ACTION PLAN FOR RADIOACTIVITY MONITORING

BETHLEHEM LANDFILL COMPANY
Lower Saucon Township, Northampton County

DEP Operating Permit No. 100020

Last Updated: July, 2019

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I. Background

A. Purpose of Plan

1. To properly respond to levels of radioactive material in solid waste that trigger radiation monitor alarms set at a level no higher than 10 μR/hr above an average background at the facility.
2. To designate responsible individuals that are qualified to respond to situations described above.
3. To designate the proper instrumentation to use during response to situations described in A-1
4. To describe the required records that must be kept during response to situations described in A-1.
5. To ensure that personnel exposure from the RAM is "ALARA" (as low as reasonably achievable).
6. To ensure that the ultimate disposal of the RAM follows the applicable State/Federal Regulations (this includes preventing unauthorized releases of RAM).
7. To specify the portable and fixed RAM detectors to be used, the conditions of use, and the technical specifications for each detector (including determination of background).
8. To specify the required training for all persons involved in this Action Plan.

B. General

The following is an excerpt from the Pennsylvania Department of Environmental Protection's (PADEP) Guidance Document on Radioactivity Monitoring at Municipal and Residual Waste Processing and Disposal Facilities.

"Almost everything in our world contains small amounts of radioactive material, and emits radiation. Most radiation found in the environment comes from NORM and cosmic radiation with the remainder coming from medical and industrial uses of radioisotopes, from the manufacture and testing of nuclear weapons, and from nuclear power plants. **Most of the alarms experienced on monitors in the municipal waste stream in Pennsylvania have been from short-lived isotopes usually used in medical procedures.** Currently, it is not possible to say if these medical isotopes are getting into the waste stream directly from the medical facilities via contaminated items getting into general trash by mistake, or from contaminated items discarded at home in municipal waste by patients who have had nuclear medicine procedures and been discharged from the treating facility. Other credible routes to the waste stream include contaminated items being discarded in regular trash containers by mistake at laboratories, colleges, or industrial facilities, misplaced encapsulated sources, and construction, residual or industrial waste containing NORM".

C. Medical Uses

"The Department expects that those who are licensed to handle radioactive materials will maintain strict controls relative to the use and disposal of the material and will take appropriate actions to prevent unauthorized releases of radioactive materials. Nonetheless, even for licensed radioactive materials, by NRC and State regulations, once isotopes have been administered to patients, they are no longer regulated and patients can be discharged from the treatment facility once the amount of isotope in the patients body is below levels specified in the latest version of U.S. Nuclear Regulatory Commission Regulatory Guide. Even the amount of isotope used for diagnostic tests or radioactivity retained on items touched by patients may emit enough radiation to set off a facility monitoring alarm".

D. Commercial Uses

"Additionally, there are a number of consumer and industrial items in general use that are distributed under general license; that is, the fabricator or distributor must be licensed but the individual owner/user does not have a specific license. Examples include some types of smoke detectors, luminous watches or clocks, thickness gauges, and many others. Some of these things, like smoke detectors and some luminous devices can be legally discarded in municipal waste landfills and others are supposed to be resumed to the manufacturer for disposal. The NRC is presently considering requiring registration and inventory of higher activity generally licensed devices".

E. Action Plan

This plan was generated utilizing the PADEP Guidance Document, 250-3100-001, dated September 2000. Bethlehem Landfill will utilize a health physicist consultant to assist in the implementation of this plan. The implimentation phase will include the development of detailed policies and procedures to support the radiation monitoring program and will include the detailed training necessary for the initial execution by Bethlehem Landfill personnel.

F. Action Plan Amendments

All amendments to the plan will be reviewed and approved by DEP prior to implementation.

