Remedial Priority Scoring (RPS) System Overview

I. RPS Overview

A. Statutory Requirements

The Remedial Priority Scoring (RPS) Model is a ranking system developed by the Department of Environmental Protection (Department) to categorize sites based on the potential risk to the public health, safety, or the environment. The RPS was mandated pursuant to The Spill Compensation and Control Act (N.J.S.A. 58:10-23.16) as amended in section 39 of P.L. 2009, c.60 Site Remediation Reform Act (SRRA). The statute requires the Department to create a ranking system that establishes categories in which to rank sites based upon:

- the **level of risk** to the public health, safety, or the environment
- the length of time the site has been undergoing **remediation**
- the **economic impact**
- and any **other factor**

B. Model

The RPS model gathers data from different sources within the Department and creates a relative, categorical ranking for the Department's active and pending contaminated sites.

The RPS model takes into account the following factors when evaluating a site:

- Proximity of a site to nearby receptors
- Concentration of contaminants of concern at a site in the various media
- Inherent toxicity of each contaminant
- Potential Human Health and Ecological exposure to the contamination

C. Model Classes

The model evaluates two classes of Receptors: Human Health and Ecological. The Human Health Receptor Class is further broken down into media: Ground Water, Soil and Vapor

II. Elements of the RPS

The design of the RPS model follows the Department's Contaminant, Pathway and Receptor (CPR) Analysis of Risk Methodology to determine the potential risk of the site. The evaluation of the contaminant, pathway and potential receptors are performed separately for each media and then combined to generate a final score.

A. Contaminant Concentration (Site Analytical Data)

1. Evaluating the levels of contamination

The RPS determines the site conditions based on the electronic analytical data that has been submitted to the Department. A methodology has been developed to characterize the relative level of contamination at a site. Each sample that exceeds the applicable standard is normalized so that contaminants with different properties and different concentrations across distance and time can be compared. The normalized results are then combined into a single

value, which characterizes the site. This single value for the site is referred to as the "**Site Condition Score**." A Site Condition Score is calculated for each media.

If the Department does not have an approved electronic version of the sampling data, then Surrogate values are used, which are based on results that are available for comparable sites.

2. Contaminant Extent Area

An extent of the contamination is required by the RPS model in order to evaluate the potential interaction between a site and nearby receptors. The RPS uses the term "**Extent Area"** to define this area. The RPS model uses an Extent Area for all three media. The Extent Areas are:

- Ground Water Extent Area
- Soil Extent Area
- Vapor Extent Area

At this time, the Department does not have an electronic version of the Extent Areas, so a "Surrogate Extent Area" is created around the site coordinates for each of the media. The Surrogate shapes and sizes are created based on information available to the Department. The shape of the surrogate Ground Water Extent Area is elliptical extending in the direction of flow if ground Water Flow is known, otherwise it is circular. Surrogate Soil Extent Areas are based on the parcel information for the site, if available, otherwise it is circular. The Vapor Extent Area is created by buffering Ground Water Extent Area.

B. Pathway (Exposure)

The RPS evaluates potential pathways that a contaminant can travel to expose a human population or adversely affect an ecological system based on information provided to the Department in the site's Receptor Evaluation Form. A Pathway is completely "closed" if the Remedial Investigation (RI) has been completed and no pathway has been identified. All other pathways are considered "open."

The RPS model uses a binary toggle to denote the pathway. If the pathway has been determined to be completely closed, then a 0 is assigned to the "**Pathway Score**." All open pathways are assigned a Pathway Score of 1.

C. Receptor

1. GIS Layers

The RPS Model evaluates potential receptors based on Geographic Information System (GIS) layers developed by the Department. A GIS layer is spatial data displayed in a map-like format. A wide range of data can be associated with the GIS layers, which makes it a powerful format to evaluate potential receptors. The RPS Model assigns values to within a layer to represent potential receptors..

