

Pipeline Services

General

Pipeline transmission and gathering systems require a thorough understanding of the engineering, environmental and construction components that comprise successful projects. Baker's understanding of these requirements is derived from many years of experience in all phases of pipeline projects. Our diverse experience encompasses not only pipeline design, but also the environmental, planning, construction, and practical operations-maintenance expertise that is essential for such multi-faceted projects.

This full range of services has enabled Baker to serve as Program Manager for large, complex projects. For example, Baker was the lead design engineer and provided construction management for a \$10 million, Natural Gas Gathering System project for CONOCO, Inc. in Oklahoma City, OK in 1992-94. This project encompassed all engineering, construction management, evaluation, on-site construction inspection and permitting for the 450 miles of pipeline.

Pipeline engineering services include initial planning and conceptual feasibility studies, design engineering, and preparation of construction plans and specifications, value engineering studies, bid phase engineering, construction and construction phase engineering, facility start-up services, and on-going operation and maintenance consulting services.

Additionally, Baker provides services in surveying, planning, mapping, design, geotechnical engineering, environmental permitting, construction management and program management for pipelines, site development projects, municipal water and wastewater facilities, hydroelectric development, dams and impoundment's, marine facilities, fiber optic cable routes, airports, and recreational facilities. In the private sector, services are primarily provided to telecommunications, electric, gas, oil and coal companies.

Finally, Baker's diverse engineering capabilities have focused on pipeline projects requiring **special expertise**. In particular, we offer special expertise in the following areas:

- Cold Region Design
- Pipeline System Evaluation and Upgrade
- Coalbed Methane Application

Feasibility Studies

Baker has conducted several feasibility studies for proposed oil and gas pipeline projects. Evaluations are based upon, but not limited to, the following criteria: constructibility, geologic conditions, surface and/or deep mine activities, number of property owners involved, availability of acquirable properties, wetlands, endangered species, stream and river crossings, highway crossings, historical and archaeological sites, facilitation of existing and proposed compressor stations and gathering systems, and assessment of design standards and permit requirements of governing regulatory agencies. The results of the criteria along with recommendations are documented into a formal report.

BAKER SERVICES

- Program/Project Management
- Feasibility Studies
- Route Alignment Design
- Environmental Services and Permitting
- Survey and Mapping
- AM/FM and GIS
- Right-of-Way Acquisition
- Horizontal Directional Drilling, (HDD)
- Compression Design
- Construction Management and Inspection
- Record Documentation
- Special Expertise
 - Cold Region Design
 - Coal Bed Methane Applications
 - Pipeline System Evaluation and Upgrades

We view challenges as invitations to innovate

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Route Alignment Design

Following industry standards and proven, accepted engineering practices, Baker can prepare a detailed, comprehensive route alignment design that includes: pipeline location, coordinate system and monumentation, drainage features, property owner and property line identification, foreign utilities, wellhead locations, access roads, compressor station locations, valve locations, soil erosion and sedimentation control devices, detailed stream/river/high-way/railroad crossings, typical construction details, and detailed cost estimates.

Environmental Studies and Permitting

Baker's professional environmental staff provides environmental services ranging from basic field surveys to complex, multi-disciplined evaluations. Our highly diversified group of environmental scientists, geologists, ecologists, and archaeologists successfully work in concert on environmental investigations, impact assessments, and permitting related to pipeline projects.

The range of environmental services include: wetland identification and delineation, wetlands analysis, regulatory wetland encroachment permitting, wildlife habitat evaluation, wetland replacement design, water quality studies, aquatic habitat analysis, threatened and endangered species surveys, air quality studies, noise analysis and noise barrier design, vibration analysis, socioeconomic evaluations, visual impact assessments, and cultural and historic resource management.



Surveying and Mapping

Since our inception in 1940, Baker has been a leader in the survey industry, utilizing the most current technology and providing our clients with innovative solutions. Our crews are equipped with total stations interfaced with data collectors. We perform high accuracy GPS surveys using dual frequency receivers with kinematic capability. We also collect feature positions, to sub-meter accuracy, and feature attributes using Pathfinder GPS receivers.

Baker has provided photogrammetric mapping services for over 45 years. We have complete in-house aerial photo reproduction services. Digital topographic

mapping is performed on first order analytical stereoplotters interfaced to graphic workstations. Digital

orthophotos are produced using our Intergraph/Zeiss high resolution photo scanner and Intergraph ImageStations running Imager software. Digital topographic map files and digital orthophoto files are delivered in a variety of formats compatible with the customers hardware/software platform of choice.

Baker has provided surveying and mapping services for many thousands of miles of corridor type projects serving the pipeline, telecommunications, power, highway, and rail transportation industries. Baker's full spectrum of surveying services offered to the pipeline industry include design alignment staking, construction staking, boundary, right-of-way, easement, condemnation, land title, subsidence monitoring, hazardous material sites, topographic data collection, photogrammetric mapping control and magnetic location/tracing surveys.

Mapping services include aerial photography, photo enlargements, control extension by analytical aerotriangulation, digital terrain modeling (DTM), profiling and cross sectioning by digitizing or extraction from DTM, digital planimetric and topographic mapping and color and black and white digital orthophotography.

AM/FM and GIS

GIS is a Core Competency at Baker permeating all of our business units. We have used GIS technology to help many of our clients achieve higher levels of efficiency and productivity in their businesses.

Baker offers GIS expertise in consulting services including strategic planning, implementation planning, needs assessment and database design. In addition, we offer data conversion and application development services.

Right-of-Way Acquisition

Baker's right-of-way support staff provides right-of-way services ranging from property ownership investigations to negotiating agreements for utility easements. The range of right-of-way support services include: investigation of property ownership, property appraisals such as coal and timber rights, negotiation of option agreements for easements, negotiation for temporary construction work space, negotiation of settlements for construction damages and releases, and preparation of final documents for recording purposes. Our ROW staff is experienced veterans in every aspect that involves right-of-way issues on pipeline projects. Their

experience includes dealing with individual property owners to negotiating major agreements with railroads, utility companies, and Federal agencies.

Horizontal Directional Drill (HDD)

Since its inception in the 1960's, Horizontal Directional Drilling (HDD) has made possible the installation of utility conduits through sensitive or congested areas without the surface disturbance inherently a part of conventional trenching methods. Baker has completed the design and permitting activities required for numerous HDD projects ranging in size from short road, stream and wetland crossings to bores for trans-oceanic cable landings and major river crossings thousands of feet in length. The specific activities completed by Baker for HDD projects include: field investigations to determine possible HDD routes and staging areas; investigations to define property ownership, existing geologic conditions and obstructions within the project area; design of the horizontal and vertical alignment of the bore; consultation with HDD contractors to verify material, equipment and construction requirements; development of design, construction and as-built documents and project specifications; and permitting activities required by Federal, State and local jurisdictional agencies.

