



Water Quality Impacts in the Animas and San Juan River Basins

Research Bulletin S&T Project 1790

While historical water quality data for this watershed is available, more data was needed to determine how monsoon events affect the influent water quality to the SJL WTP. Turbidity may be used to predict several total metals concentrations and suspended sediment concentration when the turbidimeter is recording values lower than its maximum recording limit.

Mission Issue

Results from this study will be used to design the Navajo-Gallup Water Supply Project San Juan Lateral Water Treatment Plant's intake settling basin to mitigate high suspended sediment concentrations and metals concentrations from monsoon events.

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Problem

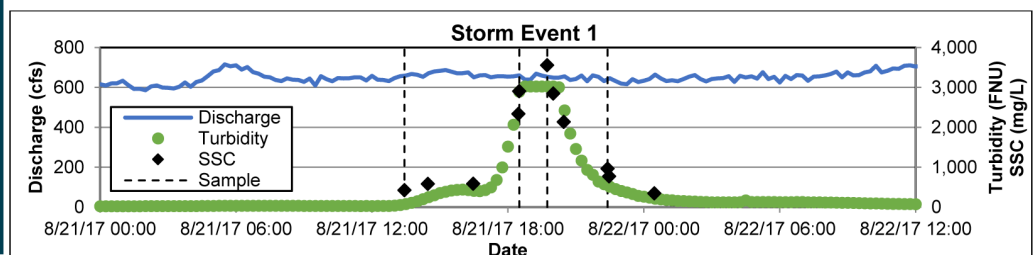
The Navajo-Gallup Water Supply Project will convey water from the San Juan River to the eastern section of the Navajo Nation, the southwestern portion of the Jicarilla Apache Nation, and the City of Gallup, New Mexico. The design and construction of the San Juan Lateral (SJL) water treatment plant (WTP) is part of this project. The SJL WTP will treat water from the San Juan River to meet Safe Drinking Water Act (SDWA) requirements. Chemical dosing and filter run times are examples of water treatment operational parameters that are dependent on the influent water quality.

The specific objectives of this study were to:

1. Identify the duration and magnitude of water quality fluctuations in the San Juan River based on the data collected and analyzed.
2. Determine if there is a relationship between flow, turbidity, and suspended sediment concentrations (SSC) in the San Juan River near the proposed WTP intake location (Hogback Diversion).
3. Assess if/how online turbidity or suspended sediment measurements can be used to inform WTP intake operations.
4. Determine whether suspended sediment or metals concentration is the primary water quality parameter that would dictate temporarily suspending river water intake to the WTP.

Solution

This project measured water quality from four storm events: three in 2017 and one in 2018. Turbidity, discharge flow rate, and SSC were measured throughout the storms. Other water quality parameters, including total and dissolved metals, were measured several times during each storm. The parameters that exceeded SDWA limitations during the storm events include total aluminum, total antimony, total arsenic, total barium, total beryllium, total iron, total lead, total manganese, total dissolved solids, and sulfate. The duration of the water quality impacts to the river from the storms ranged from approximately 12 hours (Storm Event 1) to 4 days (Storm Event 3); however, based on the level of suspended sediment and metals, water intake may not need to be suspended for the entire storm event.



More Information

<https://www.usbr.gov/research/projects/detail.cfm?id=1790>

Application and Results

No correlation was observed between discharge flow rate and turbidity or SSC in the San Juan River near the Hogback Diversion, based on data from the four storms studied. This may be a characteristic of the San Juan River because there are many ephemeral streams in its watershed that could increase solids without increasing river flow. We believe that the turbidimeter falsely recorded low values during Storm Event 3 because the high SSC interfered with its measurement process. When Storm Event 3 data were excluded, the relationship between turbidity and SSC was strong. Strong correlations also occurred with turbidity and many total metals. There is potential to use turbidity to predict SSC and several total metals if the turbidity is not near the maximum recording limit of the turbidimeter.

The suspended sediment from all four storms had similar metals content. SSC displayed linear relationships with many of the total metals, even when Storm Event 3 data was included. This information could be useful for plant operators, who could use these linear relationships to calculate total metals exceedances based on the influent SSC.

Future Plans

The SJL WTP intake will first feed into presedimentation basins designed to settle much of the suspended sediment in the influent water before the water enters the rest of the WTP processes. The tentative target intake shutdown SSC is 12,000 mg/L based on preliminary Reclamation SJL WTP 30% design assumptions. Only three samples taken during this study were above this limit, and they were all during Storm Event 3. Intake design engineers should consider the implications of potential metals concentrations when they finalize intake shutdown limits based on SSC. At 12,000 mg/L, water will be allowed into the intake that may have elevated total/dissolved metals concentrations. Dissolved metals would likely pass through the pretreatment sedimentation basins; therefore, it may be necessary to conduct further research to discover why dissolved metals did not correlate to total metals and to determine if there is a way to predict high dissolved metals concentrations.

