2016 Addendum to the South Dakota Mercury TMDL

1.0 Introduction

The South Dakota Department of Environment and Natural Resources (SDDENR) adopted the Statewide Mercury total maximum daily load (TMDL) that included 90 waterbodies (70 Assessment Units) in January 2016. The TMDL was formally approved by the United States Environmental Protection Agency (EPA) in March 2016. South Dakota, through this addendum, formally seeks coverage for five more waterbodies under the original mercury TMDL in accordance with Section 303(d) of the Clean Water Act. This addendum document does not modify any aspect of the 2016 South Dakota Mercury TMDL, and the TMDL and allocations remain as presented in the original TMDL:

Annual Statewide Mercury TMDL Calculation
TMDL (595.32 kg/yr) = WLA (4.84 Kg/yr) + LA (590.48 Kg/yr) + MOS (implicit)

Refer to Section 10.0 of the original TMDL for more information on how this this annual load was calculated and how a daily load (3.21 Kg/day) was derived. This addendum includes information specific to five assessment units (AUs) in South Dakota. Figure 1 shows their locations. Fish tissue samples collected from these five AUs exhibited methyl mercury concentrations exceeding the 0.3 mg/Kg human health criteria identified in the Administrative Rules of South Dakota (ARSD) Chapter 74:51:01 Appendix B.

Sheridan and Stockade Lakes were included as part of the original AUs included with the statewide mercury TMDL. However, issues with legacy mining as a potential localized mercury source were raised by EPA during the TMDL public comment period and final approval process. EPA took "no action" until additional information and data analysis confirms that atmospheric loadings were the primary source of mercury for these two lakes.

Sheriff Dam, Clubhouse Lake, and Segment of 8 of the James River are also included in this addendum because these waterbodies were not part of the original South Dakota Mercury TMDL list subject to public comment. EPA also took "no action" on these waterbodies. To ensure these three waterbodies are fully vetted with regards to their inclusion under the original TMDL they will be public noticed with this addendum. Segment 4 of the Belle Fourche River (AU: SD-BF-R-BELLE_FOURCHE_04) was initially included with this group. Further data review has determined that this river segment was incorrectly characterized as impaired by mercury in the original TMDL, thus TMDL coverage is no longer sought.

Refer to the original, approved TMDL document for details related to the overall methods and assumptions used in establishing the South Dakota Mercury TMDL. For the South Dakota Mercury TMDL to be applicable to a waterbody, the following conditions need to be met:

- It falls entirely within state jurisdiction,
- If jurisdiction is shared, it may only be applied to those portions of the water under South Dakotas' jurisdiction,
- The standard length fish (SLF) tissue methylmercury concentrations from the water does not exceed 0.878 mg/Kg,
- There are no potential impacts from current or historic gold mining processes,

- If it is a river or stream, NPDES discharges do not exceed permitted limits,
- The TMDL will meet the water quality standards in the proposed water, and
- The original TMDL assumptions (e.g., source contributions, loading capacity, etc.) are still valid.

This addendum demonstrates that these conditions are met for each of the five waterbodies described above, and thus all five are appropriate for coverage under the original South Dakota mercury TMDL.

Waterbodies added to the South Dakota Mercury TMDL:

Assessment Unit ID	Common Name-County	Acres/Miles as reported in EPA ADB
SD-BA-L-SHERIFF_01	Sheriff Dam – Jones County	20.6
SD-JA-L-CLUBHOUSE_01	Clubhouse Lake - Marshall County	208.1
SD-JA-R-JAMES_08	James River - Beadle County	39.0
SD-CH-L-STOCKADE_01	Stockade Lake-Custer County	125.4
SD-CH-L-SHERIDAN_01	Sheridan Lake-Pennington County	367.9

2.0 Jurisdiction

Both Stockade and Sheridan Lake are under the jurisdiction of the State of South Dakota with regards to the water quality standards and the Clean Water Act. Stockade Lake is a 125 acre lake created by the Civilian Conservation Corps (CCC) during the Great Depression (circa 1935). It is owned by the State and managed by the SD Game, Fish, and Parks (SDGFP) as part of Custer State Park (Figure 1).

Sheridan Lake is a 368 acre lake located in the Black Hills National Forest (Figure 1). Its campgrounds and most of its watershed are owned and managed by the United States Forest Service (USFS) although the fishery is managed by the SDGFP. This lake was also created by the CCC during the Great Depression.

The remaining waterbodies and their watersheds, Clubhouse Lake, Sheriff Lake, and Segment 8 of the James River, all fall within the jurisdiction of the State of South Dakota. Figure 1 shows the locations of the waterbodies with respect to tribal reservations and state boundaries.

3.0 Comparable Existing Conditions

To determine the applicability of the South Dakota Mercury TMDL for additional waterbodies, including the five presented in this addendum, a review of existing conditions must be completed. This review should discuss fisheries and water quality data, loadings analysis, and potential sources, both point and nonpoint, that were similarly discussed within the original TMDL.

3.1. Fishery

Figures 2 through 12 present the distribution of mercury concentrations in fish species sampled from each of the five waterbodies included in this addendum. Table 1 shows the fish collected from each of the five waterbodies that exceeded the water quality standard of 0.3 mg/Kg (ARSD Chapter 74:51:01 Appendix B). Table 1 can be found at the end of the document.

The following section compares fish tissue mercury concentrations collected from these five addendum waterbodies to the dataset used in the original TMDL. If this evaluation demonstrates sufficiently similar concentrations, SDDENR expects to satisfy the third and sixth bulleted conditions listed above. Or stated more simply, as long as the fish populations in these five lakes do not exhibit notably higher

concentrations of mercury, the original TMDL and loading reductions will lead to water quality standards attainment in the five addendum waters. Direct comparisons, however, are complicated by differences in fish species. The original South Dakota mercury TMDL used walleye to derive TMDL reduction targets but not every waterbody in the state supports a walleye population. Walleye were only collected from Clubhouse Lake and Segment 8 of the James River. In the absence of Walleye from Sheridan, Stockade, and Sheriff Dam, other species were used to show mercury trends in fish flesh for these three waterbodies. The figures also show how the data compares to the statewide walleye data used to calculate the SLF concentration.

3.1.1. Sheridan and Stockade Lake

Sheridan and Stockade were initially managed as cold water fisheries focusing on trout populations. Through the years, unintended or accidental fish introductions not supported by the SD Game, Fish and Parks, i.e. Northern Pike, Yellow Perch and Rock Bass, have established naturally-reproducing populations in many locations throughout the Black Hills Forest Management Area (Davis 2012).