Compression Design

Whether the project calls for a small portable field compressor or a large horsepower stationary compressor, Baker has the experience and expertise to evaluate and determine the proper compressor to meet the compression requirements. Conceptual and final compressor engineering includes: size, performance and material specifications, site/foundation design, "custody transfer" quality metering design, gas flow regulation, auxiliary and support systems (electric transformer/switchgear, engine fuel gas system, water cooled exchangers, etc.) coordination, and the evaluation of alternative economics - the approach of buying, leasing and contracting compression.

Construction Management and Inspection

The construction services staff of Baker provides the necessary expertise required for the successful completion of construction activities. Construction Management Services include: the daily monitoring and reporting of work progress as it pertains to contractual performance, technical interpretation and field design modifications required during construction activities, overseeing that the quality of work performed by

contractors is in accordance with specifications, and preparation of scope change documents along with the effects on budget and schedule. In connection with construction management services, Baker provides inspection services that include: daily inspection records describing and documenting the construction activities, maintenance of material quantities and record drawings, and verification that construction is done in accordance with the design plans and specifications.



Program/Project Management

Baker has long been recognized as leaders in the field of Program/Project management of large scale pipeline projects. Each of our Project Managers has extensive experience in the pipeline field, with many of them coming directly from careers at major pipeline companies. Typical Program/Project Management services Baker provides include: scheduling, cost estimating, manpower allocations, client satisfaction reviews, quality control/assurance and overall administration of the projects.

Record Documentation

The availability of accurate documentation of pipeline and compressor station facilities is a technically challenging assignment; having the expertise and experience is essential. Baker provides this service with a technical staff that has significant experience with record documentation for facilities ranging from small diameter pipelines to highly developed, complex gathering systems and compressor stations. Baker utilizes virtually every source of information available, from inspection notes to field reconnaissance/verifications to existing records. State-of-the-art resources such as CADD systems, automated databases, and Global Positioning System (GPS) are commonly used depending upon the required level of detail.

SPECIAL EXPERTISE

Cold Region Design

Baker has operated in cold region environments, from Europe to Greenland, on a continuous basis since 1942. Our Alaskan experience started with surveys, design,

and construction engineering services connected with the rapid military build up in Alaska during World War II. The firm's ability to provide a rapid effective response to the mobilization requirements of major projects on the "last frontier" has been carried through to its services for the energy industry, the State of Alaska, and the Federal Government through succeeding years.

Baker served as an engineering consultant to Alyeska Pipeline Service Company from 1969 through 1978. Over 3,200,000 work hours of service were provided to the Trans-Alaska Pipeline System project through all project development phases from concept to commissioning. During this period, Baker also provided essential personnel to the team formed for the location and concept development of the El Paso Natural Gas Pipeline project.

The Baker team was called to service again in early 1978, this time for the Alaska Natural Gas Transmission System (ANGTS). We participated in the early studies and field engineering connected with this project. In late 1978 we were selected to provide a "blue ribbon" team of professional experienced in the design and construction of major pipeline projects in Alaska to develop conceptual designs, project description and estimate for the ANGTS Federal Energy Regulatory Commission filing. In 1980 the 50/50 joint venture of Gulf Interstate Engineering Company and Michael Baker Jr., Inc. was brought under contract to provide all design and construction phase engineering services for ANGTS. These services continued through mid-1982.



In subsequent years, Baker has provided engineering services on a number of projects to the Alaska Department of Transportation and Public Facilities and to Federal Agencies with facilities in the arctic. Baker has recently completed a joint-venture contract with a Canadian firm whereby Baker provided operations and maintenance services to DEW Line sites across the arctic from Alaska to Greenland. In recent years, we have designed special purpose military facilities for the DOD in Alaska and Greenland. We currently hold contracts with a U.S. company and provide construction

engineering support for an above-ground crude oil pipeline in the Russian arctic, and with Alyeska Pipeline Service Company for engineering and preliminary design of a section of TAPS which is under consideration for conversion from buried to above-ground mode.

In late 1995, Baker's Alaskan Operation began a Conceptual Engineering Study for ARCO's Colville River Delta Oil and Gas Reservoir on the North Slope of Alaska. This project will require the "best-of-the-best" in Cold Region Pipeline Engineering and Construction Management; the main reason Baker was chosen to complete the project.

Coal Bed Methane Applications

Coalbed methane gas has always posed a threat to coal mining because it accumulates in the mines and can explode. Because there is very little commercial difference between coalbed methane gas and conventional natural gas, oil and gas companies have been looking for a way to turn coalbed methane into a marketable commodity while mitigating the hazard for the miners. Developing this resource, however, has proven difficult because of complex regulatory and ownership issues, and the mountainous terrain usually associated with coal mines.

Since the winter of 1990, Baker has been involved in the development of technology that has turned a natural resource from a waste product to an economically viable and marketable commodity. Baker has been providing pipeline engineering services for the capturing and transport of millions of cubic feet of coalbed methane gas from underground mines and coal seams in the coal-rich Appalachian Basin region of the United States. Typical projects involve the design and construction of various sizes of pipelines and compressor stations. Baker's services have included: photogrammetric mapping, route selection, right-of-way acquisition, field surveys, mechanical, structural and hydraulic designs for collection lines and compressor stations, electrical designs, permitting, material procurement and inventory, and construction inspection.

Pipeline System Evaluation and Upgrade

Baker offers special expertise in the evaluation and upgrade of existing pipeline systems. In the United States, such upgrades are required by the U.S. Department of Transportation and must comply with the Code of Federal Regulations (CFR), Title 49, Parts 191 and 192. The design, construction, operation, and maintenance history of the pipeline system must be

reviewed and, where sufficient historical records are not available, appropriate tests must be performed to determine if the pipeline system is in a satisfactory condition for safe operation. The pipeline right-of-way, all aboveground segments of the pipeline system, and appropriately selected underground segments must be visually inspected for physical defects and operating conditions which reasonably could be expected to impair the strength or tightness of the pipeline system. All known unsafe defects and conditions must be corrected in accordance with the conditions prescribed in the CFR. The pipeline system must be pressure-tested to a predetermined value above its maximum allowable operating pressure. Each operator must keep a record of the investigations, tests, repairs, replacements, and alterations made for the life of the pipeline under the requirements of the CFR.

Baker has been involved in providing not only engineering services, but also construction services related to the evaluation and upgrade of existing systems to meet compliance regulations. Baker services include: inventory and evaluation of existing records, preparation of design and construction procedures for pipeline remediation, construction supervision and inspection, construction material procurement, disbursement and inventory, permitting with applicable agencies, coordination of right-of-way services, and preparation of final documentation records.

Pipeline engineering and construction management is a major part of Baker's civil engineering capability. We strive to provide the latest in engineering/construction techniques, while applying the "state-of-the-art" technology to all aspects of the project.

Summary

More information on the specific pipeline services Baker offers can be supplied upon request. In the following sections, specific project information is provided to further demonstrate Baker's pipeline experience.

