World Pipelines Article

Expectations v. Realities – Using a Project Execution Plan and Teamwork to Achieve Success

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Experienced professionals in pipeline projects understand how important it is to have a Project Execution Plan (PEP) that well defines and well documents work processes. Technical consultants are compensated for an expertise to provide a logical, thoughtful, step-by-step process to drive quality results – given adequate resources, time and money. The previous statement is qualified by using the word "adequate," which often contains vastly different expectations between clients and consultants. It is always a balancing act of cost versus schedule versus quality. If clients and consultants begin with good intentions, how can expectations be balanced with the realities of implementation?

PERCEPTIONS AND PAST EXPERIENCES

Experienced consultants find that many clients do not have scopes defined, and do not have the time, experience, resources or patience to understand the depths to which a solution or deliverable should be examined prior to implementation. The expectation is that each understands "the other side." The reality is that they don't. Clients and consultants have different roles, tasks, drivers, pressures and corporate cultures to contend with. Project managers must create an environment of teamwork, collaboration, understanding, and communication with the client and within the consultant team. It is imperative that expectations be consistent with all foreseeable realities. This is essential to harmoniously resolve the issues that will ultimately determine if a project succeeds or fails.

PROJECT EXECUTION PLANS

Whether building houses, implementing new software, or building a pipeline, a well-defined PEP is essential. The PEP does many things, but paramount is the definition of roles and deliverables of the consultant. PEPs for a typical large pipeline project might include the following:

- identify the client's objectives
- define the project scope and our deliverables
- establish a budget and schedule
- develop a Quality Assurance manual
- provide qualified resources with compatible responsibilities
- communicate, verify, and correct issues that arise and changes in scope

PROJECT SCOPE

It is important to define what "scope" actually means to both client and consultant. Many client documents define scope as a statement of what facility is to be installed. For example, a typical client scope statement may read, "Install 55 miles of 24-inch pipeline in Uintah County, Utah." Consultants however, generally define scope of work in terms of the level of services to be performed (conceptual, Front End Engineering & Design [FEED], detailed engineering) and the associated deliverables. Therefore, the consultant takes the client's generic scope and extrapolates further for example 20 alignment sheets, 4 site-specific crossing drawings, 13 property plats, 8 road crossing exhibits, 4 facility drawings, and 3 tie-in drawings might be developed.

Additionally, the consultant may need to provide project budgets, schedules, and status reports, develop material specifications, obtain various permits, prepare construction bid documents; and, perform construction management. Regardless of the definition, project scopes and PEPs must be defined early and remain flexible to reduce delays and costs. The consultant's deliverables must be defined to the client in terms that are understood as soon as practical in the project. It should be understood by both client and consultant that changes to the project and the PEP are inevitable, and that management of those changes is essential for success.

Before a project scope is finalized, it is often a challenging task to balance the wants and needs of all project shareholders. Within the client organization, competition and some times conflict arises from trying to satisfy all aspects of shareholder desires, project economics, environmental constraints, landowner issues, constructability reviews, technical considerations, and materials availability and selection. And of course, there is always the budget and the schedule to consider.

CASE STUDY

The following case study is based on a recent project that Alliance Engineering successfully completed. The intent here is to communicate some of the required tasks for a typical pipeline project, and that by having a solid PEP, as previously defined, we successfully managed changes and client expectations for a pipeline project in northeast Utah and northwest Colorado (see Photograph 1). The pipeline constructed is 55 miles in length and crosses federal lands managed by the Bureau of Land Management (BLM) in Utah and Colorado, state lands in Utah, lands managed by the Bureau of Indian Affairs (BIA) in Utah, and private lands in both Utah and Colorado. The project consisted of two pipelines that are 24" O.D. and 4.5" O.D. The 24" O.D. pipeline transports unprocessed wet natural gas and is paralleled by a 4.5" O.D. pipeline that transports natural gas liquids. It must be understood that many of the tasks described were worked on simultaneously.

Client Expectation

The project scope was initially defined by the client, and the client perceived that the scope would not change throughout the duration of the project. Consequently, there was no budget money or schedule time initially allotted for the consultant to address refinement of the project.

Throughout the scoping process, constant communication is required with the client because "defining the scope" was not originally in the work plan. However, it was ultimately determined that project refinement needed to take place, and thus costs for the overall project were adjusted and the project schedule was also adjusted.

The client's expectation was that the project scope was well-defined. The reality is that it wasn't, and couldn't be defined in the early stages of the project. Therefore, it cannot be stressed enough that flexibility must be maintained prior to freezing the scope and determining the "right" project.

