TECHNICAL MEMORANDUM TM-PA-1

12 April 1995
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To: Ed Brauner, City of Santa Rosa
Dan Carlson
Marie Meredith

From: Andy Hauge
Robin Cort
Rich Maurer

Subject: Santa Rosa Subregional Long-term Wastewater Project
Pipeline Alignments

We want to establish the engineering design criteria for the proposed major pipelines for the alternative projects under study. This includes the lines from the treatment plant to the storage reservoirs, and from the reservoirs to the various discharge points, i.e., irrigation areas, wetlands rapid infiltration areas, aquifer storage and recovery areas, and the Geysers steamfield. It is essential for completion of our design of the pipelines and for completion of a cost estimate that we fix the alignments or routes for all these pipelines.

My understanding regarding the alignments or routes for pipelines is that engineering is being directed to use existing public rights-of-way (i.e., roads), versus cross-country alignments, to the maximum extent possible. Our understanding of the reason for this direction is to minimize potential environmental impact on wetlands, species, and habitat, and to minimize the cost of studying these potential impacts for pipeline routes across or along private properties. Another real reason for this direction, especially considering the large project study area, is the minimization of the political difficulties associated with gaining right-of-access to private properties to study alignments and environmental impacts, let alone the "cost" of later trying to acquire the private properties or easements for actual construction.

However, we want to point out, for the record and for final concurrence by both the project management and the client, the ramifications of the direction to generally avoid cross-country alignments for pipelines.

First of all, construction of pipelines of the sizes and lengths under study following public rights-of-way (i.e., roads) versus using a more direct cross-country alignment will undoubtedly add significant cost to the construction of these lines, for several reasons:

1. Additional pipeline length and fittings (i.e., bends) will be required. This equates directly into more cost, which, for these size lines (up to 42" diameter), is significant, i.e., millions of dollars per alternative project.
2. Much repaving of roads will be necessary because much of at least one lane of mostly two-lane county roads would be impacted. For the pipelines of the sizes under study (up to 42" diameter), this could mean repaving up to an 8-foot wide swath of pavement for every foot of pipeline length. For piping along such roads as Chalk Hill Road, significant portions may cross back and forth between two lanes and, therefore, both lanes would need to be repaved. Pipe trench soil compaction requirements and testing will also be more demanding for pipelines built in roads, which will translate to higher construction costs.
3. Utility crossings along these mostly rural county roads will be necessary as water, sewer, gas, electrical power and telephone utilities are usually aligned in roads so as to serve the properties adjacent to the roads. These utilities could be largely avoided, were pipelines installed cross-country.
4. More significant staged construction, traffic control and safety measures will need to be employed by the contractor during construction for public safety and convenience reasons, and to provide for essential and emergency traffic flow. This adds extra cost to their bid.
5. Because of Items 1 through 4 above, the eventual detailed engineering of the pipelines will be more expensive.
6. Because of Item 1 above, the operating cost of the pipeline will be more expensive because more flow friction loss will be necessary, which the pumps must overcome, which will require more electrical power. This is significant for a pipeline of this size (42'), flowrate (30 MGD), length (12 miles from base of hill to top), and hydraulic lift (3,300 feet). Extra headloss is the last thing desired for a pipeline of this magnitude and operating pressure.

Following the above-mentioned directive that existing public rights-of-way (i.e., roads) should be utilized to the maximum extent possible, there will basically be three categories of pipelines involved among the six alternative projects under study:

A. Pipelines following public and private roads (other than the pipeline to the Geysers up Pine Flat Road). These are generally relatively straight, flat, two lane, paved county roads.

B. Pipelines following short cross-country alignments to specific terminal locations (i.e., reservoirs, discharge points) where there are no existing roads.

C. Pipeline up Pine Flat Road to the Geysers.

Pipelines for this project are, generally speaking, not providing services along the way, but rather, are transporting water from point A to point B. The most expeditious

and least costly way to do this is to use pipeline alignments cross-country to minimize excess length of line and avoid the issues enumerated above.

