PIPELINE ROUTE SELECTION:

The factors you consider during the routing phase can make or break your pipeline project

BY MARK NUSSBAUM, SR/WA

A new client unfamiliar with the pipeline business recently asked me what is typically required in developing a pipeline project. I responded in the only way an experienced right of way professional can-that there is no typical pipeline project, since each project takes on its own unique challenges based on the location, environmental sensitivity, size of pipe, product to be transported and proposed schedule.

The client then asked what I believed was the most important aspect of planning a successful pipeline project when project scheduling and budgeting are the overriding concerns. Quickly, I ran through a summary of all the stages of planning a pipeline project, beginning with safety, and moving on to routing, engineering, right of way acquisition, survey, mapping, GIS, environmental, and finally, construction.

I explained that if I had to pick one aspect of planning that impacts a pipeline project from beginning to end, it is route selection - the time, analysis and reasoning put into the original routing of the pipeline by the stakeholders who would have to work within the parameters imposed by the chosen route.

In the planning stage, there is one key component that all pipeline projects have in common–how the initial routing of the pipeline will affect the eventual interface of all activities required for the project.

HOW A ROUTE IS SELECTED

At Mustang Engineering, where I serve as Director of Pipeline Services, we first hold a project kick-off meeting where all the specifications of a project are discussed. Next we assemble a routing team to start the detailed process of developing a successful route. The routing team is usually comprised of an engineering project manager, a design engineer, and a representative of each field service group, including right of way, environmental, GIS, survey and

construction. By involving every group that will ultimately be impacted by the pipeline route selection, everyone gets the opportunity to identify issues and problems with a proposed route and suggest routing changes that may mitigate these issues. This helps alleviate the need for re-routing of the pipeline further along in the project schedule, when changes can become more costly and time-consuming.

In the initial stages of route selection, most of the basic routing is done in the office by the GIS specialist using a web-based viewer that is customized for the specific project. This step requires the GIS specialist to download any publicly available information that could potentially impact the project disciplines. Examples of information that are searched out and made into data layers include:

- Recent aerial photography
- All federal, state and local parks, wildlife management areas, forests, public lands
- Tax maps and associated landowner information
- Foreign pipelines and other utilities that cross the proposed route
- Road, railroad and water crossings
- Jurisdictional boundaries of states, counties, cities
- Native American ownership or interests
- Federal and state threatened and endangered species
- Wetlands and other environmentally sensitive properties

This listing is a sample of the information that may be developed into data layers for eventual incorporation into the GIS viewer to use in preparing the desktop routing study. Once the data layers have been developed and added to the viewer, the routing team meets and begins the process of laying out the pipeline route.

ENVIRONMENTAL AND ENGINEERING FACTORS

In addition to specific data layers, there are also functional attributes that impact the final selection of a pipeline route. For example, a team needs to know whether a new pipeline will loop or parallel an existing pipeline, or if the client wants to avoid routing the pipeline in greenfields or environmentally sensitive areas. In many instances, regulatory and resource management agencies can dictate the complete avoidance of impacts to environmentally sensitive areas in the development of the route. In most cases, when complete avoidance of environmentally sensitive areas is not possible, regulatory and resource management agencies will request routing that minimizes and mitigates those impacts. When preparing the desktop routing study, these impacts are weighed and route deviations are developed, or construction techniques such as horizontal directional drills are used to avoid or minimize the impacts.

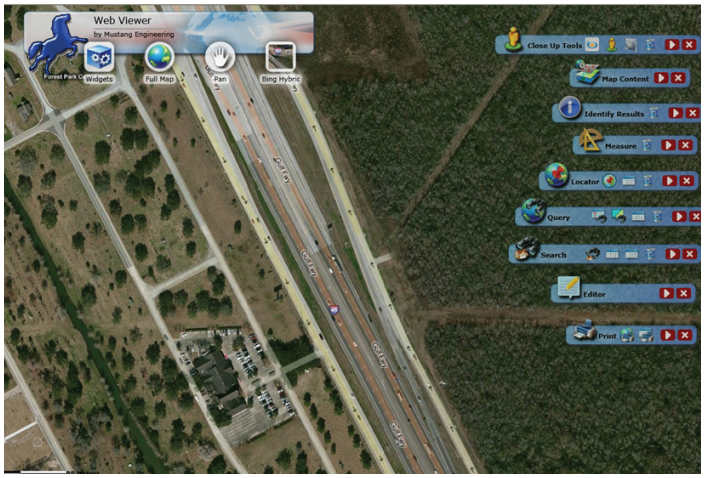
In addition to the environmental factors, engineering and design issues are taken into account in the selection of a successful pipeline route. These can include the future location of pump/compressor stations, valve sites, storage yards, inter-connects, meter sites, temporary and extra temporary workspace, drill layouts, access roads, topography, hydraulics and numerous other variables.