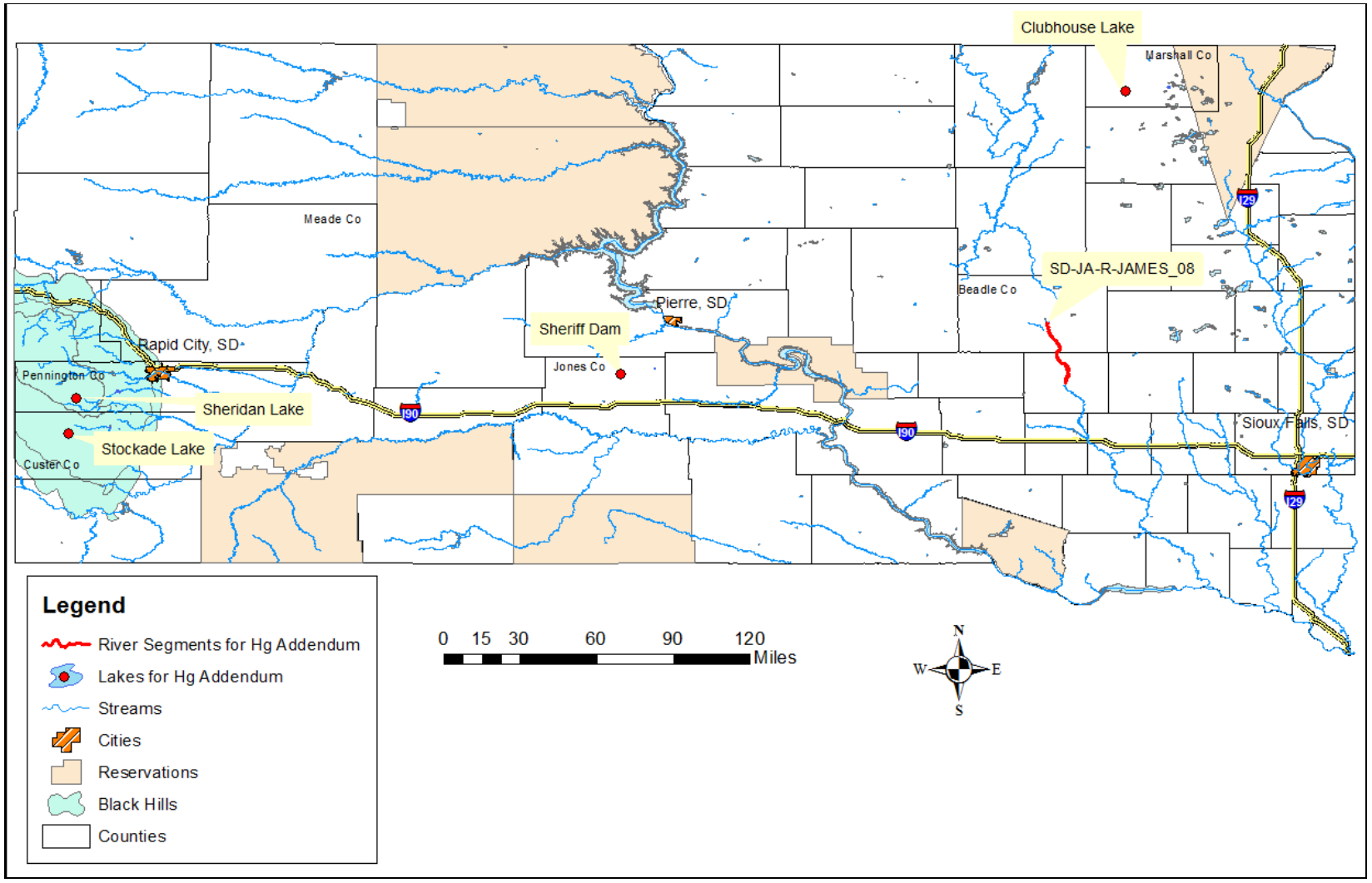

Figure 1. Locations of Five Waterbodies to be added to the South Dakota Mercury TMDL 2016.

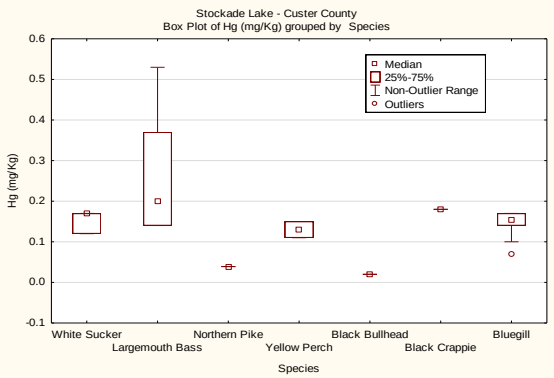

Figure 2. Stockade Lake Mercury Concentrations by Species.

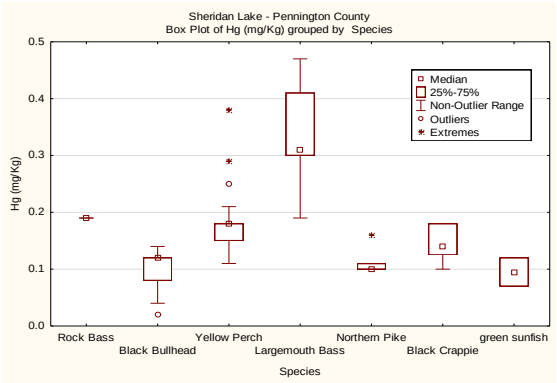

Figure 3. Sheridan Lake Mercury Concentrations by Species.

Although not initially desired, current management practices for both of these lakes have shifted focus to more warmwater species, especially largemouth bass and yellow perch. More details on the management of these reservoirs may be found in the Fisheries Management Plan for Black Hills Reservoirs 2015-2019. Management objectives for a warmwater dominant species are of particular concern with respect to fish tissue methylmercury concentrations. Dominant cold-water species (salmonids) such as trout tend to have lower concentrations of mercury. In fact the maximum concentration observed in 121 samples collected from salmonids in South Dakota was 0.11 mg/Kg. Changing the management focus to a trout dominant fishery may result in full attainment of the mercury standard prior to achieving all of the atmospheric reductions outlined in the original TMDL. Regardless, reestablishing a viable salmonid fishery can be challenging and costly, and South Dakota must consider the current fishery while assessing the risk to human health.

Figures 2 and 3 clearly show largemouth bass (*Micropterus salmoides*) as the species most susceptible to increased concentrations of methylmercury for both Stockade and Sheridan Lakes. The only other species found to have fish flesh concentrations over the 0.3 mg/Kg threshold was a single yellow perch (*Perca flavescens*) collected from Sheridan Lake.

For the period of 1998-2015, a total of sixty one (61) individual fish samples were collected from Stockade Lake of which a total of five (5) largemouth bass exceeded the threshold (Table 1). Of the 65 total fish sampled from Sheridan Lake for the period of 2003-2015, eight (8) largemouth bass and one yellow perch (previously mentioned) were above the threshold. Table 1 presents the individual fish samples including length, year caught, and mercury concentration for fish over the 0.3 mg/Kg threshold and Figures 2 and 3 graphically display each Lakes' fish tissue datasets organized by species. Concentrations in the fish which exceeded the 0.3 mg/Kg threshold ranged from 0.31 mg/Kg to as high as 0.53 mg/Kg. Note that all fish exceeding the 0.3 threshold were collected during the 2012 and 2015 field season.

To determine individual waterbody support status for the 2016 Integrated Report (IR) with respect to mercury in fish tissue, a minimum of 10 fish tissue samples must have been collected between January 2006 through September 2015. For an impairment designation a minimum of one of two scenarios needs to be satisfied: 1) the 95th percentile of this data for each individual lake needs to exceed 0.3 mg/Kg or 2) a fish consumption advisory has been issued. Thirty-six (36) samples were collected within the required time period from Stockade Lake resulting in a 95th percentile of the all species dataset of 0.47 mg/Kg (> 0.3 mg/Kg). Stockade Lake was subsequently classified as impaired by mercury.

Forty (40) samples were collected from Sheridan during the same period exhibiting a 95th percentile of 0.41 mg/Kg, which also exceeds the 0.3 mg/Kg threshold. Sheridan Lake was also classified as impaired by mercury.

While South Dakota's mercury assessment method (described above) evaluates data from all available fish species, the original mercury TMDL analysis primarily focused on walleye (*Sander vitreus)*. Walleye typically exhibited higher concentrations than similarly aged fish from other species and are the most popular fish for the angling public in South Dakota. However, walleye have not been found in either water body. Although northern pike (*Esox lucius*) were also considered in the TMDL they were found in small numbers in the Sheridan (n=7) and Stockade (n=5) datasets with none exceeding the threshold.

Figure 4 compares northern pike samples collected from Sheridan and Stockade to samples collected from all other waterbodies in South Dakota. Similarly, Figure 5 compares largemouth bass in Sheridan and Stockade to statewide concentrations for the same species. Concentrations in northern pike caught in Stockade and Sheridan Lakes were considerably lower (<25th percentile) than concentrations found in the remainder of the State and were lower than the distribution of walleye data collected statewide. Figure 5 shows a similar a similar situation for largemouth bass.

