Assessing Future Conditions and Related Infrastructure Needs - City of Blair Water Supply Resiliency Project

Source: NRC Water Sustainability Fund

Contact:

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Key Message: To build long-term resilience, pull in the right experts to identify solutions that work at a watershed level.

Overview

The city of Blair provides drinking water and wastewater services to residential, industrial and commercial customers. It owns and operates the entire municipal water system, including a water treatment plant that draws from the Missouri River. It can provide 20 million gallons per day (MGD). The city of Blair has a connection with Omaha through a rural system that can provide up to 1 MGD in an emergency.

Problem

The city is concerned about both flooding and drought, due to changing climate conditions. In particular, it is concerned about the resiliency of its water system during extreme events.

Flooding: Extreme flood events in 2011 and 2019 caused significant damage to the utility and surrounding areas. Flood mitigation measures have been applied, but drought is now a threat of critical concern.

Drought: The U.S. Army Corps of Engineers (USACE) has notified water users on this portion of the Missouri River to prepare for a future drought scenario. It would involve releases of 9,000 cubic feet per second (cfs) from the upstream dam. In that situation, Blair could no longer meet its demand for water production.

> *Supporting details*: A river flow of 13,000 cfs is the typical annual low flow in this portion of the river. A flow of 12,000 cfs is the minimum level Blair's water intakes. If flow falls below 12,000 cfs, the city will no longer meet its normal demand for water.

In 2012, the USACE informed Missouri River water users downstream of Gavin's Point Dam that flows in the Missouri River may be significantly reduced due to drought conditions in the future. The USACE told the city of Blair to prepare for a future where water could be released from Gavins Point at a rate of only 9,000 cubic feet per second (cfs).

Currently, the city supplies 1-4 MGD to its 8,000 residential and rural customers, 10-15 MGD to the Cargill biocampus (a large industrial user and regional employer), and about 2 MGD to other commercial and industrial customers. Through its interconnection with Omaha's Metropolitan Utilities District, the city can draw 1 MGD in case of emergency.

The emergency supply could provide some of the water necessary to sustain residents, but it is ten times less than what the city needs for its industrial and commercial users. Cutting the water supply to the Cargill biocampus would significant affect to the area's economy. Cargill and the consortium of biocampus companies are the largest employer in the area. Conservation by residents would only go so far, since the industrial demand is so much higher. Cargill's monthly water bill is over $500,000, and they already employ water conservation measures to mitigate for this expense.

Solution
The city has been working to address this issue with their water supply. It considered numerous adaptive measures, including installing intake pumps that can be raised and lowered, deploying pumps on barges, and installing wellfields or collector wells that draw from the alluvial aquifer. The cost effectiveness and permitting requirements for each option varies.

(*Note: the following information was pulled the EPA case study listed in the References below)*
To better understand their vulnerability, the city of Blair assessed potential climate change impacts using the U.S. Environmental Protection Agency's (EPA) Climate Resilience Evaluation and Awareness Tool (CREAT). For this assessment, individuals from the city of Blair joined EPA staff to think critically about potential climate impacts, prioritize assets and consider adaptation options. During the CREAT exercise, the city considered three adaptive measures to reduce the consequences of the drought threat.

Table of CREAT Outcomes:

ADAPTIVE MEASURE	DESCRIPTION
Install external pumps	Pumps that could be raised or lowered in the river to continue supplying 20 MGD
Construct new lower intake	A lower intake could pull water from lower in the river and continue to supply 20 MGD
Construct barge intake	Would allow the utility to continue to supply 20 MGD; however, it could be struck by river debris during flooding, it would need to be stored when not in use, and has significant permitting requirements

The alternative with the lowest cost, considering the permitting and operational requirements, is to build a lower intake:

- It provides a redundant water supply that allows for maintenance of the existing intake.
- It provides for future expansion to 20 MGD.
- It costs more than either rail-mounted or barge-mounted supplemental pumps but does not have the operational issues or interruptions in service.
- It uses existing electrical building for control components and pumps.
- It will not require changes to the WTP, because the water chemistry is the same.

This project will allow the city to address future drought conditions. The proposed design for the lower intake would allow Blair to draw water from the Missouri River even during a severe drought.

Additional Project Details:

- This project will address two specific plans. The first is the Papio Missouri River Natural Resources District's (NRD) Integrated Management Plan or IMP. The IMP was jointly developed by the Nebraska Department of Natural Resources (NDNR) and the NRD and adopted on August 31, 2014. The project will also support the goals and objectives of the Papio Missouri River NRD's revised Groundwater Management Plan (GMP), adopted in 2016.
    - This project helps meet the IMPs first goal and objectives by allowing the city to use the Missouri River as its primary source of water, instead of wells that would increase pressure on the groundwater resources. To supply 20 MGD from the local groundwater aquifer would require installing 44 wells across an extensive wellfield. That would significantly reduce the capacity of

future groundwater development in the area. Over 250 wells are currently registered with NDNR within a 3-mile radius of Blair.

- By constructing this new lower intake structure, existing groundwater uses are protected from impacts of a new wellfield. This project shows how a community can help the NRD meet its GMP water sustainability goal. By using the Missouri River as its source of water, it is managing surface and groundwater resources to protect the ability of future generations to meet their water needs. Furthermore, it allows the USACE to continue to regulate flow in the Missouri to promote a healthy watershed. The USACE needs this flexibility to manage flows in the Missouri River to ensure that the needs of all water users are met sustainably.

Timing: 2018-2020

- Preliminary design for the intake was started in 2018 and completed at the end of 2019. Final design completed at the end of 2020. This phase of the work provided the city with working drawings for construction and permitting.
- The city met with USACE - Omaha, Nebraska Game and Parks, Federal Fish and Wildlife, and the Coast Guard in 2019 to review the permit requirements for the project. In May 2021, the city recommended approval to the Nebraska Department of Environment and Energy to award a contract for a new water intake structure.

Partners Involved:

- City of Blair
- US Army Corps of Engineers (USACE)
- Omaha's Metropolitan Utilities District (MUD)
- Nebraska Department of Environment and Energy (NEDEE)

Funding Sources: Total Cost $15 million; funding has been secured

- Nebraska Natural Resources Commission / Nebraska Water Sustainability Fund Program ($6 million)
- The remaining balance of $5.8 million will be paid through the state revolving loan fund with 15% forgiveness and 0% interest for 30 years; to be paid by the city of Blair

Photos:

Figure 2 The Blair's water intake pump house on the Missouri River looking downstream toward the Mormon Bridge.

Figure 3 The Blair's water intake pump house on the Missouri River looking upstream.

Caption: The Blair water pump house on the Missouri River next to Mormon Bridge. (Source: Nebraska Natural Resources Commission, 2019)

References:

- City of Blair Water Supply Resiliency Project application to Water Sustainability Fund

- EPA case study: Water and Wastewater Utilities Planning for Climate Change
- Pilot Tribune and Enterprise article May 18, 2021
- City of Blair Grant Acceptance Letter