Kennedy/Jenks Consultants

Engineers & Scientists

OMD – Camp Rilea Challenges of a New Small Water System

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Summary

- Overview
- Needs and planning
- Challenges
- Treatment process
- Design challenges
- Conclusions

Camp Rilea

Designated Emergency Response Center

Warrenton

Camp Rilea

- Need for self-sufficient water system

It Takes A While

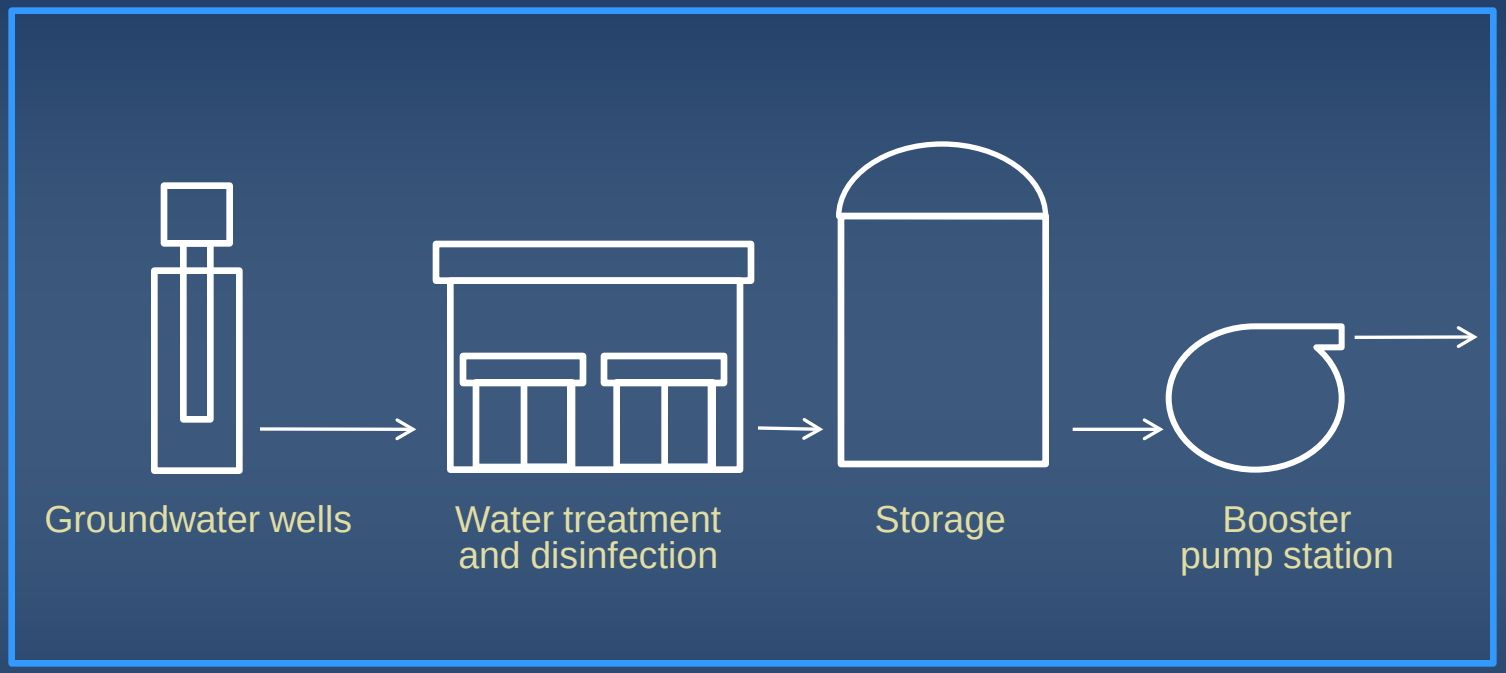
- Water Master Plan in 2005
- Distribution improvements
- Test wells
- Obtain water rights 2006-7
- Pilot study 2008
- Design 2009
- Funding 2009 - 2010
- Construction 2010 - 2011

What Did They Have?