II. Monitoring and Detection of Radioactive Material

A. Plan Implementation

The District Manager or the designated on-duty operations manager is responsible for the implementation and execution of the plan. All involved personnel will receive annual training with regard to their respective roles. At a minimum this will include the fundamentals of radiation and radiation safety, the operation of the monitoring instrumentation, including periodic operation/calibration checks and all aspects of the plan. Details of training are found in Section Xll . The written alarm procedures will be clearly posted in the scale house. Furthermore, all of Bethlehem Landfill customers will be notified of the existence of radioactivity monitors at the landfill and will be provided with instructions should their load trigger an alarm at the site. The exposure limits outlined in Guidance Document on Radioactivity Monitoring at Municipal and Residual Waste Processing and Disposal Facilities will be followed for all potentially exposed individuals for the implementation of this plan.

B. Equipment

The instumentation described below will be purchased and installed for implemenation of the radioactive material detection program. If replacement instrumentation is required, only similar/ equivalent instruments will be used. All radioactive sources used to perform response checks of the instrumentation shall be stored in a secure location.

a. Vehicle Monitors

High quality NaI or plastic scintillator detector systems designed to monitor vehicles for radioactive material shall be used. The system will provide the state of the art sensititivity for detection of radioactive material. It will utilize a micro-processor based electronics system that will continually monitor background and provide automatic background subtraction for "floating" alarm setpoints. If the vehicle monitoring systme is "out of service" for any reason, then vehicles may be monitored with the hand held units.

The detectors will be shielded in order to maintain background levels below 10 μR/hr above background, using a Cs-137 gamma source as a reference and set to detect 50KeV, and higher energies. They will be placed as close as practical and arranged in a geometry to optimize the radiological monitoring of the load.

The system will undergo annual calibrations. Daily source response checks will be performed on site, using a Cs-137 check source. The source check will be performed per the manufacturer's recommendations.

Hand-held Instruments

1. **Survey Meters**

   These response kits utilize a microprocessor based rate meter/scaler. These units shall have a minimum detection capability to include between 10μR/hr to 100 mR/hr. The instrument is calibrated with two separate external detectors, including a pancake G-M and a NaI detector. The instrument can be switched from rate meter to scaler mode to facilitate going from dose rate surveys to wipe/smear counting as it is being used.

   The unit has a four-digit LCD display and is auto-ranging. It also has Alert and Alarm levels, and other paramenters that can be set from an internal switchard.

   The G-M detector can be equipped with an extendable handle to facilitate surveys of trucks or locating sources in the waste load. A long handle can be used with the NaI detector for truck surveys in order to eliminate the need for ladders.

   Radiation survey instruments shall be calibrated at intervals not to exceed one year. Survey equipment will be response checked prior to each use.

   Calibrations shall be performed: by the manufacturer or directly by a contract service.

   Dose rate and count rate calibrations shall be performed by a method following the general guidance provided in regulatory documents, utilizing a NIST-traceable Cs-137 source, and only by a service working under the authority granted by the USNRC or other applicable state agencies for that purpose.

2. **Portable Multi-Channel Analyzer (MCA)**

   The portable MCA will be used for isotopic identification. It uses a NaI detector and has an internal library to identify most commonly expected isotopes. The library is expandable to accommodate other isotopes found or considered to be needed in the library.

   The portable MCA also has a dose rate function. It can be used as a backup survey meter and will be calibrated for that purpose as well. The manufacturer will perform the annual calibrations.

III. Short Lived RAM Waste Disposal Blanket Application

Bethlehem Landfill Company hereby applies for a Blanket Approval to dispose of <65 day half life RAM under the following conditions:

1. The source is identified by gamma spec with a half life as a nuclide listed in Appendix B of DEP Guidance DOC:250-3100-001.
2. The above information is documented.
3. The RAM is deposited in the Bethlehem Landfill, following the PA State Approved Procedures.

IV. Small Quantity TENORM & NORM Waste Disposal Blanket Application

Bethlehem Landfill Company hereby applies for a Blanket Approval to dispose of NORM or TENORM under the following conditions:

1. The source is identified by gamma spec as NORM or TENORM.
2. The NORM containing natural abundance K-40 compounds has no processing or disposal restrictions.
3. The NORM from the undisturbed natural environment (cover soil or rock) has no disposal restrictions.
4. The TENORM volume is not >1 cu ft. and does not contain >5 pCi/gr of combined Ra isotopes.
5. The above information is documented.
6. The RAM is deposited in the Bethlehem Landfill Company following the PA State approved procedures and includes specific approval from the DEP Health Physicist for incidents of TENORM disposal.

