



Ohio Administrative Code

Rule 3745-54-97 General ground water monitoring requirements.

Effective: September 5, 2010

The owner or operator must comply with the following requirements for any ground water monitoring program developed to satisfy rule 3745-54-98, 3745-54-99, or 3745-54-100 of the Administrative Code.

(A) The ground water monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that:

(1) Represent the quality of background ground water that has not been affected by leakage from a regulated unit;

(a) A determination of background ground water quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:

(i) Hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; and

(ii) Sampling at other wells will provide an indication of background ground water quality that is representative or more representative than that provided by the upgradient wells; and

(b) Reserved.

(2) Represent the quality of ground water passing the point of compliance; and

(3) Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.

(B) If a facility contains more than one regulated unit, separate ground water monitoring systems are not required for each regulated unit provided that provisions for sampling the ground water in the



uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered the ground water in the uppermost aquifer.

(C) All monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the ground water.

(D) The ground water monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of ground water quality below the waste management area. At a minimum the program must include procedures and techniques for:

(1) Sample collection;

(2) Sample preservation and shipment;

(3) Analytical procedures; and

(4) Chain of custody control.

(E) The ground water monitoring program must include sampling and analytical methods that are appropriate for ground water sampling and that accurately measure hazardous constituents in ground water samples.

(F) The ground water monitoring program must include a determination of the ground water surface elevation each time ground water is sampled.

(G) In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background must be appropriate for the form of statistical test employed, following generally accepted statistical



principles. The sample size must be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which must be specified in the unit permit. This sampling procedure must be:

(1) A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants; or

(2) An alternate sampling procedure proposed by the owner or operator and approved in the permit.

(H) The owner or operator will specify one of the following statistical methods to be used in evaluating ground water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen must be conducted separately for each hazardous constituent in each well. Where practical quantification limits (PQL's) are used in any of the following statistical procedures to comply with paragraph (I)(5) of this rule, the PQL must be proposed by the owner or operator and approved by the director. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (I) of this rule.

(1) A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.

(2) An ANOVA based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must 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 submitted by the owner or operator and approved in the permit.

(I) Any statistical method chosen under paragraph (H) of this rule for specification in the unit permit must comply with the following performance standards, as appropriate:

(1) The statistical method used to evaluate ground water monitoring data must be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters for hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.

(2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or ground water protection standard, the test must 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" experimentwise error rate for each testing period must be no less than 0.05; however, the "Type I" error of no less than 0.01 for individual well comparisons must 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 must be proposed by the owner or operator and approved in the permit if it is found to be protective of human health and the environment.

(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 must contain, must be proposed by the owner or operator and approved in the permit if these parameters are found to be protective of human health and the environment. These parameters will 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 must 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 quantification limit (PQL) approved in the permit under paragraph (H) of this rule that is used in the statistical method must 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, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(J) Ground water monitoring data collected in accordance with paragraph (G) of this rule including actual levels of constituents must be maintained in the facility operating record. The permit will specify when the data must be submitted for review.