Pipeline Experience Overview

Baker has been involved with the engineering, permitting, right-of-way, and construction management of pipeline projects since the early 1940's. A partial listing below demonstrates some of Baker's experience.

Conoco

Analysis and upgrade of a natural gas distribution system. The system collected gas from wells in the Oklahoma City area and distributed it to local gas plants for processing. Baker provided all engineering and construction services responsible for bringing the approximately 410 miles of two DOT regulated natural gas gathering and transmission pipelines into compliance with the Code of Federal Regulations (CFR), Title 49, Parts 191 and 192 as administered by the Oklahoma Corporation Commission. Services included evaluation of existing records, preparation of design and construction procedures, permitting with applicable agencies, construction management and inspection, construction material procurement and disbursement, and preparation of final documentation records.

Conceptual design, route selection, alignment survey, right-of-way research and acquisition, alignment design, environmental permitting, construction inspection, and preparation of record drawings for 54 miles of 16- inch diameter steel pipeline running from Buchanan County, Virginia, through Pike County, Kentucky, to Mingo County, West Virginia. The project involved transporting coalbed methane from various sources along the route, and delivering it to a major distribution network.

Conceptual design, right-of-way acquisition, environmental assessment, permitting, aerial mapping, route selection, alignment surveys, design, and permitting for approximately 80 miles of a coal bed methane (CBM) collection pipeline. This gathering system included 150 CBM wells and 80 miles of 4 to 12-inch diameter steel and polyethylene low and high-pressure pipelines. Coalbed methane is being collected from Consolidation Coal Company's Buchanan Mine in Virginia. Construction phase services included right-of-way acquisition, construction inspection, and record drawings.

Provided engineering design, drafting, and CADD developed project plans for a 64 kilometer, 32.38 cm diameter pipeline in the Russian Republic. This elevated pipeline was constructed through a non-thaw stable discontinuous permafrost area, utilizing an expansion loop configuration. It was designed to carry warm crude oil from production facilities to another pipeline in the Russian Arctic. Specific services on this project included: geotechnical characterization and design modeling based on route specific soils data; prepared 92 plan and profile sheets for the length of the pipeline; prepared special plans for river, roadway, and reindeer crossings; provided construction surveys, quality control, and coordination with Russian survey parties working on this project.

Oxy USA, Inc.

Conceptual design, final design, right-of-way services, alignment surveying, route selection, permitting, photogrammetric mapping, environmental assessment, compressor design, mechanical design, electrical design, construction inspection, material yard management, construction management, and record documents for over 100 miles of a 1 to 12- inch diameter coal bed methane collection pipeline, interconnecting 300 wells, 28 compressor facilities, four electrical substations, and 60-miles of electrical distribution lines. Coalbed methane gas is being collected from Island Creek Coal Company Mines in Virginia.

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Air Reduction Company

Design, plans, specifications, and surveys for a 70 mile, 20-inch diameter, high pressure, and gaseous oxygen pipeline running from Arroyo, West Virginia to Aliquippa, Pennsylvania.

Alaska Northwest Natural Gas Transportation Company

The joint venture of Baker and Gulf Interstate Engineering Company provided pipeline and civil engineering services on this pipeline system, running from Prudhoe Bay, AK to the Canadian border. The data gathering and design work for the 745 mile, 48-inch diameter pipeline was accomplished through offices in Houston, Texas and Fairbanks, Alaska. Baker provided survey and Geotechnical management, technical support for center line drilling, material site investigations, frost heave analysis, preparation of permit drawings for material disposal sites, and provided civil engineering design for the construction work pad, access roads, airports, pipeline and work pad bridges over major streams, and various temporary facilities.

Alyeska Pipeline Service Company

Provided pipeline design, surveys, and construction phase services for the 789 mile, 48-inch diameter, \$8 billion Trans-Alaska Pipeline, stretching from Prudhoe Bay to the Port of Valdez. Project participation over a nine-year period also included feasibility studies, civil and structural engineering design of pump stations, and drainage studies for contingency plans, amounting to more than 3 million hours of engineering effort. Specific projects included: Mile-by-Mile Pipeline - Pipeline design, surveys, optimization and follow-up during pipeline construction; Design of Tanana River aerial pipeline suspension structure and 17 modular structures for aerial pipeline river and stream crossings; Design of pipeline supports for elevated pipeline; Special design with respect to fault zones, and animal and public road crossings; Yukon River to Prudhoe Bay Highway - Survey, design, construction phase services, and quality control inspection; Access Roads - Survey and design; Civil engineering design services (site plans, design of foundation and pipe supports, building plans, design of water supply and water disposal, technical specifications, etc.) for pump stations; Hydrologic and hydraulic engineering including rivers and floodplain pipeline design; Material Sites - Field reconnaissance and borings, analyses, reports, mining plans, and management of operations; Disposal Sites - Field reconnaissance, investigation reports, and site utilization plans.

Preliminary design of approximately 4,000 feet of the 48-inch diameter crude oil pipeline, which was being considered for retrofit from, buried to above-ground

mode at Wilber Creek along the Trans-Alaska Pipeline. Baker's responsibilities included: supported Geotechnical and hydrologic engineering studies; identified route and developed pipeline layout; prepared design drawings for preliminary design; designed special construction details including workpad, access road crossings and tie-in details; determined specifications requirements and prepared procurement specifications for engineered materials; and prepare technical report.

ANR Pipeline Company

Provided right-of-way, field surveying, mapping, design and drafting services for a 380 mile, 30-inch diameter pipeline, running from Defiance, Ohio to Tamarac, Pennsylvania. Planimetric mapping was prepared at a scale of 1 inch to 400 feet for the route, which was used as a basis for the surveying. In compliance with the project schedule, the surveying for the entire pipeline route was completed in a 6-week period. This was accomplished with survey crews working 10-hour days, 7 days a week. The design drafting included the preparation of 75 alignment drawings at a scale of 1 inch to 1,000 feet and 196 special construction drawings. A staff of 35 drafting technicians was utilized to complete the drafting within a 5-month schedule.

Apollo Gas Company

Field surveys and permit preparation for two river crossings, and four railroad crossings of a 12-inch diameter gas pipeline in Armstrong County, Pennsylvania.

ARCO Chemical Company

Design and construction inspection of a 4-inch diameter nitrogen gas pipeline serving an existing major chemical processing plant for ARCO Chemical Company, located in Monaca, Pennsylvania. Services included selection of the final alignment, preparation of the construction drawings, supervision of the construction inspection, and preparation of the final record drawings.

Prepared a pipeline survey manual for field engineers to follow during the supervision of contract surveyors.

Baltimore Gas and Electric Company

Provided engineering services for 4 miles of 24-inch diameter high pressure gas pipeline running from Creswell to Emmorton, Maryland. The design involved Global Positioning Survey (GPS), aerial photography, topographic mapping, field surveys, route studies, courthouse research, easement plats and legal descriptions, environmental assessments, permitting, design, construction plans, and construction phase services.

