Case Study of Remediation of Pesticide Impacted Soils in Florida Using On-Site, Ex-Situ Thermal Desorption

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Abstract: The remediation of 5,000 tons of pesticide impacted soil was accomplished using on-site ex-situ thermal desorption and completed in August of 2000 at the FMC Corporation facility in Tampa, Florida. This abstract highlights the design approval stages with regulatory agencies, bid preparation, and the competitive bidding process and remedial implementation. Numerous issues were brought to solution in ways that cost effectively achieved the required soil cleanup goals. A two-part project structure was developed. Part one involved approval of the remediation approach with the regulators. Among the many issues addressed were regulatory and technical acceptance, public acceptance, local permitting, and process quality control and sampling to support compliance decisions. Due to the severe drought, reclaimed water was used in lieu of potable water to serve the thermal process that consumed water in excess of 100,000 gpd. Part two of the project structure involved planning, design and construction management practices to limit potential cost liabilities and risks, including the use of pre-approved excavation cutlines, ITRCG guidelines, and bid specifications that reduced risks, downtimes, and costs. The field duration was less than eight weeks from beginning of mobilization to completion of demobilization, with a recognition of cost savings in excess of $250,000.

The FMC site located in Tampa, Florida is approximately 2.6 acres in size and was established in 1946 as a pesticide formulation facility. The main processes at the facility were the blending of ethion with fuel oil, the formulation of dry nutrient mixtures containing metal salts and phosphates, and packaging and storing a variety of dry pesticide products. The site is currently bordered by several active light industries and there are residences within a quarter mile of the site. Site operations ceased in 1988. Identified site contaminants included DDT, chlordane, toxaphene, gamma-BHC (lindane), ethion, and fuel oil.

Proper characterization of the site contamination was critical for timely regulatory approvals. The characterization of the horizontal and vertical extent of on-site soil and groundwater contamination was challenging for several reasons including:

- The variety of pesticide compounds present with resulting matrix and analyte interferences
- Target clean-up goals at or near detection limits in the sub-ppb range and
- The lack of a single, defined source area.

By completing a detailed evaluation of the historical site data, a pre-remediation sampling plan was designed and implemented. This final characterization effort was critical to promoting a better and updated understanding of the site contaminant

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patterns. The specific goals of the effort were to confirm historical data, identify dominant compounds that would drive the remediation, and define localized source areas as tightly as possible (in lieu of considering all site soils as a contamination source).

In conjunction with the pre-remediation sampling plan, a review of site operating history, local topography, and historical aerial photographs supported the division of the site into seven contaminant “hot-spot” areas, ranging from approximately 2000 to 14,000 square feet each. Hot-spots were characterized as multiple source areas with distinct mixtures of soil contaminants based on historical analytical data and the depth of contamination. The total estimated excavation area was about 53,000 square feet, with depths ranging from 0.5 to 2.5 ft (or to groundwater) for a total of 5,000 tons of soil requiring treatment.

A key to project success was obtaining technical acceptance and subsequent approval by the regulatory authorities. With the established concept of multiple source areas, regulatory approval of the Interim Remedial Action Plan (IRAP) based on the removal of these hot spot soil source areas (as contributors to groundwater contamination) was obtained. The rationale for determining the extent of excavation at the site was based on over 150 sample locations to develop pre-excavation cutlines for each hot-spot. The cutlines were established through iterative sampling to meet Florida Soil Cleanup Target Levels, which are significantly lower than the typical exposure-based risk levels in order to be protective of shallow groundwater from contaminant leaching. The use of pre-excavation cutlines increased the confidence level for complete removal of contaminated soil and eliminated the need for in-situ confirmation sampling. The pre-excavation cutlines were also useful to better manage the excavation process, minimize over-excavation/under-excavation, reduce the potential for costly field change orders for the remediation contractor. Pre-excavation cutlines also allowed for a more efficient excavation process, thus lower costs.

Applicable remediation technologies were evaluated in the IRAP and included traditional excavation and off-site disposal, bioremediation, chemical treatment, and in-situ and ex-situ on-site thermal treatment (EPA 1978, Weston 1994). On-site thermal treatment and traditional excavation/off-site disposal approaches offered the most cost-effective and proven technologies to achieve the extremely low target cleanup levels in a timely manner. Bids were accepted from remediation contractors for both approaches. Because of the volume of soils involved and haul distance for secure disposal, a savings of over $250,000 was realized by selecting on-site thermal treatment over the traditional excavation/off site disposal method. In addition, the on-site thermal approach offered other advantages including permanent elimination of waste disposal liability, less risk from waste transport and less neighborhood disruption due to the high volumes of truck traffic in an already highly trafficked area.

Regulatory approval of ex-situ thermal treatment was expedited to take advantage of the dry season which allowed for lower groundwater tables, less soil moisture content and less concerns for stormwater control during the project execution phase. Coordination with local regulatory authorities was also completed. This included wetland permits where the excavation intruded into jurisdictional areas and tree clearing

permits (City of Tampa tree ordinance) and root removal required prior to the excavation. Since the site is located in a mixed industrial/residential neighborhood, a Community Information Plan was developed and implemented. This plan included door-to-door distribution of project information summaries and contact information. Presentations to employees of the local industries were also conducted.

By incorporating ITRCG Guidelines (1999) into the IRAP, the regulatory approval process was greatly enhanced. In addition, in lieu of a formal test burn of the unit, conditional approval was obtained using formal test burn data from other pesticide sites to demonstrate the efficacy of the selected thermal unit. A start-up plan was included in the bids to demonstrate system operability and actual performance before full-scale operations were allowed. This was completed in lieu of a full test burn protocol and resulted in significant cost savings.

The performance criteria for the thermal treatment unit (TTU) was post-treatment pesticide levels that were below the Florida Soil Cleanup Target Levels. Treated soil was discharged into discreet 100-ton piles from which composited samples were obtained. Post-treatment samples were collected for every 100-ton pile for laboratory analysis. Over 90% of the composite samples passed initial clean criteria. Due to potential exceedances, two piles were resampled, and also passed clean criteria. None of the treated soil required re-treatment, and the samples passed the rigorously low soil cleanup target levels.

To ensure that emissions from the unit were within local air quality guidelines and that the TTU was operating as designed, Automatic Waste Feed Cut Off (AWFCO) parameters were pre-programmed into the TTU controls. This was part of the bid specification and their performance was confirmed during start-up. The AWFCOs, if exceeded, automatically stopped the feed of untreated soil into the TTU when a condition existed that was outside an established operating condition or range. The AWFCOs included CO emissions (25 ppm), soil exit temperature, negative pressure on the primary unit burner (0.01” water column), burner temperatures, and induced draft fan operation. AWFCOs were logged independently from the soil treatment contractor as an oversight measure to track compliance with the set points.

Due to the severe drought conditions the use of potable water was restricted. Thus reclaimed water from the City of Tampa Wastewater Treatment facility was used for dust control and TTU cooling. Portable tanks with a combined capacity of 120,000 gallons were staged at the site. Over the ten-day burn period, over 1 million gallons of reclaimed water was re-used in the thermal process.

References

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