Reality

For this project, multiple options were investigated, scoped, and priced in order to determine the "best" project. The case study began as a project to install a single 4" natural gas liquids pipeline, 13 miles in length, with no booster pumps. The process of evaluating options and considering multiple issues caused the project scope to grow, mutate, and eventually shrink back down in size.

At one point, the project scope grew to two pipelines, one natural gas, and one NGL, 73 miles in length, with over 150,000 hp of compression, before the "best" alternative was reached: two pipelines, approximately 55 miles in length. Throughout the process, multiple line sizes and horsepower options were considered, evaluated, and ruled out for varying reasons, with cost being the final decision maker.

It was necessary to work closely with the client to define and redefine the processes, roles, and deliverables that would be provided. The goal was to minimize waste and rework, and therefore costs, so that the project would continue to move forward. The PEP was flexible and still required revisions that were consistent with the client's expectations for deliverables, schedule and costs.

Preliminaries

After the scope of the project had been finalized, a revised project schedule and budget were developed, and the applicable regulations for the project were determined. Department of Transportation (DOT) Code of Federal Regulations (CFR) 49 §192 and §195 were applicable to the project. The project was not FERC jurisdictional. United States Geological Survey (USGS) 7.5 minute quads were used to determine a preliminary route that paralleled existing pipelines, wherever possible (see Photograph 2). At this time, engineering, design, and technical standards were determined to ensure consistency in the deliverables. CAD standards for alignment sheets, Process Flow Diagrams (PFDs) (see Figure 1), Pipe and Instrument Diagrams (P&IDs), mechanical, and civil drawings were also developed.

The next step in the planning process was to perform a field review of the preliminary route identified on the USGS quads (see Figure 2). This was done to determine if the proposed route selected could be built. The route review also:

- identified reroutes that required to occur due to inconstructability
- reviewed proposed river crossings to determine if the proposed location could be horizontally directional drilled (HDD) or if the crossings needed to be relocated so that they could be HDD
- identified Temporary Use Areas (TUA's), extra work space, and potential pipe yard
- identified locations that needed to be bored
- determined areas that required blasting
- resolved any conflicts of the route with any existing pipelines
- identified locations such as washes or dry creek beds that would require river weights in the event of heavy rains or snow melt
- determined locations for mainline block valve sets as required by DOT
- ascertained potential locations for pig launchers and receivers

Right of Way

Right of Way (ROW) work needs to begin as soon as possible (see Figure 3). Many projects are delayed due to ROW not beginning early enough in the project to resolve land-owner issues. Some of the tasks that ROW needs to focus on are:

- obtaining permission for the preliminary route review;

- acquiring permission for center line and environmental surveys;
- performing mainline title search;
- developing a line list including all ownership of the lands that are being crossed by the project;
- acquiring, through negotiation, permanent and temporary ROW, extra work space, staging areas, and pipe yards;
- determining ROW for mainline block valve sets and metering facilities;
- obtaining ROW grants from the BLM, state, and BIA;
- applying for county special use permits, road crossing permits, highway crossing permits, Army Corp of Engineer permits; and,
- obtaining addresses for metering and compressor facilities for emergency response requirements.

After the preliminary route review for the project was completed and the centerline survey permission was obtained, a global positioning system (GPS) survey of the centerline was completed. During this survey, foreign line crossings were identified and shown on the alignment sheets, the edge of the permanent and temporary ROW were staked, and the planned areas of disturbance were identified (see Figure 4). A Plan of Development (POD) and an Environmental Site Assessment (ESA) were required to obtain the necessary ROW grants due to the project crossing federal, state and BIA lands. Additionally, an Application for Transportation and Utility Systems and Facilities on Federal Lands, Standard Form 299 (SF-299), was required to be submitted with the POD.

