

## Frequently Asked Questions for the Impact to Ground Water Pathway in Soil Remediation Standards

### General Questions

#### *1. When do I have to do an Impact to Ground Water (IGW) pathway investigation?*

Addressing the IGW pathway is part of the Soil Standards Rule (N.J.A.C 7:26D-1.1(b) and N.J.A.C 7:26D-1.2(b) 2). The same guidelines apply to the IGW pathway as to the direct contact pathways, with one exception. The IGW pathway must be addressed whenever a discharge or potential discharge of a contaminant has occurred in the unsaturated zone. Unlike the direct contact pathways, the IGW pathway does not apply below the water table.

#### *2. How will I know whether my contaminant concentrations are of concern when there are no generic Impact to Ground Water Soil Remediation Standards (IGWSRS)?*

To determine whether the contaminants may contaminate ground water in the future, compare the concentrations of each contaminant in the soil with the IGW Soil Screening Levels found in Table 1 in the Soil Water Partition Equation guidance document at [http://www.nj.gov/dep/srp/guidance/rs/partition\\_equation.pdf](http://www.nj.gov/dep/srp/guidance/rs/partition_equation.pdf) If soil concentrations exceed the concentrations in this table, a site specific IGWSRS for that contaminant must be developed.

#### *3. What do we do for IGWSRS below the water table?*

The impact to ground water pathway only pertains to the unsaturated zone. If soil contamination exists below the water table, then pursuant to N.J.A.C. 7:26E-4.1(b) 3, if delineation or a vertical soil contaminant gradient has not been established to the water table, then:

For contaminants having water solubility greater than 100 milligrams per liter at 20 degrees Celsius to 25 degrees Celsius, saturated zone soil shall be delineated for both residual product pursuant to N.J.A.C. 7:26E-2.1(a)11 and for direct contact soil remediation standards; and

For other contaminants, delineation must be completed to the direct contact soil remediation standards.

#### *4. Can I choose capping as a means to address soil contaminants exceeding the site specific IGWSRS?*

Capping as a remedial option is only allowed for inorganic and semivolatile contaminants under certain conditions. Guidance on this is provided in the Technical Guidance document “Capping of Inorganic and Semivolatile Contaminants for the Impact to Ground Water Pathway” Version 1.0, available at <http://www.nj.gov/dep/srp/guidance/rs/>.

5. I have calculated IGW remediation standards using more than one of the options (partition equation, SPLP, etc.). Can the highest number calculated using these various options be used as the IGW remediation standard?

Yes. For example, if the SPLP option gives a higher remediation criterion than the partition equation, the number calculated using the SPLP option may be used as the standard.

### **Relationship between IGW Pathway and Ground Water Contamination and Use**

1. Do I need to address the IGW pathway if my ground water is clean?

Impact to ground water standards are designed to prevent future contamination of the ground water from current soil contamination or residual contamination remaining after remediation. In the past, the IGWSRS were sometimes inappropriately used as a trigger for ground water investigation. If ground water on a site is clean it may be because contamination in the soil has not yet made its way to the water table. Or it may be that contamination in the soil is at a low enough concentration that it will never impact the ground water in exceedance of the applicable Ground Water Quality Standard (GWQS). Whenever there is a discharge or suspected discharge, the IGW pathway must be investigated and addressed along with the direct contact pathways. Only by determining a site specific IGWSRS can it be determined whether the pathway is an issue or not for the site in question.

2. When do I need to put in a well?

The Technical Requirements detail when a ground water investigation is needed, and when to install a well (see NJAC 7:26E-3.7(a) and 4.4).

3. If my site has an existing pump and treat, what do I need to do for the IGW pathway?

Existing pump and treat systems address current ground water contamination. The impact to ground water pathway addresses the potential for future ground water contamination from the existing soil contamination. Therefore the two are not connected. The IGW pathway must be addressed such that future contamination of the ground water does not occur.

4. No one is drinking the water under my site. Why does the IGW pathway still need to be addressed?

In accordance with the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq. "It is the policy of this State to restore, enhance and maintain the chemical, physical, and biological integrity of its waters, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial and other uses of water." In order to maintain the integrity of ground water, no addition of chemicals that would result in an exceedance of the GWQS is allowed.

### **Synthetic Precipitation Leaching Procedure (SPLP)**

*1. The SPLP option calculates the remediation standard in more than one way. Can I use the highest calculated number as the remediation standard?*

Yes. The SPLP spreadsheet automatically does this.