Provided engineering services for 10 miles of 24-inch diameter high pressure gas pipeline between Notch Cliff and Joppatowne, Maryland. The design involved Global Positioning Survey (GPS), aerial photography, topographic mapping, field surveys, route studies, courthouse research, easement plats and legal descriptions, environmental assessments, permitting, design, construction plans, and construction phase services.

Prepared a wetland delineation report and a Section 404 Non-tidal wetland permit application for five wetland and stream crossings for 3,000 feet of 20-inch diameter pipeline, and 4.5 miles of an 8-inch diameter pipeline that provides natural gas service to Aberdeen Proving Grounds, MD. On this project, Baker provided coordination with the Maryland Historic Trust, the Maryland Natural Heritage Program, and the U.S. Fish and Wildlife Service.

Provided all preliminary and final design, surveying, right-of-way services, and construction management for 7.5 miles of 20-inch diameter natural gas pipeline, located on a new right-of-way north of Baltimore, Maryland. Baker provided all environmental services required to identify, delineate, and permit wetland impacts along the pipeline right-of-way. Project impacts were documented in an Environmental Assessment Package which included: the Environmental Review outlining the general procedures for pipeline construction right-of-way restoration and alternatives analyzed; a review of the environmental requirements of the state Non-tidal Wetland Regulations; a Section 404-Nontidal Wetlands Permit application identifying all permanent and temporary impacts to wetlands and streams; and the Wetland Delineation Report, documenting the hydrology, soils, and vegetation of each wetland or stream.

Provided project management services for 4.5 miles of 30-inch diameter waterline, 20 miles of 12-inch diameter oil pipeline, and 30 miles of 24-inch diameter, high pressure, natural gas pipeline to service a major expansion of the Perryman Power Plant in Perryman, Maryland. Ranging from surveys through construction, Baker's comprehensive project management services for this project included: Global Positioning Surveys (GPS); aerial photography and topographic mapping; field surveys; route studies; courthouse research; easement plats and legal descriptions; environmental assessments; complete civil, mechanical, and electrical design; cathodic protection design; checking of shop drawings during construction; operations and maintenance plans. The pipeline project was on Intergraph CADD platform and included a geographic information system (GIS). The GIS incorporated environmental and engineering constraints as database attachments to the CADD drawings.

Services provided by Baker on this project included a feasibility study, aerial photography, digital mapping, surveying, wetland identification and delineation, permitting, preparation of erosion and sedimentation control plans, archaeological investigation, and project management for an 8.5 mile, 24-inch diameter natural gas pipeline to be located within an existing powerline right-of-way.

Buckeye Pipeline Company

Investigated subsurface oil pollution along a leaking pipeline in Clarkson, Michigan. Monitored groundwater and determined direction of plume; developed a collection and treatment design plan.

Design, field surveys, and plans and specifications for relocation of a 7,000 foot, 10-inch diameter flammable products pipeline in Blair County, Pennsylvania.

Design of 12 miles of gasoline product pipeline in Pittsburgh, Pennsylvania.

Field surveys, aerial photography and photogrammetric mapping, geologic field mapping, core borings, and test pits were performed in determination of remediation alternatives following a landslide and rupture of a 10-inch diameter petroleum pipeline in Armstrong County, Pennsylvania. Baker developed plans, and managed construction activities for stabilization of the landslide.

CNG Transmission Corporation

Performed transit (slope chain) surveys, condemnation surveys, expert witness appearances, prepared construction alignment plans, line lists, erosion control mapping, permitting plats (roads, streams, rivers, and railroads), DOT sheets (pipe classifications) and right-of-way plats for over 160 miles of pipeline routing combinations running throughout western Pennsylvania.

Carnegie Natural Gas Company

Design, route selection, surveys, and permit applications for a 15 mile, 16-inch diameter gas pipeline between Crown Point and Gary, Indiana including three river crossings and many railroad crossings.

In performing environmental engineering services for this pipeline project in Pittsburgh, PA, Baker completed a study to determine locations where hazardous pipeline residue may have contaminated the environment, and the nature and extent of such deposits. The technical approach developed to accomplish this objective included a file search and interviews with employees, waste characterization, site investigations involving some drilling and boring activities, and an organic vapor analysis.

Columbia Gas Transmission Company

Extensive survey & mapping experience for over 150 miles and approximately 50 various pipeline projects involving, surveys, condemnation plans, utility relocations, and related tasks due to major highway and airport construction projects, and maintenance work throughout West Virginia, Pennsylvania, New York, Ohio, Virginia, Kentucky and New Jersey.

Consolidated Gas Supply Corporation

Preparation of an environmental assessment report for a 34 mile gas pipeline between Colvin and Tonkin pumping stations in southwestern Pennsylvania. The report was prepared according to FERC regulatory requirements.

Mapping and feasibility study of a 190 mile pipeline running through the states of Virginia, Maryland, and Pennsylvania.

Design, specifications, route relocation surveys, and mapping for a 240 mile, 36 and 40-inch diameter, high pressure gas pipeline between Lebanon, Ohio and Koppel, Pennsylvania.

EICON, Inc.

In performing environmental engineering services for this pipeline project, Baker located potential voids at gas pipeline crossings beneath various Connecticut state roads and interstate highways. The voids occurred due to pipe jacking operations of a pipeline running through the southwest part of the state. Performed a geophysical survey to guide remediation of the voids via grouting or excavation and backfilling.

Exxon, U.S.A.

Provided engineering services and Geotechnical investigations concerning borrow materials at Point Tompson, Alaska.

Hess Oil and Chemical Company

Designed, prepared plans and specifications, conducted location surveys, staked of right-of-way, designed fuel storage tanks, and provided construction phase engineering services for a 75 mile oil pipeline between Smithdale and Lumberton, Mississippi.

Hope Gas Company

Approximately 50 miles of miscellaneous pipeline projects involving detailed surveying and mapping throughout West Virginia.

Interstate Oil Pipeline Company

Route location surveys, profiles of stream, highway, railroad, and levee crossings, terrain reconnaissance, and mapping for a 104 mile pipeline between LaRose and Belle Rose, Louisiana, and Sunset to Anchorage, Louisiana.

Iroquois Gas Corporation

Location surveys, and staking of right-of-way for a 90 mile, 24-inch diameter natural gas pipeline running from Alma to Lancaster, New York.

Kiantone Pipeline Corporation

Engineering design of an intermediate booster station to increase capacity for an oil pipeline running from West Seneca to Warren, Pennsylvania.

Knauf Fiberglass Company

Pipeline design, route selection, surveys, and permitting for a 4 mile gas pipeline including two river crossings and three railroad crossings in Shelbyville, Indiana.

Mississippi Valley Gas Company

Route location studies and right-of-way investigations for a 100 mile, 18-inch diameter pipeline running from West Point to Greenwood, Mississippi.

Provided engineering services concerning the planning, design, and construction of a 6 mile, 8-inch diameter pipeline running from West Point, Mississippi to the R.L. Burns Pipeline.

