Surveys vs. Sampling

What is the Difference?

Surveys vs. Sampling

- Radiation surveys tell you whether or not there is radioactive material present.
- Surveys also provide information regarding the radiation exposure levels

Surveys vs. Sampling

- The traditional unit for radiation exposure is the roentgen or rem (R)
  - 1 milliroentgen (mR) = .001 roentgen
  - 1 microroentgen (uR) = .000001 roentgen

- *For practical purposes, consider the roentgen and the rem to be equal with gamma or x rays.*

Surveys vs. Sampling

- Exposure rates in air are measured in units of radioactivity per unit time (i.e., uR/hr, mR/hr)

- Exposure rates from contamination may be measured in units of counts per unit time (i.e., counts per minute or cpm)

Surveys vs. Sampling

- Sampling tells you:
  - The type of radioactive material (i.e., Ra-226, Ra-228) present, and
  - The amount or concentration of the radioactive material (i.e., picocuries per gram [pCi/g])
  - TENORM concentrations are usually measured in pCi/gram

Surveys vs. Sampling

- The curie is the traditional unit of radioactivity.
- One (1) curie is approximately the amount of radioactivity emitted by one (1) gram of Radium-226
  - 1 picocurie (pCi) =
    - .001 nanocurie (nCi) =
      - .000001 microcurie (uCi) =
        - .000000001 millicurie (mCi) =
          - .000000000001 curie (Ci)
- How does this relate? 1 picocurie is a millionth millionth of 1 curie

Surveys

- Use of a radiation survey instrument or device to determine if the material of concern contains radioactive material.

Surveys

- Key elements for proper radiation surveys
  - Choose an appropriate survey instrument
    - Should be appropriate for the type of radiation to be detected (i.e., alpha, beta, gamma)
    - Should have the ability to measure low levels of radiation (e.g., uR/hr meters for TENORM)
      - Sodium iodide and plastic scintillators are a good choice for measuring low level gamma radiation
    - Should be durable

Surveys

- Key elements for proper radiation surveys (continued)
  - **Surveys should be performed by trained personnel**

Surveys

- Key elements for proper radiation surveys (continued)
  - Surveys must be performed using established protocols
    - Describe proper survey speed (typically 1" to 2" per second)
    - Describe proper survey distance from source (i.e., 1 cm for surfaces)
    - Describe the number of points to be surveyed

Surveys

- Key elements for proper radiation surveys (continued)
  - Determine unit is operational
    - Check calibration date
    - Perform battery check
    - Select proper range or multiplier

- 25 scale: ~6.0 uR/hr
- 50 scale: ~13.0 uR/hr
- 250 scale: ~60.0 uR/hr
- 500 scale: ~130.0 uR/hr
- 5000 scale: 1300.0 uR/hr

- X1 multiplier: ~ 0.6 uR/hr
- X10 multiplier: ~ 6.0 uR/hr
- X100 multiplier: ~60.0 uR/hr
- x1000 multiplier: ~600.0 uR/hr

Surveys

- Key elements for proper radiation surveys (continued)
  - Determine if unit is operational
    - Perform function check using a “button” check source or known source of activity
  - Check physical condition/integrity

Surveys

- Key elements for proper radiation surveys (continued)
  - Survey technique
    - Acquire a background reading
    - Always approach the source from the furthest distance surveying as you move toward the source
    - Survey at equal distance for all readings
    - Survey at constant speed
    - Document your results

Sampling

- Key elements for proper sampling
  - Sampling must be performed using established protocols
    - Use of proper PPE
    - Proper sample containers
    - Must be a representative load sample
  - Sample analysis must be performed using approved analytical or screening methods

Sampling

- Approved Laboratory Analytical Methods:
  - EPA 901.1 (M) – modified for solids
  - HASL 300
- Approved Field Screening Methods:
  - Gamma Spectroscopy (utilizing 186 keV peak with 0.571 correction factor)
- Other methods are "In the Works"

Sampling

- A list of Department approved methods and testing facilities is available on our website http://www.ndhealth.gov/AQ/RAD/Licensed_tenorm_testing.htm

Requirements

- Surveys
  - NORM/TENORM Processing facilities
    - Surveys of all areas where TENORM impacted materials or equipment are used or transported through the facility.
    - Surveys of equipment used in restricted areas prior to leaving the restricted areas (i.e., for service)
    - Public dose surveys – outer boundary