Camp Rilea Water Distribution System

North

What Did They Need?



ALL NEW

Water Challenges

- No water rights
- Limited available water
  - no surface water available
  - groundwater limitations
- Arsenic just over 10 ppm

Ground Water

Ocean Water

Surface Water

Site Challenges

- Butterfly habitat
- Camp usage
- Site access

Coastal Challenges

- Winter flooding
- High winds
- Thick mist

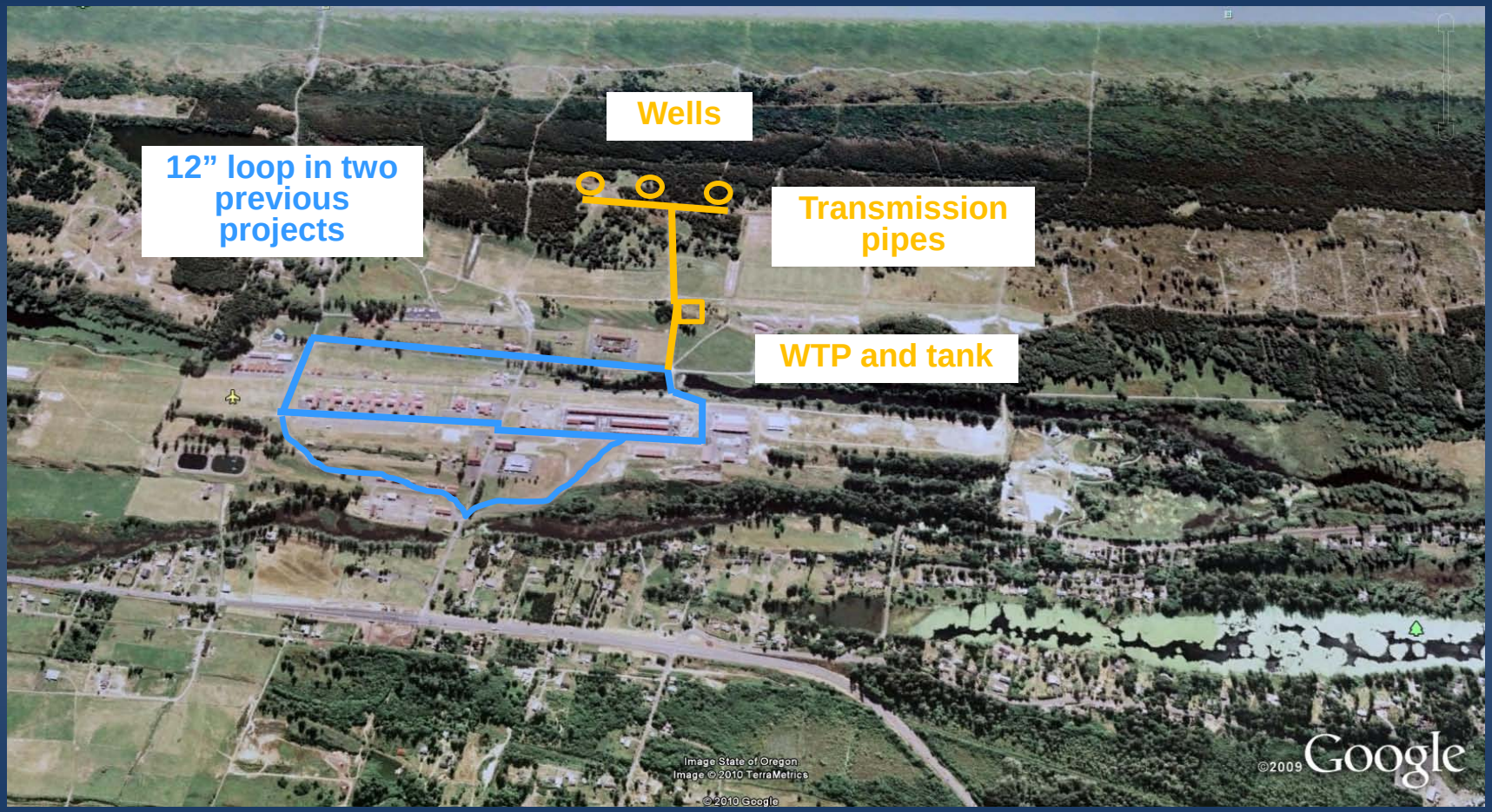
Functional Challenges

- Service population 120 to 3,000
- Large fire flow demand
- Stepped water right

Management Challenges

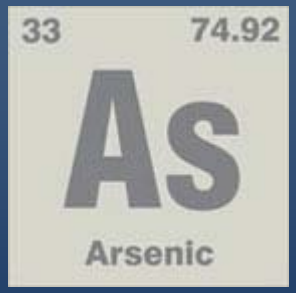
- Limited funding
  - drives design decisions
  - need to prioritize
- No trained operators
- Schedule
  - water rights
  - funding

Location Of Facilities



Treatment Goals

- Arsenic removal and disinfection
- Fire flow and storage requirements
- Corrosion control

