

TECHNICAL SPECIALTIES

Phase I/Phase II Environmental Site Assessments (ESA), remedial investigations, feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, and sediment. Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

EXPERIENCE SUMMARY

Twenty-seven years' experience: Principal Engineer/Senior Engineer at Roux/Remedial Engineering, P.C; Project Engineer at Camp Dresser & McKee

CREDENTIALS

B.S. - Civil Engineering, Manhattan College, 1991
M.E. - Environmental Engineering, Manhattan College, 1994
Professional Engineer, New York, 1995

KEY PROJECTS

- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry-cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry-cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux. The remedy, as summarized in the Remedial Action Work Plan, consisted of soil hot spot removal to 35 feet below grade, a physical barrier to limit on site migration, a permeable reactive wall to mitigate offsite contaminant migration, and a sub slab depressurization system. In order to reach the target excavation depths of 35 feet, maintain stability of the adjacent aging building, limit VOC emissions and avoid significant dewatering, soil was removed from the hot spots by excavating trenches, which were simultaneously backfilled with a cement /bentonite slurry mix. Roux conducted continuous monitoring of VOCs and dust at the site perimeter and of all personnel working in the excavation exclusion zone. Vapor suppressant foam was used to control VOC emissions and water was used to control dust during excavation and loading of trucks. Implementation of a perimeter community air monitoring plan assured that the public was not exposed to contaminants during the remediation process. Roux, under the direction of Ms. Clarke provided full time oversight of the remediation and prepared the Final Engineering Report and Site

Management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux is currently providing post-remediation monitoring services.

- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications and permit applications), permitting, bidding, contractor selection, construction management and regulatory reporting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the New York State Department of Environmental Conservation Voluntary Cleanup Program. The remedy included dredging, *ex situ* stabilization and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. As part of the remedy selection process, a bench scale testing program for several stabilization reagents was developed and implemented. Roux was responsible for specification, sourcing and testing of multiple types certified clean backfill and capping materials. The work included permitting of remedial activities with multiple federal, state and local agencies. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC for dredging of Mill Creek, bank stabilization and construction activities in the wetlands; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations. Roux was heavily involved in coordinating with the client, regulators and contractor for mobilization to the site in late 2006. During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.

- Principal-in-Charge of an extensive investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping over eight acres, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design to promote vegetative growth and enhance wildlife habitats. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of in situ stabilization/solidification reagents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple in situ stabilization reagents were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke. For all projects, Roux was responsible for specification, sourcing and testing of multiple types certified clean backfill and capping materials.
- For the same petroleum terminal in Buffalo, New York, the work also includes performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.
- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at

the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to the regulatory agencies; overall project coordination; and budget management and tracking.

- Principal Engineer for a complex dredging project on the Allegheny River in New York to remove petroleum impacted sediments. Included the Site Investigation, Remedial Investigation, Alternative Feasibility Study and regulatory permitting with multiple federal, state and local agencies and for upcoming dredge of 1,000 tons of sediment.
- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.
- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal within the basement of the building, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. Roux was responsible for specification, sourcing and testing of certified clean backfill material. Remedial construction was completed under the oversight of Roux, including continuous monitoring of VOCs for all personnel working in the basement excavation area. A combination of ventilation, work sequencing and vapor suppressant foam was used to control VOC emissions and allow the work to be completed successfully in this challenging setting. The Final Engineering Report and Site Management Plan were prepared by Roux and the Certificate of Completion for the Site was obtained

in 2016. Roux is currently providing post-remediation monitoring services.

- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered to by the two systems and the spill was closed by NYSDEC in 2011.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. VOC emissions were controlled during the excavation and loading of trucks using vapor suppressant foam. Dust was controlled using water. Implementation of a perimeter community air monitoring plan assured that the public was not exposed to contaminants during the remediation process. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal engineer for a NYSDEC BCP redevelopment in Staten Island, New York of a former retail service station site. There is soil, groundwater, and vapor contamination from petroleum-related constituents near the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. An interim remedial measure consisting of removal of four underground gasoline storage tanks, pump island, associated piping and petroleum impacted soil was completed in 2015. VOC emissions were controlled during the excavation and loading of trucks using vapor suppressant foam. Dust was controlled

using water. Implementation of a perimeter community air monitoring plan assured that the public was not exposed to contaminants during the work. The Site-wide remedy, described in the Remedial Action Work Plan prepared by Roux, will consist of a sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site (comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas) and a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building and offsite migration of impacted soil vapor.

- Principal-in-charge of the hot spot soil removal and final soil capping of a former 7.5-acre petroleum terminal in Hastings on Hudson New York. Roux oversaw the field work which included sourcing and sampling of over 22,000 cubic yards of soil and topsoil that was transported to the Site via barge and truck to backfill the hot spot excavation and implement a two-foot soil cap across the Site. Oversight activities included ensuring compliance with the contract documents, daily oversight and health and safety for subcontractors on land and on barge, implementation of site specific storm water pollution prevention plan and community air monitoring at the Site perimeter to ensure that VOC and dust emissions during construction did not impact the surrounding community.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux was responsible for specification, sourcing and testing of certified clean backfill material. VOC emissions were controlled during the excavation and loading of trucks using vapor suppressant foam. Dust was controlled using water. Implementation of a perimeter community air monitoring plan assured that the public was not exposed to contaminants during the remediation process. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment

sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work currently also included technical support for evaluating and optimizing system performance.

- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the U.S. Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution

terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/compliance monitoring services at the sites that currently have active remediation system installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux Associates is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.

- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux Associates successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman's Training Center site in Nassau County, New York. The work included development of a preliminary design

report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.

- Project Engineer for the design, specification, construction and operation of an air sparging and soil vapor extraction pilot at the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.
- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.
- Project Engineer for the design of a 0.50-mgd groundwater treatment facility a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including: investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater

contamination. Responsible for project coordination and budget management and tracking.

- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including: soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination; budget management and tracking; and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester County Department of Environmental Facilities in New York. Designed upgrades to the main

influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.

- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.
- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.

- Project Engineer for the design of a submersible pump station to handle sewage flow from a proposed dog pound for the City of Waterbury in Connecticut. The design included a concrete manhole pump station with two 100 gpm submersible grinder pumps, a separate valve vault, and a 4-inch force main. The station was designed to operate automatically based upon wet well levels and included monitoring and transmitting of alarm conditions via a telephone interconnection.
- Project Manager for the annual emissions testing of the landfill gas thermal oxidizer at the Oyster Bay Solid Waste Disposal Complex on Long Island. Responsibilities included scheduling the field testing; coordinating with the testing subcontractor, the Town's laboratory, and the site project manager; overseeing the field testing; compiling and analyzing the test data; and preparing a draft and final test report.
- Project Manager for the Flow Augmentation Needs Study (FANS) for Suffolk County Department of Public Works, New York. Responsibilities included coordinating and implementing the annual wetland monitoring effort for collection of data to characterize the vegetation communities and surface water and groundwater conditions at four freshwater wetland sites in Suffolk County. Duties also included maintaining a database of all vegetation data collected; developing and refining equations to characterize the groundwater table and wetlands vegetation in all monitoring areas; evaluating potential impacts of sewerage on sensitive wetlands; and evaluating the need for any mitigation of these sites as triggered by vegetation changes correlated to groundwater drawdown. Responsibilities also included coordinating the production of a draft and final annual monitoring report summarizing the findings the program.
- Task leader for two project tasks for the Nassau County Water Management Plan for Nassau County Department of Public Works. The first task included researching, compiling data and describing the County's approximately 50 public water supply systems and mapping their different methods of treatment, storage and pumping. The second task included summarizing all Federal, State and local laws, regulations and programs that relate to the protection of the County's groundwater resources.