Remedial Priority Scoring System Brief

Background

The Remedial Priority Scoring (RPS) system was mandated pursuant to N.J.S.A. 58:10-23.16 as amended in section 39 of P.L. 2009, c.60 which states "…the department shall establish a ranking system that establishes categories in which to rank sites based on risk to public health, safety or the environment"… To accomplish this goal, the RPS process gathers data from different sources and creates a relative categorical ranking score for approximately 12,000 of the Site Remediation Program's (SRP) active, contaminated sites. It is important to note that not all of the contaminated sites in NJ are included in the process. Some sites are excluded. These consist of homeowner sites and unregulated heating oil tank cases, sites under going operations and maintenance monitoring, child care facilities, Initial Notice cases, Cleanup Stars Program cases, and unknown source cases.

The fundamental advantage of the computerized RPS system is that it allows for relative ranking by categories of all the selected contaminated sites using consistent, defensible data sources and model assumptions that provide reproducible results. It has been designed to minimize subjective human interpretations and anecdotal data inherent to traditional ranking processes - where data can be acquired through automation using a rule-based process.

To obtain the data required, the RPS system uses Geographic Information System (GIS) tools, multiple geographic data bases and layers, selected data elements from the New Jersey Environmental Management System (NJEMS), the Known Contaminated Sites (KCS) report which is derived from NJEMS, as well as groundwater sampling data collected during the investigation and remediation process (HazSites).

Future Development and Existing Limitations

The impact of sites having groundwater contamination is included in this first version of the RPS. This pathway represents significant threat to human and ecological health in terms of exposure and spatial extent. It also forms the basis for evaluating vapor intrusion. Ongoing development of the model will incorporate soil contamination and the corresponding pathways.

There are many areas for improving RPS. While the use of GIS and electronic data is extremely powerful allowing rapid, comprehensive categorization of sites, it is a new approach with few precedents. As data and analysis techniques are developed they will be used to improve the quality of the model. Mandates, such as mandatory timeframes, established under the Site Remediation Reform Act (SRRA) are integral to this effort. Through improved collection and management of site data, the Department will be able to better characterize the anticipated extent of contamination where actual extent is not yet known. Similarly, the affirmative obligation to address site contamination includes new procedures for reporting Immediate Environmental Concerns and Receptor Evaluation data. It will require submission of GIS-compatible data representing the site boundary and ground water contaminant plume delineation. These data are critical to modeling actual conditions and modifying evaluation of potential impacts. It is necessary that these data be in digital format. Finally, the model will improve as new spatial datasets representing the surrounding landscape and receptors are created and existing datasets are updated.

Data Sources

GIS Data

Spatial data includes existing GIS databases (layers). Census data, municipal wells, lakes, streams, wetlands, schools and more are considered by the model. Where a GIS layer does not exist, new layers can be derived from the existing layers. For example, "private well areas" are defined as the area outside of the "Community Public Water Purveyor" areas and coinciding to residential land use areas. The sensitivity of each dataset varies depending on its role in determining potential human and ecological health risk. Numeric values have been assigned to each layer which represents this risk. Layers which are more sensitive to site contamination will have a higher range of values. For example, various census tracts have higher population values and therefore have a higher human health risk. These areas are given higher values to represent that risk.

In order to improve the processing time of layers, each of the “risk” layers were converted into raster layers. Each raster layer consists of a uniform grid of 100 by 100 foot cells covering the entire state. Each cell reflects a value within a range determined for that layer.

NJEMS Data

NJEMS is an Oracle database used to track administrative data and site progress. RPS applies selected non-spatial data stored in NJEMS to the RPS score calculation. For example, the bureau designation and case type used in determining buffer extent is found in NJEMS.

HazSites Sampling Data

HazSites is a database which is used to store case sampling data. HazSites represents the most comprehensive source of sampling data available to SRP at this time. RPS normalizes the sampling data for comparison of different chemicals using a calculated value known as the “Exceedance Quotient” (EQ). The EQ is derived by dividing a sample result value by the pre-existing standard for that contaminant. For instance, a sample result of 800 ppb with a standard of 70 ppb would have an EQ of 800/70 or 11.43. The EQ would be approximately 11 times greater than its standard. The Department is currently in the process of moving SRP sampling data into a new data depository.

