

**NORTH CAROLINA WASTEWATER/GROUNDWATER LABORATORY CERTIFICATION  
APPROVED PROCEDURE FOR THE ANALYSIS OF VECTOR ATTRACTION REDUCTION  
(VAR): OPTION 5**

**Aerobic Processes at Greater Than 40 °C [503.33(b)(5)]**

This document provides an approved procedure for the analysis of VAR: Option 5 for compliance monitoring per 15A NCAC 2H .0805 (a) (7) and (g) (4).

**HOLDING TIME:**

Not Applicable – sample temperature is measured in-situ.

**GENERAL INFORMATION:**

- Option 5 must be used for composted aerobically-treated sewage sludge.
- Option 5 may also be applied to sewage sludge from other aerobic processes such as aerobic digestion as long as temperature requirements can be met and the sewage sludge is maintained in an aerobic state for the treatment period; however, Options 3 and 4 are likely to be easier to meet for these type sewage sludges.
- All compost temperature measurements must be made with a National Institute of Standards and Technology (NIST) traceable temperature-measuring device with a demonstrated accuracy of  $\pm 0.5$  °C that is able to distinguish temperature changes of 0.1 °C and equilibrate rapidly. Traceability to NIST may be established by comparison with a Reference Temperature-Measuring Device as described below.
- Infrared (IR) devices are not acceptable for compost temperature measurements.
- All temperature-measuring devices must be immersed in the sample to the proper depth as specified by the manufacturer. Partial immersion thermometers are designed with scales calibrated to indicate the true temperature when the thermometers are immersed to specified depths. Total immersion thermometers are designed with the scales calibrated to indicate the true temperature when the bulb and the portion of liquid column, to just above the temperature being read, is exposed to the sample being measured. If a total immersion thermometer is used as a partial immersion thermometer, an emergent stem correction must be performed. NOTE: Probe type thermometers will also have a specified immersion depth. Refer to the manufacturer's manual for the proper immersion depth.

**THERMOMETER CALIBRATION:**

- A Reference Temperature-Measuring Device is an NIST traceable temperature-measuring device used only to verify the calibration of other temperature-measuring devices. It must have a stated accuracy of  $\pm 0.5$  °C, be able to distinguish temperature changes of 0.1 °C and equilibrate rapidly.
- When temperature-measuring devices with their own valid NIST traceable certificate are used to measure compost temperatures, initial verification is not required. However, they must be verified against a Reference Temperature-Measuring Device and the process documented at the proper frequency (i.e., every 3 months for digital devices and every 12 months for all other types) after the date of first use or certificate expiration, whichever comes first.
- Non-digital compost temperature-measuring devices without an NIST certificate, or with an expired NIST certificate, must be verified against a Reference Temperature-Measuring Device and the process documented initially and every 12 months thereafter (or sooner if the temperature-measuring device has been exposed to temperatures beyond the manufacturer's recommended range of use or other stresses).
- Digital compost temperature-measuring devices without an NIST certificate, or with an expired NIST certificate, must be verified against a Reference Temperature-Measuring Device and the process documented initially and at least every 3 months thereafter (or sooner if the temperature-measuring device has been exposed to temperatures beyond the manufacturer's recommended range of use or other stresses).

- To check a compost temperature-measuring device, compare a reading at the temperature of use (i.e., 40 ± 0.5 °C) against a Reference Temperature-Measuring Device and record the two readings. The readings from both devices **must agree within 0.5 °C**. If they do not, the device may not be used.
- Verification documentation must include the serial number of the device being checked and the serial number, stated accuracy and expiration date of the Reference Temperature-Measuring Device used in the comparison. Verification data must be kept on file and be available for inspection for 5 years. (NOTE: Vendors or other Certified laboratories may provide assistance in meeting this requirement. When a vendor or other Certified laboratory provides this assistance, they must provide a copy of their NIST Certificate or the serial number, accuracy and calibration expiration date.)

### **PROCEDURE:**

Check and document the temperature of the compost at representative locations within the pile each day of a 14-day period using a calibrated temperature-measuring device. Each day the temperature must be over 40 °C (104 °F).

At the end of the 14-day period calculate and document the average temperature over the 14 days. The average temperature must be greater than 45 °C (113 °F).

Because the entire mass of sewage sludge must attain the required temperatures for the required duration, the temperature profiles from every monitoring point, not just the average of the points, must be over 40 °C (104 °F) and the average temperature must be greater than 45 °C (113 °F).

It has been found that points within 0.3 m (1 foot) of the surface of aerated static piles may be unable to reach these temperatures, and for this reason, it is recommended that a 0.3 m (1 foot) or greater layer of insulating material be placed over all surfaces of the pile. Finished compost is often used for insulation. It must be noted that because the insulation will most likely be mixed into the composted material during post-processing or curing, compost used as an insulation material must be a Class A material so as not to reintroduce pathogens into the composting sewage sludge. Regardless of whether an insulating layer is used, temperature measurements must be performed within 0.3 m (1 foot) of the surface of the unfinished compost.

### **DOCUMENTATION:**

The following must be documented in indelible ink whenever sample analysis is performed:

1. Facility name or permit number, and sample site (ID or location)
2. Collector's/analyst's name or initials
3. Parameter analyzed
4. Method reference or Standard Operating Procedure
5. Dates analyzed
6. Sample temperature measurements for each day in the specified units

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$$

7. 14-day average temperature at each sample location
8. Thermometer/instrument identification (serial number preferred)
9. Units of measure
10. Data qualifiers, when necessary
11. Equipment maintenance (recommended)

Refer to <http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/technical-assistance-policies> for additional quality assurance and quality control requirements.

This document was prepared using Control of Pathogens and Vector Attraction in Sewage Sludge, EPA/625/R-92/013, (July 2003) as a reference.