It is our belief that following public rights-of-way (i.e., roads) versus using a more direct cross-country alignment for these pipelines will add significant cost to their construction and operation, as outlined in paragraphs 1 through 6 above. As a ballpark figure, we estimate that for every extra 1,000 feet of pipeline length, for pipelines under category A above, the construction cost alone will be an extra $300,000, partly because of the extra length that following a road will require (paragraph 1 above), and partly because of the extra repaving, utility interferences, and staging and traffic control issues outlined in paragraphs 2, 3, and 4 above. Even if following roads resulted in the same length of pipeline (unlikely), the road alignment would still be more expensive because of the items in paragraphs 2, 3, and 4 above. Other than the cost impacts outlined above, design of the category A pipelines along public right-of-way is feasible from an engineering stand-point.

To construct a pipeline following the alignment of Pine Flat Road to the Geysers (pipeline category C above) will cost considerably more than pipelines in category A above. Unlike the relatively straight, wide, and stable roads in the Santa Rosa plain, or in west or south county (most of pipeline category A above), Pine Flat Road is neither straight, wide, nor stable. Pine Flat Road is a mountain road. It has considerable switchbacks, which would add considerable length to a pipeline to the Geysers. It is not sufficiently wide to accommodate construction of a pipeline of the necessary diameter (42") without severe disruption of the local traffic (an inconvenience and safety issue), and without the need, in several locations, to widen the road to accommodate the excavation and pipe laying operation. Pine Flat Road is marginally a two-lane road, and the existing paved roadway is only 10 feet wide in many places, with confining trees or a steep dropoff on one side and a steep bank on the other. The narrow road also means that the contractor could not readily stockpile piping materials along the road. All of these issues means more difficult and more costly construction. During construction, the road access would essentially be cut off to residents, and construction vehicle traffic would be dense as lengths of pipe and construction materials were hauled from storage sites to the construction sites.

Pine Flat Road is a historical path to the top of the mountain, originally constructed in horse and buggy days. It is not built to modern standards and, although a county-maintained road, undoubtedly does not have sufficient right-of-way width. It would need to be surveyed, and additional right-of-way obtained to accommodate the improvements needed to accommodate construction and maintenance of a pipeline along the road. This road has historical significance and the legal and political battles to be fought to acquire a wider right-of-way may be significant. This undertaking would take the agreement and participation of Sonoma County, the benefits to which may not be sufficient to warrant their participation in the "costs."

Because of the narrow width and obvious unstable slopes along this road, it would be essential to widen the road in many places, reconstruct the roadbed, and install features to stabilize the slopes both below and above the roadway. This would be necessary not only to accommodate construction of the pipeline but to protect this large diameter and high pressure pipeline against future slides and washouts caused by the heavy rains to which this mountainous area is subject.

All these considerations mean that, to build the pipeline following the Pine Flat Road alignment, considerable construction cost would be added to the project for the road reconstruction and widening, slope stability improvements, and extra pipeline length and bends, pipeline anchoring, and thrust restraint. These items would add several million dollars in cost to the construction and operating costs to follow the road alignment.

Pursuing a cross-country route will require right-of-access to private properties to locate such an alignment. We have earlier proposed two candidate cross-country alignments to be field-investigated, and we requested right-of-access for this purpose. During a public meeting on February 16 with the property owners along these candidate alignments, Ed Brauner, Andy, and Rich Maurer attempted to obtain voluntary agreement from the property owners to allow a field investigation of the two candidate alignments. We were unsuccessful.

CONCLUSIONS AND RECOMMENDATIONS

C1. Please be aware of our concerns presented in this memorandum that following public rights-of-way (i.e., roads) versus using a more direct cross-country alignment will add cost to both the construction and operation of the large diameter pipelines to storage and discharge sites. Please provide final direction on the criteria to be used by engineering for alignment for these major pipelines.

C2. Regarding the pipelines in category B above, Rich will soon present a summary of all such unavoidable cross-country alignments, and will request confirmation of these proposed alignments.

C3. Regarding the pipeline up the mountain to the Geysers, prudent, experienced civil engineering practice and judgment dictate that a pipeline of this size, length and pressure class, in particular, should be built cross-country in as straight an alignment as can be found. It should not follow the circuitous route of Pine Flat Road. We acknowledge the direction the BPU has provided and note our concerns expressed in this memo.