Provided engineering services in connection with the planning, design, and construction of a 6 mile, 8-inch diameter pipeline connecting the Splunge Gas Field to the Armory Storage Field.

Mobil Pipeline Company

Provided engineering services in connection with the planning, design, and construction of an 8 mile, 18-inch diameter pipeline running from a Mississippi Valley South Pump Station to a Texas Gas Transmission Corporation Pipeline.

New York State Electric & Gas

Approximately 6 miles of various pipeline projects involving utility relocations, surveys, and right-of-way acquisition plans due to major highway and airport construction projects throughout Pennsylvania.

Provided aerial photography, topographic mapping, and GPS surveys for a 500 mile gas distribution pipeline system located in Tompkins County, New York.

Aerial photography, mapping, and surveys at various locations for a 45 mile existing pipeline system and extensions, running from the Ohio State Line to Greensburg, Pennsylvania.

Pennzoil Company

Design, surveys, preliminary engineering studies, and cost estimating to determine the size of an 8-inch diameter crude oil pipeline and pumping stations, running from Rouseville to Midland, Pennsylvania.

Peoples Natural Gas Company

Approximately 6 miles of pipeline relocation and construction projects due to highway and airport construction projects in Pennsylvania. Services provided by Baker included pipeline design, surveying, layout, construction monitoring, and preparation of as-built record plans.

Aerial photography, field surveys, and mapping at various locations of an existing system and extensions running for 600 miles through the states of Pennsylvania and New York.

Environmental sampling and contamination assessments were performed at a natural gas pipeline transfer facility. The assessment was performed as part of a statewide (PA) investigation of the natural gas industry's handling and disposal of pipeline liquids. The assessment revealed elevated concentrations of polychlorinated biphenyl compounds (PCBs) in shallow soil samples collected within a metering regulating building and near an outdoor pipeline leak. Baker developed draft and final remediation work plans for regulatory agency review. The final work plan included the following tasks: pre-cleanup sampling; soil excavation and off-site disposal at a landfill licensed to receive toxic substances; post-cleanup confirmatory sampling; remediation report preparation. The remediation was performed in accordance with the work plan. Statistically based three-dimensional grids were established for collection pre- and post-cleanup samples.

Shell Oil Company

Engineering design services for the Thomasville high pressure gas and sulfur production facilities, located in Rankin and Simpson Counties, Mississippi, included structural design of pipe and vessel supports, tank foundations, stack anchors, well drilling pads, and pipeline anchors.

Field surveys in connection with the construction of a 429-mile pipeline running from Poplar, Montana to Fort Laramie, Wyoming.

Sun Pipeline Company

Prepared a report containing alternative solutions to relocate a 10-inch diameter petroleum product pipeline subjected to landslides in Rochester, Pennsylvania. Various cost estimates were prepared supporting the relocation recommendation.

Professional engineering services for a 190 mile oil pipeline running from Fox Chapel, Pennsylvania to Hudson, Ohio.

Tennessee Gas Company

Performed geophysical engineering services for a gas transmission line that had previously been jacked beneath the Massachusetts Turnpike and along a railroad embankment. The project required ground penetrating radar profiling to delineate zones of suspected voiding within the sub-base and embankment materials.

Provided engineering services for planning, design, and construction of a 4 mile, 4.5-inch diameter pipeline running from Rye Dobbs Well No. 20-1 to a Tennessee Gas Compressor Station in Jackson, MS. The project was designed, constructed, and put into service in one month.

Texaco Incorporated

Topographic survey, design, and resident inspection of a 10-inch diameter pipeline from a Buckeye Pipeline, Coraopolis terminal, to the Texaco Inc. Pittsburgh terminal.

Texas Pipeline Company

Field surveys for alignment and profile, preparation of maps, plans, crossing permits, and terrain reconnaissance for a 162 mile pipeline running from Hearne to San Marcos, Texas.

Field surveys for alignment of pipeline route for construction, preparation of alignment plans, property ownership maps, aerial mosaics and profiles, and terrain reconnaissance for a 327 mile pipeline between Jal, New Mexico and Cushing, Oklahoma.

Tioga Pipeline Company

Route selection, alignment survey, alignment design, permitting, construction inspection, and preparation of record drawings for a 12-inch diameter, 10,000 linear foot steel pipeline that provides aviation fuel to Pittsburgh International Airport.

Union Carbide Corporation

Designed, provided construction specifications, performed location surveys, and mapping of a 13 mile pipeline located near Ashtabula, Ohio.

Provided professional engineering services for an oxygen pipeline serving the Republic Steel Corporation in Youngstown, Ohio.

United States Air Force Reserve

As part of an open-end agreement, Baker designed an upgraded gas distribution system for the 911th Tactical Airlift Group located at Pittsburgh International Airport. The old system was leaking and had inadequate gas pressure. Baker began by researching the existing system records and performing a site survey to determine the location and size of the pipeline. The optimal solution called for sliding 1.5 to 6-inch diameter plastic pipe into the existing metal pipeline. Baker drafted the plans, completed the construction specifications, and estimates for this work, including: Site Condition Survey - location and inspection of gas valve boxes; verification of the location of existing gas lines; measurement and inspection of existing regulator station. Pipeline Design - determination of the correct pressure for regulator stations, and adjustments to the main regulator; specifications for a new regulator station for each building; Recommendations for repairs; design of identified repairs; checking of shop drawings during construction.

United States Marine Corps

In performing environmental engineering services for this pipeline project, at Camp Lejeune, Baker conducted a site assessment investigation for the military base's aircraft refueling area. The study was performed to address concerns of possible leakage of the refueling system, which included a 6-inch diameter pipeline, numerous underground storage tanks, and all associated piping. Assessment activities included reviewing background information, soil and groundwater sampling for analysis, installation of ten penetrometers, and installation of several groundwater monitoring wells.

United States Navy – LANTDIV

In performing environmental engineering services for this pipeline project at the Norfolk Naval Base, Baker conducted a site characterization of an abandoned 8 and 12-inch diameter pipeline running from an above ground fuel filter area. The investigation revealed the presence of absorbed phase (soil) and dissolved phase petroleum hydrocarbons. Free phase (floating) product was not detected. Recommendation involved: remediation of the soils (passive) to remove the source. Passive remediation was recommended as well, due to limited area of contamination, lack of detectable levels of driver compounds, absence of pathways for human exposure, and the relative stability of the contaminant plume.

Washington Gas Light Company

Provided planning, surveys, records research, CADD conversion, plan preparation, and drafting and designing of transmission/distribution gas main extensions for an open-end contract with the gas company. Baker provided some or all of these services on more than 300 projects involving over 800,000 feet of pipeline.

Provided planning, design, surveying, permitting, land acquisition, and construction phase services for a pipeline running through southern Maryland, along U.S. Route 301. The work involved 5,000 feet of 12-inch diameter wrapped steel transmission pipeline inside a highway right-of-way.

