Texas Water 2017

A Tale of Two Waters – Remove Radionuclides, Desalinate or Both?

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Acknowledgements

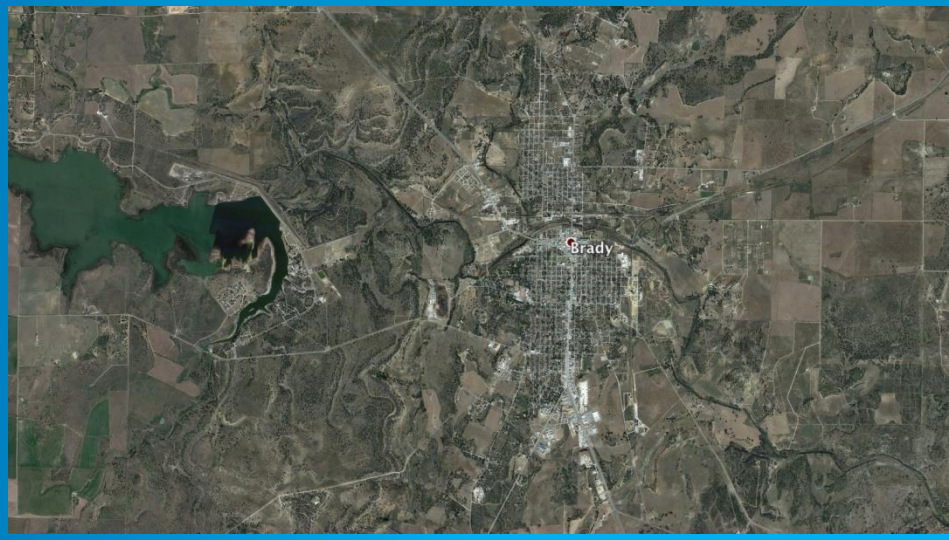
- City of Brady
- City of San Angelo - Assistance with Data
- Environmental Protection Agency (EPA) – Coordination for Approval
- Texas Commission on Environmental Quality (TCEQ) – Coordination for Approval
- Texas Water Development Board (TWDB) – Coordination for Funding
- HDR Engineering – Assistance with Initial Distribution Modeling

Topics

- Background
- Current Challenges or “Opportunities”
- Still Need to Correct the Opportunities!
- Project Alternatives
- Groundwater Treatment Options
- Surface Water Treatment Options
- Distribution Alternatives
- Recommended Project
- Piloting and Regulatory Approval
- Costs and Funding
- Current Project Status
- Path Forward
- Conclusions
- Q&A

Background

- Brady was first incorporated in 1906 and is home to 5,500 residents
- Home of Curtis Field Airport, which was used for pilot training in WW II
- A German POW camp was located here during WW II, which mainly held prisoner's from Rommel's Afrika Corps
- Home of one of the first horse racetracks in Texas
- Home of the World Championship Barbecue Goat Cook-Off (Labor Day Weekend)

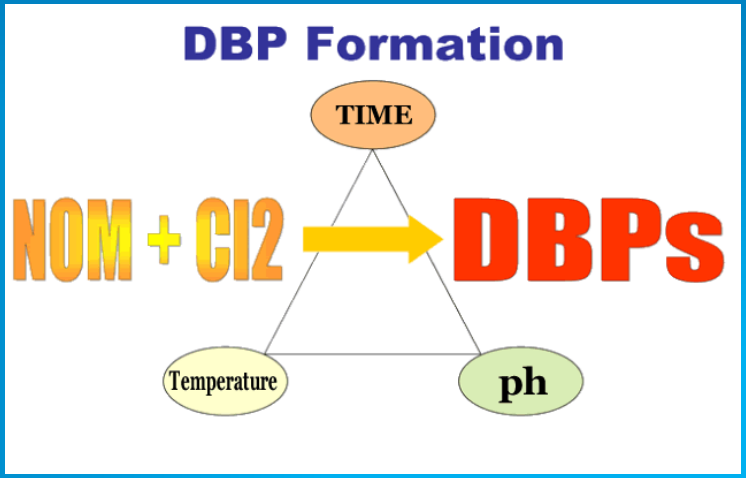


Current Challenges or "Opportunities"

- Primary Water Source is Groundwater
  - Opportunities
    - Combined Radium - 12-40 pCi/L
    - Gross Alpha Particles - 20-40 pCi/L
    - Iron - 0.5-1.5 mg/L
    - Manganese – 0.1-0.5 mg/L

