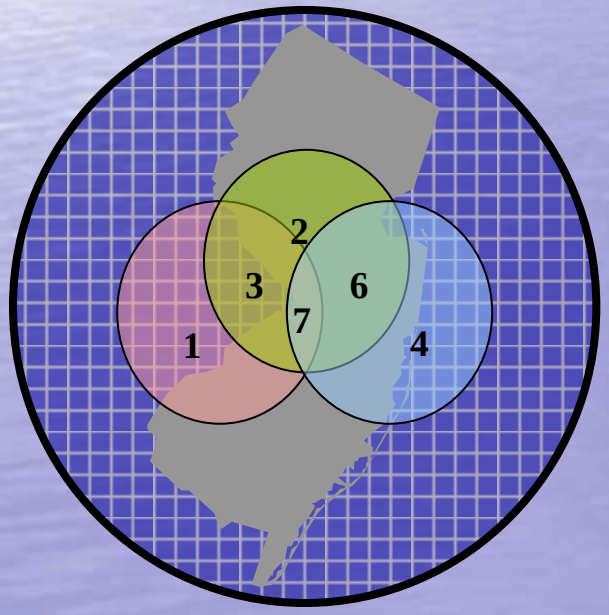
Remedial Priority System

Remedial Priority Scoring (RPS) System Overview



March 2012

Remedial Priority System

- **RPS Overview**
- Elements of the RPS
  - **C**ontaminant, **P**athway and **R**eceptor - "CPR" Analysis of Risk
- GIS Receptor Layers
- Procedures to Calculate RPS Scores
- Establishing Categories

Remedial Priority Scoring

Remedial Priority Scoring (RPS) System is a ranking system developed by the 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**

RPS Overview

The RPS model gathers data from different sources within the Department and creates a relative, categorical ranking for SRP'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

Remedial Priority Scoring

- RPS Overview
- **Elements of the RPS**
  - **Contaminant, Pathway and Receptor - "CPR" Analysis of Risk**
- GIS Receptor Layers
- Procedures to Calculate RPS Scores
- Establishing Categories

Elements of the RPS Model

- Contaminant Concentration (Site Analytical Data)
- Pathway (Exposure)
- Receptor (GIS Layers)

Contaminant, **P**athway and **R**eceptor = "CPR" Analysis of Risk

Elements of the RPS Model
Receptor Classes

The RPS model evaluates two receptor classes and yields a score for each class.

Currently, there are two receptor **classes:**

- Human health
- Ecological health

Future versions of the model will include Economic Impacts and any other factors determined by the Department as data becomes available.

Elements of the RPS Model
Media

The impact to the human population (Human Health Receptor Class) is determined by the potential exposure to various media. The model evaluates each media exposure independently and then combines each score to derive a final ranking.

At present, there are three **media** included in the RPS Model.

- Water
- Soil
- Vapor

Elements of the RPS Model
"CPR" Analysis of Risk

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.

- Contaminant
  - the RPS determines the site conditions based on the electronic analytical data that has been submitted to the Department.
- Pathway
  - The RPS model evaluates routes of exposure to a receptor based on information provided to the Department in the site's Receptor Evaluation.
- Receptor
  - The RPS evaluates potential receptors based on Geographic Information System (GIS) layers developed by the Department.

The evaluation of the contaminant, pathway and potential receptors are performed separately for each media and then combined to generate a final Human Health score.

Elements of the RPS Model
Contaminant

What was released and how much:

- The Department has developed a methodology to characterize the relative level of contamination at a site.
- In order to compare contaminants with different properties and different concentrations across distance and time, the RPS Model normalizes each sample concentration, called the **Exceedance Quotient** (EQ).
- Each normalized result is combined into a single value, which characterizes the site. This single value for the site is referred to as the **Site Condition Score**.

Elements of the RPS Model
Contaminant Properties

The properties taken into account to normalize each sample concentration during the EQ calculation.

