Web-based GIS Systems for Radionuclides Monitoring

Dr. Todd Pierce
Locus Technologies
What is the problem?

- Nuclear power plant operators need to monitor radionuclides to safeguard the environment and meet regulatory needs
- Monitoring leads to very large amounts of data to analyze
How can GIS help?

- Analysis of spatial relationships not readily seen in tables
  - Correlation between measured values (such as tritium and groundwater levels)
  - Distance and direction between locations
  - Movement through time and space
- Generation of maps and other output
- Qa/Qc of data
Compare these reports of Tritium results and Groundwater Levels...

### Selected Analytical Results:

<table>
<thead>
<tr>
<th>Field Sample ID</th>
<th>Location ID</th>
<th>Date Sampled</th>
<th>Parameter Name</th>
<th>Report Result</th>
<th>Report Units</th>
<th>Lab Qualifier</th>
<th>Detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPN-14-57753</td>
<td>R-56 S1</td>
<td>2014-04-18</td>
<td>Tritium</td>
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<td>N</td>
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</tbody>
</table>

### Selected Groundwater Readings:

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Date Measured</th>
<th>Time Measured</th>
<th>Groundwater Elevation</th>
<th>Well Depth</th>
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</thead>
<tbody>
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</table>
...with this GIS map showing Tritium results and groundwater contours...
Overview

April 2014 Tritium Results with June 2014 Groundwater Contours

...and this printed output map.
Overview

diamond The ways GIS can help are greatly enhanced when the GIS application runs in the cloud
  ○ Shared access to one consistent data source, anywhere Web is available
  ○ Quickly perform analysis and create maps
  ○ Gain ownership of your data – work on your own without waiting for someone else or paying extra
  ○ No software to install or maintain
Specific examples will be shown from two web-based GIS systems developed by Locus Technologies

- **Intellus**
- **EIM**
Intellus is a public website developed by Locus with Los Alamos National Laboratory.

WELCOME!

Intellus New Mexico contains environmental monitoring data provided by the Los Alamos National Laboratory and the New Mexico Environment Department (NMED) DOE Oversight Bureau (DOE OB). All data contained in this system are unclassified.

Getting Started

Use links below or click on the tabs on the top right of the page.
- DATA: A variety of data search options.
- MAPS: An interactive map with associated analytical results.
- REFERENCES: Data-related information such as procedures and methods.

* Pop-up blockers must be disabled.

Please provide feedback

This tool is still being refined. Comments and suggestions are welcome.
- Use the CONTACT US tab to submit comments, suggestions, questions or to find out about upcoming training classes.
Intellus

* Displays the same internal data that Los Alamos scientists and regulatory agencies see and use for environmental analysis and monitoring of the site
* Contains more than 9 million records, including historical data as well as a near-real-time view of ongoing data collection activities
* Provides transparency for cleanup and monitoring programs at the site
EIM is a cloud-based environmental data management software used by several nuclear power providers as well as many other organizations.

Among others
Complete analytical data management, including validation, EDD error checking, multiple EDD format uploads, and customizable valid values

Many data analysis reporting tools for trending and statistics

Upload field data through Locus' eWell smartphone application

Manage, share, and visualize complex geologic, hydrogeological, and geotechnical data

Export reports in multiple formats including Excel, Text, HTML, XML
Spatial Relationships

◊ GIS can show sampling locations on top of a road map or image, along with additional layers such as boundary lines, watersheds, areas of concern, or response sectors
  ○ Site boundary determines if NRC or EPA regulations apply

◊ GIS can create maps of radionuclide exceedances and determine if any exceedances lie close to sensitive areas
Spatial Relationships
Spatial Relationships
Spatial Relationships
Spatial Relationships
Spatial Relationships
Spatial Relationships
Spatial Relationships

- GIS lets user draw a **polygon** on the map and get all data from locations in the polygon, or enter a **street address** and view all data from locations within a given **radius** of that address.
- GIS can generate and display **contours** and **heat maps** for sample results and show changes **over time**.
Spatial Relationships
Spatial Relationships
Generate Maps

- GIS can generate high quality maps with standard map elements
  - Map pane
  - Legend
  - Scale bar
  - Title
  - North arrow
  - Additional text elements
Generate Maps
Generate Maps

Most Recent NMED GW CONS Tritium Exceedances, Mortandad Valley

For informational purposes only.
Most Recent NMED GW CONS Tritium Exceedances, Mortandad Valley
GIS can support quality control of data by looking at locations and data on a map
- Coordinate accuracy
- Data accuracy

Over 1000 boreholes in Mexico, due to missing coordinates
Either this is a very hot spot, or there is a data value error
Conclusions

- **GIS can significantly assist in radionuclide monitoring by supporting**
  - Display and analysis of spatial relationships in data
  - Creation of maps and other outputs
  - Quality control of data
If you are interested in learning further about Intellus or EIM, please contact us at:

info@locustec.com

+1–650–960–1640
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