

CHAPTER 4

SURFACE WATER SOURCES

4.1 INTRODUCTION

The purpose of this chapter is to identify possible surface water sources that could be used as a municipal water supply source for the City of Gillette, Wyoming. The potential surface water supplies identified and discussed include the following:

- Lake DeSmet Reservoir
- Keyhole Reservoir
- New Clear Creek Water Storage Reservoir
- City of Gillette Waste Water Treatment Plant Effluent (Source for irrigation that currently comes from municipal source)

4.2 SURFACE WATER

The City of Gillette, Wyoming is located in the east-central Powder River Basin (PRB). The PRB is a 20,000 square mile area occupying most of the northeast quadrant of the state of Wyoming, bounded by the Black Hills to the east, the Big Horn Mountains to the west, and the Laramie Range/Hartville Uplift to the south. This vast structural and topographic basin is renown for its wealth of mineral resources including coal, uranium, oil and natural gas reserves. The PRB has five stream drainages basins forming the Upper Cheyenne River, the Belle Fourche River, the Little Missouri River, the Powder River, and the Tongue River. Ironically, none of these streams produce much water. The surface water that is available is largely appropriated or allocated under interstate compacts with neighboring states. What water is left available would not be considered a reliable source for municipal use.

The City of Gillette is located in rolling to hilly country a few miles east of a triple drainage divide, where surface water drains either west toward the Powder River, north to the Little Missouri River, or easterly into the Belle Fourche River. The closest reservoirs/water sources to the area are Keyhole Reservoir to the east and Lake DeSmet to the west, with the closest source being the Keyhole Reservoir approximately 50 miles away. Another source that was

evaluated was a water storage reservoir permit, Permit 7292 off of Clear Creek near Lake DeSmet.

Not only would these water sources require construction of transmission facilities (pumping and piping) to deliver the water to the City where it would then need to be treated to meet the requirements of the USEPA's Surface Water Treatment Rule. For the reasons described in the following sections, none of these water sources are viable options at this time.

4.2.1 Lake DeSmet Reservoir

Lake DeSmet is a reservoir located approximately 80 miles west of the City of Gillette, near the Town of Buffalo, Wyoming in Johnson County. The reservoir is constructed between the upper reaches of the Powder River and the Tongue River watersheds. Water currently is pumped from Clear Creek into the reservoir and flows by gravity into the reservoir from Piney Creek, Rock Creek, and as well as a small amount of natural drainage into the reservoir from nearby small streams such as Shell Creek. The primary reservoir outlet is Piney Creek, although a small amount can be released to Box Elder Creek, a tributary to Piney Creek. Piney Creek is a tributary to the Powder River north of the town of Arvada. Water in the reservoir is currently used for recreation, irrigation, power generation, and for maintaining flow in Piney and Clear Creeks in time of drought.

Originally, Lake DeSmet was a natural lake. Runoff from Shell Creek was stored in Lake DeSmet where it evaporated, creating a "brackish body of water".⁶ The lake was converted to an off-channel storage reservoir for agricultural users in 1921 by constructing a dam at the north end and diverting water from Piney Creek through an intake canal into the reservoir. The Reynolds Mining Corporation acquired the reservoir, surrounding land and associated mineral resources in the 1950's. Through the late 1960's, a campaign was undertaken to expand the reservoir as a promotional tool for potential coal development in the area. New supply systems from Piney Creek and Clear Creek were planned and the reservoir was enlarged for storage of all available water. In the early 1970's, Texaco, Inc. purchased all of the interests in Lake DeSmet, surrounding land and associated mineral resources from Reynolds. Texaco completed the reservoir enlargement to its current capacity by the late 1970's. Texaco operated Lake DeSmet Reservoir until early 2001, when the current owner, the Lake DeSmet Counties Coalition (LDCC) acquired it.

Campbell County, the county that the City of Gillette is located in, was a member of the LDCC. In December, 2003, Campbell County decided to withdraw from the three county joint powers board of Sheridan, Johnson and Campbell Counties, effective July 1, 2004.

The total water storage rights held in the lake total 234,987 acre-ft. of capacity (at High Water Level of 4620'). Of the total water storage rights, Lake DeSmet Energy Company has 62,199 acre-ft., Lower Clear Creek Irrigation District has 11,800 acre-ft. and other irrigation users (Box Elder) have 875 acre-ft. The total stored amount controlled by the LDCC is 160,113 acre-ft. Of this amount, 10,870 acre-ft. is committed to a long-term contract with water users comprised of shareholders of the former LDRC (1920's) and 38,960 acre-ft. is below the reservoir outlet and is unavailable for consumptive use (dead storage) by gravity flow. This leaves approximately 110,000 acre-ft. of the stored water controlled by LDCC which is not committed for other uses and is therefore available for annual development. Of the 110,000 acre-ft. available for development, only an estimated 28,000 acre-ft. is available annually for consumptive use on a firm-yield basis as reported in the WWDC Lake DeSmet Master Plan meeting.¹ Therefore, approximately 28,000 acre-ft. is the dependable amount available every year above and beyond that capacity which is already in use. This estimate was derived from theoretical operational studies of the reservoir performed on a long-term basis (1950-2002) based on historic stream flow, precipitation and diversion records, adjusted for present-day ownership of storage rights by LDCC.

Approximately 28,000 acre-ft is equivalent to approximately 9,125 million gallons (MG), which divided by the additional amount of water that is needed to meet 30-year future incremental demands, 12,800 gpm (18.432 MGD), gives 425 days. This quantity is more than enough to meet the water demands previously established for a 30 year projected need. One advantage of this alternative may be the guarantee of a water supply throughout the year which would not exist with some other options, such as the Keyhole Reservoir. At the present time the reservoir is essentially full, making Lake DeSmet a viable source. Due to this circumstance, the City of Buffalo and City of Sheridan have also considered using water from Lake DeSmet to meet their future water supply needs.