V. Disposal of Consumer Products Containing RAM

Bethlehem Landfill hereby applies for a Blanket Approval to dispose of RAM Consumer Products under the following conditions:

1. The source is visually identified as a consumer product such as a smoke detector, watch, uranium glaze ceramic, welding rods, or other Thorium alloy, and IS NOT an aggregate quantity of consumer items. No aggregate quantities of consumer items shall be disposed of.
2. EXIT signs containing RAM may not be buried. They will be returned to a licensed manufacturer for recycling or shipped for proper low level radioactive waste disposal.
3. The above information is documented.
4. The RAM is deposited in the Bethlehem Landfill following the PA State Approved Procedures.

VI. Environmental Assessment & Pathways Analysis

A special Environmental Assessment or Radionuclide Pathway Analysis will only be performed at the specific request of DEP BRP.

VII. Action Plan - Detection of RAM at Bethlehem Landfill

A. Level One Alarm

If the alarm level is exceeded, the Weighmaster may immediately divert the truck to the staging area for the initial survey or have the vehicle drive past the monitors a second time at less than 5 MPH. If the alarm is repeated, the responsible Bethlehem Landfill employee will direct the driver of the truck containing the suspect load to the dedicated staging area indicated on Attachment #1 and the truck will be detained and the subsequent steps will be followed. If alarm is NOT repeated, the truck should be monitored a third time. If no alarms is triggered, two out of three times, the load may be disposed of in a normal manner.

If the driver leaves with the vehicle before the vehicle can be isolated, Bethlehem Landfill will contact the Pennsylvania State Police and provide them all possible information regarding the vehicle. Bethlehem Landfill will also immediately contact the PA-DEP. A complete contact list is included in Attachment #2.

The dedicated staging area will be immediately quarantined and all personnel, including the driver, will be removed from the area. The staging area is situated to create an isolation distance of 10 feet from vehicles parked within.

Bethlehem Landfill's designated trained personnel or consultant will be notified. Designated trained personnel shall be on site and qualified to perform an initial survey to determine and set the proper isolation distances. In the event that trained personnel are not available on site a consultant will be contacted and respons to the site prior to the end of the business day. In addition, Lower Saucon Township will also be contacted. The weighmaster will remain in the scalehouse to monitor other incoming vehicles and contact Bethlehem Landfill's designated personel to direct, survey and characterize the waste. An initial investigation will be conducted as described below. All necessary precautions to ensure workers safety will be conducted prior to surveying the vehicle. Only one vehicle at a time will be surveyed.

An initial investigation survey will be conducted as follows:

Initial Investigation Survey

1. The Bethlehem Landfill Company designated trained personnel or consultant will survey the outside of the vehicle at a distance of 5 cm with a portable survey meter. Chalk, tape, marker or other means will be used to mark the area with the highest dose.

2. A representative wipe sample will be taken and analyzed for loose contamination.

3. If surveying the vehicle with a portable survey meter at 5 cm fails to reveal the presence of radioactive material; the driver will be scanned with a portable survey meter to determine if the driver has triggered the alarm.

4. If the inspection indicates the driver himself has triggered the alarm because of having received medical treatment, then another driver will drive the truck back through the monitors. If no alarm occurs, then no further action under this guidance document is necessary. This detected RAM alarm will still be documented even though the source of the alarm was the driver. Otherwise, if RAM (Radioactive Material) is determined to be in or on the vehicle, the following action will be taken.

    a. Immediately document the incident.

    b. If the exposure rate indicated by the portable survey meter at a distance of 5 cm from the truck exceeds background + 10 microR/hr, but is less than 50 mR/hr above background, caution tape or rope and appropriate radiation caution signs will be placed at the 2 mR/hr boundary.

    c. The radioisotope(s) involved will be characterized through the use of gamma spectroscopy. (To the extent that off-loading of part or all of the waste is deemed necessary for proper characterization, the procedures within Section VlIl of this plan will be followed.)