Requirements

- Surveys (continued)
  - Landfills licensed and permitted to accept TENORM waste
    - All in-coming loads
    - All in-coming equipment
    - Public dose surveys – outer boundary

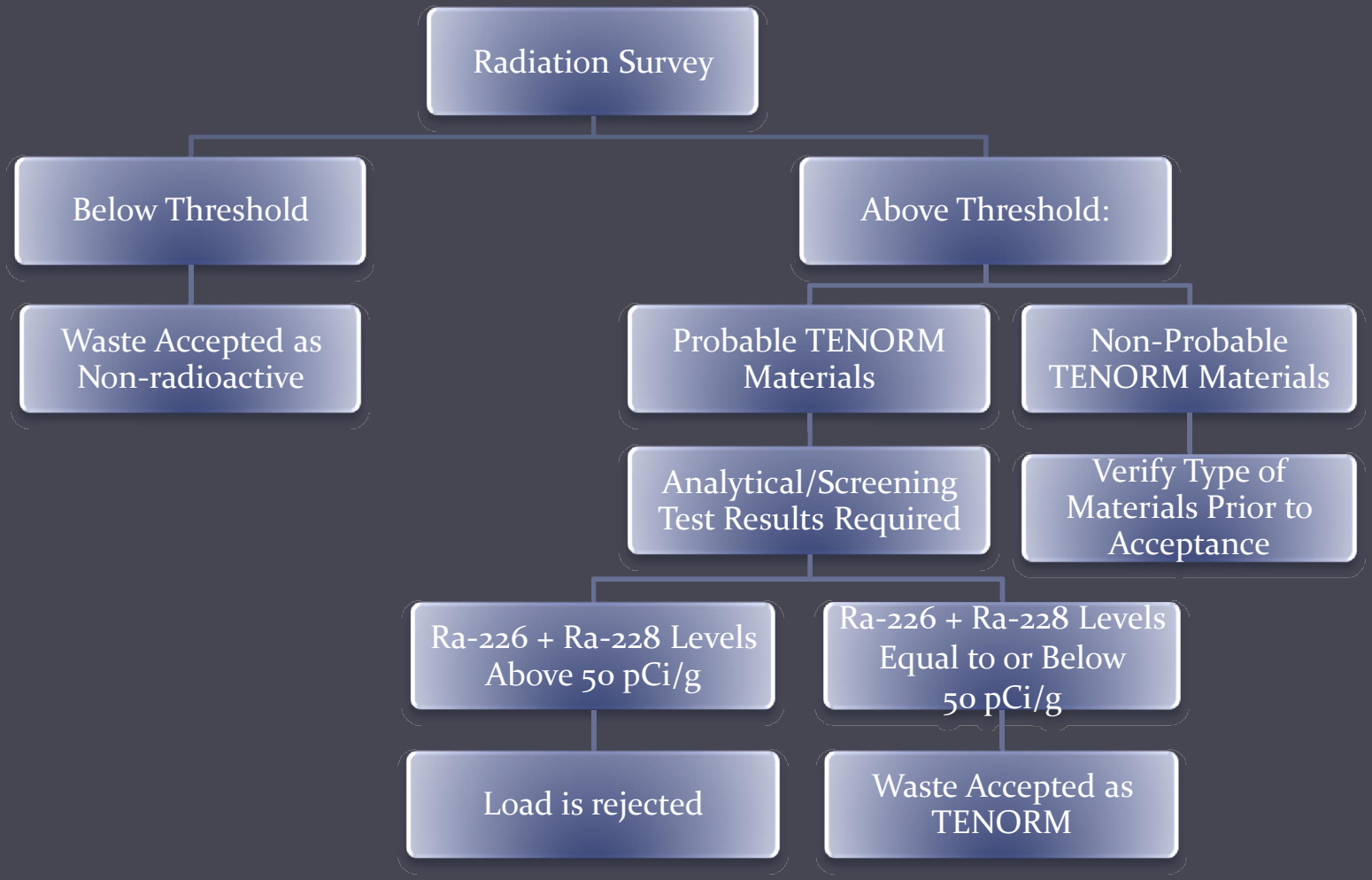
Requirements

- Sampling
  - NORM/TENORM Processing facilities
    - All waste material being sent for disposal
    - Materials must be sampled prior to adding any other materials (i.e., drying agents)