Calculations

The RPS system produces an overall score combining a human health score, an ecological health score, and a contamination score. GIS, NJEMS and HazSites data are combined into one overall score.

A key GIS layer in the RPS is the KCS layer derived from the KCS Report. The KCS layer contains the coordinate locations needed to place sites within the GIS landscape. Site location determines the relationship of the site to all surrounding features and thus determines impact. Currently, a circular buffer around each KCS point represents the aerial extent of contamination. The radius of the buffer is based on the typical extents identified for cases being managed by specific bureaus. This rough extent for sites is replaced by a more accurate extent of contamination as information is provided.

Receptor scores are derived by "stacking up" the applicable grid layers, extracting the cells within each site radius, summing these values for each layer, then summing the resulting values for all human health and ecological health layers.

GIS - Human Health

Human health layer and cell scores were created by reviewing all the RPS layers and putting them in order based on potential risk and the best professional judgment of SRP experts. Human health receives higher risk scores than ecological health. The cell values within each human health layer are processed using the site radius.

GIS - Ecological Health

The ecological health layers were created and summed using the same concepts described for the human health score.

NJEMS

NJEMS data is used to identify and score contaminant – receptor pathways which may be "closed" due to engineering controls or other site conditions. As information is incorporated into the database reflecting actual existing pathways, data will be adjusted accordingly.

HazSites - Exceedance Quotient

The formula used to calculate raw EQ scores is discussed above (i.e. conc. / std. = EQ). This calculation results in a separate EQ score for each contaminant, at each monitoring well and each sampling episode (date). This results in the generation of many EQ scores with values having a tremendous range, spanning orders of magnitude. To make the EQ scores manageable, two steps were taken.

- A method was developed which selects the EQ value of the highest, most recent sample result and then uses that single value to represent the entire site. This value is known as the "Site Threat Score";

- All site threat scores are divided into categories. Each tier is assigned a value from 1 to 5. This value is known as the “Site Threat Factor”.

The tier system was established as follows:

Site Threat Score	Site Threat Factor
1-9	1
10-99	2
100-999	3
1,000-9,999	4
>10,000	5

Several methods were developed and reviewed before selecting the method mentioned above. The reasons for selecting this specific method are:

- It accounts for remedial improvements by using the most recent sample at any given sample location;
- It accounts for remedial improvements by removing EQs that correspond to an NJEMS case that is “closed”;
- It accounts for the worst contamination by using the most recent, highest EQ for each contaminant.

Human health and ecological health scores are multiplied the Site Threat Factor. This assumes the existence of a pathway between the source of contamination and receptors. This scenario reflects an "open" pathway where a connection exists between the source of contamination and receptors.

A pathway is "closed" when this potential is abated. For example, a site without groundwater contamination could not impact receptors like wells. Similarly, institutional and engineering controls may be placed on a site that break the pathway. A site having a cap or fencing will prevent direct contact with contaminated media. A classification exception area (CEA) will prevent wells from being improperly placed in contaminated zones. There are many ways to break the pathway between source and receptor to ensure impacts are eliminated. Where a pathway is demonstrated to be "closed" the threat value is multiplied by zero (0). This eliminates scoring where no impact is possible.

Once the applicability of a pathway has been incorporated into final scoring, the resulting value is categorized using “natural breaks” to describe the cumulative risk posed by each site. These categories were established to comply with NJSA 58:10-23.16.

Conclusion

RPS is a model. It is intended to represent site conditions, contaminant pathways, and potential receptors as well as other available data. The RPS score is calculated to determine a relative categorization of contaminated sites posing the greatest potential risk to human health and the environment. There is no perfect model for determining risk; therefore, all models must be improved over time to achieve the greatest possible accuracy and reliability. Factors, such as contaminant transport are variable. Only through investigation and data development can we predict exposure and the risk posed by a site. Sites early in the process will apply statistically supported assumptions. As site investigation moves forward, assumptions are replaced with facts. All parties share an interest in representing site impacts as accurately as possible whether the goals involves identifying and addressing the most significant site concerns, limiting liability, reducing cleanup costs, or protecting health and the environment.