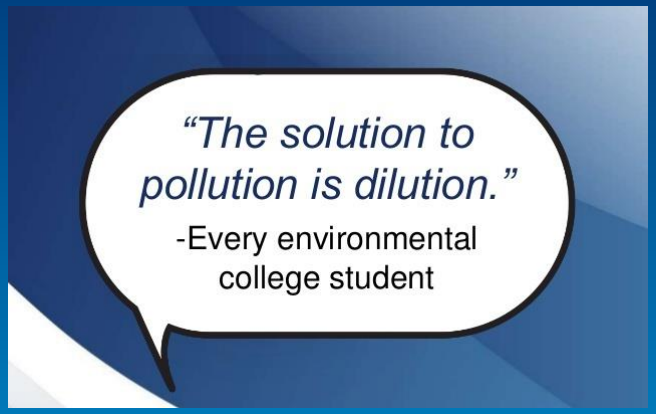
Contaminant	MCL
Combined radium-226 and radium-228	5 pCi/l (0.185 Bq/l)
Gross alpha (excluding Rn and U but including Ra-226)	15 pCi/l (0.555 Bq/l)
Beta particle and photon radioactivity	4 mrem/year (0.04 mSv/year)
Uranium	30 µg/l

- Secondary Water Source is Surface Water
  - More Opportunities
    - Alkalinity - 120-160 mg/L
    - TDS - 1,000-1,500 mg/L
    - TOC - 10-14 mg/L
    - Arsenic – 0.008-0.009 mg/L



Current Challenges or "Opportunities"

- 2009 – Completion of an MF and RO desalination facility to treat the City's surface water and use it to blend down the radionuclide concentrations in the City's groundwater

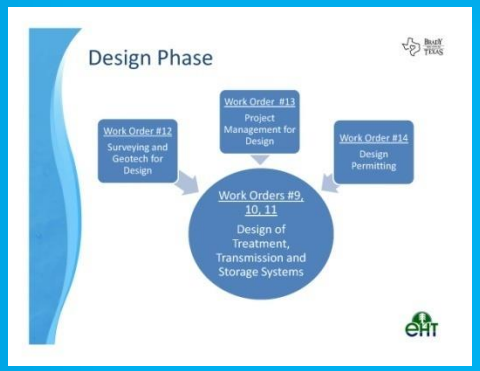


- **THAT PROJECT WAS NOT SUCCESSFUL**
  - 2 years of violations for noncompliant DBP levels AND noncompliant radionuclide levels
  - The City all but decommissioned its surface water treatment plant

- **So Now What Do We Do?**

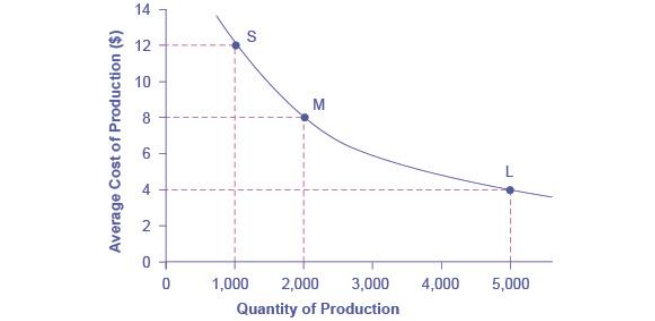
Still Need to Correct the Opportunities!

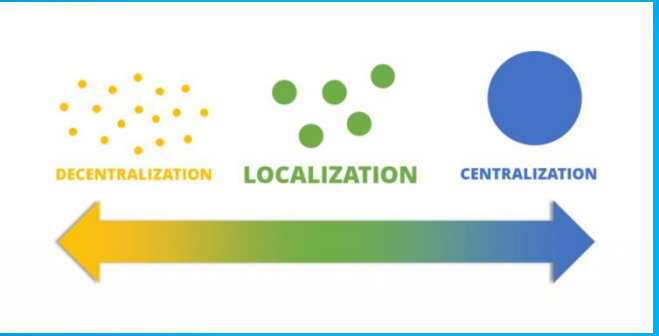
- Summer 2014
  - The City's Project Team began planning efforts including:
    - Identify treatment concepts for reduction of radionuclides
    - Identify improvements to the surface water treatment system to improve treatment performance efficiency and reliability
    - Identify options to improve minimum water system pressures throughout the City
    - Improve performance of the City's multiple existing well sites
- Planning was completed in Spring 2015
- Design began in Winter 2015 following obtaining of 100% loan forgiveness eligibility for design funding



