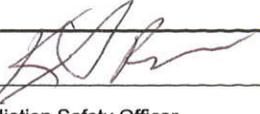


Approved by:		
	General Manager	Radiation Safety Officer

STANDARD OPERATING PROCEDURE

15.OPS.11

ROUTINE CONTAMINATION SURVEYS

1.0 OBJECTIVE

To define general and specific methods and procedures for conducting routine surveys for radioactive contamination at the Clean Harbors Deer Trail (CHDT) landfill or other job sites.

2.0 SCOPE

This standard operating procedure (SOP) addresses the performance of routine contamination surveys to determine and document ambient radiation and contamination levels in locations around and within the CHDT landfill and to evaluate if controls are necessary when performing routine maintenance or other tasks that could encounter radioactive materials. This standard operating procedure (SOP) does not apply to special or emergency situations.

3.0 POLICY

Contamination surveys will be in areas potentially impacted by radioactive materials on a routine basis to identify contamination issues and verify that worker exposure is maintained as low as reasonably achievable (ALARA). In addition, routine contamination surveys that demonstrate an absence of contamination will serve to demonstrate the effectiveness of contamination control methods and will be used as a baseline of surface radioactivity levels if a contamination event is suspected.

4.0 RESPONSIBILITIES

Responsibilities of the CHDT Radiation Safety Officer (RSO), management, and staff are defined in the CHDT Radiation Protection Plan (DR.RPP.01).

5.0 GENERAL SURVEY METHODS

Direct surveys may be conducted using a Ludlum Model 44-9 Geiger Mueller (GM) "pancake"-type probe with Ludlum Model 3 survey meter (or equivalent) for surface beta-gamma measurements; a Ludlum 43-93 alpha-beta scintillation detector with Ludlum 2360 survey meter (or equivalent) for surface alpha-beta measurements; a Ludlum Model 19 (or equivalent) for ambient exposure rate measurements; a Ludlum Model 193-6 Survey Wand (or equivalent) for large area gamma scanning measurements; or any other radiation measuring instrument appropriate for the task. Equipment surveys will be supported by smear sample analyses for removable radioactivity using the Ludlum 3030 alpha-beta sample counter (or equivalent).

5.1 Pre-Survey Instrument Check List

Prior to use of any field instrument, the operation of the probe and survey meter used shall be checked using the following general procedure. Specific direction is provided in the SOP for each individual instrument.

- Check Batteries
 - Turn the switch to “BAT” or flip the “BAT” switch to “ON.”
 - The needle on the meter face should move to a position within or beyond the indicated area on the meter scale.
 - Replace batteries if needed before use.
- Check Count Rate Meter Speaker
 - Turn the audio switch, if present, to ON.
 - Set the Fast-Slow toggle switch to the F position (for fast response).
 - Set the count rate meter scale to X1.
 - The rate meter should “chirp” or “click.”
 - If the speaker does not function, the survey meter can be used, but the survey technician will need to check the meter reading or display frequently.
- Background Check
 - Conduct background check during daily quality control (QC) measurements.
 - On most instruments, the background count rate is observed when the survey meter scale is set to the lowest scale setting – X0.1 or X1.
 - Prior to conducting surveys, verify background at that location.
 - Most surveys rely upon the technician to identify contamination above background. Therefore, *the survey technician must have a strong understanding of what background is for the instrument being used.*
 - Do not use the meter if it does not register a background reading.
- Source Check
 - Conduct source check during daily QC measurements.
 - Use the same source in the same geometry for all QC measurements.
 - The technician should be familiar with the detector response to a source.
 - Do not use the instrument if the QC falls out of requirements.

5.2 Routine Contamination Surveys

Routine contamination surveys will be performed to verify the absence of contamination in high-traffic portions of the site, areas where eating, drinking, or washing may occur, or other areas

that may be susceptible to cross contamination. Routine surveys shall be recorded in ink on appropriate survey forms, which shall document the following:

- Time and date of the survey
- Technician(s) performing the survey
- Instrument(s) used, with serial number, calibration due date
- Measurement locations, with pictures or drawings as necessary
- Background and efficiency information for the instruments, as appropriate
- Raw measurements, including measurement type and count time (if necessary)

Where necessary, surveys may be documented in a field logbook in the absence of a survey form. Pictures or drawings of equipment, vehicles, or frequently surveyed items may be electronically inserted into the survey form to facilitate documentation. For frequent routine surveys, specific survey forms may be developed by the CHDT RSO or designee to facilitate data collection.

5.3 Routine Survey Frequency

The frequency of routine surveys will be dependent on the frequency of radioactive material receipt at the CHDT landfill. Surveys will be conducted according to the frequencies listed in Table 1. A minimum of five locations (subject to each of the measurements indicated) will be required for each area in Table 1.

Table 1. Frequency of Routine Contamination Surveys

Area	Minimum Survey Frequency	Survey Type
Disposal cell, before and after installation of daily cover	Daily during radioactive materials emplacement	Exposure rate (Ludlum 193-6 or Model 19) or gamma
Cell truckwash	Daily during radioactive materials emplacement	Exposure rate or gamma; removable alpha/beta
Cell sample shack	Weekly during receipt of radioactive materials; otherwise monthly	Exposure rate or gamma; fixed alpha/beta; removable alpha/beta
Sample station	Weekly during receipt of radioactive materials; otherwise monthly	Exposure rate or gamma; fixed alpha/beta; removable alpha/beta

Area	Minimum Survey Frequency	Survey Type
Laboratory area	Weekly during receipt of radioactive materials; otherwise monthly	Exposure rate or gamma; fixed alpha/beta; removable alpha/beta
Men's locker room	Weekly during receipt of radioactive materials; otherwise monthly	Exposure rate or gamma; fixed alpha/beta; removable alpha/beta
Operations building lunch room	Weekly during receipt of radioactive materials; otherwise monthly	Exposure rate or gamma; fixed alpha/beta; removable alpha/beta

Other areas or buildings may be subject to contamination surveys on an as-needed basis or randomly, based on radioactive materials handling activities. The CHDT RSO or designee will determine if additional areas require routine surveys.