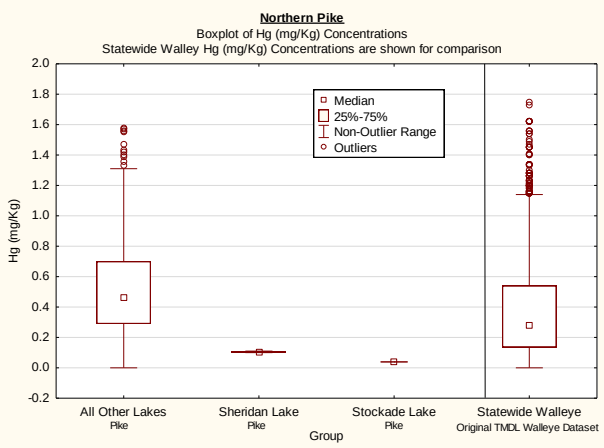

Figure 4. Mercury Concentrations in Northern Pike.

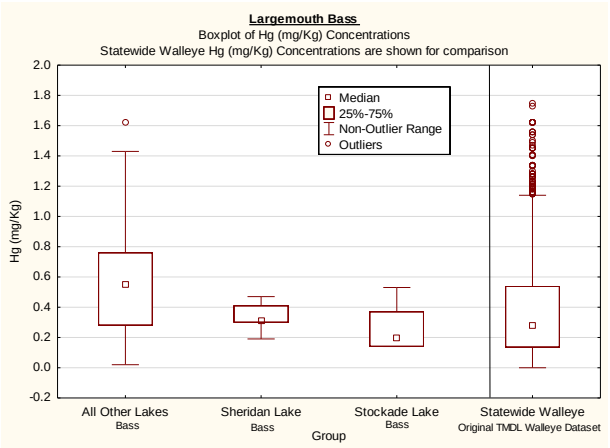

Figure 5. Mercury Concentrations in Largemouth Bass.

In the absence of walleye in the two lakes largemouth bass, because they were the species exhibiting the highest concentrations of mercury and those concentrations fell within the data distribution of the statewide walleye concentrations, were chosen as a surrogate representative species for establishing the existing condition. Figure 6 presents length to concentration for each of the lakes as well as a statewide average. The trend lines represent an approximate accumulation rate as the fish age. Each of the Black Hills waters showed signs of lower or slower bioaccumulation rates in comparison to the statewide average. This would suggest either lower ambient mercury concentrations or, because of lower productivity rates within these lakes, there is a reduction in the methylation rates. Both of these conditions can lead to slower accumulation rates in the bass.

Largemouth bass and northern pike were also addressed in the original South Dakota Mercury TMDL in Section 3.4.6.1 which has been included here as part of this discussion.

"3.4.6.1 Methylation Rate Data

Fish tissue methylmercury data was standardized and analyzed according to the Standard Size Predator Fish section. Included in the data set were all standard length fish calculations for walleye, northern pike, and largemouth bass. These species are all considered top predator fish and are likely to have higher methylmercury concentrations relative to other fish species. To provide for the largest dataset and include as many water bodies as possible, MeHg concentrations in these three species were compared at their standard lengths, which were calculated as the mean length for the species population sampled. Due to low numbers of waters with adequate paired samples for a correlation between largemouth bass and walleye, comparisons were only drawn between northern pike and walleye as well as northern pike and largemouth bass. Correlations between northern pike and walleye were strongest (n=27, r^2=0.6805, p=0.0000). Northern pike to largemouth bass exhibited a slightly lower correlation (n=11, r^2=.5059, p=0.0141)."

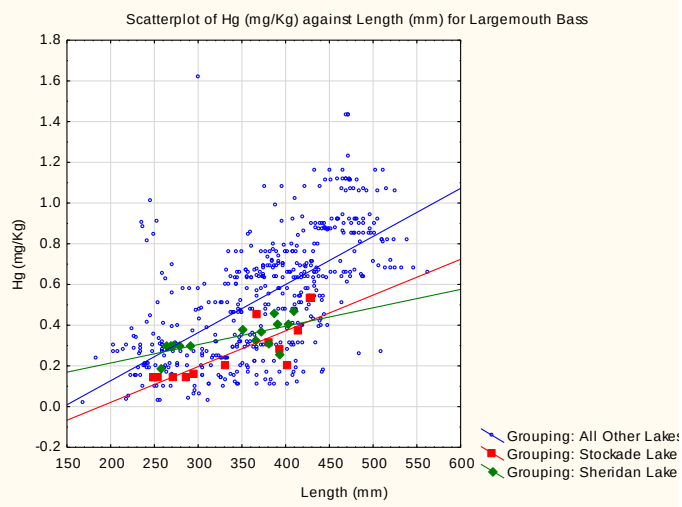

Figure 6. Methylmercury Accumulation Comparison for Largemouth Bass.

3.1.2. Sheriff Dam (Jones County)

Walleye data from Sheriff Dam were unavailable. In the absence of walleye other species were used as evidence to support the inclusion of Sheriff Dam under the South Dakota Mercury TMDL.

Sheriff Dam is a small 21 acre impoundment located on the Fort Pierre National Grasslands in Jones County South Dakota (Figure 1). The SD Game, Fish, and Parks manages this small dam as a largemouth bass/bluegill fishery although, according to the most recent fishery survey, the catch per unit effort (CPUE) for bass was below the three year mean.

There has been only one fish collection event for mercury analysis associated with Sheriff Dam. In 2015 36 fish were collected; 15 black bullhead (*Ameiurus melas*), 15 bluegill (*Lepomis macrochirus*), and 6 black crappie (*Pomoxis nigromaculatus*). The average concentrations for these three species were 0.049, 0.370, and 0.184 mg/Kg, respectively. The 95th percentile of the data was 0.40 mg/Kg exceeding the Integrated Report (IR) 2016 assessment criteria resulting in an impairment designation for the 2016 IR.

Black crappie were the only species of the three mid-trophic level predators sampled from Sheriff Dam that exceeded the 0.3 mg/Kg (4 out of 6 total black crappies sampled) (Figure 7). The resulting concentrations fall within the bounds of the statewide walleye data distribution used to calculate the SLF in the original TMDL. Figure 8 shows this comparison along with the distribution of the larger pool of black crappies collected statewide. Both figures show the utility of black crappie as the surrogate

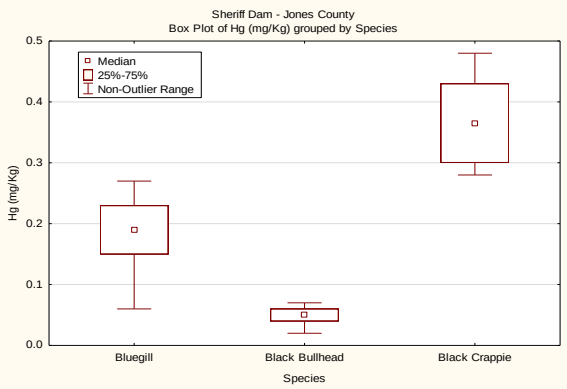

Figure 7. Sheriff Dam Mercury Concentrations by species.

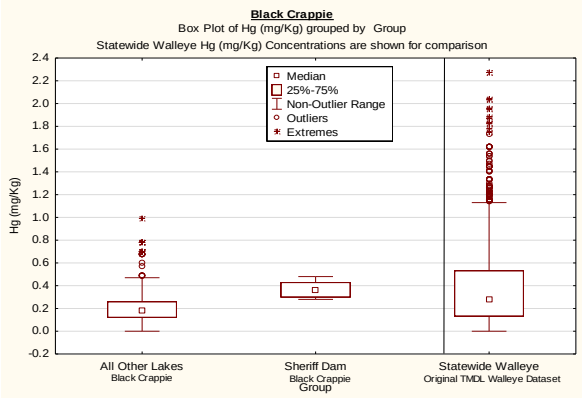

Figure 8. Mercury Concentrations in Black Crappie (Sheriff).

species needed to establish the existing impairment condition for the waterbody. Table 1 shows those fish collected from Sheriff Dam exceeding the 0.3 mg/Kg mercury fish flesh standard. The concentrations from the six black crappies from Sheriff Dam were slightly higher than those observed in statewide sample population for black crappie. This is explained by the small number sampled (n=6) and the fact that they are all from the same length class ranging from 244mm to 262mm (Figure 9). The average back-calculated lengths (mm) for each age class of black crappie sampled from Sherriff Dam suggest that these were relatively old fish possibly exceeding six years old (SDGFP, 2012).