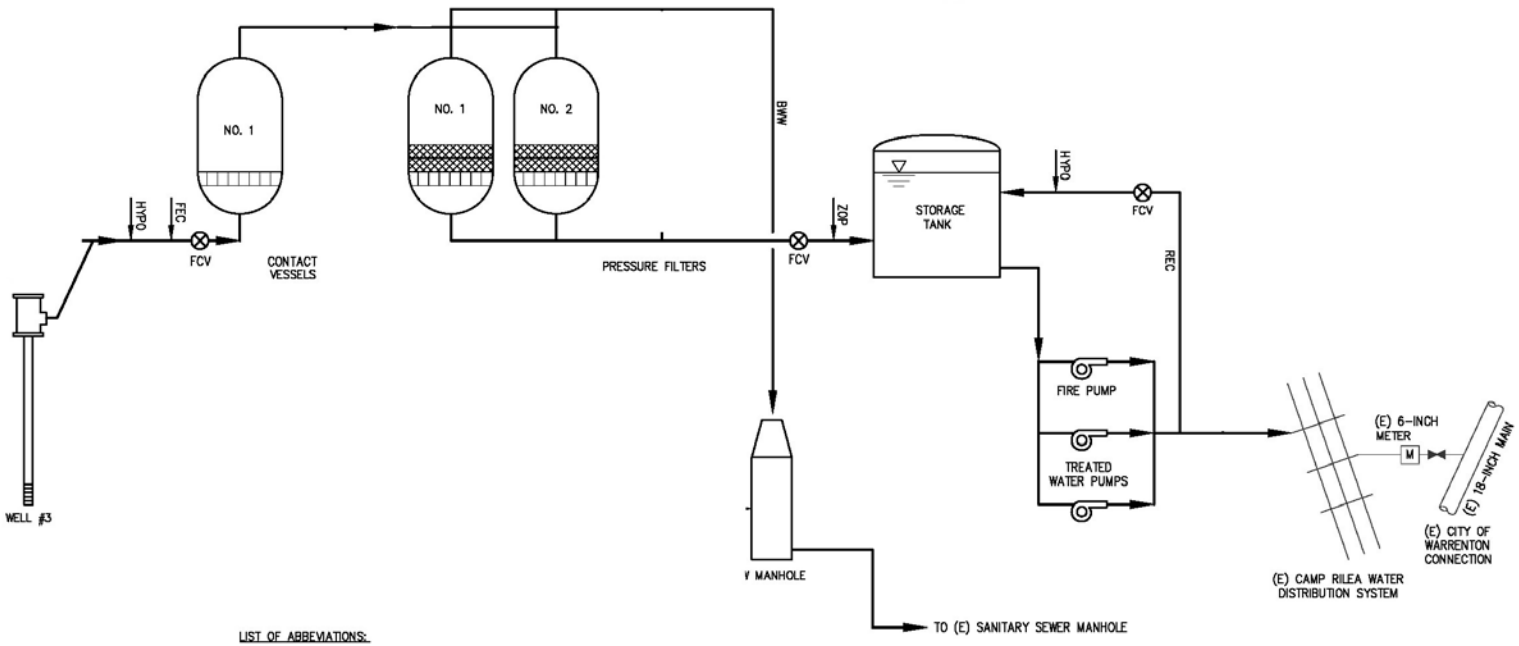


Pilot Study

- Influent As 17 ppb
- Effluent As < 10 ppb
- Sizing of system

