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DEPT. OF NATURAL RESOURCES

Willow Creek Near Pierce, Nebraska
00232500

LOCATION

Latitude and Longitude

42.18047, -97.55484

Road Log

Pierce county, 2 miles SW of Pierce, Nebraska below Willow Creek Reservoir. From Pierce on 549 Ave 2-miles south, one-mile west on 851 Road, and about one-mile north on 548 Ave to reach the Willow Creek Reservoir Dam.

Nearby Features

Willow Creek Reservoir is just above the gage.

Equipment Details

Recording Gage

A Sutron SL3 encoder with a Dome antenna and an OTT radar unit; installed in a 5 feet x 7 feet x 8 feet metal corps type shelter set on a channel iron frame on upstream face near principal spillway on Willow Creek Dam.

Real-time data can be accessed through the internet https://nednr.nebraska.gov/RealTime

External Gage

Staff gage located on the left-wing wall of outlet pipe chute.

Benchmark and Reference Marks

Gage Datum (NAVD88) is 1,590.177.

BM #1(PID #ARZ211) (BM Willow) is a tablet benchmark located in abutment in the vicinity of north end of the dam. April 1, 2014 survey indicates that **BM #1** is at elevation 1647.46 feet MSL (NAVD88) or 57.28 feet gage height. Survey from September 19th, 2022 finds BM#1 at 57.28-feet gage height.

RM #1-A is the northeast bolt that holds the grate to the channel iron that forms a step into the gage house. The top of this bolt has 4 stamped dots that form a square. September 19th, 2022 survey indicates that **RM #1-A** is at 55.37 feet gage height.

RM #1-B is a steel plate encased in a concrete pad extending about 6 feet deep and is located about 225 feet NE of the north relief well outlet and about 80 feet' east of ***observation well P-14***. September 19th, 2022 survey indicates that **RM #1-B** is at 14.32 feet gage height.

RM #2 is a steel plate encased in a concrete pad extending about 6 feet deep. **RM #2** is located about 600 feet NE of the north relief well outlet and about 26 feet NW of property line fence corner post located north end of rock channel below the dam. June 24th, 2019 survey indicates that **RM #2** is at 29.91 feet gage height; ***not surveyed in 2022*.**

RM #3 (formerly RM #1) is a chiseled "x" on the north wing wall of concrete stilling basin chute about 21 feet west of staff gage. September 19th, 2022 survey indicates that **RM #3** is at 13.50 feet gage height.

RM #4 (formerly stated RP #2) is a chiseled "x" on the north wing wall of concrete stilling basin chute is about 1 foot from the mounted staff gage. September 19th, 2022 survey indicates that **RM #4** is at 13.54 feet gage height.

RM #5 (formerly stated RP #3) is a chiseled "x" on the south wind wall of the stilling basin on top level. September 19th, 2022 survey indicates that **RM #5** is at 13.53 feet gage height.

RP #4 is a chiseled "()" mark on the north wing wall of the stilling basin on top level. September 19th, 2022 survey indicates that **RP #4** is at 22.09 feet gage height.

CP-4 is a 2-foot rebar in dam centerline 27.7 feet east of southeast corner of gage house. Surveyed on May 23, 2012 at elevation 1647.48 feet and was ***not found for survey in 2019, or 2022*.**

BM #1 (PID #LB0018) (00232500) is at a 3-inch disk with punch mark, 21.9 feet northeast from gage house. September 19th, 2022 survey indicates that **BM #1** is 57.28 feet gage height.

Hydrology

Drainage Area

Twenty-one (21) square miles.

Channel and Control

The control for the gage is the Willow Creek Channel immediately below Willow Creek Dam. This channel is rock lined for about ¼ mile in length immediately below Willow Creek Dam. The rock lining should inhibit scouring of channel. It has been noted that the channel may be partially blocked by fisherman building a rock walkway in channel immediately below plunge pool. Also, Russian thistle (tumbleweeds) blowing into channel during the winter can cause further backwater conditions.

Discharge Measurements

Some low flow measurements are made by wading stream on rock riffle at end of rock lined plunge pool below gage. The cross section is very uneven due to all the rock in the channel. An alternate measuring section is in the vicinity of the first county road 549 Ave Bridge approximately half a mile downstream from the dam. This stream section here is uniform, with a sandy stable bottom which usually affords excellent measuring conditions. High water measurements are now made at the same county roadway 549 Ave bridge. An irrigation diversion for a center pivot (650 GPM) is located between the measuring point

and the gage location so an addition for this pump diversion is necessary if pivot is observed in operation. A dual measuring analysis was conducted in the late 1980's. This analysis did verify that stream gains or losses were miniscule between the gage site and the alternative measuring site. Thus, there are no adjustments made for this condition, however, if the center pivot is running and the stream flow measurement is made downstream from this pump diversion, 1.33 CFS must be added to the measurement. Some low water measurements are conducted in the vicinity in rock lined channel which has a potential for a greater margin of error in measuring.