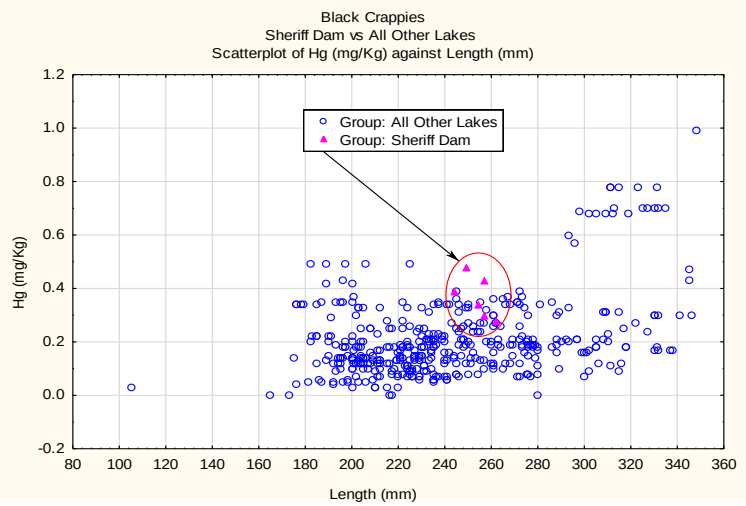

Figure 9. Black Crappie Hg (mg/Kg) vs Length (Sheriff Dam vs Statewide).

3.1.3. Clubhouse Lake and Segment 8 of the James River

Walleye were both collected from these waterbodies. Figures 10 and 11 show the concentrations observed from the various species collected. Average mercury values observed in the walleye were 0.33 mg/Kg and 0.52 mg/Kg for Clubhouse Lake and the James River, respectively. The 95th percentile for each of these waterbodies exceeded the 0.3 mg/Kg value (Clubhouse Lake = 0.36 mg/Kg and James River = 0.90 mg/Kg) triggering the impairment designation in the 2016 IR.

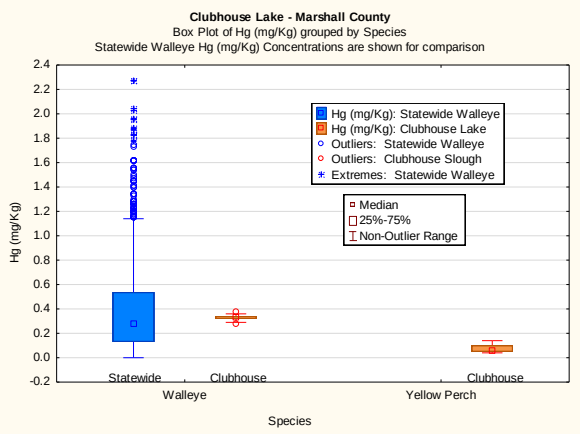

Figure 10. Clubhouse Lake Mercury Concentrations by Species.

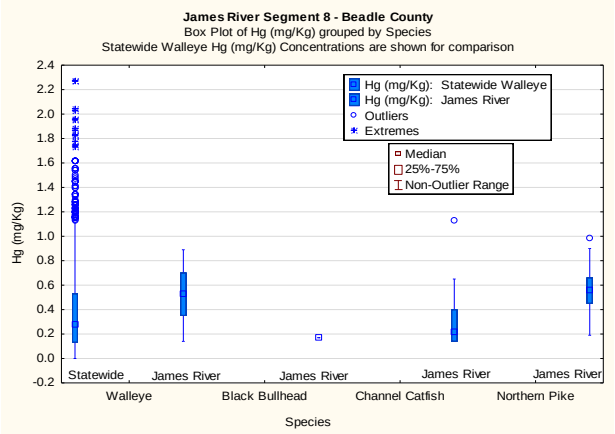

Figure 11. James River - Segment 8 Mercury Concentrations by Species.

Although there were multiple species collected from both waterbodies Figures 10 and 11 show walleye as the species exhibiting the higher concentrations. Walleye were also used to develop the statewide SLF concentration in the original mercury TMDL. One of the stipulations for including additional waterbodies to the original TMDL is that the SLF tissue methylmercury concentrations from these waterbodies should not exceed 0.878 mg/Kg with the caveat that walleye are present in the water. In these two cases walleye data were available so the SLF concentration could be calculated.

Nine walleye were collected from Clubhouse Lake in 2015. In the original TMDL (Section 3.0), analysis on the statewide Walleye dataset indicated a standard length fish (Walleye) was 384 mm long. Plugging

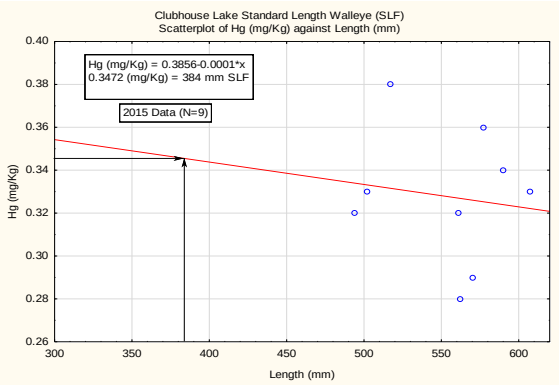

Figure 12. 2015 Clubhouse Lake Mercury Concentrations (mg/Kg) vs. length of Walleye (mm) (N = 9).

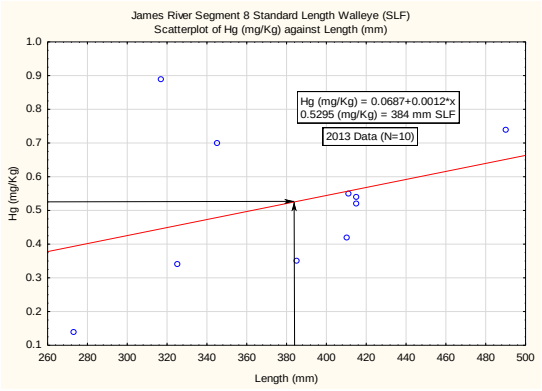

Figure 13. 2013 James River - Segment 8 Mercury Concentrations (mg/Kg) vs. length of Walleye (mm) (N=10).

this into the equation derived for Clubhouse Lake, which is shown Figure 12, a 384 mm walleye would exhibit a mercury concentration of 0.347 mg/Kg.

Ten walleye were collected from Segment 8 of the James River in 2013. Using the mercury concentration vs length equation shown in Figure 13, a 384 mm Walleye collected from the James River would exhibit a mercury concentration of 0.530 mg/Kg.

The SLF concentrations for both Clubhouse Lake and the James River fall well below the statewide SLF concentration of 0.878 mg/Kg. All of the waterbodies included in this addendum (Sheridan, Stockade, Sheriff, Clubhouse, and Segment 8 of the James Rivers) meet this specific fisheries condition for including them as part of the South Dakota Mercury TMDL.