Project Alternatives

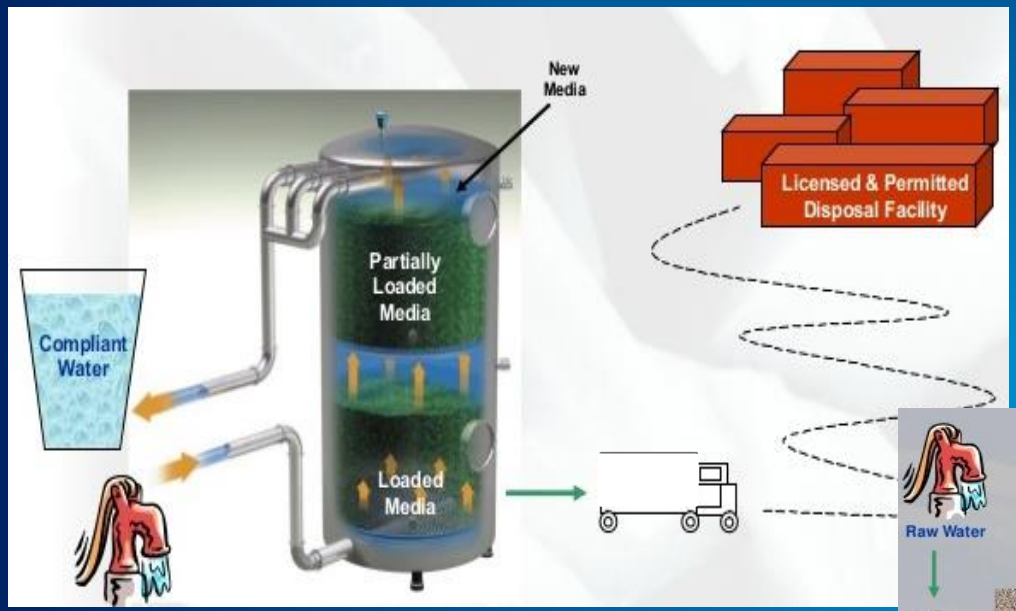
- Treat only Groundwater?
  - Treat at each well site or consolidate treatment?
- Treat only Surface Water?
  - Sustainability, flexibility, opportunities to utilize groundwater supply?
- Treat both Groundwater and Surface Water?
  - Consolidate groundwater treatment or treat at each well site and blend with treated surface water?

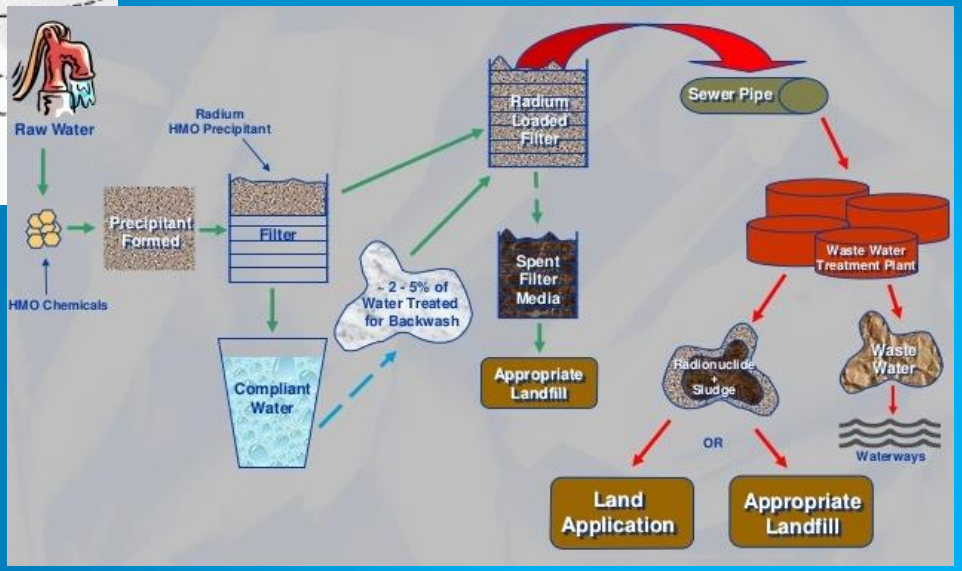




Groundwater Treatment Options

- Two Primary Radionuclide Reduction Technologies in Use in Texas
  - Non-Regenerable Ion Exchange (IX)
  - Hydrous Manganese Oxide (HMO)



