



MEMORANDUM

To: Olen Zirkle, Ducks Unlimited
From: Neil Schild, P.E.
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Reviewed by: Chris Petersen, P.G., C. HG.
Date: April 17, 2006
Subject: Summary Cover Letter for Task 7.1
Attachment: A – Task 7.1a – Survey Sonoma County Water Supply Operations - Telephone Interview March 28, 2006
B – Task 7.1b – Survey Results of Collector Well Operators
C – Task 7.1c – Meeting Minutes from Three Conference Calls with Matt Reed, Ranney Division and Dan McManus, Department of Water Resources
D – Task 7.1d - Refine Well Yield - Groundwater vs. River
E – Task 7.1e - Energy Requirements of the Ranney Well Water Supply
F – Task 7.1f – Maintenance Costs

The objective of this memorandum is to summarize the conclusions and recommendations of six tasks that present extensive information on other collector well operations, potential cost savings strategies, energy requirements, and operation and maintenance costs for the proposed M&T Ranch/Llano Seco Ranch collector well system.

1. Survey Sonoma County Water Supply Operations

A review of the regional and local hydrogeology at the SCWA and M&T sites shows that the two are drastically different (**Appendix A**). At SCWA, the alluvial aquifer is tightly bound at approximately 100 feet below ground surface and at the valley edges by nearly impermeable bedrock. The width of the valley is 800 to 4,000 feet. At M&T, the bounding depth is far enough away from the proposed wells to not pose a limitation to well yield. Permeable sediments extend to approximately 3,800 feet below ground surface. The width of the valley also does not pose a limitation on well yield with the nearest bounding bedrock unit outcropping approximately 14 miles to the east. It is recommended that a facility with more similar hydrogeologic conditions be used as a comparison to the proposed M&T site. Such a facility would be the Nearman Water Treatment Plant in Kansas City, Kansas. Here the geologic and river conditions are similar to the M&T site. More information on this site can be found in **Appendix B**, Survey Results of Collector Well Operators.

Another main difference between the SCWA distribution system and M&T is the mechanics of delivery. SCWA pressurizes their pipes and system to generate 500 feet of head prior to release

into their distribution system. M&T requires the lift (no greater than 100 feet) to convey water to an open canal.

2. Survey Results of Collector Well Operators

Based on geological and hydrogeological information collected in the survey presented in **Appendix B**, the Nearman Water Treatment Plant program in Kansas City, Kansas is most similar to the proposed Project. The Nearman Water Treatment Plant has two collector wells with 14 laterals each. Each collector well supplies approximately 25 MGD. The alluvial aquifer is semi-confined with cobbles, gravels, sands, silts, and clays. The Missouri River is approximately 100 feet from the well caissons and the caissons are spaced 1,000 feet apart from each other.

Other projects that may have similar characteristics are the following:

1. City of Cedar Rapids, Iowa
2. Olathe District, Kansas
3. City of Lincoln, Nebraska
4. Humboldt Bay Municipal Water District, California

We can expect the Project collector well system to operate much like these projects if we assume that the data is accurate and conditions at the site are similar.

3. Meeting Minutes from Three Conference Calls

Three conference calls were conducted with Matt Reed (Ranney Division), Dan McManus (Department of Water Resources), and MWH staff. During these calls, the following were discussed;

- ◆ various locations for multiple Ranney Wells,
- ◆ types of fuel for pumping,
- ◆ alternatives of conveying the water to the canal,
- ◆ water conservation, and
- ◆ operation of the wells.

Discussions concluded that geologic conditions would be favorable to locate one well near the canal in Llano Seco Ranch. Information regarding energy costs and fuel types were discussed and results are presented in **Appendix E**. Two alternatives for conveyance of water from the wells to the canal at M&T Ranch were discussed; utilization of the existing sump and pipe system from the wells, or construction of a conveyance to the canal from the wells. The alternative utilizing the existing system was favored, but would require additional lifting costs from the sump. The favored water conservation alternative is to line the existing canal between Big and Little Chico Creeks to reduce losses from seepage along that section. It was also discussed that the wells may not incur operational costs as high as estimated because the maximum allocation may not be necessary 12 months of the year.

4. Refine Well Yield - Groundwater vs. River

Based on the evaluated simulations, it is not expected that river migration will substantially affect yield capacity and operation of one to four collector wells operating at 24.25 MGD each,

spaced 1,500 to 2,000 feet between well caissons, and with 200 foot long laterals placed at 95 feet bgs.

5. Energy Requirements of the Ranney Well Water Supply

The proposed M&T Chico Ranch/Rancho Llano Seco Ranney Well Option includes construction of four wells for pumping of water to the existing M&T/Llano Seco Pumping Plant. The issue that this memorandum evaluates is the comparative cost of energy for alternative energy sources and initial planning to reduce the reoccurring costs associated with pumping of the raw water from the Sacramento River to the existing M&T/Llano Seco Pumping Plant. The means and methods used for evaluation involved standard hydraulic engineering including the Energy Equation of Pipe Flow and Hazen Williams Equation for Friction Head Loss to estimate system losses and total dynamic head for pumping power requirements. The system pumping power requirements were converted into costs per year based on cost per unit energy for the various alternative energy sources. The results of the evaluation showed that natural gas is the most economical source of energy based on the market conditions for energy sources evaluated. The sources evaluated included electricity, diesel fuel, natural gas and gasoline. The conclusions of this Technical Memorandum include a recommendation for using pipe material and sizes most suitable for lowering the energy costs in concert with utilizing natural gas as an economical source of power for the proposed well pumps.

6. Maintenance Costs

The proposed M&T Chico Ranch/Rancho Llano Seco Ranney Well Option, if constructed would add pumps, motors, valves and controls as maintenance items that would require consideration related to manpower, schedule and annual budgeting. The issue evaluated in this Technical Memorandum was the annual costs associated with development of this proposed construction option. Experience and standards of the industry were used as the means and methods for the estimate of annual maintenance costs for the M&T Chico Ranch/Rancho Llano Seco Ranney Well Option. The results of the evaluation provided an estimate of the anticipated maintenance costs in terms of a conceptual level analysis. The estimate is approximately \$162,125/year for maintenance of the facilities.