

**INTRODUCTION TO SITE-SPECIFIC
IMPACT TO GROUND WATER SOIL REMEDIATION STANDARDS
GUIDANCE DOCUMENTS**

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Revised

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I. Introduction

The Remediation Standards rules, N.J.A.C. 7:26D-1.1 and the Technical Requirements for Site Remediation, N.J.A.C. 7:26E-1.3 require the person responsible for conducting the remediation to develop site-specific soil remediation standards that are protective of ground water. A site-specific impact to ground water IGW soil remediation standard must be developed when a discharge to soil is known or suspected. The Department has identified several methods that may be used to develop site-specific impact to ground water remediation standards which are briefly described below.

The person responsible for conducting the remediation may use any of the following procedures to develop a site-specific IGW soil remediation standard. The methods may be used at any time during the remediation provided that sufficient site data and information, as described in the various guidance documents, are available on which to base the standard. The Department strongly recommends that IGW soil remediation standards developed using the methods described in these guidance documents be submitted to the assigned case manager prior to implementing the remedial action at a site.

The purpose of the site-specific IGW soil remediation standards is to prevent unacceptable risk to human health from the ingestion of contaminated ground water, caused by the migration of contaminants from the unsaturated soil zone to the ground water. The standard is developed to protect against future contamination of ground water. The standards will be developed using the applicable health-based ground water quality criterion (GWQC) for the ground water where the site is located. The procedures that are provided in the guidance documents are all designed to be protective of Class II ground water.

For Class I or III ground water, the Department will develop site-specific health-based ground water quality criterion appropriate for the ground water classification from which a site-specific IGW soil remediation standard can be derived.

The site-specific IGW soil remediation standard will be based on the calculated health-based criterion or the soil Practical Quantitation Level (PQL), which ever is higher. For Arsenic, the health based site-specific IGW soil remediation standard defaults to the state wide natural background of 19 ppm.

II. Methods to develop site-specific IGW soil remediation standards

1. Soil-Water Partition Equation

Site-specific IGW soil remediation standards are back calculated from the health-based Ground Water Quality Criteria, N.J.A.C. 7:9C using the USEPA soil-water partition equation (USEPA 1996). The soil-water partition equation may be used with default assumptions, and is the only method that does not require any site-specific information. For this reason, this method may be used to develop an initial screening level to determine whether site-specific information is needed. In response to numerous requests for with screening levels for the Impact to Ground Water pathway, the Department has provided such a table in the Soil Water Partition Document. These levels can be used as screening levels where no site-specific information exists. The soil water partition equation can also be used when a site-specific Dilution Attenuation Factor (DAF)

is developed, when site-specific organic carbon content is available, and for ionizable phenols when a soil pH is available that is different from the default pH of 5.3. Further guidance on this procedure is available in the Soil-Water Partition Equation guidance document.

http://www.nj.gov/dep/srp/guidance/rs/partition_equation.pdf

2. Synthetic Precipitation Leaching Procedure

For inorganic and low volatility organic contaminants, the Synthetic Precipitation Leaching Procedure (SPLP) will often be the most useful and practical procedure to develop site-specific IGW soil remediation standards. This is particularly the case when the contaminant is in contact with the ground water, which precludes the use of the “Immobile Contaminants” and “SESOIL” options discussed below. Inorganic and low volatility organic contaminants may be highly adsorbed to soil and exhibit low mobility, which limits their potential to impact ground water. The SPLP procedure will provide an accurate measure of this mobility for these types of contaminants, and may be used to develop an impact to ground water remediation standard. The data required for this procedure are total soil concentrations and the SPLP leachate results including pH. Further guidance on this procedure is available in the Synthetic Precipitation Leaching Procedure Guidance Document.

http://www.nj.gov/dep/srp/guidance/rs/splp_guidance.pdf

3. SESOIL Model

When there is a “clean” or “buffer” zone between the contaminant and the water table, and where *ground water is not impacted*, the SESOIL vadose zone model may be used to demonstrate that the soil contamination will not impact the ground water above the applicable GWQS. This option is useful where a contaminant has low mobility, or has a higher mobility but is present at low concentrations and has a low toxicity. It is a good choice when considering chemicals with relatively low mobility that are not eligible for the “Immobile Contaminants” option or fail the SPLP test, but where a clean zone larger than two feet exists between the contamination and the water table. Further guidance on this procedure is available as a separate guidance document (SESOIL guidance).

<http://www.nj.gov/dep/srp/guidance/rs/sesoil.pdf>

4. SESOIL/AT123D Model

When *ground water is already impacted*, the SESOIL/AT123D model may be used to demonstrate that certain contaminant concentrations will not lead to unacceptable ground water impacts. The SESOIL model is used to model vadose zone contaminant transport, followed by the AT123D model to evaluate ground water transport. The model estimated contaminant concentrations are evaluated at two points to determine an acceptable site specific IGW soil remediation standard. This option may be useful for volatile organic contaminants at low concentrations with a small source where a site specific point of compliance is desired. Further guidance on this procedure is available as a separate guidance document (SESOIL/AT123D guidance).

http://www.nj.gov/dep/srp/guidance/rs/at123d_guidance.pdf

III. Site information and data needs

The impact to ground water pathway is sensitive to variations in contaminant type and soil properties. The amount of information and data that are needed to develop a site-specific IGW soil remediation standard varies based on the procedure that is used. Each of the standards development methods have their own site information and data requirements which are described in each guidance document. Default IGW soil remediation standards which do not require any site-specific information, are available in the Soil-Water Partition Equation Guidance Document.

Depending on the procedure that is used to develop site-specific IGW soil remediation standards, a minimum of one sample must be taken in each area of concern in order to characterize soil properties and to determine the distribution of existing soil contamination. If soil properties are variable across an area of concern, additional sampling may be required. Sampling requirements of the Technical Regulations must also be followed. Sample results are compared to the site-specific IGW soil remediation standards developed for the area of concern or site on a point-by-point basis.

VI. Using site conditions to evaluate impacts to ground water pathway

The Department has identified methods to evaluate the impacts to ground water without the need to develop a site-specific IGW soil remediation standard. The nature and extent of contamination and other site-specific conditions will dictate whether there will be future impacts to ground water and determine if further remediation is required. When specified site conditions are met, the Department would not require further remediation for the impact to ground water pathway.

1. Immobile Contaminants

The Department modeled the transport of contaminants that exhibit very low mobility in soil and has determined that under certain conditions, existing soil contamination is not likely to migrate to ground water. If the person conducting the remediation can demonstrate that at least a two-foot clean zone is present between the contamination and the water table, no remediation may be required for the impact to ground water pathway. A list of the immobile chemicals that are considered to be immobile and further guidance on this option are available in the Immobile Contaminants Guidance Document.

http://www.nj.gov/dep/srp/guidance/rs/immobile_chemicals.pdf

2. Site Soil and Ground Water Analytical Data Evaluation

Metals & Semi-Volatile Organic Compounds Contamination

http://www.nj.gov/dep/srp/guidance/rs/observed_metals_semivocs.htm

Volatile Organic Contamination including methyl tertiary butyl ether (MTBE) and tertiary butyl alcohol (TBA) derived from discharges of Petroleum Mixtures

http://www.nj.gov/dep/srp/guidance/rs/petroleum_mixtures.htm

V. References

USEPA (1996). Soil Screening Guidance: Technical Background Document, May 1996. U.S. Environmental Protection Agency, Office of Emergency Response: Washington, DC, EPA/540/R-95/128 PB96-963502.