    With the radioisotope identified, at this juncture, landfill management may execute the following options:

        (1) Landfill Disposal - If the truck meets Action Level One criteria based upon the survey results and is a short lived isotope from a medical procedure, NORM or TENORM, or from a consumer product for which, through this plan and related application, blanket approvals have been permitted (as outlined in Section V or Vl), and IS NOT RAM controlled under specific or general license or order authorized by any federal, state, or other government agency, the waste may be accepted for disposal or,

        (2) Return Load to Generator – With the load secured, Bethlehem Landfill will then notify the PA-DEP and request from the PA-DEP a PA-DOT Exemption

Form signed by the Department's Area Health Physicist. Upon receipt of a properly filled out and authorized PA-DOT Exemption Form, the truck may be released from the site to be returned to its point of origin for further characterization. **NOTE**: **The driver must carry the signed PA-DOT Exemption Form with him.** Prior to the release, Bethlehem Landfill will stamp the original manifest to indicate that the load was rejected from Bethlehem Landfill due to the presence of radioactive materials. In the event that the load does not have a manifest a form will be provided, stamped by the site indicating the reason for rejection of the load.

Bethlehem Landfill will retain a copy of the DOT Exemption Form to include with the incident documentation.

For loads indicating dose rates equal to or greater than 2 mR/hr in the cab and/or 50 mR/hr above background on the vehicle and/or the presence of contamination, Bethlehem Landfill. will conduct the steps outlined in Action Level Two.

B. **Action Level Two**

For waste that has measured dose rates equal to or greater than 2 mR/hr in the cab and/or 50 mR/hr above background on the vehicle and/or the presence of contamination (defined as 2,200 dpm/100 cm^2), Bethlehem Landfill will notify the PADEP Area Health Physicist immediately. Bethlehem Landfill will take the following steps:

For loads indicating dose rates equal to or greater than 2 mR/hr in the cab and/or 50 mR/hr above background on the vehicle and/or the presence of contamination or if such levels are detected during characterization per Action Level One, Bethlehem Landfill will notify the PA-DEP Area Health Physicist immediately. Access to the area adjacent to the load will be controlled by personnel and/or standard radiation ropes and signs, as appropriate, in order to prevent inadvertant entry into areas of 2 mR/hr, or greater. The ability to further isolate and identify the source will be discussed with PA-DEP.

VIII. <u>RAM Characterization Procedures (if off-loading is necessary)</u>

All vehicles that activate the radiation detector alarm will be directed to the dedicated staging area and quarantined until such time as a Bethlehem Landfill trained personnel or consultant arrives. Upon arrival, the following process will be followed only if it is deemed necessary to off-load waste to properly characterize the RAM. The off loading of waste will occur in the vicinity of the working face at an isolated distance. The area will be marked and roped off similar to the staging area requirement.

Radionuclide Identification.

The radioisotope(s) involved will be characterized through the use of gamma spectroscopy. An initial attempt will be made to perform gamma spectroscopy from the outside of the vehicle in order to have

this information available for DEP when the notification is made. To the extent that off-loading of part or all of the waste is deemed necessary for proper characterization,this would first be discussed with DEP and then the following steps will be followed.

A. Surveys

The vehicle will be surveyed with a portable survey meter set at the most sensitive setting and holding the survey meter no more than two inches (5 cm) from all vehicle surfaces. Areas where radioactivity levels exceed alarm set points will be marked.

If the exposure rate on the vehicle does not exceed 50 mR/hr above background begin surveying the individual waste containers (if waste is containerized). If the waste is not containerized, a laydown area may be established by laying down a clean plastic sheet, sized to allow the entire load to be dumped from the truck. The individual conducting the survey will systematically scan the waste to identify the radioactive constituents.