The channel at the county roadway 549 Ave bridge (alternative measuring site) averages about 20 feet. The streambed consists of fine sand that shifts readily with stage. The banks are about 4 foot above the low water channel and are covered with grass and a few trees. This locality is superior for measuring purposes because of accessibility, channel stability and access from high water measuring. Measuring in late summer can be difficult in all reaches of Willow Creek due to water plant growth.

Floods

Flood flows are moderately regulated by detention storage in Willow Creek Reservoir upstream. Maximum discharge for a period of record at 1540 cfs occurred on March 15th, 2019 at a gage height of 11.09 feet. The second maximum discharge for a period of record was 700 cfs occurred on June 14, 2010, at 2115 hours at a gage height of 8.08 feet.

Point of Zero Flow

Point of Zero Flow for this site is difficult due to various sized rock in Plunge Pool and outlet channel. PZF is recorder at Wade site location just east of 549th Ave.

No PZF was recorded for WY2022, or WY2023.

Winter Flow

There is very minimal freezing on the channel for several miles below the dam in winter due to groundwater relief well input from the reservoir.

Regulation and Diversions

There are minor diversions for irrigation from Willow Creek above the reservoir during the summer period. Groundwater withdrawals for irrigation may cause further depletions in reservoir inflow. Reservoir outflow may be further depleted from reservoir evaporation and other reservoir losses. The relief well system will show dramatic depletion of flow if well irrigation is intense for a month or so.

Accuracy

Records are good except for period of estimated record, which is poor.

Establishment and History

Established by an agreement between State of Nebraska, Department of Natural Resources and the Lower Elkhorn Natural Resources District dated December 14, 1983. The purpose

of the gage is to provide hydrologic and hydraulic data pertaining to Willow Creek Dam and Reservoir for monitoring the performance of this state and local funded project. Willow Creek Dam and Reservoir was:

Started construction during the Spring of 1982

Dam closure on September 20, 1982

Reservoir fully filled and passing water by March 23, 1984

A Stevens A-71 water stage recorder activated by servo-manometer with gas purge system was placed in operation on January 10, 1984. Equipment installed in a 5 feet x 7 feet x 8 feet metal corps type shelter set on a channel iron frame on upstream face near principal spillway on Willow Creek Dam. Manometer is connected to an open orifice located on left wing wall of concrete chute. The staff gage is considered the base gage. It is composed of an enameled gage plate that is fastened to the left wing wall of the concrete chute below Willow Creek Dam on January 10, 1984.

On November 6, 2002, Stevens A-71 and Servo-Manometer were removed and replaced with XL-500 Design Analysis electronic recorder. Data can be retrieved by a data cards. The Lower Elkhorn NRD (LENRD) owns XL-500 recorder.

On April 4, 2006, a satellite uplink DCP was installed to provide realtime data on the department's secure website. The pressure sensor consists of an H-350 Lite (LENRD owned).

On March 8, 2017 an H-3553 was installed to replace the nitrogen tank system. The satellite uplink consists of an H-222 with Yagi Antenna with GPS. All data is now retrieved through satellite DCP uplink to the department's webpage. Real-time data can be accessed through the internet at https://nednr.nebraska.gov/RealTime

On September 29, 2021 a Sutron SL3 and a Sutron Dome Antenna were installed (**but not operational**).

November 23rd, 2021: OTT radar installed. A Sutron SL3 system transmits for the reservoir and creek. Radar reads for the creek.

Revision History

Original description by: William H. Birkel September 21, 1988

Revised February 23, 1989 by Wm. H. Birkel

Revised March 7, 1990 by Wm. H. Birkel

Revised July 15, 1993 by Wm. H. Birkel

Revised March 11, 1994 by Wm. H. Birkel

Revised September 12, 1996 by Wm. H. Birkel

Revised February 15, 2000 by Wm. H. Birkel

Revised February 26, 2003 by Wm. H. Birkel

Revised March 24, 2004 by Wm. H. Birkel

Revised July 6, 2005 by Wm. H. Birkel

Revised August 8, 2007 by Wm. H. Birkel

Revised June 21, 2008 by Wm. H. Birkel

Revised April 2, 2009 by Wm. H. Birkel

Revised May 13, 2010 by Wm. H. Birkel

Revised March 22, 2011 by Kenneth M. Meikle

Revised July 16, 2012 by Wm. H. Birkel

Revised December 19, 2013 by Wm. H. Birkel

Revised January 21, 2014 by Wm. H. Birkel

Revised January 26, 2016 by Wm. H. Birkel

Revised July 6, 2016 by Wm. H. Birkel

Revised January 18, 2016 by M. Wieseler

Revised December 5, 2017 by M. Wieseler

Revised November 20, 2018 by Grant Beckman

Revised October 14, 2019 by A. Houser

Revised September 30, 2021 by A. Houser

Revised October 31, 2022 by A. Houser

Revised October 3, 2023 by A. Houser