Plan of Development

The POD is a document required to obtain ROW on lands owned by the United States. The POD report consists of eight sections, and several tables and figures. The first three sections of the POD were developed by collaborating with the client, and consisted of:

- Purpose and Need
- Design Factors
- Additional Components of ROW

Sections four through eight of the POD were developed with input from an environmental consultant and the client and included:

- Governmental Agencies Involved
- ROW Locations
- Construction of the Facilities
- Stabilization and Rehabilitation Measures
- Operation and Maintenance Plans

The POD included tables that listed:

- Land Crossed by the Pipelines
- Legal Descriptions of the Pipelines
- Permits and Approvals Applicable to the Project
- Sensitive Areas Traversed by the Project
- Federal Threatened and Endangered Species Listed by the U.S. Fish and Wildlife Service

Figures included in the POD were:

- Current Production Levels (in the area where the wet gas and natural gas liquids were being removed)
- Topographic Maps (showing the proposed route of the pipelines)
- Typical Crossing Drawings

Environmental Tasks

The components of the environmental tasks required to supply the BLM, state, and BIA with supplemental information to the POD and to develop the ESA were:

- Permit Requirement Identification
- Cultural Resources Survey
- Paleontology Survey
- Special Status Species Surveys
- Stormwater Notice of Intent (NOI)
- Trench Dewatering NOI
- Hydrostatic Test Water NOI

Since the project crossed the Utah / Colorado state line, two BLM field offices were involved and a "lead office" needed to be established. Due to the backlog of projects in the BLM offices, 1 ½ years was required to complete the review and approval process. State, county and BIA agencies required only 30 to 60 days to complete the review and approval process. All timeframes for approvals were built into the project schedule. The overall permitting requirements drove all subsequent tasks for the project.

Project Engineering

Included in the scope for engineering was the development of specifications for pipe, pipe coatings, valves, fittings, induction bends, meters, line break actuators, Cathodic Protection (CP) system, pipeline markers, CP test stations, river weights, and other miscellaneous material.

Project design engineering also included:

- pipe grade and wall thickness
- mainline block valve sets with line break actuators
- induction bends
- pig launchers and receivers
- special crossing details for rivers and wetlands
- above-ground berms
- blasting plans
- typical crossing details
- site-specific river crossings to be installed by HDD

Additional project engineering included:

- development of alignment sheets from the centerline GPS survey data
- completion of a class location study as defined by DOT
- finalization of pipe quantities according to wall thickness and grade
- finalization of mainline block valve set locations to meet the requirements of the DOT
- preparation of property plats for fee-owned and state lands for ROW negotiations
- development of a hydrostatic test plan indicating withdraw and discharge locations

Many of these tasks required input from the client, and also client approval. Communication during this phase of the project was important so that the flow of information did not get disrupted and cause project delays in either the development or the approval process.

Procurement

The engineering consultant was also given a role in the procurement process of materials and services for the project. Long-lead items such as pipe, valves and induction bends were identified early in the project. Standard procurement procedures require an Invitation to Bid including a delivery date and secured price until delivery has been met for long-lead items. For example, several pipe mills were queried regarding an order placed in January. The pipe mills indicated that with an order placed in January, production would begin in early July. This long-lead time was taken into account in developing the schedule so that the pipe specifications and bid packages would be ready to be sent out for bid in early December, with an order being placed the first week of January.

Valve manufacturers were also contacted and the lead time for valves was determined to be between 12 and 15 weeks. The 15 week delivery schedule was built into the project schedule so that the valves would be delivered to the fabrication contractor prior to the start of construction of the mainline. This was done so that the fabricated valve sets, launchers, and receivers would be delivered on site during the first week of construction of the mainline. The induction bends lead time was eight weeks, and this was also built into the schedule so that the induction bends would be delivered to the job site during the first week of construction.

Bid Packages

The bid packages for Non-Destructive Testing (NDT); inspection; fabrication pipe receiving, unloading, and stacking; and the mainline construction were included in the project scope. The project schedule included preparation, client review, and revision of the bid packages prior to being sent out for bid. The schedule also included a time frame for the bid packages to be sent to contractors for review and bid submittal, and for engineering bid evaluation and recommendation.

Construction Scheduling

A four-month construction schedule involving multiple construction spreads was included in the planning process. In addition to normal construction activities, tasks included:

- construction staking of the centerlines and ROW limits (both permanent and temporary)
- as-built survey of the mainline
- as-built alignment sheets of the mainline
- as-built drawings of the mainline valve sets, launchers, and receivers
- job book completion

Summary

In summary, developing and using a solid PEP is essential to implement large-scale pipeline projects. The PEP is a collaborative process between client and consultant to define roles, expectations and deliverables so that communication is enhanced. The PEP must be a living document that identifies deliverables, costs and schedules so that all shareholders understand what is required to complete the client’s project scope. The most important step in planning a project of this type is to define the scope of the project as early as possible to reduce delays and to avoid increased costs. The next step is to develop a schedule using these major tasks based on the in-service date requested by the client. The schedule must be constantly reviewed. If there is a delay of any task, the schedule must be revised to ensure project completion on the designated in-service date.