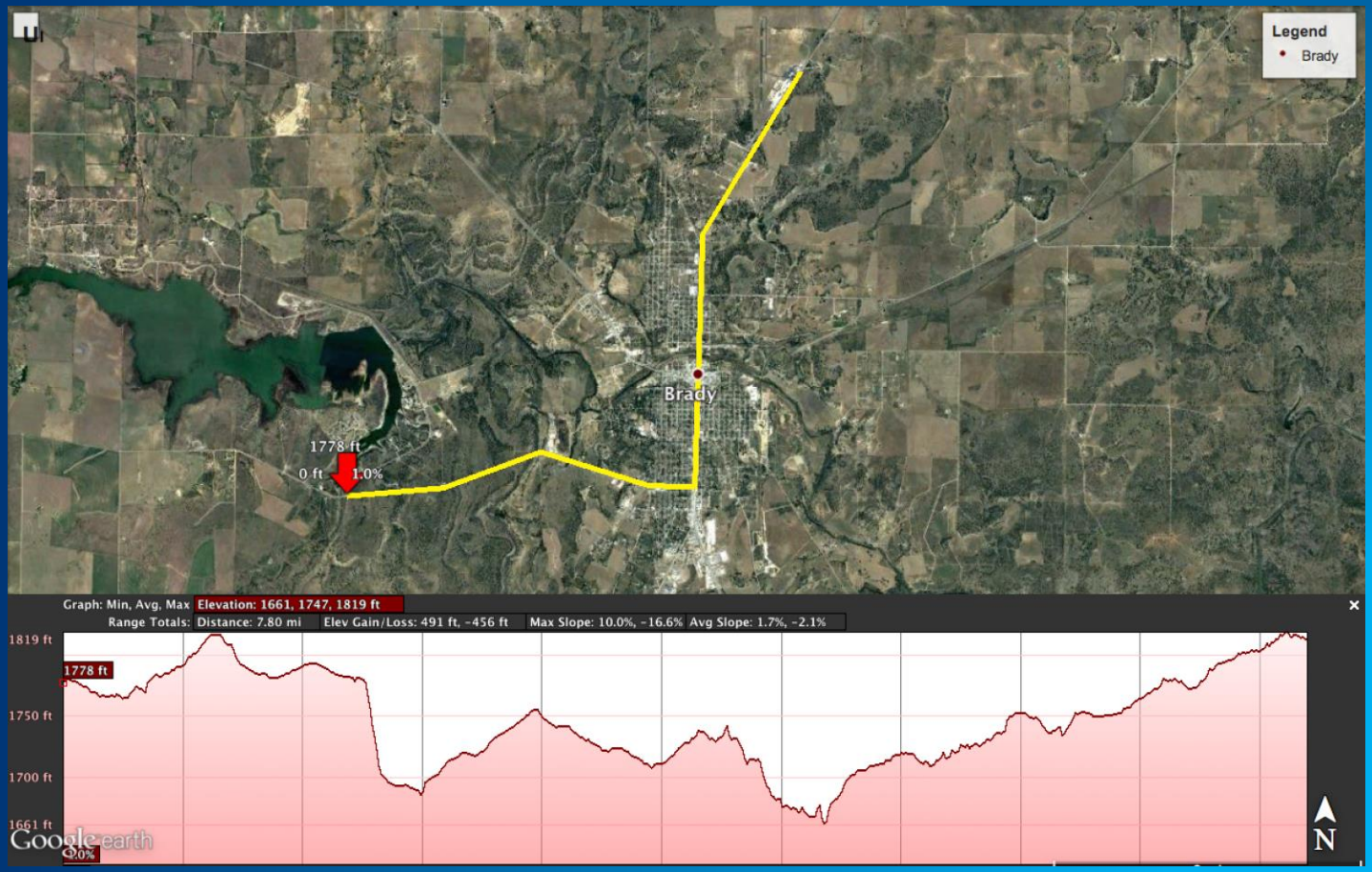


Surface Water Treatment Options

- Where to Start?
  - Do You Use the Surface WTP at all?
    - Ongoing investment, diversification of water supplies
  - Operate the WTP and Utilize an Alternate Disinfectant?
    - Nitrification concerns, chlorite concerns, safety concerns with ozone use
  - Operate the WTP and Strip DBPs Post-Treatment?
    - Can we remove enough formed DBPs?
  - Operate the WTP and Remove DBP Formation Potential Prior to Disinfection?
    - Corrosivity concerns over just RO permeate, high life cycle costs with GAC
  - Operate the WTP and Remove DBP Formation Potential Prior to Treatment?
    - TOC of 12+ mg/L and alkalinity of 140+ mg/L means only about 30% TOC reduction…not enough…