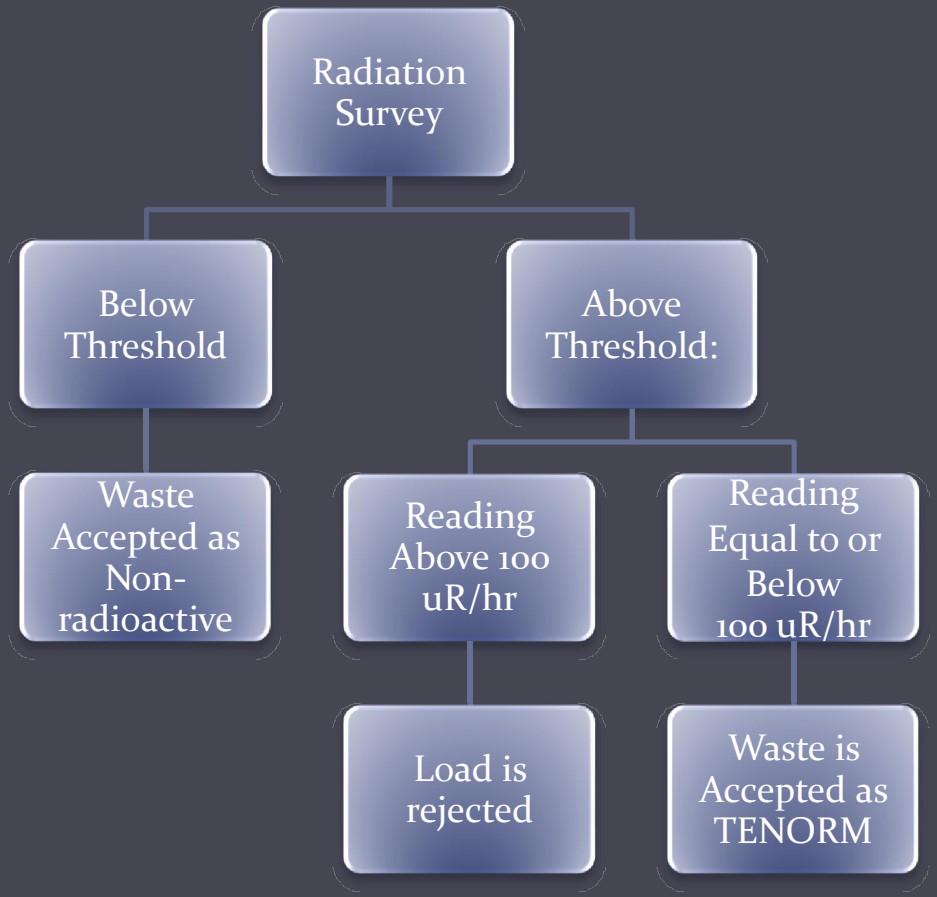
Requirements

- Sampling (continued)
  - Landfills licensed and permitted to accept TENORM waste
    - All in-coming loads containing probable TENORM-impacted materials above the radiation survey threshold
    - A copy of the analytical/screening results for the above materials

Landfill Waste Acceptance



Equipment Acceptance



FAQs

- How do we know if the analytical test results are valid (suspect loads)?
  - The landfill operators will, overtime, gain historical data comparing the radiation survey results to the analytical results received.
  - If an abnormally high survey reading was noted during the survey and the analytical test results did not appear to coincide, then the landfill could require another sample be taken prior to acceptance or simply reject the load.

FAQs

- Are their field screening methods approved for determining the concentrations of TENORM?
  - There is one company currently licensed in North Dakota to perform screening of TENORM (for other licensees) at temporary job sites.
  - Individuals requesting approval of their methods must submit a copy of the testing protocol including a minimum of 24 split sampling results from an approved testing facility for Department approval. As new methods and facilities become approved, their information is placed on the Department website.

Conclusion

Radiation surveys (uR/hr, cpm) only tell you there is radioactive material present and sampling tells you the type and amount or concentration (pCi/g) of specific radioactive materials present.

Questions ?

David Stradinger
Radiation Control Program
North Dakota Department of Health
918 E. Divide Avenue, Second Floor
Bismarck, ND 58501
701-328-5188
dstradinger@nd.gov