Approved by:		
	General Manager	Radiation Safety Officer

STANDARD OPERATING PROCEDURE

15.OPS.21

PACKAGE RECEIPT SURVEYS

1.0 OBJECTIVE

To define general and specific methods and procedures for conducting radiation surveys for receipt of packages containing radioactive material in compliance with Colorado Regulations.

2.0 SCOPE

This standard operating procedure (SOP) applies to the receipt of bulk and containerized shipments of waste known to contain radioactive materials and receipt of waste samples known to contain radioactive materials. Most waste samples containing radioactive materials sent to CHDT are exempt quantity non-DOT labeled shipments. Similarly, most waste shipments containing radioactive materials acceptable to DR under the License are either non-DOT regulated, limited quantity, or LSA-1 shipments not requiring labels. While most of these shipments would appear not to require package receipt surveys under Colorado Regulations (RH Part 4.32, Licensees must "Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged". (RH 4.32.2.3). In the interest of complying with this part, CHDT will conduct receipt surveys on all packages and waste shipments known to contain radioactive materials.

3.0 POLICY

CHDT will conduct receipt surveys on all packages and waste shipments known to contain radioactive materials in accordance with the provisions of this SOP and Colorado Regulations. All packages known to contain radioactive materials will be monitored for radioactive contamination, radiation levels, and package integrity.

4.0 RESPONSIBILITIES

Responsibilities of the CHDT Radiation Safety Officer (RSO), management, and staff are defined in the CHDT Radiation Protection Plan (15.RPP.01).

5.0 GENERAL SURVEY METHODS

Direct surveys of packages may be conducted using a Ludlum Model 44-9 Geiger Mueller (GM) "pancake"-type probe with Ludlum Model 12 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) or SAIC Exploranium for ambient exposure rate measurements; or any other radiation measuring instrument appropriate for the task. Package 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 in accordance with SOP's 15.OPS.7 and 15.OPS.08 and 15.OPS.09.

5.2 Package Receipt Surveys

Receipt surveys will be performed on incoming packages and waste shipments known to contain radioactive materials. Where possible, surveys will be conducted in dedicated areas. Survey results 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.

A minimum of four locations will be measured for removable contamination. The CHDT RSO or designee will determine additional survey requirements as necessary. Specific measurement locations are to be determined at the discretion of the survey technician; however, measurements should be biased toward the most likely areas of contamination to provide conservative survey results.

5.3 Package Integrity Inspection

A visual inspection of the package or container holding radioactive materials will include checking for damage such as signs of crushing, wet spots or evidence of leakage. If any damage is found, the CHDT RSO or designee will be notified immediately, and the package will be segregated from other packages until the extent of damage has been determined. Any damage will be noted on the inspection form. The CHDT RSO or designee will determine what actions need to be taken and any notifications that need to be made to the carrier and regulatory agencies.

5.4 Measurements of Radiation Levels

Radiation levels will normally be measured according to the procedures in SOP 15.OPS.07, Operation of Exposure Rate/ Dose Rate Meters. Radiation levels will be measured on at least two sides of the package.

5.5 Measurements of Removable Contamination

Measurements for removable contamination will normally be performed according to the procedures in SOP 15.OPS.04 Operation of Alpha Beta Counter. 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 300 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.

6.0 STANDARDS AND CRITERIA

6.1 Data Conversion

For comparison with the measurement criteria listed in Sections 6.2 and 6.3, surface measurements in counts per minute (cpm) must be converted to units of decays per minute per 100 square centimeters (dpm/100cm^2). 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*. The Ludlum 3030 used at CHDT provides measurements in units of dpm.

6.2 Package Receipt Non-Fixed Contamination Levels

Contamination control limits for non-fixed (i.e., removable) surface contamination are established by the Department of Transportation (DOT) in 49 CFR 173.443. These limits are summarized in Table 1.

Table 1 – DOT Non-Fixed Surface Contamination Limits

Radionuclide Group	Maximum Permissible Limit (Bq/cm^2)	Maximum Permissible Limit (dpm/cm^2)[(a)]	Maximum Permissible Limit (dpm/100 cm^2)[(a)]
1. Beta and gamma emitters and low-toxicity alpha emitters	4	220	22,000
2. All other alpha-emitting radionuclides	0.4	22	2,200

(a) Averaged over 300 cm^2.

In addition, there are exposure rate limits associated with different types of shipments. Task-specific direction will be provided by the CHDT RSO or designee regarding these limits.

6.3 Quality Control

In addition to the daily QC measurements required for each individual instrument, 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

49 CFR 173. *Shippers – General Requirements for Shipments and Packagings*. Current Version.