

Mike Thompson

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Subject: Augmentation Plan

Attached is a DRAFT and I do mean DRAFT scope of work. It was harder than I anticipated to put together a plan in writing for this project. Maybe after you have digested it we can have a conference call?

I did not address the surface water diversion aspect as I am not that familiar with this portion of the project.

Chris

12/12/2006

DNR 004239

PHASE I – SCREENING MODEL FOR POTENTIAL WELL FIELD SITES

PURPOSE AND SCOPE

The Nebraska Republican River Management Districts Association (NRRMDA), Upper Republican NRD, Lower Republican NRD, Middle Republican NRD and Tri-basin NRD have received a grant to conduct a technical appraisal of augmentation project(s) to achieve and maintain compliance with the Republican River Compact (RRC). These entities are referred to as the “Committee” for this project.

The goal of the project is to identify groundwater or surface water resources that may be used to add to surface water flow in the Republican River to meet the requirement of the RRC. The project is divided into two major parts or phases. The first phase is to develop a screening model and identify potential groundwater areas within the boundary of the Republican River Compact Model, which have the ability to yield sufficient quantities of good quality groundwater. The second phase will be to evaluate the surface water options for river augmentation.

Miller & Associates Consulting Engineers, P.C. (Miller & Associates) proposes the following as a screening model for potential well field sites.

PHASE I PROCEDURE

To develop the screening model, data supplied by the committee and existing data in the MODFLOW Republican River Model, will be utilized with other geospatial data to build a Geographic Information System (GIS) for the project. The GIS model will utilize several computer programs, including Autodesk Map®, ESRI® ArcGIS®, and Spatial Analyst® software applications to produce graphical representations of non-graphic data.

Data including transmissivity, saturated thickness, specific yield, and groundwater withdraw rate per one-mile square cell will be mapped for the Republican River Compact Model Area. The relationship of each one-mile grid cell to the Republican River will be calculated from Department of Natural Resources data sets. The cell data will be used to create graphical representations for an understanding of hydraulic features in aquifers in the area.

Several figures will be generated. The figures will illustrate hydraulic data in a one-mile grid pattern over the area of the model. Separate color maps will depict transmissivity, saturated thickness, specific yield, and groundwater withdrawal rates by either yield per well or yield per square mile model grid.

The data will be used with formulas from the USGS Chapter D1 to determine stream depletion factors. Stream depletion contours will be mapped to allow the contours to be used as overlays with other graphical data. USGS groundwater decline maps will also be reviewed and generated for use as overlays with the graphical data.

Committee representatives or a sub committee will meet to review and discuss the compiled hydrogeologic data. Using stream depletion and groundwater decline overlays with the color maps, several potential well field areas will be identified. Committee representatives will select sites for further evaluation.

Site evaluations by Miller & Associates will include selecting a preliminary means and location for transporting water to the Republican River. A cost evaluation will be prepared for each site using estimates of the number of wells, the miles of pipe or open channel, estimated inlet and outlet structures, construction costs, and operation and maintenance costs. Legal, permitting and right-of way acquisition costs will be included in the evaluation but values will be a group effort between the committee and M&A. Development of detailed cost information will include preliminary sizing of transmission pipelines and surface water canals and development estimated elevation profiles for delivery of water from the source to the Republican River based on USGS quadrangle maps with 10-foot contour intervals and not surveyed data.

The cost evaluation for selected sites will be compared to the monetary cost of complying with the RRC if the water is not supplied. The monetary cost data for not supplying the water will be provided to Miller & Associates by the Committee.

The graphical data and cost evaluations for selected sites will be summarized in a full color report to the Committee. The report will include but not be limited to:

- Transmissivity Map of the Republican River Compact Model Area
- Saturated Thickness Map of the Republican River Compact Model Area
- Specific Yield Map of the Republican River Compact Model Area
- Groundwater Withdrawal Rate Map of the Republican River Compact Model Area
- Stream Depletion Contour Map of the Republican River Compact Model Area
- Groundwater Decline Map of the Republican River Compact Model Area
- Map of Sites Selected for Further Evaluation
- Maps of Preliminary Water Delivery Routes for Selected Sites
- Cost Estimates for Selected Sites
- Discussion of Factors Affecting Groundwater Withdrawal, Such as the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentive Program (EQIP)
- A Brief Discussion of Water Losses During Transportation
- A Brief Discussion of the Cost of Development Compared to the Cost of Not Delivering the Water to the Republican River.

PROPOSED FEES

The cost for the phase I evaluation and preliminary cost estimates will be.....determined after the scope is defined.....