Drones, LiDAR, and 3D Models: A New Paradigm for Data Visualization and Analysis and the Project Management Benefits for Large Hazardous Waste Remediation Projects

Background: DuPont Chambers Works is an operating chemical manufacturing complex, located in Deepwater, New Jersey. In the 1940s, U.S. Army Corps of Engineers (USACE) Manhattan Engineer District (MED) and Atomic Energy Commission (AEC) contracted E. I. du Pont de Nemours and Company (DuPont) to support the nation's atomic energy program. The USACE is addressing residual radiological contamination in multiple Areas of Concern (AOCs) under the Formerly Utilized Sites Remedial Action Program (FUSRAP), collectively referred to as the DuPont Chambers Works FUSRAP Site. As lead agency for the response action, USACE selected a remedial action, consistent with CERCLA, that includes excavation and offsite disposal of contaminated soil (beginning in 2014).

Challenge: Data sources utilized to design and guide soil excavation efforts and complete Final Status Survey (FSS) Reports include analytical samples collected from soil borings, test pits, and excavation informational sample locations, and walkover surface scan and subsurface borehole scan gamma data. The initial on-site contractor utilized conventional radiological data collection techniques and rudimentary 2D data representations to guide soil excavation efforts and FSS Reports; even though it was the industry standard, this approach did not meet the Philadelphia District's expectations for documentation, work projection or optimization.

Solution: The Philadelphia District USACE envisioned a better way to collect, process, and utilize the remedial action radiological data that would enable the project team to optimize, predictive planning and documentation expectations. To continue remediation and implement this vision, the USACE procured a new on-site contractor, Sevenson Environmental Services (SES). SES and USACE jointly developed an innovative 3D radiological data collection methodology that includes centimeter-grade GPS technology coupled to a 3 x 3 Gamma Detector. USACE needed a contractor to model and visualize these data so they procured these and other services from Ramboll. The USACE then led a collaborative team effort with SES and Ramboll to develop and implement an optimized data flow process. This presentation focuses on Ramboll's contribution to the USACE's 3D system.

Technical Approach: Ramboll successfully merged disparate data types into a comprehensive 3D Site Model, in collaboration with USACE and SES, to aid in delineating, quantifying, and remediating FUSRAP radioactive materials. Ramboll leveraged cutting-edge cloud computing, drone based high-resolution orthoimagery and LiDAR (light detection and ranging) point clouds, and best-in-class hardware and software to bring all the pieces together and visualizing these data in near-real-time. This presentation will include lessons learned and benefits for the management and on-site implementation of hazardous waste site remediation projects.

Benefits: 3D visualization of radiological laboratory and scanning data provides a tool to more accurately predict and illustrate contamination, minimize excavation of clean soils, and document remedy progress/completion. The process facilitates engineer-contractor communication and collaboration and enhances the management of hazardous waste remediation projects. Combining drone-acquired data and 3D visualization with SES's centimeter-grade GPS gamma walkover scans, analytical laboratory data, continuous downhole gamma scan readings, along with traditional topographic surveys, and historical site features, combined efforts of USACE, SES, and Ramboll have pioneered a new and improved method for radiological data analysis and interpretation.