3.2. Mining

Sheridan and Stockade lakes meet all of the conditions stipulated in the original TMDL with the exception of the presence of historic gold mining within their watersheds. The Black Hills have an extensive history of mining activities which started near present day Stockade Lake with the discovery of a small amount of gold in 1874. Larger gold deposits found in the northern hills around the Lead and Deadwood areas drove the gold rush of 1875-1876. Gold mining is of particular interest to this TMDL effort because mercury was historically used in mills and placer sites to amalgamate gold-ore into a purer product. Elevated levels of mercury in the environment have been linked to legacy gold mining in other places. In 1938 Allsman completed a review of historic mine operations located throughout the Black Hills. He documented many small claims in what would eventually become the Sheridan and Stockade Lake watersheds. These were very small with a very short window of operation. Most of the mining in these watersheds took place circa 1890-1910 with one or two that started up again in the 1930s but was worked only for 1-2 years. All of these mines lacked any consistent resource recovery and operations became unsustainable. Their historical presence warranted a more in depth review of available data to verify that current mercury impairments were not mining related. They can and will be addressed via the atmospheric reductions discussed in the original TMDL. Section 3.1.1 of this addendum has shown that fish tissue mercury concentrations in Sheridan and Stockade Lakes are comparable to other lakes in South Dakota that have no history of mining. The following section reviews available water chemistry data from these two lakes to determine whether mercury is elevated in other media (i.e., water or lakebed sediments) due to historic mining activities but for unknown reasons, exceedances may not be getting captured in the fish tissue dataset.

Mining issues, either historical or current, were not a concern with the other three waterbodies included with this addendum. The effects of historical mine tailings and current mining operations on mercury in fish flesh were presented in the Section 4.0 of the original SD Mercury TMDL.

3.2.1. Water Chemistry

Only a small number of mercury measurements were available from Sheridan and Stockade lake (both inlake and tributary). The SD water quality criteria for water column mercury as it applies to the coldwater fishery beneficial uses assigned to Sheridan and Stockade is currently set at 0.051µg/L. Reviewing the data collected within a 3 mile radius of Sheridan Lake resulted in 16 individual mercury analyses. The SD State Health Lab and the United States Geological Survey (USGS) Lab completed 14 and 2 of the analysis, respectively. The detection limit for the SD Health Lab was <0.01 µg/L whereas the USGS lab reported a detection limit of <0.1 µg/L. Expanding the search to other contaminants associated with mine wastes, including cadmium, lead, and cyanide, did not yield any result above the individual contaminates detection limit. The majority of this data were derived from elutriate samples collected from both Mitchell Lake and Lake Sheridan in 2003. Mitchell Lake is a small ≈10 acre impoundment located upstream of Sheridan on Spring Creek (Figure 14). Elutriate samples usually

consist of two or three individual samples: 1) a mixture of 50% sediment 50% lake water, 2) receiving water, which is 100% lake water collected near the sediment/lake water interface, and 3) a sediment sample (note that receiving water in this instance has no NPDES implications). The receiving water refers to the water that would be exposed to the sediment should the sediment be disturbed. The USGS samples were collected by USGS personnel from USGS gage 06406920 in 1991 and 1992. Figure 14 shows the location of the USGS gage with respect to Sheridan Lake. In all 16 mercury samples collected within the Sheridan Creek/Spring Creek area the labs reported either "no detection" or "present below quantification limit".

Conducting a similar data search for Stockade Lake yielded six elutriate samples collected from two Stockade Lake sites (Figure 15). These samples were part of a SDGFP lake restoration project (1986 to 1989) undertaken to improve the water quality and recreational value of the Stockade lake. Nutrient laden sediment removal, shoreline stabilization, renovations to the spillway and dam, and complete restoration of the fishery were all completed by 1989. Analysis of the elutriate samples yielded concentrations of mercury ranging from <0.2 µg/L, which was the detection limit for Travis Laboratories (Rapid City SD) to 3.2 µg/L collected from Stockade Lake Site 2. The highest concentrations were observed in the sediment samples. Over 200,000 cubic yards of sediment was removed as part of this lake restoration project. An estimated 1,480 tons of phosphorus was also removed from the lake as part of the sediment load.

In a separate project the city of Custer, SD proposed to remove sediment from a small city pond located along French Creek (Figure 15). This small pond was created by a partial dam across French Creek which is the primary source of water for Stockade Lake. Although the project was discontinued before sediment removal took place two elutriate samples were collected from the pond in 2010. The SD Health Lab did the analysis on the sample which resulted in nondetects for all parameters including mercury. The mercury detection limit for the SD Health Lab was <0.01 µg/L. Additional mercury samples were collected by the USGS in 1990-1994. Water quality samples were collected from two USGS gages located on French Creek (Gage 06402990 and 06402995) (Figure 15). None of the samples exhibited any detectable level of mercury (USGS lab detection limit of <0.1 µg/L) or any of the other contaminates, i.e. cadmium, lead, and cyanide. An absence of detectable levels of contaminants commonly associated with mining wastes within the Custer City Pond and the various instream water quality measurements collected by the USGS implies that impacts resulting from mining activities was/is negligible. If any mercury was present in Stockade Lake it has since been removed as part of the dredging activities conducted in the late 1980s.

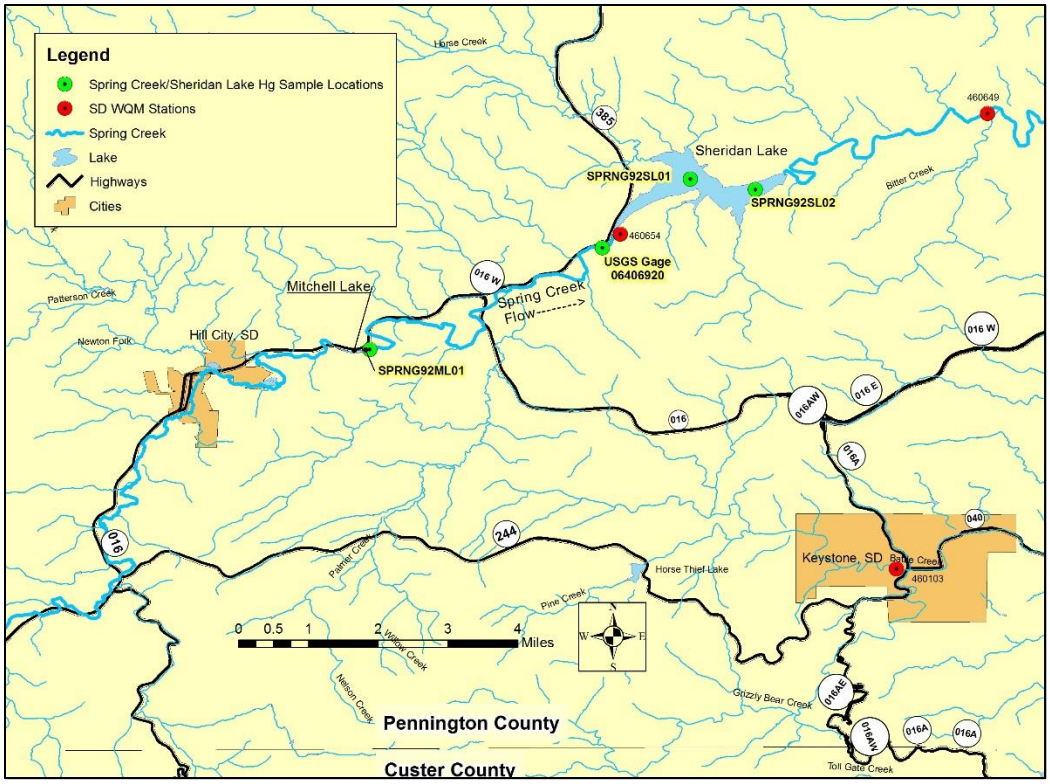

Figure 14. Sheridan Lake Watershed.

