ISCO Remediates Crude Oil Spill

THE CHALLENGE

GES was contracted to aggressively remediate remaining soil and groundwater impact resulting from the rupturing of an underground crude oil pipeline. The 336,000 gallon spill had impacted over 55 miles of shoreline, with oil flowing overland, into wetlands, a tributary, and eventually reaching the Leaf River.

After 11 years of response and multiple remediation approaches at a cost of over $20 million, contaminant concentrations were still well above Mississippi Department of Environmental Quality (MDEQ) Tier I cleanup levels across the spill area on both sides of the underground pipeline. Primary contaminants of concern consisted of benzene and total diesel range organics (TPH-DRO). GES was engaged to implement an aggressive remediation approach to achieve closure at the site.

GES SOLUTION

GES designed an approach to implement in-situ chemical oxidation (ISCO) using a combination of short-term injection events and continuous injection. HypeAir was performed at 12 permanent injection wells over the course of two short-term injection events, the first lasting five days, and the second, three days, 13 weeks apart. HypeAir-EX, using a mobile ozone generation unit capable of producing 15 lbs/day ozone, was plumbed into the injection well network to enhance the chemical oxidation process. The HypeAir-EX ozone generator operated continuously between the two HypeAir events; during this period, hydrogen peroxide was also intermittently injected into the injection wells, and ferrous sulfate solution was injected as a catalyst to enhance the subsurface chemical reaction. Sodium persulfate was also injected to provide long-lasting oxidative effects for weeks after injection.

Groundwater quality and contaminant concentration data were regularly collected from existing monitoring wells prior to and during injection activities. Soil vapor extraction (SVE) was performed at two separate monitoring well locations near the existing pipeline to protect it from vapors generated by the oxidation process. AS/SVE also served to enhance subsurface oxidant distribution. Vapor stream monitoring detected no elevated readings for volatile organic compounds.

CLIENT BENEFITS

The chemical oxidation system achieved 95% uptime over its 13 weeks of operation, and resulted in a 99% decrease in benzene and an 80% decrease in TPH-DRO across the site.

The project was completed at a cost below $155,000. The MDEQ granted closure following well abandonment activities.

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Facility Preparation for New Terminal

THE CHALLENGE

GES was engaged by an oil & gas client to develop and implement a cleanup plan that would allow development of 14 acres as a terminal with more than one million gallons of biodiesel storage and blending facilities. The property still contained many structures, equipments, tanks, trailers, and impacts from its former utilization as a truck cleaning and maintenance facility.

GES SOLUTION

GES developed an innovative work plan that would yield savings to the client while incorporating “green” soil re-use methods and meeting the property construction schedule requirements. GES managed the scope development, competitive bidding, and oversight of work that included asbestos abatement, hazardous materials management, building and tank demolition, soil remediation, excavation, transportation, and disposal, and backfill placement/compaction.

A unique demolition approach to remove exterior concrete block walls from asbestos-contaminated buildings was regulator-approved through an exemption process and determined to be safer, faster, and more cost-efficient than traditional mechanical blasting and removal methods. This alternative process saved the client over $200,000 in one building.

Site management included soil erosion planning, engineering controls, a stabilized construction entrance, storm sewer inlet protection devices, and other runoff controls.

Soil remediation involved treatment, sampling, and discharge of over 527,000 gallons of impacted groundwater according to NJDEP permit criteria. GES permitted, designed, installed, and operated a 100 gpm dewatering and groundwater treatment system (GWTS) to treat up to 50,000 gallons per day of groundwater impacted by zinc and various organic compounds. The equipment, adjacent to the main excavation area footprint, featured secondary containment for the main process vessels. The treatment train included oil/water separator, three frac tanks, organic clay filtration, sand filtration, bag filtration system, specialized resin units, and activated carbon units.

The NJDEP approved GES’ soil reuse plan which utilized ex-situ soil stabilization and recycling as as an alternative to soil excavation and off-site disposal. This approach reduced the cost of soil remediation by close to $800,000, and had the additional benefits of reduced liability from off-site disposal and eliminating the carbon footprint of off-site truck transportation and logistics.

CLIENT BENEFITS

The project was completed in coordination with the construction schedule, allowing property development to proceed in support of the client’s business strategy. The local government was appreciative of our client’s ongoing support of the community with the utmost attention to economic growth with safety.
Closure through Regulatory Advocacy

THE CHALLENGE

The facility operator sought remediation for subsurface soil and groundwater impact associated with its 992,000-gallon petroleum bulk storage tank field and rail loading area. GES was retained to evaluate the site’s SPCC Plan, assess the subsurface impact, develop a remediation strategy, and negotiate with regulators and the property owner to attain a “No Further Action” status.