Source: ATEC Systems

Process Flow



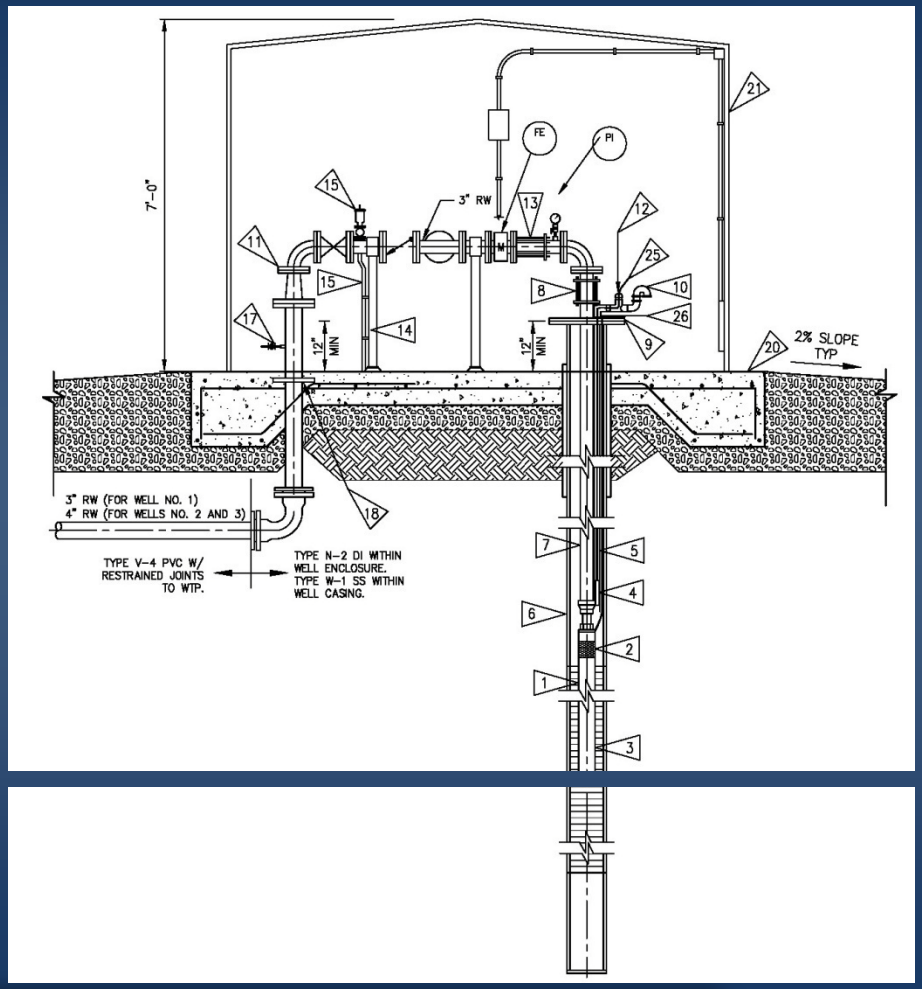
LIST OF ABBEVIATIONS:

