CASE STUDY:
JADCO HUGHES FACILITY

DATA DRIVEN SITE INVESTIGATION

INTRODUCTION

To demonstrate the insight gained from using the EnviMetric model, we ran a case study of this well-known Superfund site in Belmont, NC. We ran the EnviMetric model using data from the Jadco-Hughes facility (a solvent reclamation and waste facility operated from 1971 to 1975) whose data is available for the span of the site's activity.

We can run the EnviMetric model using the information that project managers had preceding the remediation and compare it to data that was collected for the duration of the site characterization and remediation efforts.

For this site, the EnviMetric model captured 100% of the contamination extent as presented in EPA's 3rd FYR (2011).

The original remediation method fell short at this site, likely due to a lack of monitoring wells far enough down hydraulic gradient. Because of this, in April 2011 the original remediation was modified to capture previously unaddressed groundwater impacts.

If the EnviMetric model had been available for project managers it would have suggested the need for further site investigation downgradient and possibly saved the project manager, EPA, and other stakeholders from such a withdrawn remedial period

ABOUT THE SITE

The site is relatively flat, with groundwater flowing north at a flow rate of approximately 8 to 14 feet per year. There are several contaminant source areas identified at the site, including spills occurring in the operations area, two pits where contents of chemical drums were poured, and a landfill on site. Site remedial operations began April 1997. The remedial approach applied included a groundwater collection, extraction, and treatment system.

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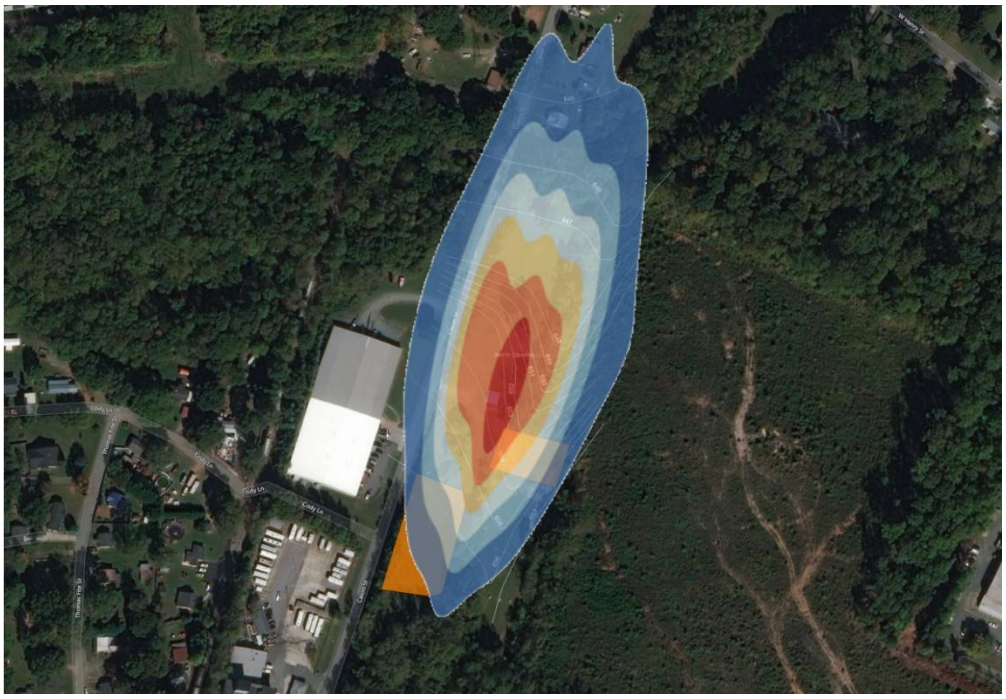

Figure 1: Contaminant extent model of the Jadco-Hughes Facility

PROBLEMS FACING THE ORIGINAL ASSESSMENT

- **Plume not fully characterized**
  - In the Final Design Report, Vol. II, there are only two monitoring well locations down hydraulic gradient of the most down gradient extraction point.
- **Treatment system was not addressing groundwater impacts**
  - The EPA's third Five Year Review conducted for the JHF site stated that, "the originally designed groundwater collection, extraction, and treatment system addressed the shallow impacted groundwater and, to a lesser extent, the intermediate depth impacted groundwater. However, recent groundwater monitoring data shows intermediate groundwater impacts may

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exist in areas outside the primary capture area of the existing containment system. VOCs have been detected in groundwater samples collected from the intermediate monitoring wells located downgradient of the perimeter collection system. VOCs have also been detected in groundwater samples collected from deeper portions of the saprolite."

- **Treatment system had to be modified:**
    - Because of this, in April 2011 (14 years after the original remedial strategy was implemented) two monitoring wells were converted into extraction wells to capture contaminants present outside of the previous extraction system's capture area and further evaluation was proposed in the third FYR.

THE SOLUTION

An EnviMetric analysis was conducted for the site, using a subset of data matching the Appalachian Highlands physiographic province and the Southeastern U.S. Plains eco-region (based on the site's location) to train the predictive model. Four generalized source areas were used (for the landfill, the operations area, and two pits) and groundwater elevations were used from the Final Remedial Design Report, Vol. II that predates the implementation of the groundwater extraction and treatment system.

The EnviMetric model shows the most likely extent of underground contamination using a machine learning model synthesizing many prior spills. The model provides an additional line of evidence for an environmental investigation, emphasizing the common and most likely results consistent with sites that have similar soil, groundwater, climate, and topographic characteristics. EnviMetric models are a cost effective source of initial site characterization, verification, and investigation of unknown source zone, and probability estimates of source zone contamination range estimates. EnviMetric models do not replace site investigations and sampling, but instead complement and provide context for environmental site assessment investigations. The EnviMetric model was developed by Azimuth1 with support from the National Science Foundation.

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The EnviMetric contaminant destination model predicted contaminant dispersion as seen in Figure 1. The EnviMetric contaminant dispersion model captured 100% of the plan view contamination extent as presented in EPA's 3rd FYR.

Candidate Source Distance (m)	Probability (%)	Cumulative Prob. (%)
0-50	23.853	23.853
50-100	20.183	44.036
100-150	18.349	62.385
150-200	11.927	74.312
200-250	8.257	82.569
250-300	3.670	86.239
300-350	6.422	92.661
350-400	1.835	94.496
400-450	1.835	96.331
450-500	1.835	98.166

The major problem with the extraction points selected for the 1997 extraction and treatment system was that they did not capture all of the contamination downgradient of the source zones; that is, the extractions points were installed too far up hydraulic gradient and thus did not successfully remove the contaminated water. In the Final Design Report, Vol. II, there are only two monitoring well locations down hydraulic gradient of the most down gradient extraction point.

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BOTTOM LINE

- If the EnviMetric model had been used to aid in the site characterization process, it would have suggested the need for further site investigation downgradient.
- If the site had been characterized more thoroughly in that area, then the original extraction point would have likely been located in a different area, more likely to capture the contaminant present.
- This could have saved the team involved up to 14 years.