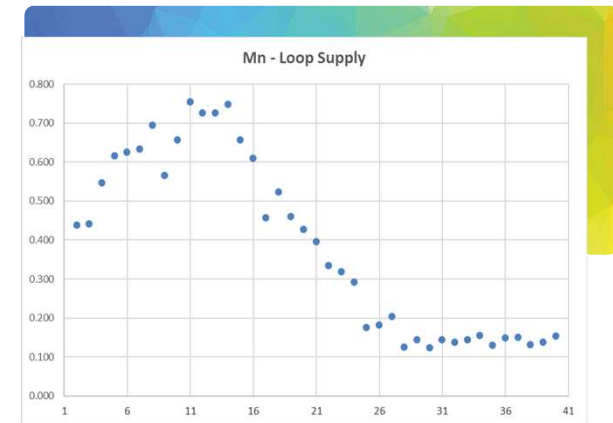




Kotzebue Water Treatment Plant Action Plan

Executive Summary

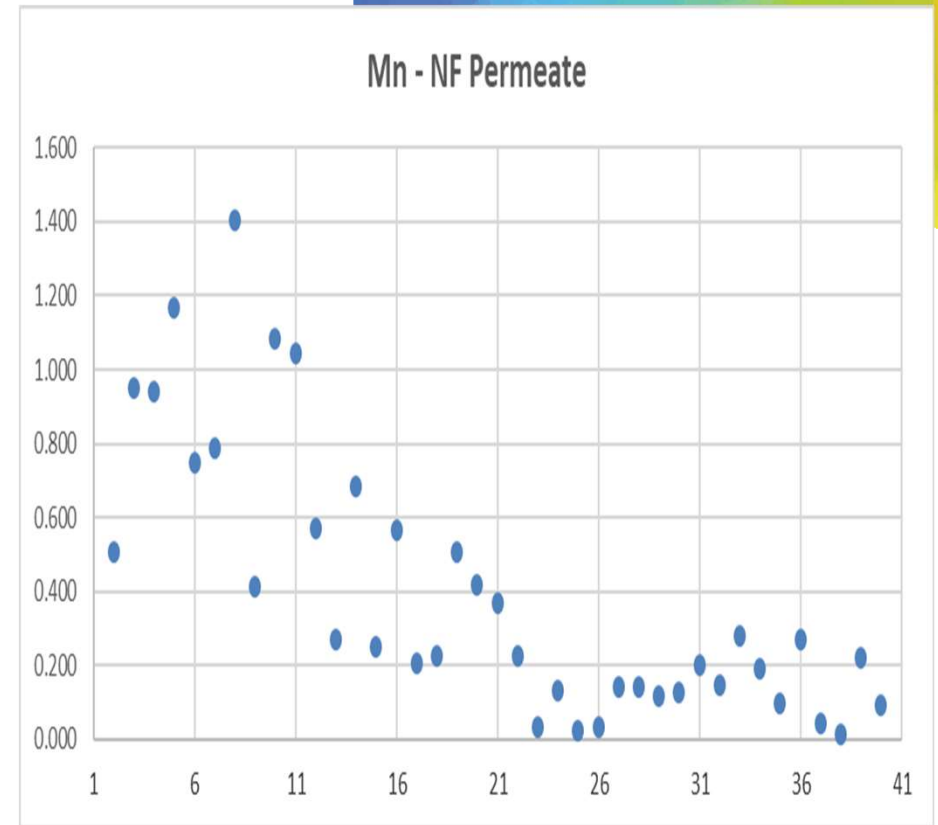
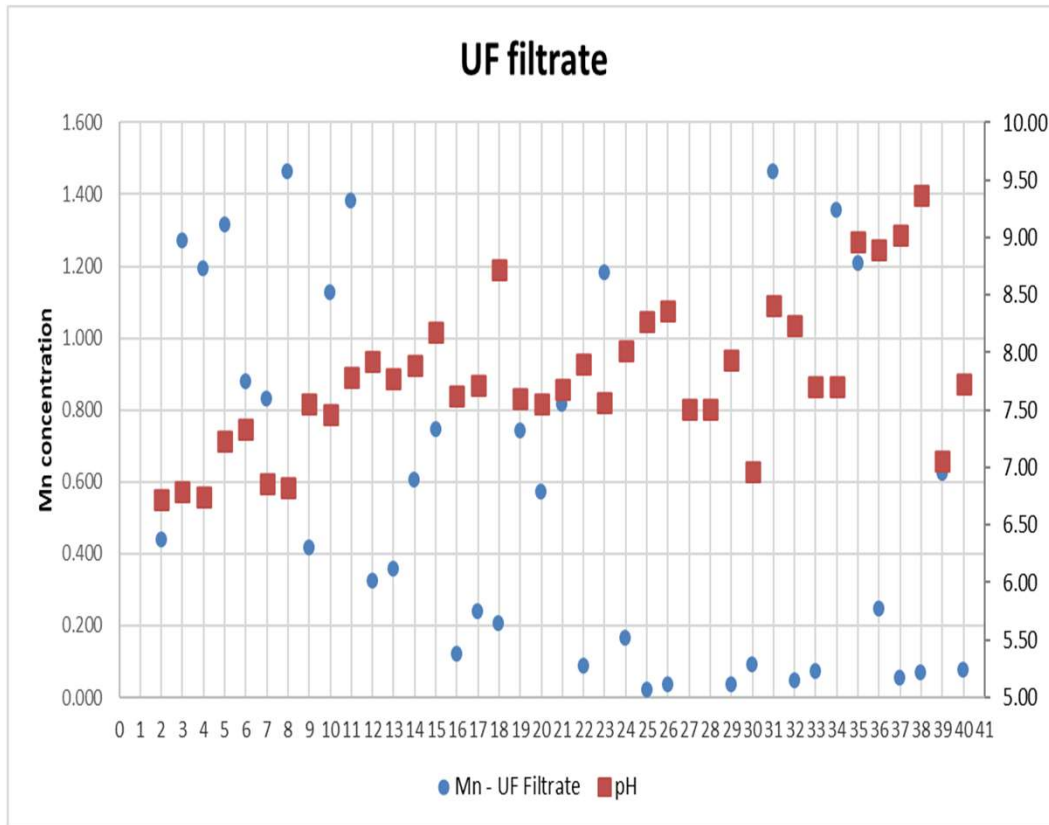
- Water Quality from the Plant is improving due to the increase in pH of 8.0 to 8.5 coupled with the permanganate injection at Devils Lake .
- Short Term Plant Modifications are needed to provide consistent flow and chemical feed.
- Two longer-term improvements are being analyzed:
 - Addition of a Clarifier, DAF, Greensand Filter or High-rate Clarifier prior to the UF System.
 - Addition of a Greensand Filter downstream of the NF system to capture any Manganese that passes thru the NF system.
- These longer-term improvements need to be further analyzed for capital costs, operating costs, funding potential and effectiveness.
- Team needs to analyze which proposed action meet the Raw Water quality experienced in Winter & Spring of 2024
- A revised Action Plan is provided at the end of the presentation