*2. I used the SPLP spreadsheet and Option 1a was successful, because all soil concentrations passed. But when the IGWSRS was calculated, the highest soil concentration (102 ppm) was rounded down to 100 ppm and is now below my highest tested concentration. Do I have to remediate to 100 ppm?*

No. In this case the IGWSRS will be the highest soil concentration tested, which should not be rounded down. In the example above the IGWSRS would be 102 ppm.

*3. What if I get non-detect (ND) results with the SPLP test?*

If a total soil concentration result is ND, SPLP calculation cannot be conducted on that sample, because the sample is uncontaminated. Contaminated soil needs to be sampled and tested.

If a leachate concentration is ND, this result can still be used in SPLP options 1 and 2. You would enter the aqueous reporting limit as the leachate concentration. The resulting standards calculated via options 1 and 2 would be applicable. Because the leachate concentration is assumed to be equal to the reporting limit, leaching is overestimated and the resulting soil standard is conservative. Option 3 cannot be used, however, since this requires a regression analysis of actual leachate concentrations.

If all leachate concentrations are below the reporting limit, then the highest soil concentration tested using SPLP can be used as the IGW remediation standard.

*4. What if the SPLP test calculates a higher remediation standard than any of the concentrations tested?*

The highest concentration actually tested becomes the remediation standard. The reason for this is that the adsorption capacity of the soil may be exceeded at higher concentrations, and the SPLP calculations do not take this into account. The SPLP spreadsheet automatically makes this adjustment if necessary. If a higher remediation standard is desired because on-site concentrations are higher than the calculated standard, a higher concentration soil sample will need to be collected and submitted for SPLP testing.

## SESOIL

*1. When using SESOIL without AT-123D, is a clean zone required between the contamination and the water table?*

The Department policy has changed on this issue and the guidance document at <http://www.nj.gov/dep/srp/guidance/rs/sesoil.pdf> will be modified to reflect this change. A clean soil zone is not required if 1) maximum expected leachate concentrations of the contaminant are achieved during the model run due to elimination of the contaminant from the vadose zone, or 2) the contaminant travels at least one sublayer in distance over 100 years (normally 1 foot) and the leachate concentration at the bottom of the soil column does not exceed the applicable leachate criterion. Since the SESOIL model begins contaminant transport in the middle of a soil sublayer, the contaminant must travel a minimum of 6 inches (in a 1-foot sublayer) in order to reach the water table. This may result in highly adsorbed contaminants not reaching the water table during the model run even though the contaminant is in contact with the water table at the site. This discrepancy is dealt with by the above modeling requirements, which ensure contact of the contaminant with the water table.

*2. Can I use the SESOIL model alone without AT-123D to determine soil remediation standards even if the ground water is already impacted?*

The Department policy has changed on this issue and the guidance document at [http://www.nj.gov/dep/srp/guidance/rs/at123d\\_guidance.pdf](http://www.nj.gov/dep/srp/guidance/rs/at123d_guidance.pdf) will be modified to reflect this change. Yes, the SESOIL model can be used to determine unsaturated zone soil remediation standards in this situation, and it is a simpler approach than using the combined SESOIL/AT-123D model. This policy change is being made because situations arise where ground water remedial action plans are already in place, and it is desired to treat the contaminated soil as a separate issue. In order for this approach to be acceptable, ground water contamination must be adequately addressed as required by the Department.

*3. When using the SESOIL option, do I have to calculate a single remediation standard for an area of concern?*

No. The SESOIL option may result in an allowed contaminant distribution in soil, rather than a discrete number. When using the SESOIL option, a soil concentration is entered for each 1-foot interval between the soil surface and the water table. This concentration may be different for each depth interval. The entered concentration distribution may be either existing concentrations or proposed concentrations to be left behind after remediation. If this distribution yields acceptable SESOIL results (specifically, the leachate criterion is not exceeded), the distribution of chemical concentrations in the soil is acceptable as an IGW remediation condition.

4. *When using the SESOIL model, do I model concentrations that are present in the soil before or after remediation is conducted?*

There are three possible answers to this question. First, the SESOIL model can be used to model an existing concentration distribution before remediation, to determine if the impact-to-ground water pathway is of concern. Second, the model can be used to model proposed contaminant concentrations that will be left behind after remediation, to determine if the proposed remediation plan is acceptable. Third, the model can be used to model a theoretical concentration distribution, such as a proposed maximum allowed concentration at each depth interval. If a theoretical concentration distribution is shown to be acceptable as an impact-to-ground water standard, then soil concentrations at a particular depth interval may not exceed the modeled concentration for that particular depth.

