

Executive Summary

Investigation of Irrigation Water Source for Soccer Complex City of Rapid City Project 13-2098, CIP #50963

The City of Rapid City is planning to construct a sports complex in northeast Rapid City which will initially consist of twelve soccer fields on approximately 40 acres. About 81 percent of the site will be natural grass turf requiring irrigation. Total annual irrigation needs are expected to average over 3 million gallons per year, with peak daily usage of about 200,000 gallons per day.

The City municipal water system has adequate capacity to provide all irrigation needs to the sports complex, but treated drinking water is not required for turf irrigation. Untreated water from other sources would be acceptable as an irrigation supply, and could potentially reduce costs and demands on the City drinking water system. This study and report presents evaluation of technical and economic feasibility of potential alternate irrigation supply sources for the soccer complex.

Due to the absence of a reliable stream source in the vicinity, surface water was ruled out as a possible irrigation supply. Four groundwater supply sources were identified and investigated as potential sources.

Potential Groundwater Sources

Box Elder Creek Alluvium
Inyan Kara Sandstone
Minnelusa Sandstone
Madison Limestone

The Box Elder Creek Alluvium is shallow groundwater stored in subsurface gravel deposits in the Box Elder Creek floodplain. The other three potential sources are deep bedrock aquifers located from 1,600 feet to 4,300 feet below the ground surface. The bedrock aquifers are under artesian pressure which brings the water to 200 feet to 300 feet below the ground surface, thus making utilization of the water feasible using submersible well pumps. The deep aquifers are widely used in the Black Hills region for drinking water, and water quality is typically satisfactory for irrigation uses as well. Water quality in the shallow creek alluvium is typically not as good as the deep aquifers, and the quality may present soil salinity hazards with long term usage.

Schematic designs were completed for each groundwater alternative to provide a basis for cost comparison. Capital costs and operating costs were estimated for each alternative and converted to a present worth value for comparative purposes. Following is a summary of present worth costs of each alternative using a 20-year period and an interest rate of 3 percent.

Summary of Present Worth Costs

<u>Source</u>	<u>Cost (Present Worth, 20 yrs.)</u>
Box Elder Creek Alluvium	\$ 2,963,000
Inyan Kara Sandstone	\$ 2,176,000
Minnelusa Sandstone	\$ 2,492,000
Madison Limestone	\$ 2,768,000

For comparison, the value of an equivalent amount of municipal drinking water based on 2013 City rates for commercial irrigation over the same 20-year period is as follows:

City Water Value: \$2,093,000

The analysis does not show an economic advantage for using an alternative supply source in lieu of municipal drinking water. Non-tangible items such as reducing water capacity and fire protection for long-term growth were not considered.

In addition to the higher cost of alternative supplies, there are a number of technical issues with the alternatives which are of concern. These issues include possible low yielding wells, poorer quality water, interference with existing water rights and others. It is considered likely that municipal drinking water would need to be used as a back-up supply source, or as a supplemental supply source for all of the alternatives. If the proposed soccer complex is expanded to use the full 80-acre site, then the groundwater alternatives are likely to have insufficient capacity for the expansion.

It is concluded that there is no identifiable alternate irrigation supply source in this area of the City which compares favorably with the City municipal supply option in terms of cost, reliability and capacity for expansion.