- For Ground Water
  - Solubility
  - Mobility (Retardation)
  - Degradation
  - Appropriate regulatory standard
- For Soil:
  - Sample depth
  - Appropriate regulatory standard
- For vapor:
  - Solubility
  - Mobility (Retardation)
  - Degradation
  - Ground water Screening Levels established in the Department's Vapor Intrusion Guidance Document.

Elements of the RPS Model
Extent of Contamination

Characterizing the extent of the contamination:

- The RPS model uses an areal extent of contamination to evaluate the relationship between a site and nearby receptors. The RPS uses the term "Extent Area" to define this area.
- An Extent Area is utilized by the RPS model for all three media. The three Extent Areas are:
  - Ground water Extent Area
  - Soil Extent Area
  - Vapor Extent Area
- Until such time as SRP has an electronic version of the "Extent Areas", a "Surrogate Extent Area" is created around the site coordinates for each of the media.

Elements of the RPS Model
Pathway

- The RPS evaluates potential pathways that a contaminant can travel to expose a human population or adversely affect an ecological system.
  - The RPS model uses a binary toggle to denote the pathway.

    0 = Pathway is completely "closed" – A Remedial Investigation (RI) has been completed and no pathway has been identified

    1 = Pathway is either "open" or unknown

If the pathway has been determined to be completely "closed", then a score of 0 is assigned to the pathway. All other pathways are assigned a 1.

Note: *The Department uses information submitted with the Receptor Evaluation Form for the site and various other information in the Department's databases to determine the pathway conditions.*

Elements of the RPS Model
Receptors: exposure and pathways

- In order to determine potential receptor impacts, the RPS Model evaluates modes of exposure, which is a unique combination of potential exposure and pathways.

The exposures that the RPS model considers are:

- Ingestion,
- Dermal, and
- Inhalation

The Routes of exposure evaluated are:

- Soil
- Ground water
- Surface water
- Vapor

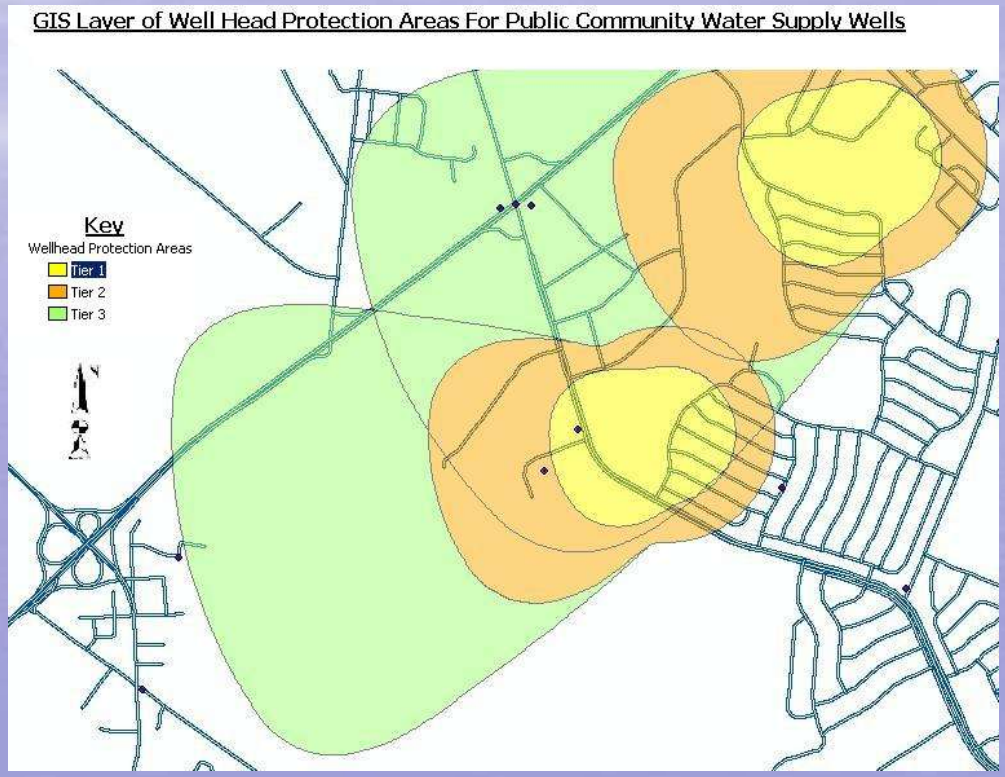
.