NATURAL AND MANMADE FACTORS

In the development of any pipeline route, there are certain natural and manmade features that should be identified and avoided if at all possible. The potential for coming into contact with these features increases depending on the location where the proposed pipeline will be built. Encountering Native American or federal lands are more common in the southwestern and western United States, while critical wetlands and Wetland Reserve Program properties are more commonly found in the midwest and southeastern United States. Manmade structures such as rivers and hurricane protection levees can require a large amount of engineering and planning prior to obtaining approval from those jurisdictions to cross land and features that those authorities own or manage.

Additionally, highways and railroads always have their own specific crossing requirements that need to be taken into consideration during the planning stage. In recent years, nature conservancy programs have increased in numbers and level of activity. This can often create barriers to the pipeline's routing, depending on the language in the conservation easement and whether a utility corridor might have been reserved for such potential crossings. In all cases, it is important to identify these potential barriers early in the routing process so they can be investigated to determine the best way to traverse the properties or decide if a re-route or route deviation will be required.

Once the route is identified and all disciplines have given input, the routing team travels to the site to perform route verification.



GIS technology plays an invaluable role during the pipeline route selection process.

ROUTE VERIFICATION ON SITE

Once the route has been identified on the GIS viewer and all the disciplines have provided input into the routing process, the routing team often travels to the actual site to perform route verification by "ground-truthing" the route. As with the desktop routing process, a core team will be selected to participate in this phase of the study. In addition, if the proposed pipeline route is a long cross-country pipeline, it could be more cost efficient to fly the route with either a helicopter or fixed winged aircraft while shooting video footage as a means of tying the route to fixed points using GPS. This way, the video can be reviewed later and specific areas of concern can then be visited on the ground.

In most cases, route verification by ground will be limited to looking at the proposed pipeline route from public roads. When this is the only alternative, the best practice is to take pictures at each public access point both upstream and downstream of the proposed route using a GPS camera. The GPS-identified pictures may then be downloaded and made a part of the GIS database for the proposed route.

Often times, a proposed pipeline project remains in the confidential stage and is not introduced to the local residents, governments or other stakeholders right away. In such instances, special precautions must be taken to minimize any attention by potential stakeholders. Experienced route selection personnel have the skills to discuss only pertinent facts about the project so as not to divulge the name of the client or any confidential information that may reveal details about the size or product to be transported by the proposed pipeline.

Any information provided to governmental agencies can become a matter of public record and can be requested through the Open Records Act. Therefore, inquiries to such agencies are handled much the same way as with private stakeholders - that is, with discretion to avoid unwittingly disclosing the confidential nature of the project.

GOING PUBLIC

Once a proposed route has been defined and reviewed in the field, the information is ready for use in developing detailed cost estimates, routing maps for meetings, engineering studies and other project activities that will facilitate the authorization and approval of the pipeline project.

The acceptance and approval of the proposed selected route by federal, state, and local leaders is an important component of selling the project to the local communities and landowners who will be most impacted. If initial contact with these stakeholders is negative or intrusive, then future issues may arise when they are approached again during the survey permission and acquisition stages of the project.

In light of recent issues and obstacles facing new pipeline projects, obtaining input from those who will be most severely impacted by the project will help to ensure the project's ultimate success. Once the operating company is prepared to go public with the proposed project, there should be an effort made to engage the local community and listen to any concerns they may have about the pipeline route. Additionally, a public outreach plan must be developed prior to meeting with any of the stakeholders who could significantly affect the successful outcome of the project.

CONCLUSION

A well selected route, chosen with input from all disciplines and proofed both in the office and the field, can save money when it comes to the time and labor needed to acquire that route, as well as in the cost of the actual construction and materials for building the pipeline. There are hundreds of factors and variables to consider in the selection of a pipeline route, and how all these factors are taken into consideration during the routing phase of the project often dictates the success or failure of the project.

Mark D. Nussbaum, SR/WA

With more than 28 years of experience in the right of way industry, Mark is Director of Pipeline Field Services for Mustang Engineering, L.P., a full-service firm that provides project management, engineering, procurement and construction management services to the oil and gas industry. Currently, Mark oversees the activities of six departments, including right of way, environmental permitting, inspection, mapping, GIS and survey. Previously, he served as Manager of Environmental Permitting and Senior Right of Way Representative at Mustang.