NOTE: If the exposure rate from the vehicle or any container exceeds 100 mR/hr at any time during unloading/scanning of the waste, Bethlehem Landfill or the consultant will stop the removal or scanning of the waste, remove personnel from the area, maintain a controlled area boundary at the 2mR/hr distance, and call the PADEP if they are not already present on-site.

If the waste is containerized, individual waste containers (if contaminated) will be removed from the vehicle and surveyed with a survey meter. During this process, the surveyor will be looking for signs and container labels that might identify the radioactive material or other hazards and the point of origin.

B. Separation of the RAM from the Load

If the waste is in bulk form, it will be removed until the estimated location of the contamination is approached. Bulk waste will be surveyed with the low level portable micro-R meter. If the source of the contamination is located, an attempt to separate uncontaminated waste from the waste containing the contamination will be made, provided that it can be done without jeopardizing the health and safety of workers. The contaminated waste, which includes all waste that is equal to or greater than 10 microR/hr above background, will be placed in an area where it can be stored safely and in a manner that protects against environmental contamination until the method of disposition is determined.

A roll-off container, drum or other appropriate container will be provided for such storage depending upon the nature of the waste. The area(s) where radioactive material is placed will be roped off or otherwise secured to prevent persons from entering these areas where the general area dose rate exceeds 2 mR/hr, and labeled with appropriate signs. The designated landfill

personnel or the consultant, in accordance with regulations, governing such waste, will monitor to insure when proper disposal can take place.

If radioactive material is not detected in any of the waste containers or in the bulk waste, the exterior of the empty vehicle will be surveyed. The areas on the vehicle where radiation levels exceed background will be marked, as the transport vehicle itself may be the source of the radiation.

C. Radioactive Contamination

All surfaces in contact with the RAM will be smeared to verify the presence of RAM contamination. All contamination must be cleaned below applicable levels, typically 1,000 dpm/100 cm^2. Cleaning material used will be considered RAM and will be stored/processed appropriately.

IX. Determining the Origin of the Waste

During the characterization and removal of material, all efforts to determine the radioactive material's place of origin will be made. Facility staff involved in the implementation of this program and specifically in determining the origin of the waste will have dose assessments conducted on them on an as need basis by a health phyisicst consultant. In addition DEP shall review/approve any revisions to this plan prior to implimentation.

X. Disposition of Waste

The radioactive waste that has been characterized at Bethlehem Landfill per section Vll above will be disposed of in accordance with the requirements of all applicable local, state and federal regulations, and at properly permitted disposal facilities. The radiation level, the type and amount of waste involved, the radioactive material present in the waste and the form in which the radioactive material is present will be considered when choosing the proper disposal option. Please note that at no time during this process will Bethlehem Landfill accept title to such waste or represent itself as the generator of the material.

Xl. Recordkeeping

The records required shall include the following:

1. Detector Source Response Log., as well as Annual Vehicle Detector Calibration.

2. Annual Calibration of all Radiation Survey Meters.

3. Daily Operations Record listing all radioactivity monitoring

The Daily Operation Record will include the following information:
(a) Date, time and location
(b) Brief narrative
(c) Specific information on origin
(d) Description of RAM
(e) Name, address and telephone numbers of suppliers or handlers of RAM and name of driver
(f) Final disposition

The Daily Operation Record will be maintained on site and has not been included as a part of this plan due to future format changes.

4. A copy of any DOT Exemption Form provided by PADEP.

5. An updated copy of this Action Plan.

6. Training and Retraining Records.

7. Annual Operation Report

The annual operation report shall be submitted on a form supplied by the DEP and shall include a record of all detected RAM.

All records described above will be retained for at least 3 years.

XII. Training

Training will be conducted by a health physicist consultant, properly trained employee or other consultant. Training will be conducted prior to the implementation of the radioactivity monitoring plan. Training will be conducted initially with refresher training conducted on an annual basis. All employees will be provided with a basic training program, however only landfill personnel directly involved with the implementation of the radioactivity monitoring will be involved in the intermediated and advanced training.