RW	RAW WATER
TW	TREATED WATER
BWS	BACKWASH SUPPLY
BWW	BACKWASH WASTE
FEC	FERRIC CHLORIDE
HYPO	SODIUM HYPOCHLORITE
ZOP	ZINC ORTHOPHOSPHATE
FCV	FLOW CONTROL VALVE
REC	RECIRCULATION

Design Challenges

- Corrosion resistant materials
- Durable construction
- Plant operation during emergency operations
- Tank mixing
- Budget constraints

Wells

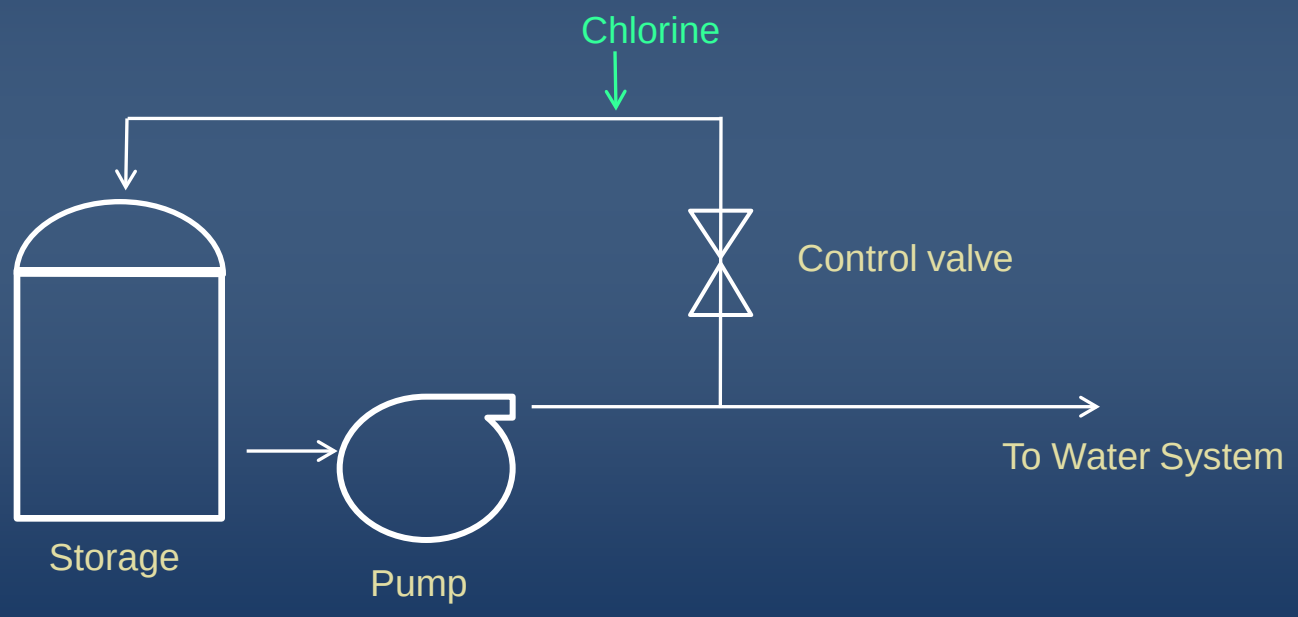

7'-0"
3" RW
FE
PI
12" MIN
12" MIN
2% SLOPE TYP
3" RW (FOR WELL NO. 1)
4" RW (FOR WELLS NO. 2 AND 3)
TYPE V-4 PVC W/ RESTRAINED JOINTS TO WTP.
TYPE N-2 DI WITHIN WELL ENCLOSURE. TYPE W-1 SS WITHIN WELL CASING.