Efforts were complicated by the facility’s need for uninterrupted operation, a poorly maintained drainage system, and its location on the Mississippi River requiring river-based loading and unloading.

GES SOLUTION

Before conducting any subsurface investigation, GES evaluated the facility’s tank field discharge system, which was incapable of handling accumulated stormwater in the bermed field. The drainage system was clogged with coagulated petroleum components. GES worked with facility managers and shift foremen to implement drainage system repairs, improvements, cleaning, and maintenance.

GES conducted multiple site investigations including sampling and delineation of groundwater and soil in the tank field and rail car areas. Due to high viscosity product stored in the tank field, vertical migration was limited to shallow soils. Excavation of the shallow soil, liner, and gravel in the tank field was selected as the remedial approach. After the Mississippi Department of Environmental Quality (MDEQ) approved the remedial action work plan, GES prepared the bid specifications for on-site activities. GES consulted with a licensed structural engineer to ensure the structural integrity of all aboveground storage tanks. Manual excavation efforts were required to minimize disruption to operations. GES oversaw all excavation, material disposal, and liner/cap replacement.

Excavation was deemed impractical for the rail car loading area. GES pursued a land use restriction via the Mississippi Brownfield Program which involved extensive communication with the MDEQ and the property owner. GES prepared and submitted the Brownfield Program Application and facilitated the agreement between the MDEQ and the property owner, which detailed the restrictive covenants and zoning for the industrial property.

CLIENT BENEFITS

After two years, the site received “No Further Action” status for the the tank field area and an approved Brownfield Agreement for the rail car loading area. GES implemented abandonment of all on-site wells and was instrumental in the replacement/improvement of the tank field’s secondary containment system.
Managing Data for an Active Refinery

THE CHALLENGE

This 350,000-barrel-a-day refinery is located in St. Croix, US Virgin Islands. The facility covers 1,500 acres along the southern shoreline of the island. Soil and groundwater impacts reflect its history of processing of over 60 different types of crude oil since 1965.

Cleanup activities are conducted under the authority of US EPA Region 2, in compliance with the Resource Conservation and Recovery Act (RCRA). Continued operation of a facility-wide groundwater and hydrocarbon recovery system is required under a RCRA operating permit. A major facility-wide Interim Corrective Measure (ICM), including a rigorous program of groundwater monitoring (and if required corrective action) at two operating hazardous waste land treatment/disposal units, three non-hazardous wastewater treatment surface impoundments, and the one closed hazardous waste management unit.

GES’ Environmental Informatics group has supported Hovensa’s environmental initiatives since 1993. The EI group combines hydrogeology expertise with GIS, dynamic simulation modeling, statistics, and other analytical and computer-based methods to study, manage, and share environmental data. Hovensa has also played an active role in assisting natural resource agencies in monitoring, protecting, and rescuing endangered and threatened species, and GES was also asked to support this effort.

GES SOLUTION

GES provided risk evaluations for ecological and human receptors. The human health risk assessment used a tiered approach to focus on those sensitive areas that required further evaluation. GES’ EI specialists participated in a comprehensive ecological risk study to evaluate the habitats of many federally-listed endangered flora and fauna at the site. Species’ habitats were delineated, mapped, and spatially analyzed using geographic information systems (GIS). Data included NOAA GIS coverages, aerial photographs, USGS topographic and digital line graphics maps, AutoCAD drawing files, Excel spreadsheet data, topographic data, and geologic cross-sections.

GES developed integrated LNAPL, groundwater flow, and dissolved-phase transport models of the site to evaluate remedial approach. A web-based database system was developed to facilitate the management of groundwater data by various project stakeholders. Diverse consulting activities include support for the development of the facility’s RCRA Part B permit renewal.

CLIENT BENEFITS

Managing the huge volumes of data at a large facility can be overwhelming. GES streamlined the environmental reporting process by integrating various systems and implementing a templated deliverable system. Groundwater modeling studies and data analysis were used to demonstrate continued effectiveness of the selected remedial approach and engineering controls at the site.
THE CHALLENGE

GES’ client, a global integrated oil company, was pursuing its business strategy of property divestment within targeted US geographic markets. Properties being divested within the state of Michigan ranged from industrial facilities to commercial buildings, retail gasoline stations, and vacant properties with long histories of mixed use.