Distribution Alternatives

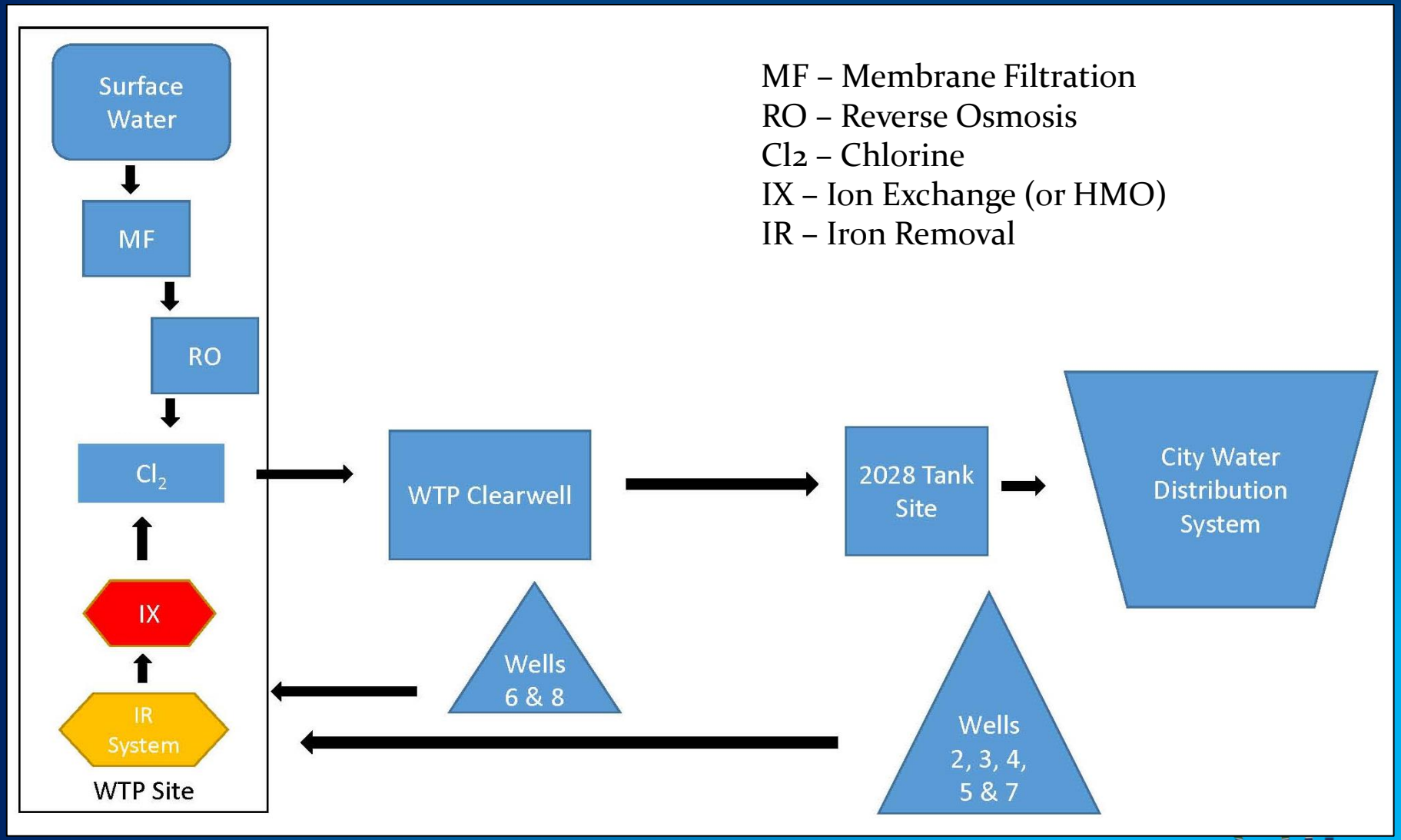
- The City's existing distribution system consists of a single pressure plane with excessive pressures in the center of the City (90-120 psi) and low pressures around the periphery of the City (30-50 psi)



Distribution Alternatives

- Two major alternatives were identified:
  - Option 1 – Split existing single pressure plane into multiple pressure planes through valve isolation and creation of new elevated storage for each pressure plane
    - High capital cost
    - Improved pressure balancing throughout City
  - Option 2 – Maintain existing single pressure plane and install additional hydropneumatic pressure systems throughout City
    - Low capital cost
    - Continuing to deal with the same pressure issues over time