Each GIS layer was created to evaluate a specific route of exposure. This was done to capture all the potential ways a contaminant could come in contact with a receptor. During model development, the layers were vetted through a significant stakeholder process. The RPS model groups the layers based on the media for which the layer was developed to evaluate. The GIS layers are:

A. Human Health Receptors
   - Water Media
     - Private Wells
     - Community Wells
     - Non-Community Wells
     - Surface Water Intakes
     - Water Bodies
     - Agricultural
   - Soil Media
     - Soil Exposure - Residential
     - Soil Exposure – School
     - Soil Exposure - Day Care
   - Vapor Media
     - Vapor Exposure - Residential
     - Vapor Exposure - School
     - Vapor Exposure - Day Care

B. Ecological Health Receptors
     - Pinelands
     - Highlands
     - Water Body:
     - Natural Heritage
     - Landscape - Habitats and Animals
     - Other Freshwater Wetlands
     - Salt Water Marsh

2. Cell Values

The RPS Model uses a 100 foot by 100 foot cell grid system to evaluate potential receptors. A Value is assigned to each cell in the State of New Jersey grid for each GIS layer. Where possible, the Receptor layers attempt to characterize the potential exposure risk of a population and assign a "Cell Value" based on the total number of receptors and an estimate of the exposure duration. In this manner, a higher population density will be represented with a larger cell value. If the population cannot be ascertained, a value is created that represents the relative exposure risk in relationship to the layers that were based on population.

3. Calculating a GIS Individual Receptor Score

   To calculate a Score for each receptor layer, the GIS layers are overlain by the appropriate Extent Area for that layer. The Ground Water Extent Area is used to evaluate the Water Media layers, the Soil Extent Area for the Soil Media and the Vapor Extent Area for the Vapor Media. The cell values that are within the Extent Area are used to calculate the "**Receptor Score**" for that layer. The Extent Area acts as a cookie cutter, cutting out and identifying those cells that intersect with the Extent Area.

III. Procedures to Calculate RPS Scores

The Site Condition Score, Pathway Score and the Individual Receptor Scores are inputted into the RPS Model to calculate the scores for the two Receptor Classes: Human Health and Ecological Health. The basic arithmetic principle of the RPS model is that receptor scores are combing using addition, but the Site Condition and Pathway Scores are combined with the Receptor Scores by multiplication.

The Individual Receptor Scores are grouped by media and then summed to calculate the "**Receptor Score**" for each media.

A. Human Health Score

1. Water Media
   - The water media consists of several different pathways and layers. As such, the six Water Media Receptor Layers are multiplied by the Pathway Score prior to their summation to allow the Pathway for individual layers to be closed without affecting the other layers. The result of this operation is the Water Receptor Score.
   - The Water Receptor Score is then multiplied by the Ground Water Site Condition Score. The result is the Water Media Score

2. Soil Media
   - The Individual Receptor Scores for the Soil Media Receptor Layers are summed up to calculate the Soil Receptor Score.
   - The Soil Receptor Score, the Soil Site Condition Score, and the Soil Pathway Score are multiplied together. The product is the Soil Media Score

3. Vapor Media
   - The Individual Receptor Scores for the Vapor Media Receptor Layers are summed up to calculate the Vapor Receptor Score.
   - The Vapor Receptor Score, the Vapor Site Condition Score, and the Vapor Pathway Score are multiplied together and the product is the Vapor Media Score.

The "Human Health Score" is calculated by summing up the Water Media Score, Soil Media Score and the Vapor Media Score.

B. Ecological Health Score

- The Individual Receptor Scores for the Ecological Receptor Layers are summed up to calculate the Ecological Receptor Score.
- The Ecological Receptor Score is multiplied by the Ecological Pathway Score and the product is the Ecological Health Score.

    - An Ecological Site Condition Scores can not be calculated because a health based ecological standard does not exist at the present time.

IV. Establishing Categories

The intent of the RPS is to ranks the contaminated sites in New Jersey. As such, the Human Health Receptor Score and Ecological Receptor Score are separated into categories using a data classification system. The classification method used by the Department is referred to as "Jenks' Optimization method" or the "Jenks' Natural Breaks" Classification method. This system is designed to minimize each category's deviation from the mean of the group by grouping likes together and separates those that are dissimilar. The sites are ranked into 5 distinct categories with Category 1 being the least potential risk and Category 5 being the greatest potential risk.