

## **15A NCAC 13B .1632 GROUND-WATER SAMPLING AND ANALYSIS REQUIREMENTS**

(a) A ground-water monitoring program shall include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of ground-water quality at the background and downgradient wells. The ground-water sampling and analysis plan shall be approved by the Division and the owner or operator shall place a copy of the approved plan in the operating record. The plan shall include procedures and techniques for:

- (1) Sample collection;
- (2) Sample preservation and shipment;
- (3) Analytical procedures;
- (4) Chain of custody control; and
- (5) Quality assurance and quality control.

(b) The ground-water monitoring program shall include sampling and analytical methods that are appropriate for ground-water sampling and that accurately measure hazardous constituents and other monitoring parameters in ground-water samples.

(c) The sampling procedures and frequency shall be protective of human health and the environment.

(d) Ground-water elevations shall be measured in each well immediately prior to purging, each time ground-water is sampled. The owner or operator shall determine the rate and direction of ground-water flow each time ground-water is sampled. Ground-water elevations in wells which monitor the same waste management area shall be measured within a period of time short enough to avoid temporal variations in ground-water flow which could preclude accurate determination of ground-water flow rate and direction. The owner or operator shall determine ground-water elevation and flow as follows:

- (1) In order to accurately determine ground-water elevations for each monitoring well, the wells shall have been surveyed. If required by G.S. 89C, a professional land surveyor shall survey the wells. [Note: The North Carolina Board of Examiners for Engineers and Surveyors has determined, via a letter dated July 16, 2010, that the surveying pursuant to this Paragraph constitutes practicing surveying under G.S. 89C.] The survey of the wells shall conform to at least the following levels of accuracy:
  - (A) The horizontal location to the nearest 0.1 foot;
  - (B) The vertical control for the ground surface elevation to the nearest 0.01 foot; and
  - (C) The vertical control for the measuring reference point on the top of the inner well casing to the nearest 0.01 foot.
- (2) In order to determine the rate of ground-water flow, the owner or operator shall provide data for hydraulic conductivity and porosity for the formation materials at each of the well locations.

(e) The owner or operator shall establish Division-approved background ground-water quality in accordance with rules .1631(a)(1) and .1632(f) through (h) of this Section for each of the monitoring parameters or constituents required in the particular ground-water monitoring program that applies to the MSWLF unit.

(f) The number of samples collected to establish ground-water quality data shall be consistent with the appropriate statistical procedures to be used, as provided for in 40 CFR 258.

(g) Should the owner or operator choose to perform statistical analysis of groundwater quality data whether for purposes of establishing background concentrations or to determine if there is an exceedance of the groundwater protection standard as defined in Rule .1634(g) and .1634(h) of this Section, the owner or operator shall select one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent. The statistical test chosen shall be conducted separately for each hazardous constituent in each well.

- (1) A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method shall include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.
- (2) A parametric analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method shall include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.
- (3) A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.
- (4) A control chart approach that gives control limits for each constituent.

- (5) Another statistical test method that meets the performance standards of this Rule. The owner or operator shall submit a justification for an alternative test method to the Division for approval. The justification shall demonstrate that the alternative statistical test method meets the performance standards of this Rule. If approved, the owner or operator shall place a copy of the justification for an alternative test method in the operating record.
- (h) Any statistical method chosen to evaluate ground-water monitoring data shall comply with the following performance standards, as appropriate:
- (1) The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator (or the Division) to be inappropriate for a normal theory test, then the data shall be transformed or a distribution-free theory test shall be used. If the distributions for the constituents differ, more than one statistical method shall be considered.
  - (2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.
  - (3) If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.
  - (4) If a tolerance interval or a prediction interval is used to evaluate ground-water monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval shall contain, shall be protective of human health and the environment. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.
  - (5) The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit (pql) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.
  - (6) If necessary, as provided for in 40 CFR 258, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.
- (i) Within 120 days from the date of sampling or as specified in the facility permit, whichever is less, the owner or operator shall submit to the Division a report that includes all information from the sampling event; including field observations relating to the condition of the monitoring wells, field data, laboratory data, statistical analysis (if utilized), sampling methodologies, quality assurance and quality control data, information on ground-water flow direction, calculations of ground-water flow rate, for each well any constituents that exceed ground-water standards, as defined in Rule .1634(g) through (h) of this Section.

*History Note: Authority G.S. 130A-294;  
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