The above availability notwithstanding, Lake DeSmet is not considered a viable source due to a preliminary cost analysis. This alternative would require both of the most expensive components of other sources, which are a long large diameter pipeline and a surface water

treatment plant. These combined costs make this an alternative feasible only if there is no other available source.

4.2.2 Keyhole Reservoir

Keyhole Reservoir is a reservoir located approximately 50 miles east of the City of Gillette and constructed on the Belle Fourche River, below Moorcroft in Crook County. The reservoir is used as a source of irrigation water and flood control. The reservoir is subject to the Belle Fourche River Compact. In 1943, the states of Wyoming and South Dakota and the federal government ratified a compact on the Belle Fourche River which allocated the inflows and storage in the reservoir flow 90% to South Dakota users and 10% to Wyoming users. The President of the United States signed the bill of Congressional consent to the compact in 1944.

The Keyhole Reservoir is currently owned and operated by the United States Department of Interior Bureau of Reclamation. The Bureau's Rapid City, SD office currently manages the reservoir. The reservoir has a conservation capacity of 193,753 acre-ft. (185,801 acre-ft. of active storage) and 140,462 acre-ft. of exclusive flood control space. Of the 90% of the conservation storage (193,753 acre-ft.) reserved for South Dakota, a portion is currently used for irrigation, approximately 57,200 acres in the vicinity of Belle Fourche and Newell, South Dakota, and a portion currently has no contract and is maintained in the U.S. (federal) account. For the portion that currently has no contract, per the Belle Fourche River Compact, this portion for long term contracts must be sold to South Dakota users only. Short term contracts for South Dakota's portion that currently has no contract could be sold to Wyoming users on an annual basis, only if there is water available.⁷

4.2.3 New Clear Creek Water Storage Reservoir

Listed in the Wyoming State Engineer's Office (SEO) Water Rights database⁸ is Permit 7292 Res. which indicates the City of Gillette has an agreement with the Lower Clear Creek Reservoir Company for the assignment of water rights for a storage reservoir permit for the Boxelder Reservoir in Johnson County near Lake DeSmet Reservoir. This permit dated February 21, 1968, was originally for 20,000 acre-ft. Permit 7292 Res. was divided and 11,800 acre-ft. was transferred and adjudicated in Lake DeSmet Reservoir and the remaining 8,200 acre-ft.

remained undeveloped. A reservoir would have to be constructed to capture the undeveloped 8,200 acre-ft. of water rights from Clear Creek.

The Wyoming State Engineer's Office, Surface Water and Engineering Division was contacted to evaluate the current status of this permit and the availability of the 8,200 acre-ft. of water rights from Clear Creek. Per discussions with John Barnes, Surface Water Division Administrator, Permit 7292 was transferred to the City of Gillette's name on February 3, 1993 and the permit expired on September 30, 2005. On January 22, 2007, the Wyoming State Engineer's Office formally eliminated the 8,200 acre-ft water rights.⁹

Although the water rights have been forfeited, the City of Gillette can file an application with the State Engineer's Office by submitting Form SW3, to try to obtain the 8,200 acre-ft. water storage rights that were forfeited. The application would need to be reviewed and approved by the State Engineer, Patrick T. Tyrrell. It is extremely unlikely, given today's political climate that a significantly large quantity of water for storage, similar to the quantity the City of Gillette forfeited (8,200 acre-ft.) would be approved. However, maybe a smaller quantity would be approved as long as it meets the requirements of the Yellowstone River Compact. Article X of the Compact stipulates that no water shall be diverted from the Yellowstone River Basin without the unanimous consent of the three signatory states, Wyoming, Montana, and North Dakota. Clear Creek is considered part of the Powder River Basin and is a higher quality than the Powder River. For this reason, the request for water storage rights would likely receive objection from both Montana and North Dakota and not be approved. Furthermore, the U.S. Army Corp. of Engineers and the U.S. Environmental Protection Agency would likely oppose construction of an on-channel reservoir when other alternatives exist.

Even if the City of Gillette could obtain these water rights and get approval to construct an on-channel reservoir, this alternative requires construction of not only all of the other facilities identified in the Lake DeSmet and Keyhole Reservoir alternatives (i.e., pumping facilities, pipeline, storage reservoir at Gillette and a surface water treatment plant) but also the construction of a reservoir at Clear Creek. Construction of a reservoir at Clear Creek alone would cost several millions of dollars. In addition, the high capital costs as well as the high annual operating and maintenance costs of the other facilities needed under this alternative, make this alternative cost prohibitive.

Due to the reasons described above, it is concluded that constructing a reservoir to capture water from Clear Creek is not a viable alternative for a long term source of municipal surface water for the City of Gillette. Therefore, this option is not considered in any further detail.

4.2.4 City of Gillette Waste Water Treatment Plant Effluent

The Gillette WWTP operates under a NPDES Permit No. WY-0020125 issued by WDEQ. The current permit expires on July 31, 2007. The permit addresses discharge from the WWTP to Stonepile Creek, which is a "Class 3B" stream at the point of discharge. Stonepile Creek then flows into Donkey Creek (Class 3B) approximately 0.7 miles downstream. A portion of the effluent also discharges to the Pacific Power and Light Company's Wyodak Power Plant. The treatment effluent from the City's WWTP is not a possible source of water for irrigation or municipal use since per discussions with City Staff, the Pacific Power and Light (PP&L) has first right to the effluent.¹⁰ For the purposes of this report, this source was not evaluated any further.