5.4 Exposure Rate Measurements

Exposure or dose rate measurements should be operated according to SOP 15.OPS.07, *Operation of Exposure Rate/ Dose Rate Meters*. Ambient exposure rate measurements using the Model 19 or similar instrument during routine contamination surveys should be collected at waist level to provide a measurement of the external trunk dose to a worker. Exposure rate measurements collected with the 193-6 should be collected at a distance of 6 inches or less from the ground surface.

5.5 Measurements for Fixed Contamination

Measurements for fixed contamination can be directly collected by scaler or scanning measurements with field instruments. Scaler measurements are collected by leaving the probe stationary over a given location, and initiating a scaler count with the meter (typically one minute in length). To allow for consistent measurement geometry, it may be necessary to rest the probe on the surface being measured. However, please note that this action *may result in contamination of the probe* and appropriate precautions should be taken to prevent cross contamination (e.g., the use of removable spacers on the probe, routine wipe and decontamination of probe surfaces, etc).

Scanning measurements are collected by slowly moving the probe over a given surface. The instrument's audio response and meter reading are monitored to identify any anomalies. Typically scanning measurements are performed to increase survey coverage over an area. The probe is held approximately 1 centimeter from the surface being surveyed and is moved at a rate of approximately 2 inches per second. If the count rate audibly increases, or if the alarm sounds, pause for 5 to 10 seconds over the area to provide for adequate time for instrument response. Scanning measurements may be recorded as a range of measurements for a given surface or area, and are generally evaluated to identify any outliers above background.

5.6 Measurements for Removable Contamination

Measurements for removable contamination are measured indirectly by the collection of smear or wipe samples. Smears are collected with a 47-millimeter smear filter. Using evenly applied pressure, the smear should be collected with an S-shape over approximately 100 square centimeters. The smear may then be removed from the paper folder, adhered to an aluminum planchet and counted in the alpha-beta sample counter.

If directed by the CHDT RSO or designee, large-area smears may be collected on a larger surface area using masselin or other absorbent cloth. The large area smear may then be checked using a field instrument for any radioactivity above background. A large area smear should be considered to be a qualitative measurement only.

6.0 STANDARDS AND CRITERIA

6.1 Data Conversion

For comparison with the measurement criteria listed in Section 6.2, surface measurements in counts per minute (cpm) must be converted to units of decays per minute per 100 square centimeters (dpm/100cm²). Procedures for data conversion are provided in SOPs 15.OPS.08, *Operation of Alpha-Beta Scintillation Detector*, and 15.OPS.09, *Operation of GM Pancake Probe*.

6.2 Surface Contamination Levels

Fixed radioactivity measured by direct measurements and removable activity measured by smear samples will be evaluated against the values listed in Table 1, from ANSI/HPS N13.12-1999 (ANSI/HPS 1999). In the absence of radionuclide data to establish the appropriate screening group, the most conservative screening levels will be used.

Table 1 – Surface Contamination Limits for Free Release Surveys

Radionuclide Group	Surface Screening Levels (Bq/cm ²)	Surface Screening Levels (dpm/100cm ²) ^(a)	Removable Contamination Limits (dpm/100cm ²)
Group 1 Radium and Thorium: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, and associated decay chains ^(b)	0.1	600	60 alpha
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, natural uranium ^(c) , and associated decay chains	1	6,000	600 alpha

Radionuclide Group	Surface Screening Levels (Bq/cm ²)	Surface Screening Levels (dpm/100cm ²) ^(a)	Removable Contamination Limits (dpm/100cm ²)
Group 3 General Beta-Gamma Emitters: ²⁴ Na, ³⁶ Cl, ⁵⁹ Fe, ¹⁰⁹ Cd, ¹³¹ I, ¹²⁹ I, ¹⁴⁴ Ce, ¹⁹⁸ Au, ²⁴¹ Pu, and others	10	60,000	600 beta
Group 4 Other Beta-Gamma Emitters: ³ H, ¹⁴ C, ³² P, ³⁵ S, ⁴⁵ Ca, ⁵¹ Cr, ⁵⁵ Fe, ⁶³ Ni, ⁸⁹ Sr, ⁹⁹ Tc, ¹¹¹ In, ¹²⁵ I, ¹⁴⁷ Pm, and others	100	600,000	600 beta

(a) Rounded to one significant figure.

(b) For decay chains, the screening levels represent the total activity (i.e. the activity of the parent plus the activity of all progeny) present.

(c) Where the Natural Uranium activity equals 48.9% from ²³⁸U, plus 48.9% from ²³⁴U, plus 2.25% from ²³⁵U.

6.3 Exposure Rate Limits

For areas with no known radioactive source, exposure rates are expected to be at background levels. If above-background levels are observed, the CHDT RSO should be notified.

For release of the disposal cell following daily cover, the exposure rates should be no greater than 1.5X the average background measurement.

Other exposure rate limits may apply depending on the situation or activity. The CHDT RSO may establish additional limits as necessary to provide additional worker protection.

6.4 Quality Control

In addition to the daily QC measurements required by each individual instrument SOP, survey forms must be reviewed and approved by the CHDT RSO or designee. The frequency of review and approval will be dictated by the frequency of the surveys.

7.0 REFERENCES

ANSI/HPS 1999. Surface and Volume Radioactivity Standards for Clearance.