Performed a planning study involving location, right-of-way easement acquisition, Geotechnical and construction costs estimates for proposed 129-mile long, 24-inch diameter transmission main running from northern Virginia to east of Richmond, Virginia.

Over a three-year period, Baker provided field services involving new pipeline extensions and construction stakeout with one to three field survey crews reporting on a daily basis to Washington Gas Light Company for their work assignments.

Provided planning, design, surveying, permitting, land acquisition, and construction phase services for these transmission and distribution pipelines. The work involved 25,000 feet of 8 and 12-inch diameter wrapped steel mains crossing country and rural state roads. The project included two pressure-regulator stations, 350 to 100 psi, in Frederick, Maryland.

Yukon Pacific Corporation

Provided planning, design, surveying, permitting, land acquisition, and construction phase services for 40,000 feet of 4 to 12 inch diameter plastic and steel distribution mains at the Air Force Base. The design required extensive effort in the relocation of existing utilities for routing the gas pipelines.

Provided planning, design, surveying, permitting, land acquisition, and construction phase services for these transmission pipelines. The work involved 20,000 feet of 8 and 12-inch diameter wrapped steel mains and one pressure-reducing station in Frederick, Maryland.

Provided preliminary engineering for this natural gas pipeline system, Trans-Alaska Gas System (TAGS). The system will transport up to 2.3 billion cubic feet per day of natural gas through a 796.5 mile-long buried pipeline running from North Slope to Tidewater Alaska. Specific assignments included: developed original engineering design and analysis tools and methodology for the analysis of damage potential to the pipeline from operating hazards, especially Geotechnical hazards of frost heave, and thaw settlement; developed a risk assessment methodology and associated tools for the pipeline; direct design and subcontractor activity for aerial crossings, above-ground pipeline design, pipeline material testing, and evaluation of pipeline design limits; assisted in the development of field and test programs for frost heave evaluation; integrated new tools and methodology into the project design criteria, project schedules, cost preparations, and response to regulatory requests; aided the preparation of the report and presenting the findings of the proposed design of the LNG terminal facilities in Valdez to the Federal Energy Regulatory Commission. This formal filing including seismic, meteorological, environmental, and structural concerns for the site in a sensitive location.

Coal Bed Methane Gas Collection System

Oakwood Gathering System

Project Description:

Feasibility studies, surveying and mapping, right of way services, environmental permitting, road and railroad crossing applications, pipeline design, compressor requirements, electrical lines and electric sub stations, site work, geotechnical investigations, material yard management, construction management and construction inspection were many of the tasks assigned to Baker for over 100 miles of 2" to 12" diameter of a coalbed methane gathering system located in southwest Virginia.



Typical valve location construction along one of the many gathering

The Challenge:

Coalbed methane gas has always posed a threat to coal mining. To work in a safe environment, the coalbed methane has historically been released into the atmosphere as the mining operations take place.

Initially the concept to collect the methane gas was to drill wells in the center of 80 acre parcels and recover the gas from these wells and transport to the Northeast United States. This elimination of the gas from the coal seams would enable the miners to work more safely because the majority of the gas would be removed before the mining operations began.

Innovated Solutions:

Soon it was determined that the wells did not produce as much methane as was hoped and the decision to "chase the gob" was made. Ventilation wells would be drilled in the proposed mining panels and when the mining operations passed these wells the amount of gas that was escaping into the atmosphere was in the range of 3 to 4 Mcf/day. Baker was asked to develop the technology to have the wells, the pipelines and the compressor designs completed ready to gather the gas from the mining operations without jeopardizing the safety of the miners and not having more than 10% of the methane gas escape into the atmosphere.



Valve location to regulate the flow of the coal bed methane to the many compressors.

Civil, mechanical, structural, and electrical engineers as well as surveyors, CAD operators, construction inspectors and other support personnel worked 16 hours per day for two years and accomplished the successful collection of 30Mcf/day of pipeline quality gas to the Northeast United States and the procedures and techniques are still being followed since the initial start of the project in 1990.

The system is still in operation and is producing 130 Mcf per day. It is estimated that there is 1.2 Tcf of methane gas in a 170,000 acre tract that is scheduled for deep mining operations.

BAKER SERVICES

- Design
- Utility Research
- Geotechnical Investigation
- Environmental Permitting
- Right-of-Way Research And Easement Settlements
- Construction Inspection

The Pocahontas Coalbed Methane Gas Pipeline Project

Buchanan County, VA

Project Description:

The objective of this project was to transport coalbed methane (CBM) gas from deep mine ventilation wells to a centralized gas compressor station. Conoco, Inc. teamed with Consol Coal Company on this project. The wells initially were ventilating CBM gas, produced from long-wall mining operations, into the atmosphere. A network of several hundreds of miles of small diameter polyethylene (PE) pipe was constructed to capture the CBM gas.

The Challenge:

Coalbed Methane (CBM) has always posed a threat to coal mining because it accumulates in the mines and can explode. Because there is very little commercial difference between coalbed methane gas and conventional natural gas, oil and gas companies have been searching for ways to turn coalbed methane into a marketable commodity,



New compressor station under construction

while mitigating the hazard for the miners. Developing this resource however, has proven difficult because of complex regulatory permitting and ownership issues, and the mountainous terrain usually associated with coal mines.

Permitting Solutions:

Baker's role on this project involved the engineering and permitting services required to construct a network of pipelines from the wellheads to a centralized compressor station. Not only did the permitting involve addressing stream, wetland, highway and railroad crossings, but it also involved acquisition of air quality permits for the use of small portable gas compressors at each well site.

A considerable amount of the engineering and permitting services required the interaction and coordination with the deep coal mining activities. This interaction precipitated the acquisition of multiple environmental permits and approvals. The permitting issues included: acquiring all stream, river, and wetland permits on Federal, State, and local levels, preparation of erosion and sedimentation control plans, obtaining necessary approvals from the State Historic Preservation Offices, field identifying environmentally sensitive areas that required special construction activities, safety issues related to the ongoing deep mining operations, and coordination with the State mining agencies.

BAKER SERVICES

- *Civil Permits*
 - Buchanan County Highway Dept.
 - VA DOT
 - Norfolk Southern Railroad
 - CSX Railroad
- *Environmental Permits*
 - VA Soil & Water Conservation Commission
 - VA Dept. of Air Pollution Control
 - VA Dept. of Mines, Minerals & Energy
 - VA Marine Resources Commission
 - VA Dept. of Forestry
 - VA Dept. of Game & Inland Fisheries
 - VA Dept. of Historic Resources
 - U.S. Corps of Engineers
- *Alignment Engineering*
- *Erosion and Sedimentation Control Plans*
- *Right-of-Way Coordination & Acquisition*
- *Quantity and Cost Estimates*
- *Pressure & Leak Testing*
- *Property & Alignment Surveys*
- *Preparation of Construction Specifications*
- *Preparation of Final Record Documents*

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The Cardinal States Gathering Pipeline Project

Buchanan County, VA; Pike County, KY;
Mingo County, WV

Project Description:

The objective of this project was to transport coalbed methane (CBM) gas from new collection systems to an existing Columbia Gas Company Compressor station. Conoco, Inc. and OXY USA, Inc. teamed together on this project. The project involved the design, permitting and construction of a 54 mile 12 and 16-inch diameter steel pipeline that traversed cross-country in three states.

