Potter County Well Field Development

West Texas

Client
City of Amarillo

Timeframe
2008 – 2009

Contract Amount
Ph I: $3,290,393 / Ph 2: $749,733

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Daniel B. Stephens & Associates (DBS&A), a wholly owned subsidiary of GLA, was retained by the City of Amarillo, Texas to develop new water supplies from its Potter County water rights holdings to meet anticipated future growth needs and address near-term supply shortfalls due to drought impacts on surface water supplies. The City's goal is to produce an additional 20 to 40 million gallons per day (mgd) of municipal water supply from approximately 45,000 acres of water rights holdings within the Northern Panhandle High Plains Aquifer. The Ogallala Formation is the principal aquifer in this area.

Phase 1 activities of the multi-year project were successfully completed in 2008. Initial hydrogeologic assessments included evaluation of geophysical logs and driller's logs from previous test drilling and well installations throughout the area of interest. Subsurface lithology and stratigraphy data were incorporated into a 3D hydrostatigraphic model using MVS software (Mining Visualization System by C Tech Development Corporation). The model was then used to select optimal sites for the initial prototype well installations based on aggregate thickness of porous sand and gravel layers as well as the geometry of the underlying Permian red beds (i.e., distribution of paleochannels).

Project Highlights

- Hydrogeologic assessments
- Drilling contract procurement and administration
- Regulatory permitting
- Exploratory borehole drilling
- Supply well engineering design
- Supply well construction oversight
- Aquifer testing and well performance assessment
- Regulatory reporting

Well field optimization modeling

Additional hydrogeologic assessments included groundwater modeling of the area of interest using MODFLOW. DBS&A updated and modified the Texas Water Development Board's Northern Ogallala Groundwater Availability Model (GAM) to perform multiple simulations of the future production scenarios assessing the capability of the aquifer to support the desired production capacity. This modeling study demonstrated that the initial plans for producing 20 million gpd from a limited portion of the City's water right's holdings would result in excessive drawdowns and rapid aquifer depletion. DBS&A advised the City that achieving this production goal would require expanding the area of development significantly to obtain the desired production capacity.

2011 National Ground Water Association Award for Outstanding Ground Water Supply Project

During the summer of 2008, DBS&A planned, designed, and oversaw installation of four prototype supply wells ranging in depth from 490 to 900 feet and conducted pump testing that demonstrated production capacities ranging from 850 to 1,140 gallons per minute. The field program also included the installation of 5 observation

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wells used to monitor water level drawdown during pumping tests and drilling 10 exploratory test borings to varying depts. Up to 960 feet.

During the winter of 2008-2009, DBS&A updated the Northern Ogallala GAM using the Phase 1 results and performed additional groundwater modeling simulations to develop the final well field design which incorporates a total of 21 supply wells with approximately 1/2 –mile to 1-mile or greater spacing located within a well field footprint area encompassing about 18 square miles. The initial estimated production capacity of the completed well field was 20.6 million gallons per day assuming an average 75% utilization rate.

DBS&A planned and oversaw the drilling of 11 additional exploratory test borings in the spring of 2009 to verify site suitability for the selected well sites and provide site specific data for well design. On behalf of the City, DBS&A prepared and submitted a Multiple Water Well Drilling Permit application to the Panhandle Groundwater Conservation District (PGCD) in the spring of 2009. Additional modeling scenarios were run at the request of the PGCD demonstrating predicted aquifer impacts from balancing future production demand between the new Potter County well field and the City's existing Carson County well field under most-likely case and worst-case future pumping demand scenarios. DBS&A's work with PGCD resulted in the approval of a new permit to drill 17 new wells, completing the well field with a permitted production ceiling of 24,900 acre-feet per year, or 22.23 million gallons per day (gpd) from a contiguous tract of 40,66 acres.

DBS&A's laboratory performed sieve analyses on soil samples from the new test drilling and on archived samples from previous test drilling. Utilizing these test results, DBS&A prepared detailed designs for 17 new supply wells with 16-inch diameter casing and screens ranging in depth from 457 to 704 feet.

DBS&A prepared plans and specifications for well drilling and construction along with a detailed estimate of construction and testing costs and an activity schedule to complete the well installations and testing over a period of 160 days using multiple drilling rigs, development rigs, and pumping crews.

Phase 2 construction activities began on July 19, 2010, and the installation and testing of 16 supply wells and six monitor wells was completed by October 10, 2010, under budget and two months ahead of schedule. Recommended maximum operating capacities of the completed wells range from 420 to 1,890 gpm. Total well field production capacity established by pump testing exceeds 25.5 million gallons per day.