Recommended Project



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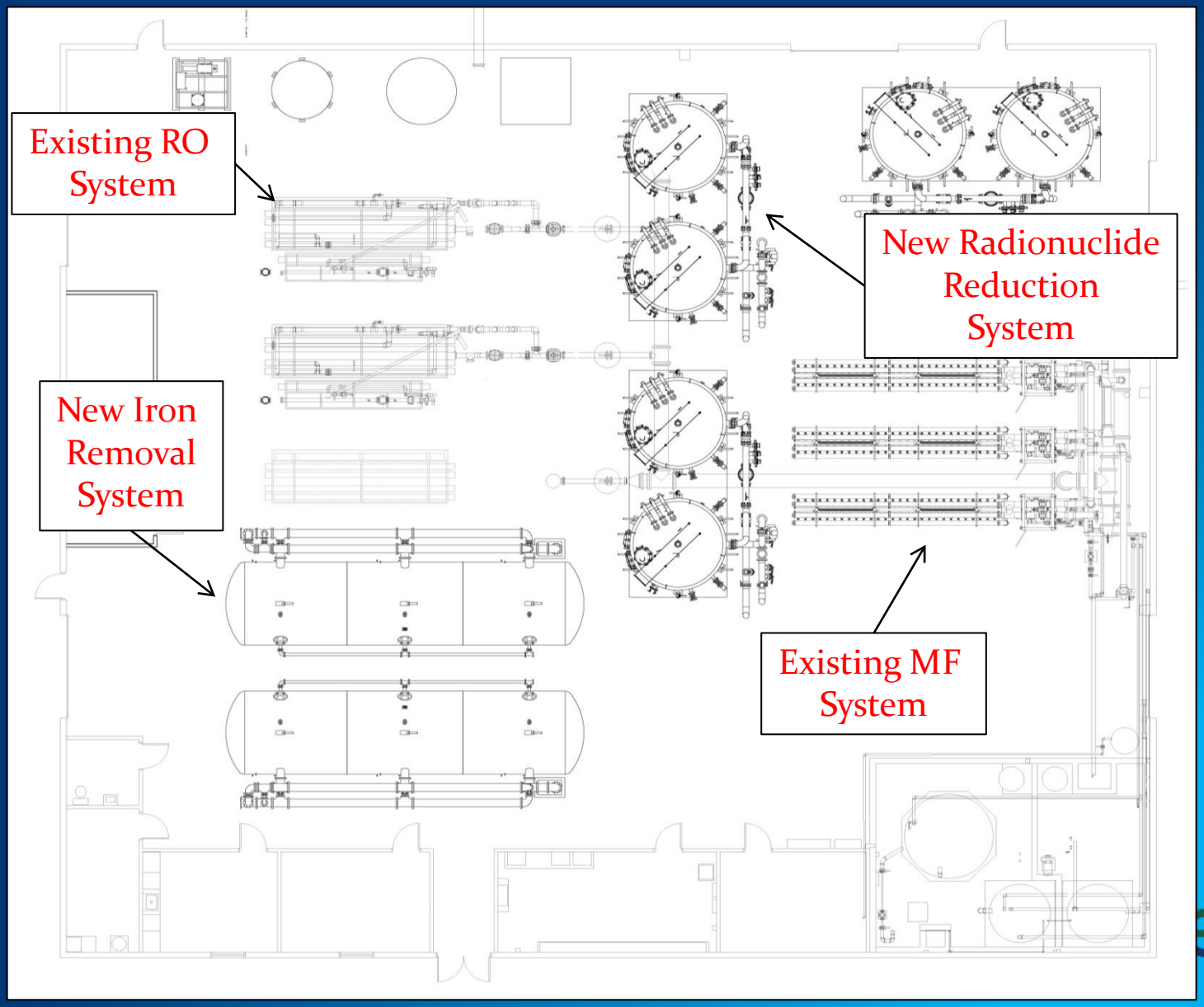