The Challenge:

Coalbed Methane (CBM) as has always posed a threat to coal mining because it accumulates in the mines and can explode. To work in a safe environment, the CBM gas has historically been released into the atmosphere as the mining operations take place. The project required the fast tracking of acquiring new right-of-way easements. In addition to the detailed real estate transactions, the environmental permitting required coordination with a multitude of agencies on the Federal, State, and local levels.

A "Jigsaw Puzzle" Easement and Permit Solution:

Baker's role on this project involved the engineering, right-of-way and permitting services required to construct a 54-mile long 16-inch diameter pipeline across three states in very rugged country. The geography in this part of the United States is comprised of steep hillsides and razor-sharp mountain ridge lines. Along with the rugged terrain, Baker had to deal with missing, erroneous, and incomplete courthouse records in three county seats. Taking into account these constraints, Baker's team of right-of-way specialists was able to secure new easements on over 300 property parcels in less than 5 months. Piecing the parcels together in "jigsaw puzzle" fashion, the pipeline route was ready for construction in record time.



Pipe being layed on razor-sharp ridge

A considerable amount of the engineering and permitting services required the interaction and coordination with the deep coal mining and strip mining reclamation activities. This interaction precipitated the acquisition of multiple environmental permits and approvals. The permitting issues included: acquiring all stream, river, and wetland permits on Federal, State, and local levels, preparation of erosion and sedimentation control plans, obtaining necessary approvals from the State Historic Preservation Offices, field identifying environmentally sensitive areas that required special construction activities, safety issues related to the ongoing deep mining operations, compliance with existing reclaimed lands restrictions, and coordination with the State mining agencies.

BAKER SERVICES

- Civil Permits
 - Buchanan County Highway Dept.
 - VA DOT
 - KY DOT
 - WV DOH
 - Norfolk Southern Railroad
 - CSX Railroad
- Environmental Permits
 - VA Soil & Water Conservation Commission
 - VA Dept. of Air Pollution Control
 - VA Dept. of Mines, Minerals & Energy
 - VA Marine Resources Commission
 - VA Dept. of Forestry
 - VA Dept. of Game & Inland Fisheries
 - VA Dept. of Historic Resources
 - U.S. Corps of Engineers
 - WV DEP
- Alignment Engineering
- Erosion and Sedimentation Control Plans
- Right-of-Way Coordination & Acquisition
- Compressor Design and Permitting
- Quantity and Cost Estimates
- Pressure & Leak Testing
- Property & Alignment Surveys
- Preparation of Construction Specifications
- Preparation of Final Record Documents

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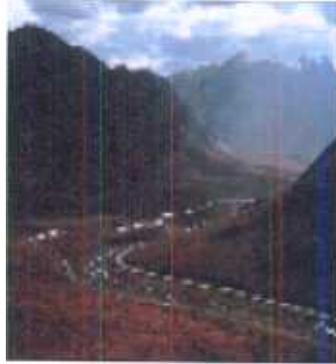
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Trans Alaska Pipeline System (TAPS)

Prudhoe Bay to the Port of Valdez, AK

Project Description:

The 798-mile Trans Alaska Pipeline was built for one major purpose: to make the 9.6 billion barrel oil reserve at Prudhoe Bay, Alaska, available to U.S. industry and consumers. At the time, this was the largest privately funded project in history. The 48-inch diameter steel pipeline begins in the Arctic desert of Prudhoe Bay with its annual rainfall of only 6 inches, climbs 4,800 feet over Dietrich Pass in the Brooks Range, crosses the Yukon River, climbs 3,300 feet over the Alaska Range and then over Thompson Pass in the Chugach Mountains before reaching the ice-free Port of Valdez.



The Challenge:

Planning for the pipeline began in 1968 after the discovery of oil at Prudhoe Bay. Extensive environmental and design studies were conducted on all phases of the system. Every foot of the route corridor was checked for environmental features, soil and seismic conditions. Construction of the actual pipeline system began in 1974 and was completed in 1978.

The construction of the pipeline required construction of the first all-season, all-weather highway to be built across the Arctic Circle in the United States. Baker provided design and surveying services on this highway and on: fifteen permanent access roads linking the main highway with pump stations and airfields; various temporary roads providing access to the pipeline ROW and material sites; three permanent airfields required to support the operations and maintenance of the pipeline; and eight temporary airfields which supported the highway and pipeline construction.

Innovated Solutions:

Baker's involvement also included detailed analysis of the soil conditions and design of the above-ground pipe support platforms. To find the most secure route and station locations, approximately 3,400 bore holes were drilled and more than 15,000 soil samples were taken. Approximately 382 miles of pipeline was installed above-ground on specially designed support platforms spaced 50 to 70 feet apart. To prevent thawing around the platform supports, a special thermal device was designed and installed in the supports to keep the ground frozen. The devices are non-mechanical and self-operating.



Since 1991, Baker has been supplying engineering services for the operations and maintenance of the pipeline system. One major effort involved the determination of the seismic hazard potential of above-ground sections of the system and the preparation of operating contingency procedures. A second major effort involved providing design services on the rehabilitation of the buried section of the system north of the Arctic Circle.

BAKER SERVICES

- Evaluation of Existing Records
- Civil Permits
- Environmental Permits
- Alignment Engineering
- Erosion and Sedimentation Control Plans
- Mechanical and Hydraulic Engineering
- Right-of-Way Coordination and Acquisition
- Quantity and Cost Estimate
- Metallurgical Testing
- Pressure and Leak Testing
- Property and Alignment Surveys
- Preparation of Construction Specifications
- Material Procurement and Disbursement
- Construction Management and Inspection
- Preparation of Final Record Documents

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The C & L Processors of DOT Pipeline

Oklahoma City, Oklahoma

Project Description:

Conoco Inc. and Liquid Energy Corporation formed a partnership known as C & L Processors Partnership (C & L) for the purchase of two large natural gas gathering and transmission systems from Oryx Energy Company. The Goldsby System was comprised of approximately 650 miles of pipeline and the Carney System contained approximately 300 miles of pipeline. Pipe in both Systems was a combination of steel, fiberglass, polyethylene, and polyvinyl chloride, and ranged in size from 2-inch through 12-inch.



A section of pipe being lowered at a stream crossing

The Challenge:

The objective of this project was to bring the DOT regulated sections of both Systems into compliance with the Code of Federal Regulations (CFR), Title 49, Parts 191 and 192, as administered by the Oklahoma Corporation Commission (OCC). All gathering pipelines located within an incorporated or unincorporated community are regulated by the DOT. Also, all Class 2, 3 and 4 pipelines and all transmission pipelines are DOT regulated regardless of geographic location. Of the 650 miles of pipeline in the Goldsby System, approximately 350 miles were identified to be regulated. Approximately 60 of the 300 miles of pipeline in the Carney System were considered to be regulated.