A. Basic Training

This training is designed to familiarize all individuals with the basic fundamentals of radiation. It provides a basic understanding of the requirements to monitor radioactive material in waste streams. It also addresses the fundamental concepts of radiation, radioactive material decay and half-life. It addresses radiation biology and risk. It discusses the naturally occuring and man-made sources of radiation and how they may become part of the waste stream.

B. Intermediate Training

The prerequisite is Basic Training. This training is designed to build on the concepts presented in the Basic Training class. It includes background information on the applicable regulatory agencies. And their relative roles. It addresses in much more detail, the requirements outlined in DEP Guidance Document 250-3100-001. It covers the facility set-up and implementation of the monitoring program. It describes the appropriate responses to the expected alarm conditions. The class includes instruction in the recognition of common potentially radioactive sources and the "radiation symbols" used to mark those materials. Facility operational staff will be trained to visually monitor waste during transfer or unloading for the potential presence of RAM. It describes the actual instruments being used at the facility. Some hands-on time with the instruments is included while students work with the concept of units of measure.

C. Advanced Training

The prerequisite classes are Basic and Intermediate Training. This class is a pratical exercise utilizing skills gained in the previous two classes and the procedures prepared for the facility's radioactivity monitoring plan. It will include responding to alarms, determining Action Levels, collecting the appropriate equipment to perform an initial survey of the truck and driver and performing the full survey, monitoring and actual waste load as if it contained source material, and completing the associated recordkeeping, and data sheets. It will include individuals normally available at the site on a daily basis, who are able to respond to alarms in a timely manner.

XIII. Implementation Schedule

This Plan was approved in the general MSW permit dated April 13, 2003. This update supecedes all previous monitoring plans

ATTACHMENT 1

INCLUDE SITE MAP

ATTACHMENT 2

Radiation Monitoring Alarm Response Proceedure for Scale Attendants:

1) **DO NOT** weigh the vehicle into the computer system.
2) Tell the driver that the alarm went off and ask the driver if he has had any recent medical treatment that may have included nuclear medicine (heart treatment, chemotherapy).

a. If yes, have another driver drive the truck through the detector (2) more times. If the alarm does not sound, the load may be disposed of normally (2 negative, 1 positive).
b. If no, have the driver drive the truck through the detector again. If the alarm does not go off, send the truck through the detector a third time. If the alarm does not go off a second time, the load can be disposed of normally (2 negative, 1 positive).
c. If the alarm goes off 2 out of 3 times, direct the driver to take the vehicle to the Vehicle Inspection Area (towards the drop-off bins, DO NOT block the bins) and instruct the driver to remain in the vehicle.

3) Contact Bethlehem Landfill personnel below. If the driver refuses to stay on-site and leaves with the load, IMMEDIATELY call the State Police with the identification of the truck. ALL VEHICLE INSPECTION FORMS NEED TO BE SENT/FAXED TO DEP WASTE MANAGEMENT PROGRAM.

BETHLEHEM LANDFILL COMPANY CONTACTS:

Astor Lawson	Work:	610-317-3200
District General Manager	Cell:	805-471-7948
David Pannucci	Work:	610-317-3200
Regional Engineer	Cell:	585-703-4952
Cody White	Work:	610-317-3200
Landfill Gas Tech	Cell:	610-390-5536

BETHLEHEM LANDFILL CONSULTANTS:

Kevin Bodner	Work:	717-264-6759
Martin & Martin	Cell:	717-729-2009
Health Physicist(s)		
Jim Fongheiser	Work:	610-431-4027
	Cell:	610-745-6901

DEP CONTACTS:

DEP Bureau of Radiation Protection	(P) 484-250-5900 (24 hr)
Terry Derstine	(P) 484-250-5950
Ken Hoffman	(F) 484-250-5951
Radiation Health Physicist Michael Cosgrove	484-250-5950
DEP Northeast Regional Office (ALSO Non-business Hours- EMERGENCY)	570-826-2511
DEP Bethlehem District Office	610-861-2070

POLICE:

Lower Saucon Township Police	610-330-2200
PA State Police	610-268-2022 (Bethlehem)
Emergency	911

TOWNSHIP:

Lower Saucon Township	610-865-3291