	Mar-19	Mar-24	Increase	
			Factor	%
Temp	37.1	35.7	1.0	-4%
pH	6.85	6.84	1.0	0%
Color	78	243	3.1	210%
Turbidity	4.83	7.36	1.5	53%
Mn	0.34	0.82	2.4	137%
Fe	1.28	6.05	4.7	373%
TOC	15.0	24.1	1.6	61%

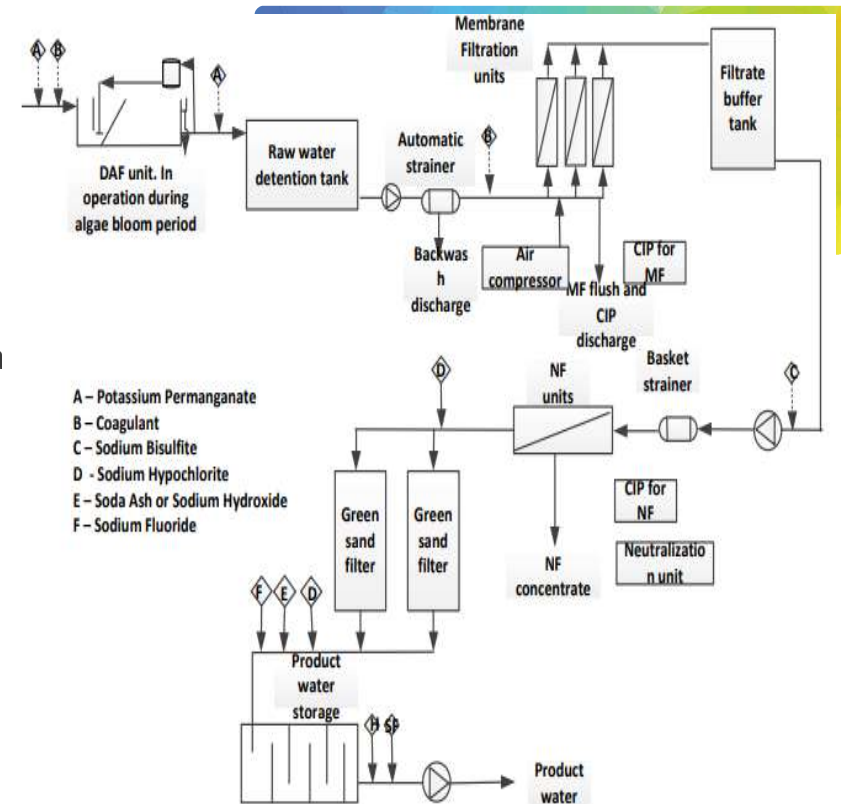
Current Positive Results from the Plant

- Recent changes to raise the pH have shown positive results.



