Cleanup of a Day-Lighted Gasoline Release in a Sand Filled Tank Hold Utilizing Total Fluid Recovery Surfactant Enhanced Extraction (SEE)

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Background/Objectives. In 2020, a large corrosion pit occurred in a submersible pump flex line which released approximately 1,100 gallons (4,164 L) of gasoline into a relatively small tank hold with two 8,000-gallon (30,280 L) USTs. The sand filled tank hold was surrounded by a silty clay aquifer with a very shallow groundwater.

Due to a record rainfall event, the phase separated light non-aqueous phase liquid (LNAPL) came to grade, emerging through cracks in the concrete and tank hatches (day-lighted). The regional water supply was within 1,400 feet (427 m) downgradient from the spill, resulting in an immediate State Emergency Response. After approximately one week of emergency fluid recovery, at existing wells, the site was stabilized. Wright Environmental was brought in to transition the site from Emergency Response to standard in-situ remediation. The primary remediation objective was to maintain control of the tank-hold fluid levels, to prevent repeated daylighting of LNAPL, which could potentially impact and shutdown one quarter of the regional water supply to several million residents. The secondary objective was to delineate the subsurface impacts from the spill and achieve regulatory closure with the State environmental agency.

Approach/Activities. Initial response was to continue total fluid recovery utilizing a vacuum truck from three tank hold wells, installed on downgradient side of the tank hold, while two recovery wells were installed on the up-gradient side, to allow additional extraction control points. MDPE events were immediately conducted to reduce the observed volume of LNAPL. An automated extraction system was installed at four of the recovery wells, equipped with peristaltic suction pumps, on customized timers, which cycled extraction across the wells. The tank hold fluid levels were controlled, with extracted fluids pumped to a 21,000-gallon (79,485 L) steel storage tank. After four months of total fluid recovery, an insitu surfactant-enhanced recovery was conducted using a non-ionic surfactant injected with push probes to enhance LNAPL mass removal. Additional subsurface investigation of the areas outside the tank hold confirmed limited impacts to soil and groundwater.

Results/Lessons Learned. Following six months of product recovery, finished with surfactant enhanced extraction (SEE), this substantially eliminated the 1,100 gallons (4,164 L) of gasoline (LNAPL) released into the tank hold, prior to the completion of a confirmatory investigation. The site remained fully operational during LNAPL remediation. The subsurface confirmatory investigation took an additional 10 months of monitoring, confirming the success of the combined MDPE and SEE for LNAPL remediation, with the site presently under review by the State environmental agency for site closure.

Lessons learned, included that there are limitations to MDPE remediation for large fresh gasoline spills, involving LNAPL, in sand filled tank holds, without continuous extraction from multiple points, and that SEE can significantly enhance LNAPL mass removal, including apparent recalcitrant LNAPL, to achieve regulatory closure.

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George is the President and Senior Remediation Specialist with Ivey International Inc. He is a Professional Chemistry (PChem), Environmental Professional (EP), with over thirty years of assessment and remediation experience. He has worked on more than 2500 major environmental remediation projects globally, which have taken him to over 50 countries. His educational background includes: Synthetic-Organic Chemistry, Geological Engineering, and a Master's Certification in Project Management. His strong aspiration to develop more effective and sustainable remediation technologies, has resulted in him holding more than 20 international patents and trademarks, and being the recipient of many prestigious international environmental awards. He recently developed PFAS-SOL® as a more effectively means to treat PFAS impacted soils and grounder, with UK university column testing showing favorable results for release in late 2022, or early 2023.