L.R. Kimball charts the course for a 200-mile electric transmission line

THE SITUATION

In the spring of 2007, an electric utility firm, headquartered in Greensburg, Pa., planned to build over 200 miles of 500 KV electric transmission lines. These lines would run through southwest Pennsylvania, across West Virginia and into Virginia. The project was necessary to meet the growing demand for electricity in the Mid-Atlantic region that could cause overloading on the utility's existing transmission system. Choosing an appropriate path for the line would require a massive effort on an extremely tight schedule to bring the line into service by 2011.

THE CHALLENGES

The company wanted to explore multiple distinct corridors—ultimately four alternates, each of which would need to be mapped and evaluated. The heavily forested region presented a significant challenge for the electric utility firm and its primary contractor. Aerial photography was essential to enable the development of digital orthophoto maps for use by the firm in laying out the line and planning its construction.

THE SOLUTION

L.R. Kimball had maintained a relationship with the electric utility firm for many years. When they put out an RFP for aerial photography, surveying and mapping, L.R. Kimball submitted a bid. The project was awarded to L.R. Kimball, working directly with the primary contractor.

The tasks before L.R. Kimball were daunting, but were expertly managed with the firm's own staff and project management resources. Projects like these are critical in delivering electricity from substations to urbanized areas – with generally increased demand for power – across the country. L.R. Kimball, a full-service architecture, engineering and communications technology firm offering a full range of surveying, mapping and geotechnical services, provided several critical support services, including:

- Selecting hundreds of ground control locations and placing aerial targets at 114 of those points.
- Deploying six L.R. Kimball in-house survey crews to perform GPS surveys and placing the large, white vinyl cross-shaped aerial targets in pre-designated locations. Access to many of the locations was challenging due to weather conditions or because the locations was remote or on private property.
- Intense project manager coordination during the targeting and GPS control surveys. Targets needed to be moved, for many reasons, and the field crews worked closely with office staff 200 miles away – around the clock – to complete the targeting and control so that the aerial photography could be accomplished.

Project Overview

CLIENT

An electric utility firm and its primary contractor

GOAL

Help to determine the most appropriate path for a new 200 mile electric transmission line

L.R. KIMBALL SERVICES

- Mapping
- Surveying
- Geotechnical Investigation and Testing
- Aerial Photography

L.R. Kimball℠

TARGETED RESULTS. EXPERTLY MANAGED.
WE STAKE OUR REPUTATION ON IT.

A CDI Company

L.R. Kimball (SM) is a service mark of CDI-Infrastructure, LLC.

- L.R. Kimball spent eight days acquiring digital photography at a time of year when the sun angle allows only three hours per day of photography acquisition. Crews used two airplanes to fly the 700 miles, capturing all four potential routes in color, at a 1" = 660' scale.
- Working with route adjustments throughout the mapping process.
- Scanning images to produce a final ground pixel resolution of six inches and using this imagery to produce color digital orthophotos at 1"=100'.
- Collecting elevation data through a digital terrain model to accurately generate contours with a vertical interval of two feet.

Completing the project ahead of schedule, L.R. Kimball delivered the color digital orthophotos, planimetric features and contours to the electric utility firm.

Geotechnical Engineering Services

In the summer of 2007, L.R. Kimball was initially retained by the primary contractor to perform a subsurface investigation at the 502 Junction substation. Based on the firm's performance, additional work was awarded to L.R. Kimball to perform similar services at the sites of two other substations along the transmission line route. L.R. Kimball worked quickly to conduct studies simultaneously at the 502 Junction and a second proposed substation that was ultimately not constructed near the Pennsylvania/West Virginia state line. Studies were also conducted at the existing Meadow Brook Substation—which was planned to be expanded—in Frederick County, Virginia. The subsurface investigations work incorporated a comprehensive array of geotechnical services implemented by L.R. Kimball's in-house engineers, including coordinating efforts to protect structures along the powerline construction route in the area by monitoring implosions. Other L.R. Kimball services included:

- Boring location surveys
- Drilling, standard penetration testing and rock coring
- Drilling oversight, logging, pyrite analysis and rock mass rating analysis
- Infiltration testing for storm water management
- Geophysical studies to support grounding design
- Landscape architectural services
- Slope stability analyses
- Employing testing at L.R. Kimball's geotechnical laboratory involving:
  - Triaxial shear strength compression tests
  - Visual classifications
  - Moisture content
  - Gradations
  - Hydrometer
  - Atterberg limits
  - Unconfined compressive strength test of rock core
  - Unconfined compressive strength test of soil
  - Moisture-density relationship (Proctor)
  - Corrosivity tests (pH, chlorides, and sulfates)
  - Large-diameter (6-inch) CU triaxial compression test
  - Acid base accounting testing for acid runoff potential
  - Forms of sulfur testing for expansive properties potential
- Construction Quality Assurance

The months-long site investigation and field and laboratory testing began in late summer, and L.R. Kimball staff worked steadily to complete the work to meet design schedules. When completed with its investigations, L.R. Kimball provided the contractor with comprehensive geotechnical engineering reports of all the data from drilling, sampling, testing, and analysis and made recommendations to designers for use in completing civil and structural designs for the sites, including foundation type, size and location; slope-stability analyses; and deep foundation lateral-load analysis. L.R. Kimball's own in-house testing lab capability supported geotechnical engineers in report development. A firm landscape architect was retained to supplement substation design drawings to improve the aesthetics surrounding the 502 Junction.

In addition, L.R. Kimball provided onsite quality control services and continues to support development of transmission lines and substations.

TARGETED RESULTS

- L.R. Kimball kept the firm mapping project on track despite sometimes difficult working conditions, providing the tools and materials that the contractor needed for final design.
- L.R. Kimball helped ensure successful geotechnical investigations. L.R. Kimball gave project managers facing a tight deadline the tools needed to complete work on time.
- L.R. Kimball's expanded capabilities in geophysical and subsurface techniques helped keep the project on schedule.
- After its experience with the electric utility firm, the contractor has included L.R. Kimball in many of its pursuits for other energy projects. The company's decision makers place particularly high value on L.R. Kimball's project management expertise, and its ability to deliver a full range of in-house mapping and geotechnical services. Without the need to manage multiple firms, the contractor and L.R. Kimball can offer energy companies nationwide a one-stop resource to execute and manage these critical power delivery projects.

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