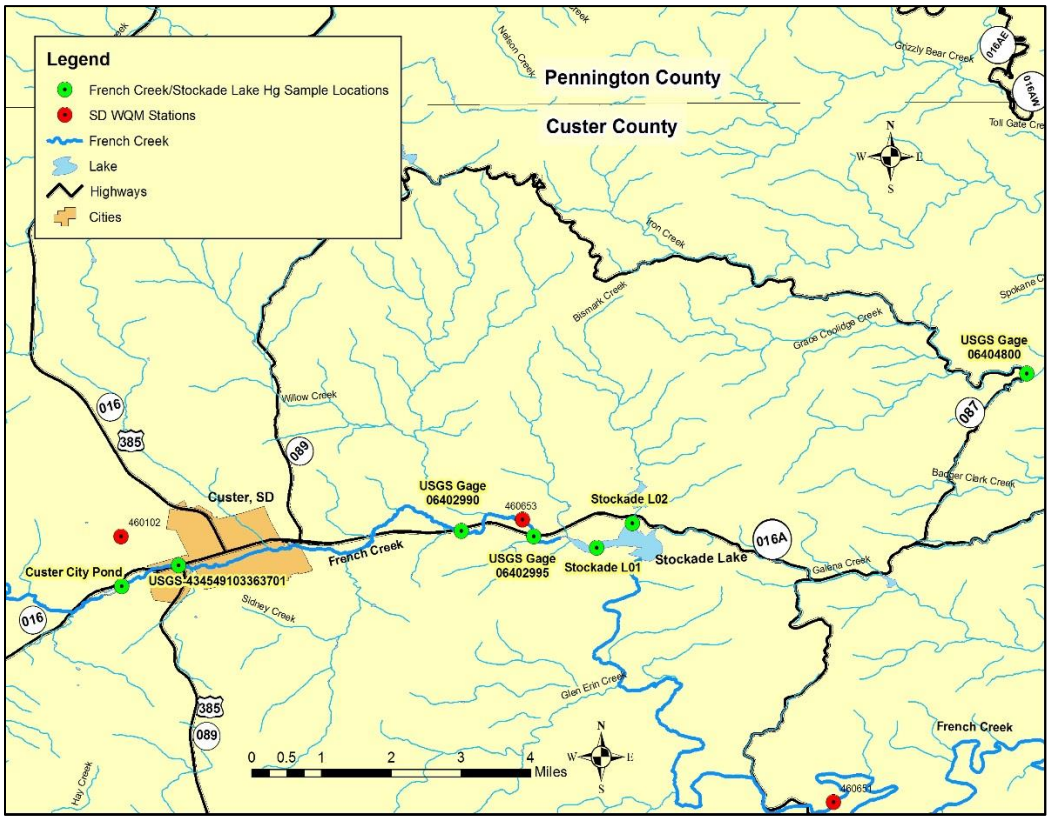

Figure 15. Stockade Lake Watershed.

4.0 NPDES Permitted Sources

SD Administrative Rule 74:51:01:27 states that point sources discharging directly into lakes must meet water quality standards at the point of discharge and are not allowed a mixing zone. This addendum, and the original TMDL, assumes that point sources are being controlled under this regulation through NPDES permit requirements and are not causing localized water quality standard exceedances of mercury in lakes. The only waterbody in this addendum not covered by this lake-specific regulation is Segment 8 of the James River, thus this section further characterizes point sources in the James River watershed in order to satisfy the fifth bulleted condition for TMDL applicability listed above.

Section 4.3 in the original TMDL addressed any non-stormwater NPDES permitted Sources. The NPDES data review for this segment indicates three small rural communities that discharge into wetlands/tributaries that eventually drain into the James River. One additional small community NPDES permittee (Wolsey) operates a zero discharge facility. Each of these communities have almost no manufacturing base and are currently meeting all of their permitting requirements. Metals sampling are not required as part of their permit because of the lack of any potential sources within their city limits. The final NPDES Permit holder for this segment is the WWTF for the city of Huron, SD. This WWTF is permitted to intermittently discharge into Segment 8. However, they have a large holding capacity with wetlands and stabilization ponds and so the facility rarely discharges to the river. The 2013 U.S. Census Bureau population estimates and NPDES permit numbers with a brief operational history are shown below. Figure 15 shows the location of the river segment relative to these communities.

Town of Alpena (pop. 285) – SD0025887

- This WWTF was a no discharge facility. As of April 1, 2016 their new permit allows them to intermittently discharge.
- During the current permit cycle (7/1/2008 – March 31, 2016), the town has reported 2 emergency discharges:
    - 1 in September 2013 needed for construction; and
    - 1 in July 2010 due to flooding.
- Total Mercury effluent data were not available.

City of Cavour (pop. 118) – SD0021806

- This WWTF discharges to an unnamed wetland.
- The facility has reported discharging during 12 months of the current permit cycle (1/1/2008 – present).
- Of these 12 discharges, there were 2 months with effluent violations:
    - Violations of daily maximum pH, 30-day average TSS, and maximum 7-day average TSS in April 2009;
    - A violation of 30-day average BOD5 in April 2010.
      Recent discharges have been in compliance with all effluent limits.
- Total Mercury effluent data were not available.

City of Iroquois (pop. 266) – SD0022438

- This WWTF discharges to the South Fork of Pearl Creek.

- The facility has reported discharging during 23 months of the current permit cycle (1/1/2008 – present).
- Of these 23 discharges, there were 2 months with effluent violations:
    - A violation of 30-day average BOD5 in March 2010.
    - Violations of 30-day average and maximum 7-day average BOD5 in March 2011.
      Recent discharges have been in compliance with all effluent limits.
- Total Mercury effluent data were not available.

City of Wolsey (pop. 393) – SDG820249

- This WWTF is a no discharge facility.
- No emergency discharges have been reported during the current permit cycle (10/1/2011 – present).
- Total Mercury effluent data were not available.

City of Huron (pop. 13,097) – SD0023434

- This WWTF is permitted to intermittently discharge to the James River.
- No effluent violations have been reported during the current permit cycle (4/1/2013 – present).
- The facility reported discharges in June 2013 and November 2015.
- Influent and Effluent Total Mercury samples from the current permit cycle have been below detection or non-detect (ND). The November 2015 discharge effluent and influent Total Mercury have not yet been submitted.

Date	Monitoring	Effluent / Influent	Total Hg Conc. (µg/L)	Detection Limit (µg/L)
06/05/2013	2013 - 1st	Effluent	**ND**	0.1 – Energy Labs
06/05/2013	2013 - 1st	Influent	**ND**	0.1 – Energy Labs
12/26/2013	2013 - 2nd	Influent	**ND**	0.1 – Energy Labs
06/09/2014	2014 - 1st	Influent	**ND**	0.1 – Energy Labs
10/29/2014	2014 - 2nd	Influent	**ND**	0.1 – Energy Labs
03/26/2015	2015 - 1st	Influent	**<0.2**	0.2 – AET

The city of Huron is the only "potential" source of mercury for the Segment 8 with its small manufacturing base. However, during the discharge events reported in 2013 both influent and effluent sampling have indicated no detectable levels of mercury. All influent sampling has shown no detectable levels of mercury as well. The most recent instream sampling available from this segment was conducted by the USGS from their gage located on the 3rd St. Bridge in the city of Huron (Figure 15). During the period from 1985 through 1990, 38 dissolved mercury samples were collected. Six samples slightly exceeded the detection limit as shown in

USGS Site 06476000 3rd St. Bridge on James River in Huron, SD Surface Water Mercury Sample Results	
USGS Detection Limit (µg/L)	0.1
Number of Nondetect Samples	32
Detections @ 0.1 µg/L	3
Detections @ 0.2 µg/L	3
All Available Samples collected between 1985 and 1990	38

the table below. Over 84% of the samples were non-detect.

Based on the following sources of information, SDDNER does not believe NPDES permitted point sources are causing or contributing to the mercury impairment on Section 8 of the James River:

- All point sources in the watershed are small, minimally discharging wastewater facilities with no known sources of mercury in their distribution systems.
- Effluent and influent data from the largest point source, while limited and collected using detection limits unsuitable for direct comparison to South Dakota's water column mercury criterion (0.050 µg/L), indicate that concentrations are no greater than two times the criterion.
- Available water column data of the James river, while dated and also collected using unsuitable detection limits, may have been collected before clean sampling procedures were followed but still show that mercury was not detected in the vast majority of samples.