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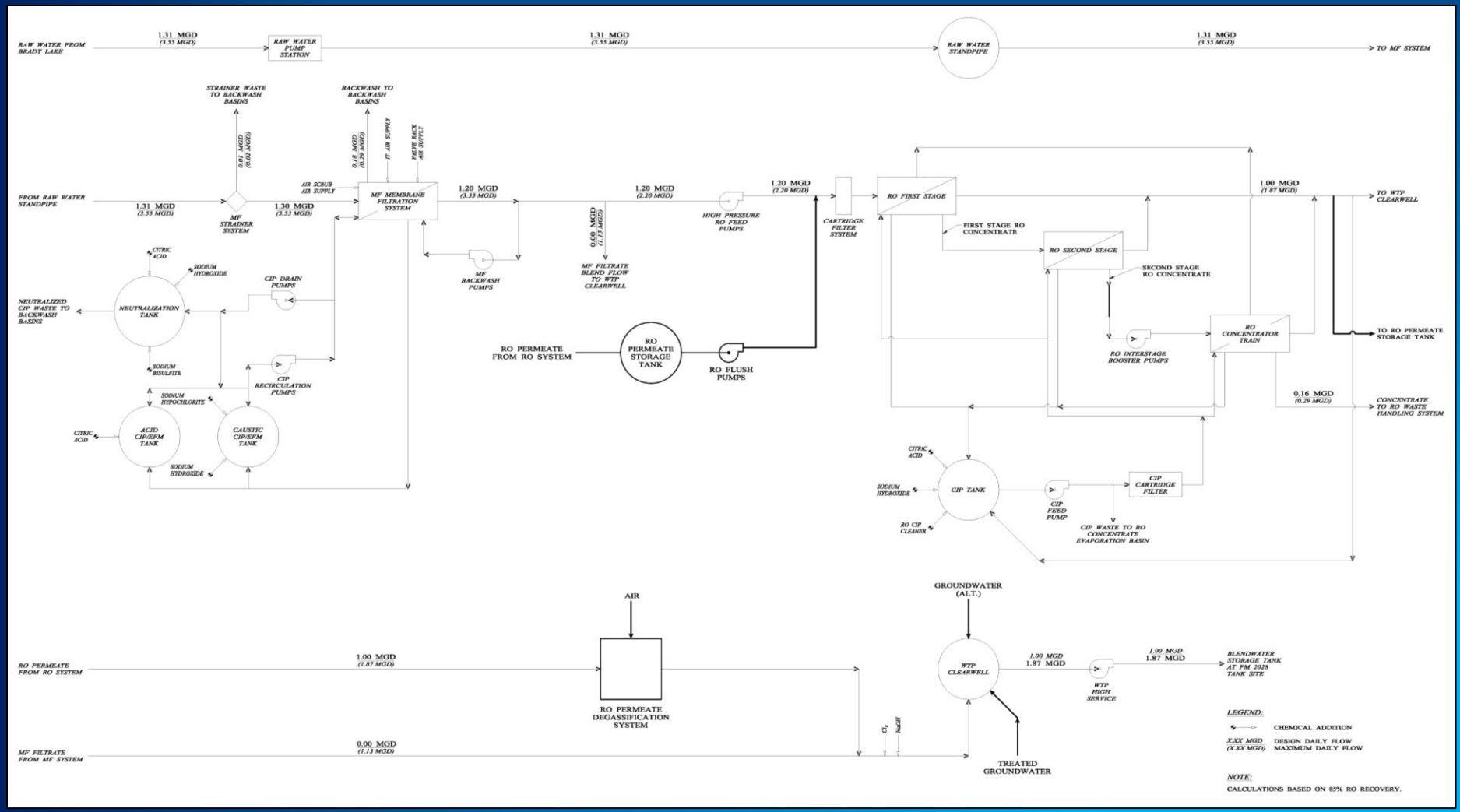

