Best Practices in Site Data Management, Analysis, and 2-D and 3-D Geospatial Visualization Tools from Hazardous Waste Site Investigation Activities

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Introduction

Site Assessment Managers, (SAMs), Remedial Program Project Managers (RPMs), and On-Scene Coordinators (OSCs) manage and analyze data to support many different programmatic functions – predicting contaminant migration processes and pathways, assessing health and environmental risks, estimating remediation costs, and allocating scarce clean-up resources most efficiently. Geospatial tools allow site managers to visualize complex information to support these functions. Over the last decade, geospatial technology has come into its own as an indispensable resource of the Superfund program. This poster illustrates a sampling of best practices.

Four Quadrants of Visualization Techniques

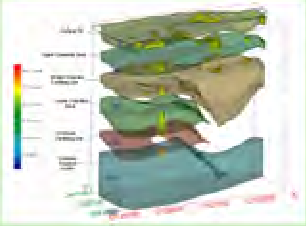
Representative best practices are arrayed in this poster into four quadrants defined by the two dimensions of analytic complexity and accessibility.

- In the lower left quadrant are **FUNCTIONAL** techniques. These techniques are basic workhorses that are neither exceptionally powerful nor exceptionally accessible, but which may be all that is needed.
- In the upper left quadrant are the most complex **ANALYTICAL** technologies. These typically demand more processing power or more extensive data than are commonly needed for functional techniques. They are also typically less accessible to wide audiences.
- In the lower right quadrant are the **INTERACTIVE** technologies, whose value is in making functional techniques widely and easily accessible via the Internet. Interactive technologies are needed for wide communication of functional information among stakeholders and the public.
- In the upper right are the **INNOVATIVE** technologies that provide both analytical complexity and accessibility. These include methods for making complex analyses widely accessible, such as to the public.

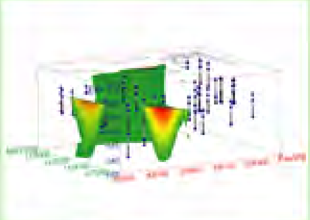
Analytical Complexity

ANALYTICAL

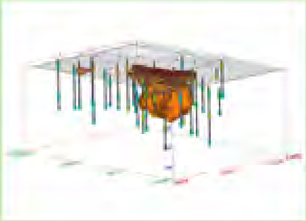
Practices that require more complex analyses and/or more extensive data



Visualizing detailed local geology & contaminant data reveal risks (e.g., groundwater contamination via containment layer hole).



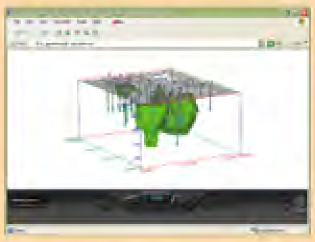
Statistical analyses of well sample data show highest contaminant uncertainties (red areas), and help in sitting new well locations accurately & cost-effectively.



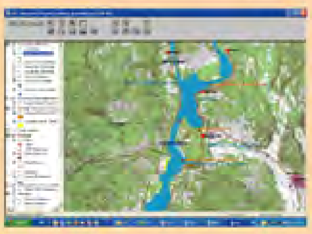
Visualizing spatial extent of contamination using sample data helps estimate mass and volume of contamination.

INNOVATIVE

Practices that deliver more powerful analytic capabilities to users over the Web



Inclusion of interactive 3-D models within Web-based site data management systems gives users access to the results of complex analyses.



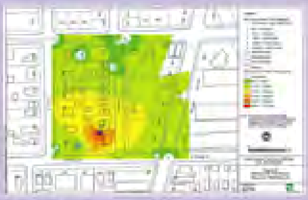
Various web technologies (e.g., Web-based GIS) allow users to share site-specific data without the need for expensive or complicated software.

Using Web-based GIS, with interactive query capability, users perform complex spatial & risk analyses without training on multiple tools.

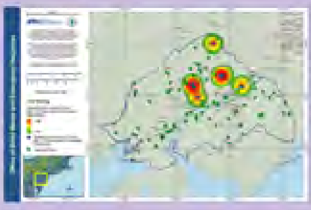
FUNCTIONAL

Practices that provide basic presentations of commonly-used geospatial site information

Mapping multi-program info (e.g., Superfund, RCRA) over population/land use density maps shows where land remediation could contribute to new economic development.



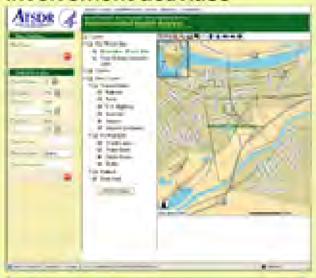
GIS contouring software shows site contamination and potential off-site risks.



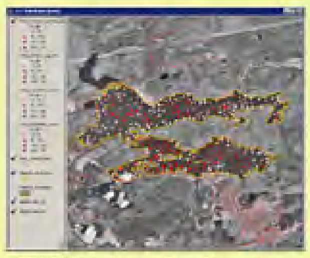
Mapping area-wide Superfund sites that are treating groundwater for VOCs shows potential for cost-sharing across projects.

INTERACTIVE

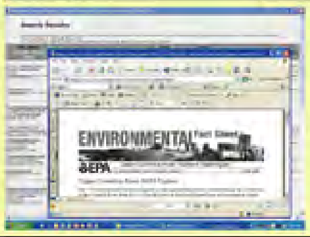
Practices that Web-enable functional types of analyses to aid community involvement activities



Web-based tools such as GATHER allow the public to find sites near them and learn about their current status.



FIELDS provides a free & easy interface to combine sample data with GIS, quickly showing contamination extent.



Online document libraries allow project team members from different places to collaborate efficiently and more cost effectively.

Accessibility

What is a Visualization "Best Practice"?

In this poster, a "best practice" is a technology that helps site managers:

1) accomplish something of programmatic value that could not otherwise be done, and/or

2) reduce the cost or improve the quality of an analysis done by other means.

Geospatial analysis is entering the mainstream of environmental information management because it does both these things.

Geospatial Technology Supporting Programmatic Needs

At its best, the strength of geospatial visualization is its immediacy (i.e., its ability to simplify complicated issues and focus attention on what is most important more quickly than could be done otherwise). In reviewing best practices, two themes emerge:

1) variations in the analytic complexity of different available technologies, and

2) variations in the accessibility of these technologies to different audiences.

A geospatial technology does not have to be the most complex or the most accessible to qualify as a best practice. It must simply offer the right combination of complexity and accessibility to fulfill a particular programmatic need.

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