5. *When using the SESOIL option, how do I enter sample concentrations if I don't have a soil sample result for each 1-foot depth interval in the soil column?*

Identify the vertically closest soil samples above and below the depth interval of interest. The higher contaminant concentration from these two samples should be used to fill in the missing depth interval. Since the SESOIL model is one-dimensional in the unsaturated zone, the horizontal variability of the contaminant in the soil column is not considered.

6. *Why can't I use multiple soil texture layers in SESOIL?*

Multiple soil texture layers cannot be used because not all of soil texture parameters can be varied with depth. While it has been suggested that there may be approaches to work around this limitation, they have not been standardized at this time. In the meantime, the median soil texture may be used as discussed in the guidance.

7. *The use of variable soil organic carbon contents with depth is allowed in SESOIL. What are the sampling requirements?*

Up to four soil layers are allowed in SESOIL, and each layer may either be assigned the default organic content of 0.2 percent, or may be assigned a site-specific organic content. For each layer where a site-specific organic carbon value is desired, a minimum of three separate soil samples must be taken and analyzed for total organic carbon. As described in the soil-water partition equation guidance, the three results may be averaged unless they vary by more than an order of magnitude, in which case the minimum organic carbon value must be used. Break points between the soil layers can be determined via visual inspection of soil borings for changes in soil texture and/or appearance.

8. *How do I use site-specific  $K_d$  values in the SESOIL model?*

Site-specific  $K_d$  values from the SPLP test may be used in the SESOIL model. As described in the SPLP guidance document, the measured  $K_d$  values can be averaged if they vary by less than an order of magnitude; otherwise, the lowest  $K_d$  value is selected. The samples submitted for  $K_d$  determination should include the highest contaminant concentration you wish to model using

SESOIL. You cannot model concentrations in the SESOIL model that are higher than those submitted for SPLP testing, due to the potential for the adsorption capacity of the soil to be exceeded at higher concentrations.

9. *Can I use a  $K_d$  value from a sample that failed the SPLP test when determining a site-specific  $K_d$  to use with the SESOIL model?*

Yes. It does not matter if a sample fails the SPLP test, because the test is being used to obtain a  $K_d$  value for use in the SESOIL model, not to determine whether that sample yields an acceptable leachate concentration.

### **Reporting Limits**

1. *The required Reporting Limits (RLs) for contaminants, especially some Volatile Organics, are very low. What if my sample results do not meet these limits?*

Current Department policy states that for cases where a RIR/NFA or RIR/RAW for soils at an area of concern (AOC) or at the site was not submitted prior to December 2, 2008, the June 2008 Soil Remediation Standards are to be applied to the AOC/site. Furthermore, when historic or current sample results are ND for a compound but the laboratory reporting limit (RL) exceeds the June 2008 Soil Remediation Standards, the person responsible for conducting the remediation (RP) is required to review the sample chromatograms, and associated raw sample and standard data to evaluate the acceptability of the data or re-sample to achieve compliance with the new soil remediation standards.

### **Background Contamination**

1. *Some contaminants on my site, such as Beryllium, were never part of site operations and yet are showing up above IGW Soil screening levels. I believe they are due to background. Do I have to remediate them?*

Contamination due to background generally need not be remediated. However it must be demonstrated that it is indeed due to background and not discharges. Past site history as well as background studies, either site specific or general, such as the NJDEP Division of Science and Research studies found at <http://www.nj.gov/dep/dsr/research/ambient-levels-metal.pdf> and <http://www.nj.gov/dep/dsr/soilrep.pdf> may be utilized.

### **Contaminants with GWQS based on secondary considerations (such as Aluminum, Manganese, Silver and Zinc)**

1. *I have heard that the IGW pathway need not be addressed for these contaminants. Is this true, and if so why?*

Soil standards, by law, must be based on health considerations. The health based GWQS are used as the endpoint from which to back-calculate the IGWSRS. The GWQS for Aluminum, Manganese, Silver and Zinc are secondary, that is they are not based on health considerations,

but primarily on aesthetic considerations such as taste, odor and appearance. Additionally, these elements may be found as background contaminants. Therefore the Department has decided that the IGW pathway does not need to be addressed for these contaminants unless there is cause to believe that their presence is due to a site discharge. The direct contact pathways must still be addressed.

The same holds true for contaminants such as Sodium and Iron, which are not on the Soil Standard contaminant list, but which may be present on a site.