Remedial Priority Scoring

- RPS Overview
- Contaminant, Pathway and Receptor "CPR" Analysis of Risk Methodology
- **GIS Receptor Layers**
- Procedures to Calculate RPS Scores
- Establishing Categories

GIS Receptor Layers

- GIS layer is spatial data displayed in a map-like format. The RPS model adapts available GIS layers into a derived layers that represents receptors.
- The figure at side is a portion of a GIS layer for Well Head Protection Areas For Public Community Water Supply Wells



- Where possible, the Receptor layers represent the potential exposure of the population. If the population cannot be ascertained, surrogate values are used.

GIS Receptor Layers
Human Health Class

Water Media (ground water and surface water)

Layer	Description of Layers
Private Wells	A derived layer based on a water purveyor layer. Areas not covered by the water purveyor layer are assumed to have private wells. The population served is taken from the 2000 US Census layer with further revision by the DEP land use layer.
Community Wells	Serves at least 25 year-round residents or at least 15 service connections which are used by year-round residents. A derived layer based on the mapped Well Head Protection Area and the pumping capacity of the well.
Non-Community Wells	Serves at least 25 individuals for more than 60 days but not year-round or serves at least 15 service connections that are used by individuals for more than 60 days but not year-round. A derived layer based on the mapped Well Head Protection Area and the people served.
Surface Water Intakes	Potential surface water contamination could impact potable water sources of Drinking Water from intake locations along water bodies.
Surface Water Quality Standards	Potential surface water contamination could impact potable water sources of Drinking Water sources, propagation of fish and wildlife, recreation, agricultural and industrial supplies, and navigation.
Agricultural	Potential exposure through ingestion of contaminated agricultural products

GIS Receptor Layers
Human Health Class

Soil Media

Layer	Description of Layers
Soil Exposure - Residential	The 2000 US Census layer and land use layers are used to estimate the potential population that could be affected by any soil contamination
Soil Exposure – School / Day Care	The Department created School and Day Care layers to estimate the potential population that could be affected by any soil contamination

Vapor Media

Layer	Description of Layers
Vapor Exposure - Residential	The 2000 US Census layer and land use layers are used to estimate the potential population that could be affected by any vapor intrusion caused by ground water contamination.
Vapor Exposure - School / Day Care	The Department created School and Day Care layers to estimate the potential population that could be affected by any vapor intrusion caused by ground water contamination.

GIS Receptor Layers

Ecological Layers

Layer	Description of Layers
Pinelands	The Pinelands coverage consists of a single layer with 9 non-overlapping categories
Highlands	This dataset is an interpretation of the Highlands Preservation and Planning Area Boundary as described by the Highlands Water Protection and Planning Act of 2004.
Water Body: (Surface Water Quality Standards)	Surface Water types: Outstanding National (ON), Category 1 (C1), Category 2 (C2) and Delaware River Basin Commission (DR) rivers and wetlands included.
Natural Heritage	This layer consists of areas of critical importance for the preservation of biodiversity or ecological habitat. The emphasis of this coverage is to track areas that are of interest to the State of NJ or to non-governmental preservation groups for future preservation acquisition and management
Landscape - Habitats and Animals	The 2008 Landscape Coverage consists of the following layers: Emergent Wetlands, Beach, Forested Wetlands, Grasslands, Wood Turtle, Urban Peregrine Falcon, Bald Eagle Foraging. Each layer is converted to a grid and the sum of scores for each layer creates the final numerical value for the cell.
Other Freshwater Wetlands	Ecologically sensitive areas outside of the Landscape coverage (at this time) include only wetlands.
Salt Water Marsh	Critical Habitat for Commercial Fisheries

