (0.167), 136 (0.592), 265 (0.598), 280 (0.252), 401 (0.114)
Sr-85	64.84 day		2.05E-04	3.00	514 (0.993)
Th (nat)	1.4E10 yr	N.A.	N.A.	N.A.	96, 238, 583, 911-968
U(nat)	4.5E9 yr	N.A.	N.A.	N.A.	74, 184, 242, 295, 352, 610, 770, 1120, 1380, 1760

*NRC Regulatory Guide 8.39, April 1997 and http://www.medicinescomplete.com/mc/current/Radioisotopes used in Medical Diagnosis.pdf

**Handbook of Health Physics and Radiological Health, 3rd ed. 1998 and Radiological Health Handbook, US FDA, 1970

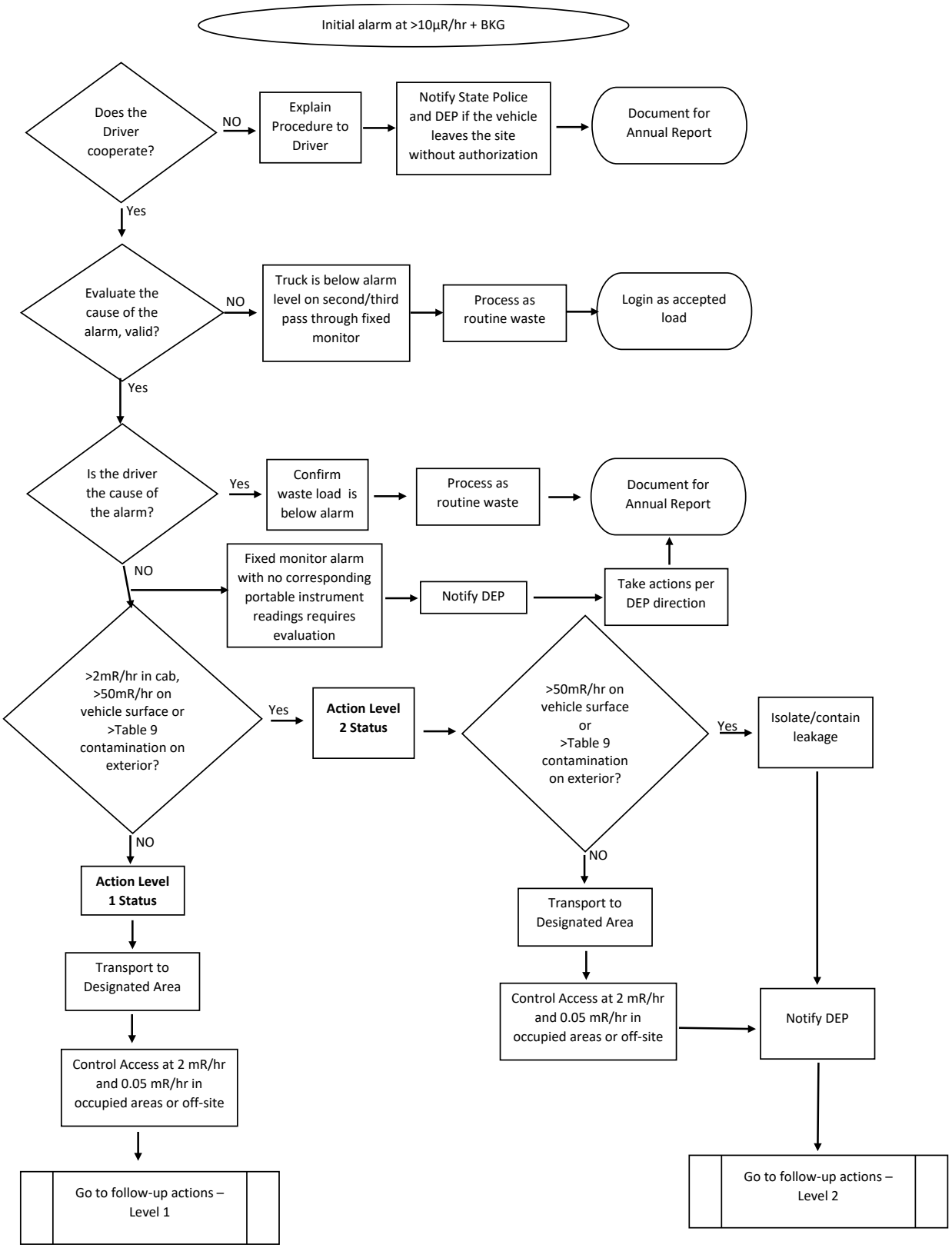
Table 2. Naturally Occurring Radioactive Material

Uranium 238 Series			Thorium 232 Series		
Nuclide	**Half-life**	**Decay Mode**	**Nuclide**	**Half-life**	**Decay Mode**
U-238	4.5E+9 years	Alpha	Th-232	1.4E+10 years	Alpha
Th-234	24 days	Beta-gamma	Ra-228	5.8 years	Beta-gamma
Pa-234	1.2 minutes	Beta-gamma	Ac-228	6.1 hours	Beta-gamma
U-234	2.4E+5 years	Alpha	Th-228	1.9 years	Alpha
Th-230	7.7E+4 years	Alpha	Ra-224	3.6 days	Alpha
Ra-226	1.6E+3 years	Alpha	Rn-220	55 seconds	Alpha
Rn-222	3.8 days	Alpha	Po-216	0.15 seconds	Alpha
Po-218	3.1 minutes	Alpha	Pb-212	11 hours	Beta-gamma
Pb-214	27 minutes	Beta-gamma	Bi-212 64%	61 minutes	Beta-gamma
Bi-214	20 minutes	Beta-gamma	Po-212	3.0E-7 seconds	Alpha
Po-214	1.6E-4 seconds	Beta-gamma	Bi-212 36%	61 minutes	Alpha
Pb-210	22 years	Beta-gamma	Tl-208	3.1 minutes	Beta-gamma
Bi-210	5 days	Beta-gamma	Pb-208	Stable	
Po-210	140 days	Alpha			
Pb-206	Stable				
Other					
K-40	1.3E+9 years	Beta-gamma			
Rb-87	4.8E+10 years	Beta			

Table 3. Radionuclides Used in Well Logging and As Tracers

Well Logging			Radiotracers		
Nuclide	**Half-life**	**Decay Mode**	**Nuclide**	**Half-life**	**Decay Mode**
Cs-137	30 years	Beta-gamma	Na-24	15 hours	Beta-gamma
Am-241/Be	432 years	Alpha-neutron	Cr-51	27.7 days	Gamma
Cf-252	2.65 years	Alpha-neutron (fission)	Rb-86	18.7 days	Beta-gamma
			I-131	8.019 days	Beta-gamma
			Xe-133	5.24 days	Beta-gamma
			Sc-46	83.8 days	Beta-gamma
			Sb-124	60.2 days	Beta gamma
			Ir-192	73.8 days	Beta-gamma

FLOWCHART OF RECOMMENDED IMMEDIATE ACTIONS FOR A SOLID WASTE FACILITY RADIATION ALARM



FLOWCHART OF RECOMMENDED FOLLOW-UP ACTIONS FOR A SOLID WASTE FACILITY RADIATION ALARM