Innovated Solutions:

Baker's role on this project involved not only the engineering and permitting services, but also the construction services. Having the added responsibility of Construction Manager, Baker managed a team of specialty contractors who x-rayed welds, replaced sections of pipe, provided metallurgical testing, and conducted pressure testing with water, nitrogen and natural gas.

A considerable amount of pipeline replacement work was required at river and stream crossings due to embankment washouts. This needed work precipitated the acquisition of multiple environmental permits and approvals. The permitting issues included: acquiring all stream, river, and wetland permits on Federal, State and local levels, preparation of erosion and sedimentation control plans, obtaining necessary approvals from the state historic preservation offices, and field identifying environmentally sensitive areas that required special construction activities.

BAKER SERVICES

- Evaluation of Existing Records
- Civil Permits
- Environmental Permits
- Alignment Engineering
- Erosion and Sedimentation Control Plans
- Mechanical and Hydraulic Engineering
- Right-of-Way Coordination and Acquisition
- Quantity and Cost Estimate
- Metallurgical Testing
- Pressure and Leak Testing
- Property and Alignment Surveys
- Preparation of Construction Specifications
- Material Procurement and Disbursement
- Construction Management and Inspection
- Preparation of Final Record Documents

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River Bore Project

Confidential Client and Location

Project Description:

A confidential client selected Michael Baker, Jr. to plan, design, and perform a river bore under a major river in a highly urbanized area in northeast U.S. This project had to be designed in an area containing numerous utility and right-of-way conflicts. Due to competitive reasons, the client has requested that their name and the project location be kept confidential.



Boring rig preparing to construct a new communication link to a major world trade center.

The Challenge:

Michael Baker Jr., Inc. performed a feasibility study using a combination of (1) on-site evaluation and (2) analysis of engineering and economic reasons to select the landing sites and cable alignment. The sites were selected based on a review of telecommunications engineering, geotechnical, and environmental engineering factors, with the consideration that any single problem could cancel the project.

Innovated Solutions:

The site selection criteria used to evaluate potential sites included considering:

- Public and private rights-of-way
- Construction permitting
- Construction access
- Constructability
- Maintenance access
- Location of existing utilities
- Environmental constraints and permitting
- River traffic
- Security

This screening criteria and the field information Baker obtained, helped to characterize and profile the suitability of two key entry/exit landing sites, and to demonstrate to the client and regulatory agencies the viability of the boring operation.

A key component in successfully obtaining access to the landing sites was our ability to identify the numerous permitting agencies, and obtain the necessary approvals, in a timely fashion, to proceed. This major coordination effort was key to successfully satisfying the various agencies that the project was in regulatory compliance.

Following engineering design and construction specifications prepared by Baker, the bore was performed by a contractor.

BAKER SERVICES

- Design
- Utility Research
- Geotechnical Investigation
- Environmental Permitting
- Right-of-Way Research And Easement Settlements
- Construction Inspection

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Washington Gas & Electric Field Design

Maryland

Project Description:

A new house, a new subdivision or a new business needs new gas service, and Washington Gas & Electric assigned two-man teams from Baker to field design the route.

The Challenge:

The package given to the Baker Teams would include the location of the new service, maps of the existing gas lines in the vicinity, size of the new service line to be placed, and owner contacts. The team communicated with the proper contact in order to schedule a meeting to find out where the entrance to the building was planned, and the date that the service was to be available. The existing system was verified and all other underground utilities that may affect the design and construction were identified. Existing maps and any other information that was needed to correctly design the project was gathered from the utility offices.

The package that was given back to Washington Gas & Electric included the existing system verification sketch, the sketch of the proposed new route, and distances with various types of topography that would be traversed. The packages also included the information for the traffic control measures that were required, the different types of construction, location of the placement of the meters, and any permitting required for construction.



After verification of the design and cost estimates tabulated by Washington Gas & Electric, the Baker Team was notified of the stakeout. The proposed alignment was then staked for construction.

Permitting Solutions:

The team visited the local, county, and state government offices to identify all permits required to be completed before the start of construction. Traffic control requirements were also collected.

BAKER SERVICES

- Feasibility Studies
- Field Design
- Permitting Requirements
- Traffic Control Requirements
- Construction Methodology
- Construction Stakeout

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Perryman Pipeline Project

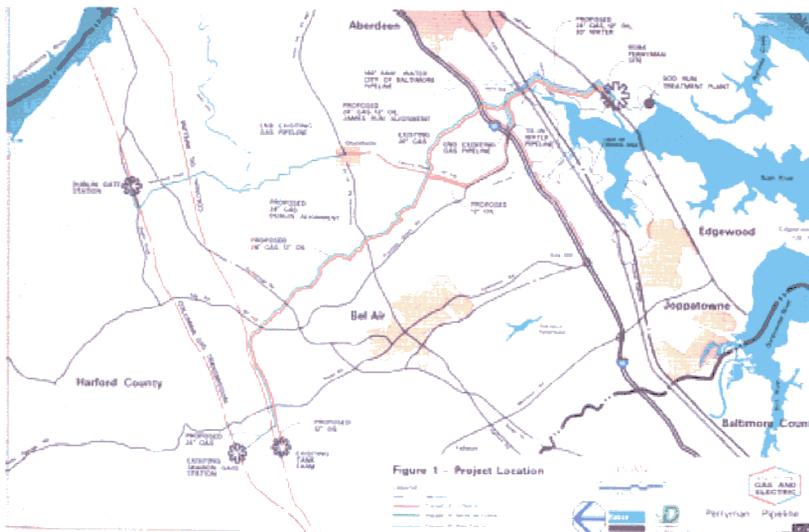
Hartford County, Maryland

Project Description:

In early 1990 the BG&E Gas Supply Department was asked to provide fuel and water resources to the proposed Perryman Plant. It was determined that the gas, oil, and water pipelines would be laid simultaneously in portions of the same right-of-way, as follows: a 12-inch No. 2 fuel oil line; a 24-inch high-pressure natural gas line; and a 30-inch water line. Although the overall pipeline route was to be 19.7 miles long, the length of the combined pipelines total approximately 45 miles. The 30-inch raw water line, which originates at a terminal northwest of the Perryman Plant Site, parallels the gas and oil pipelines for approximately 4.5 miles.

The Challenge:

- Global Positioning System Survey
- Aerial photography and topographic mapping
- Field surveys
- Route studies
- Courthouse research
- Easement plats and legal descriptions
- Environmental assessments
- Complete civil, mechanical, and electrical design
- Cathodic protection design
- Checking of shop drawings during construction
- Operations and maintenance plans



BAKER SERVICES

- Field Surveys
- ROW Support
- Engineering Support

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