If future monitoring indicates point sources are causing or contributing to a mercury impairment for a waterbody covered by the statewide mercury TMDL in a way that is inconsistent with the current allocations, SDDENR may revise the TMDL for that particular waterbody.

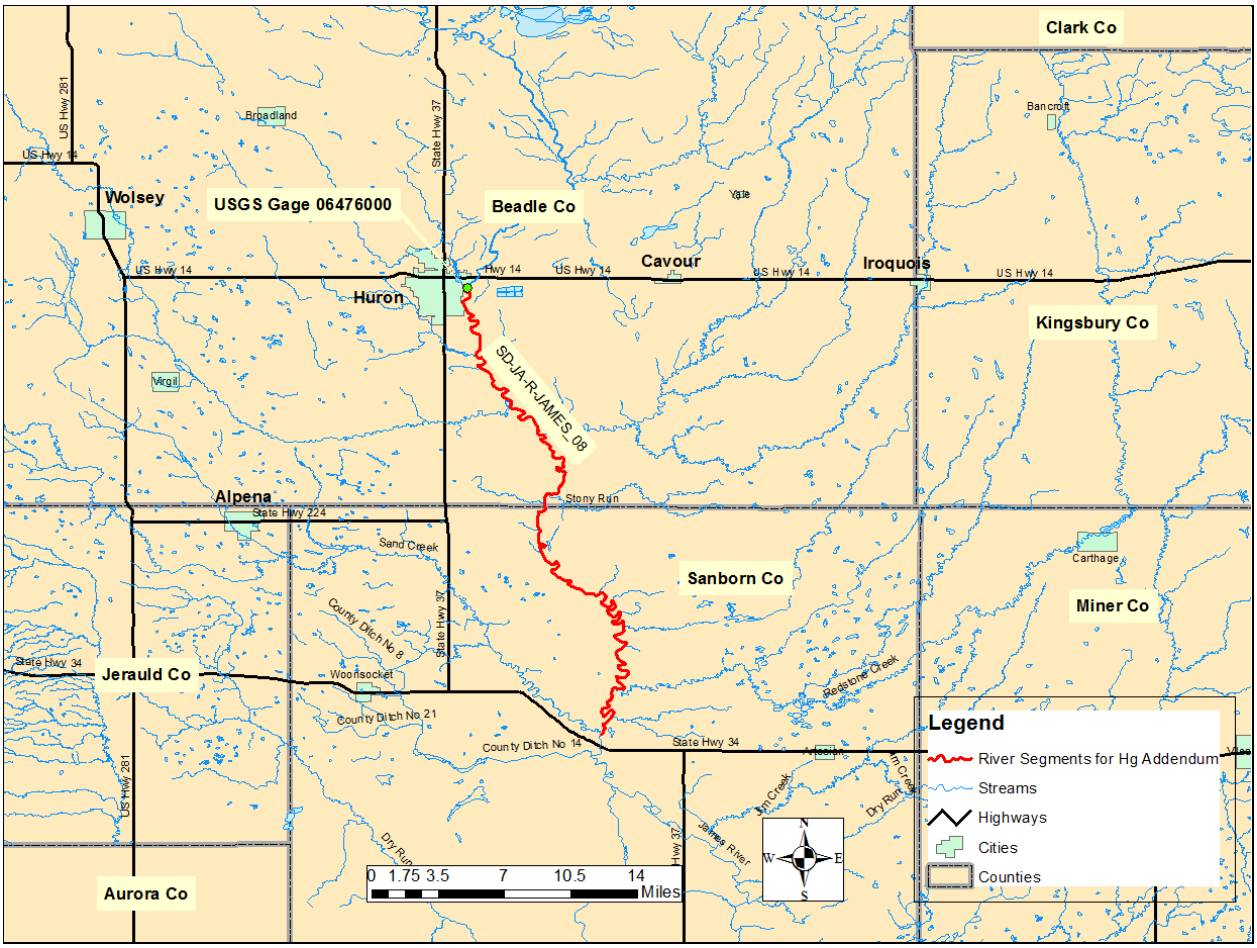

Figure 15. Segment 8 of the James River and Surrounding Area.

5.0 Water Quality Standards

All waters (both lakes and streams) are assigned the beneficial use of fish and wildlife propagation, recreation, and stock watering. All streams are assigned the beneficial use of irrigation. Additional uses are assigned by the state based on a beneficial use analysis of each water body. Each beneficial use has a set of water quality standards to protect those uses. The Administrative Rules of South Dakota (ARSD) contain the water quality standards in Chapter 74:51. South Dakota water quality standards specifically address mercury concentrations in the water column designed to address both human health as well as aquatic health. The more restrictive mercury concentrations are for human health. The following table shows the beneficial use classifications in South Dakota and the numeric criteria assigned to those uses. All criteria are reported in the total recoverable mercury or total methylmercury (for fish tissue) fraction.

Use Classification	Use Description	Human Health		Aquatic Life	
		Water Column	Fish Tissue	Acute (CMC)	Chronic (CCC
		µg/L	mg/Kg	µg/L	µg/L
(1)	Domestic water supply waters	0.050			
(2)	Coldwater permanent fish life propagation waters	0.051	0.3	1.4	0.77
(3)	Coldwater marginal fish life propagation waters	0.051	0.3	1.4	0.77
(4)	Warmwater permanent fish life propagation waters	0.051	0.3	1.4	0.77
(5)	Warmwater semipermanent fish life propagation waters	0.051	0.3	1.4	0.77
(6)	Warmwater marginal fish life propagation waters	0.051	0.3	1.4	0.77
(7)	Immersion recreation waters				
(8)	Limited contact recreation waters				
(9)	Fish and wildlife propagation, recreation, and stock watering waters	0.051	0.3	1.4	0.77
(10)	Irrigation waters				
(11)	Commerce and industry waters				

Additional water quality regulations which apply to mercury impairments include the biological integrity of waters. Elevated levels of mercury may impair biological integrity, such as through reduced reproductive success of walleye (Selch 2008). ARSD Section 74:51:01:12 states that all waters of the state must be free from substances, whether attributable to human-induced point source discharges or nonpoint source activities, in concentrations or combinations which will adversely impact the structure and function of indigenous or intentionally introduced aquatic communities. Additionally, ARSD Section 74:51:01:55 also states that toxic pollutants (including mercury) may not exist at levels which are or may become injurious to public health, safety, or welfare. Protection of these narrative criteria is best accomplished by meeting the most stringent numeric water column criteria 0.050 µg/L of total mercury.

As a part of the 2014 triennial review, SDDENR proposed and the Water Management Board adopted into the states Surface Water Quality Standards a fish flesh methyl mercury (MeHg) standard of 0.3 mg/Kg. This concentration is the EPA recommended human health criterion and applicable to beneficial uses 2, 3, 4, 5, 6, and 9.

The waterbodies included with addendum and their beneficial uses are shown in the table below.

Common Name-County	Beneficial Uses
Sheriff Dam – Jones County	9,10
Clubhouse Lake - Marshall County	9,10
James River - Beadle County	5,8,9,10
Stockade Lake-Custer County	3,7,8,9,10
Sheridan Lake-Pennington County	2,7,8,9,10

The original TMDL identified a target of 0.3 mg/Kg based on the soon to be approved EPA human health criterion (and approved by the State of SD). This fish flesh concentration standard and target required a linkage to ensure protection of the existing mercury water column standards. This linkage was accomplished through application of a bioaccumulation factor (BAF) discussed in Section 2.0 of the original TMDL. Bioaccumulation refers to the uptake and retention of a chemical by an aquatic organism from all surrounding media including water, sediment, and the foods it consumes. Assuming that the fish tissue criterion will be approved by EPA, the TMDL used a BAF to verify that the target and human health criterion of 0.3 mg/Kg would translate back to total mercury levels in the water column below the most stringent South Dakota water quality standards (0.050 µg/L). For more detail on these calculations please refer to Section 2.0 in the original TMDL.