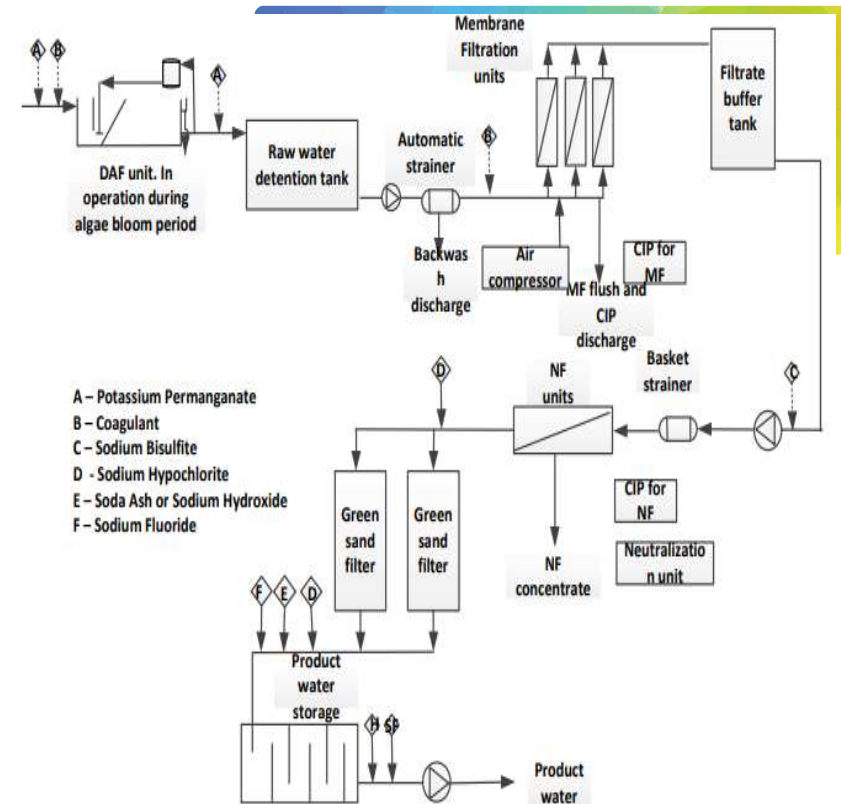
Short-Term Action Items

- Continue to maintain pH at 8.0 to 8.5 prior to the UF by:
 - Add pH sensor after the NaOH and before the UF system. Use a cartridge filter or strainer before the sensor to prevent clogging. Program using a compound loop with raw water flow as the primary with a pH trim.
 - Add pH sensor after the UF to confirm pH and provide warning and shutdown alarms.
 - Consider adding additional contact tanks before the UF System (if available).
- Optimize the UF and NF Operations by:
 - Work with Delco and the programmer to be able to maintain a constant raw water flow into the UF system
 - Work with Delco and the programmer to operate the UF system with all three trains operating during normal flows and two trains during a backwash on one train. This will help to balance the flows to the UF.
- Membrane Evaluation
 - Determine if UF & NF membranes can meet the flow requirements with Winter/Spring 2023 water quality.
 - Evaluate if additional UF membranes should be added on the three trains where there is space set aside already.
 - Evaluate if any NF membranes need to be replaced.