Remedial Priority Scoring

- RPS Overview
- Contaminant, Pathway and Receptor "CPR" Analysis of Risk Methodology
- GIS Receptor Layers
- **Procedures to Calculate RPS Scores**
- Establishing Categories

Procedure to Calculate RPS Score

The model utilizes multiple geo-spatial data bases, GIS layers, receptor information and site specific sampling data in calculating a RPS score.

- A separate final score is calculated for both Human Health and Ecological Health Classes
- The basic procedure used by the RPS system in calculating scores for all media and Classes is:
  - examine the areas around the site for potential receptors = Receptor Score
  - derive a Site Condition Score that represents the contamination at a site
  - determine if an open pathway exists between the receptors and contamination = pathway Score
- The Receptor score, Site Condition Score and Pathway Score are used to calculate a final RPS score.
- For detailed information regarding the RPS Model calculations, please read the Remedial Priority Scoring Basis and Background

Procedure to Calculate RPS Score
Human Health Score

The Human Health Score is calculated by summing the water media score, soil media score and vapor media score.

Human Health Score = Water Media Score + Soil Media Score + Vapor Media Score

Note: *If a pathway is closed, then the score for that media will be 0 even if there are nearby receptors and/or contamination present at a site.*

Procedure to Calculate RPS Score
Water Media Score

- Water Media Score = GW Receptor Score x GW Site Condition Score x GW Pathway
  - GW Receptor Score: summation of the potential impacts on receptor populations relative to the Water Human Health Layers.
  - GW Site Condition Score: site specific score for ground water contamination
  - GW Pathway Score: pathway status (Open or Closed) for the ground water and surface water pathways

Procedure to Calculate RPS Score
Soil Media Score

- Soil Media Score = Soil Receptor Score x Soil Site Condition Score x Soil Pathway
  - Soil Receptor Score: summation of the potential impacts on receptor populations relative to the Soil Human Health Layers.
  - Soil Site Condition Score: site specific score for soil contamination
  - Soil Pathway Score: pathway status (Open or Closed) for the soil pathway

Procedure to Calculate RPS Score
Vapor Media Score

- Vapor Media Score = Vapor Receptor Score x Vapor Site Condition Score x Vapor Pathway
  - Vapor Receptor Score: summation of the potential impacts on receptor populations relative to the Vapor Human Health Layers.
  - Vapor Site Condition Score: site specific score for vapor issues based on ground water contamination
  - Vapor Pathway Score: pathway status (Open or Closed) for the Vapor pathway

Procedure to Calculate RPS Score
Ecological Receptor Score

Ecological Receptor Score = Ecological Receptor Score x Ecological Pathway

Ecological Receptor Score is calculated by multiplying the following scores:

- Ecological Receptors Score: Summing up all receptors in the vicinity of the site (overlaying the ground water Extent Area with the Water Human Health Layers)
- GW Pathway Score: Determining the pathway status (Open or Closed) for the ground water and surface water pathways

At the present time, an Ecological Site Contamination Score is not included in the RPS model because.

Remedial Priority Scoring

- RPS Overview
- Contaminant, Pathway and Receptor "CPR" Analysis of Risk Methodology
- GIS Receptor Layers
- Procedures to Calculate RPS Scores
- **Establishing Categories**

Establishing Categories

- RPS model ranks the Human Health Receptor Score and Ecological Receptor Scores into categories using a data classification system designed to minimize each category's deviation from the mean of the group. It groups likes together and separates those that are dissimilar.

- The classification method used is referred to as "Jenks Optimization method" or the "Jenks Natural Breaks" Classification method.

- The sites are ranked into 5 distinct categories.
  - Category 1 is the least potential risk
  - Category 5 is the greatest potential risk.