The existing conditions explained in Section 3.0 of this addendum show that fish tissue concentrations in these five waterbodies are comparable to those used in the original TMDL (Figure 2-12). This applies to both lentic (Sheridan, Stockade, Clubhouse, and Sheriff) and lotic (Segment 8 – James River) systems.

The original TMDL used 0.669 mg/Kg (the existing condition) as the value from which to calculate reductions. These numbers were based on the SLF calculation process outlined in Section 3.0 of the TMDL. The reduction factor (RF) was based on this existing condition and the fish tissue standard of 0.3 mg/Kg. WE38 in the following equation refers to a SLF (walleye) 38.4 cm long.

$$RF = (WE38 – 0.3)/WE38$$

$$55.2\%=(0.669-0.3)/0.669$$

Reducing the methylmercury in fish flesh in these five waters by 55.2% will meet all appropriate water quality standards.

6.0 Conclusions

The presence of historical mining in both the Sheridan and Stockade Lake watersheds and public notice concerns for Sheriff Dam, Clubhouse Lake, and Segment 8 of the James River necessitated additional information and discussions before these five waterbodies could be added to the South Dakota Mercury TMDL. After further review of the fisheries, fish flesh, and water quality data, as well as NPDES and jurisdictional information, adding them to the TMDL was determined to be appropriate.

For Sheridan and Stockade Lake, the majority of fish flesh samples over the 0.3 mg/Kg methylmercury threshold came from largemouth bass as walleye are not found within these two lakes. Comparing bass collected from both Sheridan and Stockade to bass collected throughout the state, a lower accumulation

rate for methylmercury in the fish tissue was evident (Figure 6). The highest concentrations were measured in two bass collected during 2015 from Stockade Lake. At 0.53 mg/Kg, they were equal to the median concentration for largemouth bass statewide (Figure 5). The largemouth bass data fall between the 25th and 75th percentile of the statewide walleye data set used to calculate the SLF concentration.

Black crappies were the species that exhibited the highest concentrations of fish species from Sheriff Dam. Again, walleye are not found within this waterbody. The black crappie concentrations also fall within the 25th and 75th percentile for of the statewide walleye data set (Figure 8).

With walleye present in both Clubhouse Lake and Segment 8 of the James River SLF concentrations could be calculated resulting in 0.347 mg/Kg and 0.530 mg/Kg, respectively. These fall well below the statewide SLF concentration of 0.878 mg/Kg. All of the waterbodies included in this addendum (Sheridan, Stockade, Sheriff, Clubhouse, and Segment 8 of the James Rivers) meet the specific fisheries condition for including them as part of the South Dakota Mercury TMDL.

Mercury and other contaminants frequently associated with mining wastes were not detected in any sample collected from Sheridan Lake. Mercury concentrations slightly above the laboratory detection limit were found in sediment samples collected from Stockade Lake in 1986. Subsequent sediment and water column samples collected from French Creek and other tributaries to Stockade Lake exhibited non-detect concentrations.

A review of the NPDES information for all five waterbodies identified only one permitted continuous discharger draining to Segment 8 of the James River. No other NPDES potential contributors of mercury were identified for any of the other waterbodies. Laboratory analysis revealed that both influent and effluent mercury concentrations were below the detection limit.

The South Dakota Mercury TMDL calls for an aggregate reduction in mercury of 55.2%. Applying the principle of proportionality as described in Section 3.3 of the original TMDL (pg 37), the Stockade Lake largemouth bass concentration of 0.53 mg/Kg would be reduced to 0.24 mg/Kg. A 55.2% reduction applied to the rest of the fish tissue dataset for both Stockade and Sheridan would result in a fish flesh concentrations less than 0.24 mg/Kg. When this same principle is applied to the other three waterbodies fish flesh concentrations will be significantly lower than the 0.3 mg/Kg target and water quality criterion. This should provide an additional margin of safety.

Works Cited

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Davis, J. L., 2012, "Contribution of naturally reproduced rainbow trout tot he fishery in Deerfield Reservoir." M.S. Thesis, South Dakota State University, Brookings.

SD Game, Fish, and Parks, 2012, "South Dakota Statewide Fisheries Survey for Sheriff Dam, Jones County". 2102-F-21-R-45.

Table 1. Individual Fish Collected from Six Waterbodies to be added to the South Dakota Mercury TMDL in 2016 that exceed 0.3 mg/Kg.

Site	Species	Length (mm)	Sample Year	Mercury (mg/Kg)
Sheriff Dam	Black Crappie	249	2015	0.48
Sheriff Dam	Black Crappie	257	2015	0.43
Sheriff Dam	Black Crappie	244	2015	0.39
Sheriff Dam	Black Crappie	254	2015	0.34
Sheriff Dam	Black Crappie	257	2015	0.3
Sheridan Lake	Largemouth Bass	408	2012	0.47
Sheridan Lake	Largemouth Bass	386	2012	0.46
Sheridan Lake	Largemouth Bass	390	2012	0.41
Sheridan Lake	Largemouth Bass	403	2012	0.41
Sheridan Lake	Largemouth Bass	350	2012	0.38
Sheridan Lake	Yellow Perch	293	2012	0.38
Sheridan Lake	Largemouth Bass	371	2012	0.37
Sheridan Lake	Largemouth Bass	365	2012	0.33
Sheridan Lake	Largemouth Bass	380	2012	0.31
Sheridan Lake	Largemouth Bass	263	2003	0.3
Sheridan Lake	Largemouth Bass	268	2003	0.3
Sheridan Lake	Largemouth Bass	270	2003	0.3
Sheridan Lake	Largemouth Bass	278	2003	0.3
Sheridan Lake	Largemouth Bass	291	2003	0.3
Stockade Lake	Largemouth Bass	428	2015	0.53
Stockade Lake	Largemouth Bass	430	2015	0.53
Stockade Lake	Largemouth Bass	368	2015	0.45
Stockade Lake	Largemouth Bass	415	2015	0.37
Stockade Lake	Largemouth Bass	381	2015	0.31
Clubhouse Slough	Walleye	517	2015	0.38
Clubhouse Slough	Walleye	577	2015	0.36
Clubhouse Slough	Walleye	590	2015	0.34
Clubhouse Slough	Walleye	502	2015	0.33
Clubhouse Slough	Walleye	607	2015	0.33
Clubhouse Slough	Walleye	494	2015	0.32
Clubhouse Slough	Walleye	561	2015	0.32
James River	Channel Catfish	680	2013	1.13

Site	Species	Length (mm)	Sample Year	Mercury (ppm)
James River	Northern Pike	718	2013	0.99
James River	Northern Pike	645	2013	0.9
James River	Walleye	317	2013	0.89
James River	Walleye	490	2013	0.74
James River	Walleye	345	2013	0.7
James River	Northern Pike	625	2013	0.66
James River	Channel Catfish	465	2013	0.65
James River	Channel Catfish	516	2013	0.59
James River	Northern Pike	500	2013	0.58
James River	Northern Pike	715	2013	0.56
James River	Walleye	411	2013	0.55
James River	Walleye	415	2013	0.54
James River	Walleye	415	2013	0.52
James River	Northern Pike	486	2013	0.51
James River	Channel Catfish	555	2013	0.48
James River	Northern Pike	575	2013	0.45
James River	Walleye	410	2013	0.42
James River	Channel Catfish	475	2013	0.4
James River	Northern Pike	621	2013	0.37
James River	Channel Catfish	530	2013	0.35
James River	Walleye	385	2013	0.35
James River	Walleye	325	2013	0.34