Based on our ability to quickly, safely, and efficiently plan and execute portfolio-wide projects, GES was selected to complete Phase I and Phase II environmental site assessments for close to 200 properties, with priorities and time frames dictated by the client’s business transaction schedule.

The project plan included detailed tasks and resources for each site, with coordination to achieve cost-efficiencies in labor, travel, and subcontractor utilization. GES’ team was coordinated through a central project management office within our Brighton, MI operation; team members from across GES’ nationwide client program remotely supported the local team. GES managed on-site evaluations, subcontractor hiring and oversight, historical documentation research, regulatory interface, and report completion. An important component of this project was quality assurance and quality control (QA/QC) evaluation of laboratory analytical data for accuracy and completion.

GES SOLUTION

GES completed 168 Phase I and Phase II ESAs. Qualified subcontractors were selected through competitive bid process using our effective subcontractor qualification program. Scope included the installation of more than 800 monitoring wells and soil borings to complete the site investigations. GES teams ultimately performed QA/QC review of more than 1,600 soil samples and 800 groundwater samples.

Through this process, 24 underground storage tanks (UST) were identified for closure. GES was responsible for submitting UST registration and closure forms to state regulators; coordinating subcontractor activities in the field; developing site-specific health and safety plans; generating waste profiles for tank contents, soil, and groundwater; overseeing UST removals; collecting soil and groundwater confirmation samples; and evaluating laboratory analytical data.

CLIENT BENEFITS

GES managed the projects in alignment with the client’s business-driven scheduling parameters. Communication and coordination were carefully managed for GES staff, the client’s managers, local municipalities, state regulators, diagnostic laboratories, and environmental contractors. All tasks were completed without incident, using the tools of GES’ LPS (Loss Prevention System) behavioral management system. GES was also responsible for restoring the sites to their original conditions, to ensure greatest return on value to the client.
Safely Managing Refinery Assessment

■ THE CHALLENGE

This site was once the largest oil refinery in the world, and the property, both above and below ground, retained remnants of its long history of operations over much of the 20th century.

Working within a large multidisciplinary team, GES was contracted to conduct subsurface investigation of a 60-acre portion of the site. Diverse site assessment activities included soil and groundwater sampling and monitoring, anomaly investigation via test pits, pre-demolition asbestos surveys, and general site preparation. The project changed course upon discovery of a complex and undocumented abandoned underground pipeline system. This warranted a highly-detailed plan to close data gaps, implement pipe trace and mapping efforts, and safely complete tank decommissioning and removals.

Critical attention to health, safety, security, and environmental (HSSE) risks was required. Risks included rugged terrain, countless field hazards, and the potential for exposure to dangerous hydrogen sulfide and methane.

■ GES SOLUTION

GES worked with the project team to address the many challenges of this site. A detailed pipeline mapping and exploratory program was needed to pre-plan for subsurface unknowns. Prescribed test trenches were completed for over 10,000 feet of trenching. Pipe tracing was conducted for more than 30 miles of piping. Electromagnetic pipe tracing methods pinpointed the pipeline routing. As the tracing signal weakened, the crew would dig a new test pit to reacquire the pipe trace. GPS receivers were used to conduct the mapping, with real-time GIS data collection and recording on field computers. GES’ environmental informatics staff then produced detailed site maps of surface and subsurface structures.

Pipe taps were made to detect and remove multiple unknown fluids, including all grades and types of petroleum products and large volumes of water. This involved, first, drilling an investigative hole in the pipe; if fluids were found, a larger hole was drilled to allow fluid vacuuming for removal. Gas detection methods were used to identify the presence of dangerous conditions across the site.

HASP requirements included training for all staff the detection, response, and mitigation of dangerous gases. GES management utilized both regular and unscheduled visits designed to “catch people performing tasks correctly.” Staff rotations were carefully monitored to ensure an alert staff and safe performance.

CLIENT BENEFITS

The site was entered into the state brownfields program. The intensive focus on HSSE and staff training yielded results: when gases were detected on multiple occasions, all personnel responded as trained and there were no injuries. Completion of this phase of work has prepared the site for remediation and redevelopment.

site type
former refinery
location
New York
contaminants
petroleum hydrocarbons
project status
ongoing
services
site assessment
systematic pipeline mapping program
electromagnetic pipe tracing
fluid recovery
soil and asbestos sampling
well gauging and sampling
HSSE management
subcontractor management

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