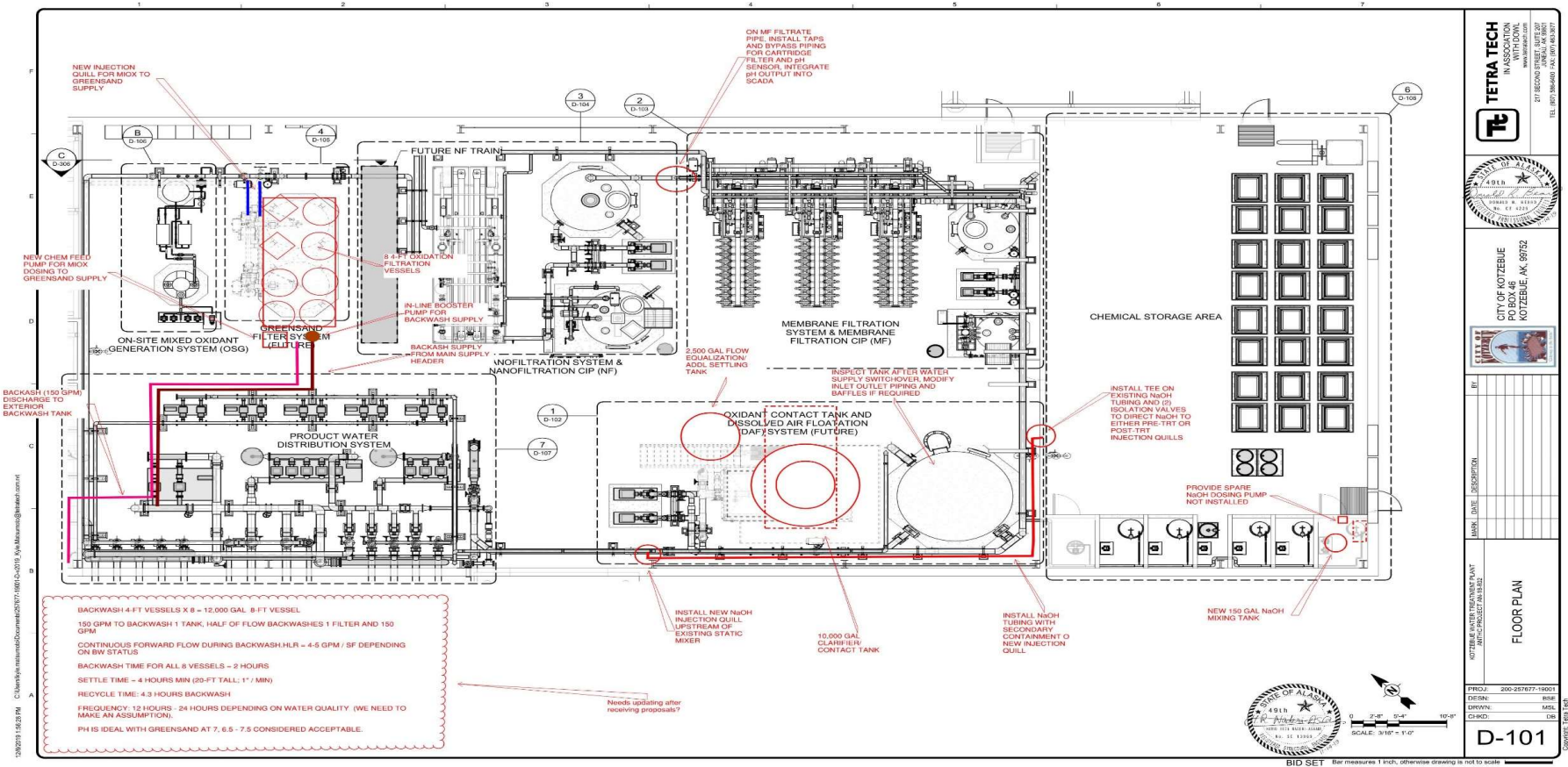


Long Term Action Items

- Additional Bench and/or Pilot Testing:
 - Perform bench scale testing in July 2024
 - Consider Pilot Testing Greensand Filters and Clarifiers?
- Evaluate Options for Improvements Upstream of UF:
 - Greensand Filters
 - DAF
 - Solid Contact Clarifier
 - High-Rate Clarifier
 - Evaluate each option based on Capital Cost, Operating Cost, Funding potential and effectiveness at treating Raw Water Similar to Winter/Spring 2024
- Addition of Greensand Filters After the NF System
- Membrane Replacement :
 - Order UF membranes to be installed in the open spaces in the racks
 - Order up to 40% of NF membranes to be replaced if required.



Draft Layout of Potential Improvements



TETRA TECH
 IN ASSOCIATION WITH
 WATSON & TAYLOR
 217 SECOND STREET, SUITE 201
 KOTZEBUE, AK 99732
 TEL: 807.346.6666 FAX: 807.462.8077

CITY OF KOTZEBUE
 PO BOX 46
 KOTZEBUE, AK 99732

FLOOR PLAN

D-101

PROJ: 200-257677-18001
 DESG: RSE
 ENGRV: JSL
 CHKCD: DB

DATE: 01/20/2020

SCALE: 3/16" = 1'-0"

BID SET Bar measures 1 inch, otherwise drawing is not to scale