

Attachment B - DEQ Denton WWTF Low Flow Stats Calculations

DEQ used the following methodology to determine annual 7Q10 and summer 14Q5 values (“low flow stats”) at the Denton WWTF (“facility”). This methodology is based on guidance that is currently under development.

The first step in the guidance is to determine if there are any gages suitable for analysis located on the receiving water. The Denton WWTF is located on Wolf Creek. Wolf Creek had one USGS daily flow gage (USGS gage 06114500 - Wolf Creek near Stanford, MT) that collected sporadic data between 1950 and 1962. Characteristics of an ideal gage for drainage area ratio comparison purposes include proximity to the facility (in terms of drainage area), a long period of record, and recent data collection. In this case, the gage location is relatively far from the facility (the drainage area ratio is 2.2; USGS methods recommend a maximum ratio of 1.5 [USGS, 2015]), the period of record is short (12 sporadic years, but only 7 *complete* climate years of daily flow), and the most recent data is more than 50 years old (Table 1). Due to these shortcomings, this gage was not used in a direct ratio comparison for low flow stats; however, the calculated low flow stats are listed here to use as a rough comparison to the final results below. Calculated stats at the gage were 0.32 cfs for the 7Q10 (based on 7 years of complete data), and 1.32 cfs for the summer 14Q5 (based on 10 years of complete data).

Table 1. Data Summary for USGS Gage Location and Facility

Location	Drainage Area (square miles)	Period of Record	Most Recent Calendar Year
USGS 06114500	116.1	12 years (sporadic)	1962
Wolf Creek near the Denton WWTF	252.5	-	-

Next, DEQ looked to see whether there were any nearby watersheds that have similar hydrology, land use, and drainage area. In this case there were none (both active and inactive USGS gages were reviewed). However, since a majority of the Wolf Creek watershed is located within a region where USGS has defined regression values, DEQ used the Upper Yellowstone-Central Montana regression equations located in StreamStats Chapter G (USGS, 2015) to estimate low flow stats at the facility. Because the standard error in these estimates is high, the lower 95% confidence interval of the low flow stats estimate was used as a conservative value. The StreamStats regression for the facility location gives lower confidence interval values of **0.23 cfs for the 7Q10 and 1.12 cfs for the summer 14Q5**. These values will be used in the permitting process. The low flow stats calculated at the gage are roughly comparable to these values.

It is usually to the advantage of the permittee to collect flow data on the stream near the facility outfall. Using the lower 95% confidence interval of the regression is likely very conservative, and thus collection of flow data could result in substantial increases in low flow stats estimates used in the permitting process.

References

USGS, Montana StreamStats, SIR 2015-5019, 2015.