

SECTION 7.2

GAMMA LOGGING OF BOREHOLES

1.0 Purpose

To describe the method for performing subsurface gamma logging measurements in boreholes.

2.0 Responsibilities

- The site coordinator is responsible for assuring that this procedure is implemented.
- Survey team personnel are responsible for following this procedure.

3.0 Procedure

3.1 Equipment

- ✓ Scintillation detector: Model 489-55 NaI detector, Victoreen Instrument Co.; or equivalent.
- ✓ Lead collimator for scintillation detector, approximately 1 cm thick with four 2.5 cm x 7 mm slots at the detector midpoint, ORISE design.
- ✓ Cable: As appropriate (see Section 5).
- ✓ Winch assembly for lowering and raising collimated detector in borehole, ORISE design.
- ✓ Portable ratemeter-scaler: Model 2200, Ludlum Instrument Co.; or equivalent.
- ✓ As required, capped plastic (PVC) pipe of sufficient length to case borehole to desired logging depth. Pipe diameter will be determined by the dimensions of the drill bit.
- ✓ Plastic bags (large enough to cover lead collimator).
- ✓ Record forms.
- ✓ Check source.

3.2 Gamma Logging

- 3.2.1 Assemble equipment; turn on scaler, test battery, and adjust voltage, if necessary. Check background count rate and the detector response to the gamma check source. Follow procedures described in Section 5.
- 3.2.2 Enclose the collimated detector assembly in double plastic bags to protect detector against direct contact with water or soil from the borehole.
- 3.2.3 If the borehole has a tendency to cave in or contains water, insert an appropriate length of plastic pipe.
- 3.2.4 Position the winch assembly over the borehole.
- 3.2.5 Lower the detector assembly until the collimator slots are level with the ground surface.
- 3.2.6 Reset the depth recorder to 0.
- 3.2.7 Lower the detector assembly slowly into the borehole, noting the count ratemeter response for indications of locations of elevated gamma activity. Record the depths of these locations.
- 3.2.8 When the detector reaches the bottom of the borehole or borehole liner pipe, record the depth of the hole.
- 3.2.9 Set the scaler timer to 0.5 or 1 minute, depending upon contaminant and ambient detection level; start and accumulate the counts.
- 3.2.10 Record depth and count rate on the Borehole Logging Form (Figure B-11, or equivalent).
- 3.2.11 Raise the detector to the nearest even multiple of 30 cm (1 unit on the depth recorder) and repeat steps 3.2.9 and 3.2.10.
- 3.2.12 Repeat at 30 cm intervals and at noted locations of elevated activity until a depth of 15 cm is reached.
- 3.2.13 Obtain a measurement at 15 cm below the ground surface and at the ground surface.

3.2.14 If the identities and ratios of the radionuclides in the subsurface soil are known, calibration factors can be developed and applied to the individual count rates at various depths to estimate the concentrations in picocuries per gram. If the ratios of radionuclides in the subsurface soil have been shown to vary, the logging is used only to indicate locations and relative levels of soil concentrations.

NOTE: Borehole logging can also be done using a non-collimated NaI for shallow or small diameter boreholes or for collecting general information concerning the radiation activity characteristics of the borehole.