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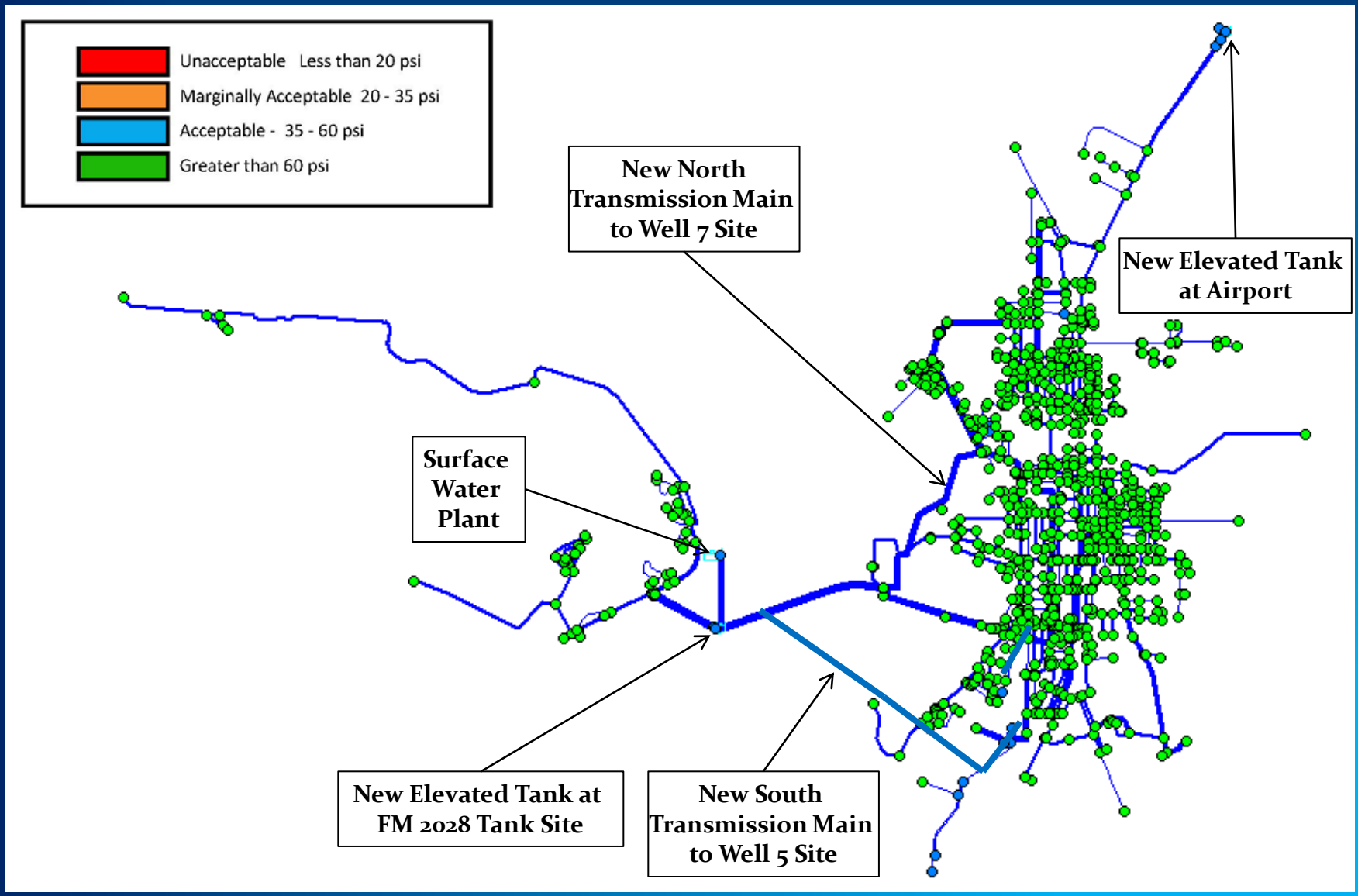

Piloting and Regulatory Approval

- The City of Brady received permission from the City of San Angelo to reference their pilot results with TCEQ for consideration of use of an IX treatment system, exception approval for both WRT and Dow IX resins
- However, because of the potential for iron fouling of the IX system, pilot testing was conducted to verify effects of iron fouling
  - WRT's IX system still performed well, but Dow's system was eliminated from the proposed project – base bid
  - Consideration is being given to the HMO approach as a bid alternate in the project, and an amended exception approval request is currently being prepared for TCEQ review
- Pending TCEQ approval, both treatment approaches will be bid competitively in Fall 2017 and will be required to complete full-scale performance verification testing (i.e. traditional pilot testing shifted to construction phase)

Costs and Funding

- Anticipated project cost - $25 M
- eHT worked with the City and the Texas Water Development Board (TWDB) to identify appropriate funding options, including obtaining eligibility for the TWDB's EDAP program for the City's project
- The City was also eligible to obtain a Determination of Nuisance Finding from the Texas Department of State Health Services, which enables the City to be eligible for up to 100% loan forgiveness for this project
  - Currently approximately 85% loan forgiveness is anticipated for the project

Texas Water Development Board

TEXAS Department of State Health Services

eHT

Current Project Status

- Design is approximately 75% complete
- Project will be ready to construct by the end of 2017
- Just waiting on EDAP funding!

Path Forward

- Pending availability of EDAP funding, anticipated start of construction in Spring 2018
- Significant construction sequencing is planned:
  - Phase 1 – Completion of groundwater treatment plant (GWTP), installation of new elevated storage tanks, upgrade of two well sites to transfer groundwater to the new GWTP, completion of one of the new finished water transmission mains
    - Finished supply consists of 33% treated groundwater, 67% untreated groundwater
  - Phase 2 – Completion of surface water treatment plant (SWTP) improvements, upgrade of two additional well sites, completion of the remaining finished water transmission mains
    - Finished supply consists of 67% treated groundwater, 33% untreated groundwater
  - Phase 3 – Completion of upgrade of remaining well sites
    - Finished supply consists of 100% treated groundwater and/or treated surface water as needed

Conclusions

- Completion of this project has required significant ongoing coordination between the City of Brady, eHT, EPA, TCEQ and TWDB

- This project is a great example of cooperative coordination between each project stakeholder, with the biggest benefits going to the City of Brady residents, in getting safe, cost-effective drinking water!

Questions?