**Section 724.197 General Groundwater Monitoring Requirements**

The owner or operator must comply with the following requirements for any groundwater monitoring program developed to satisfy Section 724.198, 724.199, or 724.200.

a) The groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that fulfill the following requirements:

1) They represent the quality of background groundwater that has not been affected by leakage from a regulated unit. A determination of background groundwater quality may include sampling of wells that are not hydraulically upgradient from the waste management area where the following is true:

A) Hydrogeologic conditions do not allow the owner or operator to determine what wells are upgradient; or

B) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells;

2) They represent the quality of groundwater passing the point of compliance; and

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

b) If a facility contains more than one regulated unit, separate groundwater monitoring systems are not required for each regulated unit provided that provisions for sampling the groundwater in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered the groundwater 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 groundwater 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 groundwater.

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

1) Sample collection;

2) Sample preservation and shipment;

3) Analytical procedures; and

4) Chain of custody control.

e) The groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples.

f) The groundwater monitoring program must include a determination of the groundwater surface elevation each time groundwater 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 points. 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 groundwater 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 that must be specified in the unit permit upon approval by the Agency. This sampling procedure must fulfill the following requirements:

1) It may be 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) It may be an alternate sampling procedure proposed by the owner or operator and approved by the Agency.

h) The owner or operator must specify one of the following statistical methods to be used in evaluating groundwater monitoring data for each hazardous constituent that, upon approval by the Agency, 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 (pqls) are used in any of the following statistical procedures to comply with subsection (i)(5), the pql must be proposed by the owner or operator and approved by the Agency. Use of any of the following statistical methods must adequately protect human health and the environment and must comply with the performance standards outlined in subsection (i).

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 analysis of variance (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 by the Agency.

i) Any statistical method chosen pursuant to subsection (h) for specification in the unit permit must comply with the following performance standards, as appropriate:

1) The statistical method used to evaluate groundwater monitoring data must 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 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 a groundwater 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 groundwater monitoring data, the specific type of control chart and its associated parameter value must be proposed by the owner or operator and approved by the Agency if the Agency finds it to adequately protect human health and the environment.

4) If a tolerance interval or a prediction interval is used to evaluate groundwater 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 by the Agency if the Agency finds these parameters to adequately protect human health and the environment. These parameters will be determined after considering the number of samples in the background database, 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 adequately protect human health and the environment. Any practical quantification limit (pql) approved by the Agency pursuant to subsection (h) 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) Groundwater monitoring data collected in accordance with subsection (g), including actual levels of constituents, must be maintained in the facility operating record. The Agency must specify in the permit when the data must be submitted for review.

(Source: Amended at 42 Ill. Reg. 22614, effective November 19, 2018)