Chemical Feed Systems

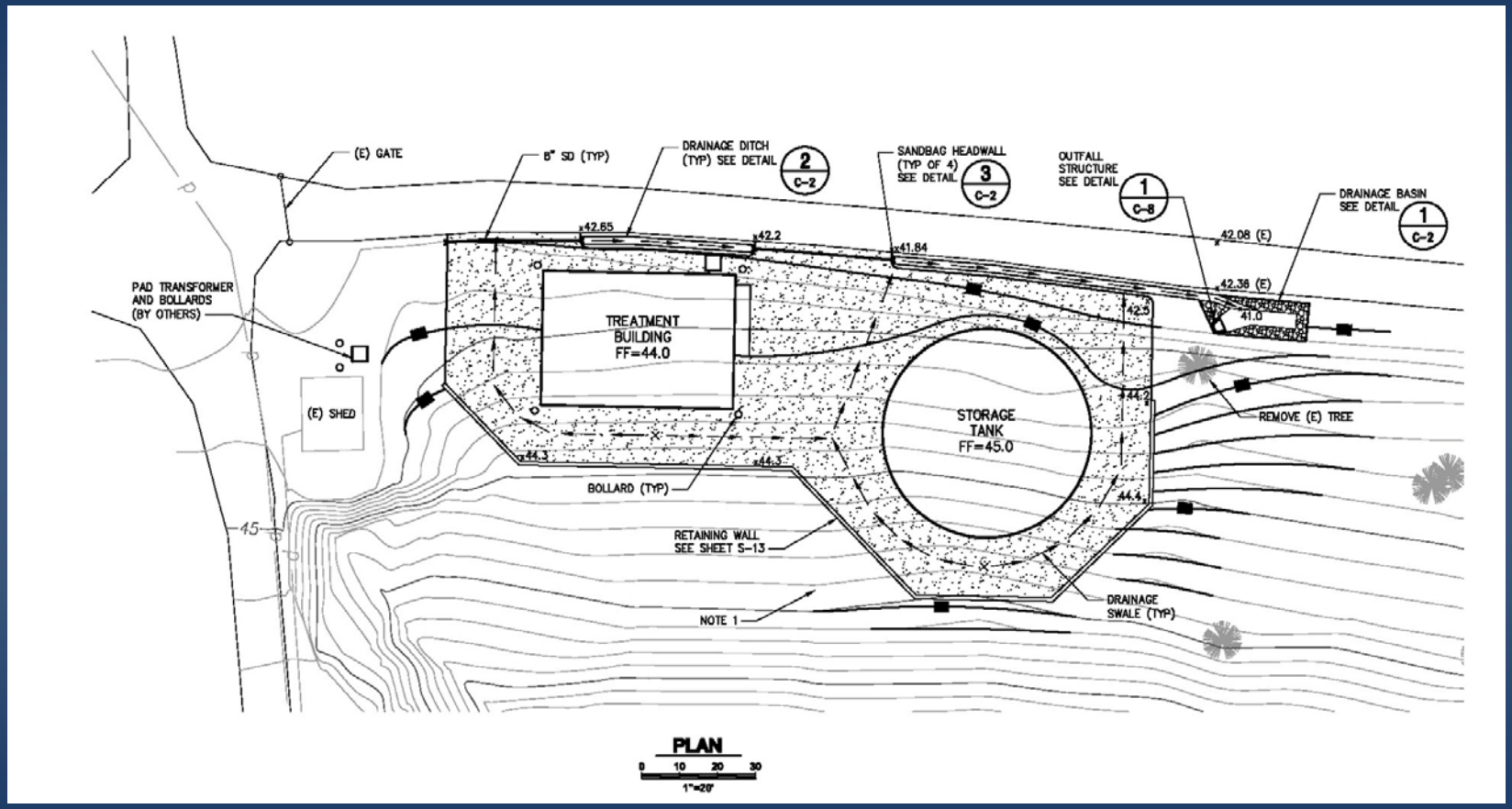
- Sodium Hypochlorite
- Ferric Chloride
- Zinc orthophosphate

Storage and Pumping

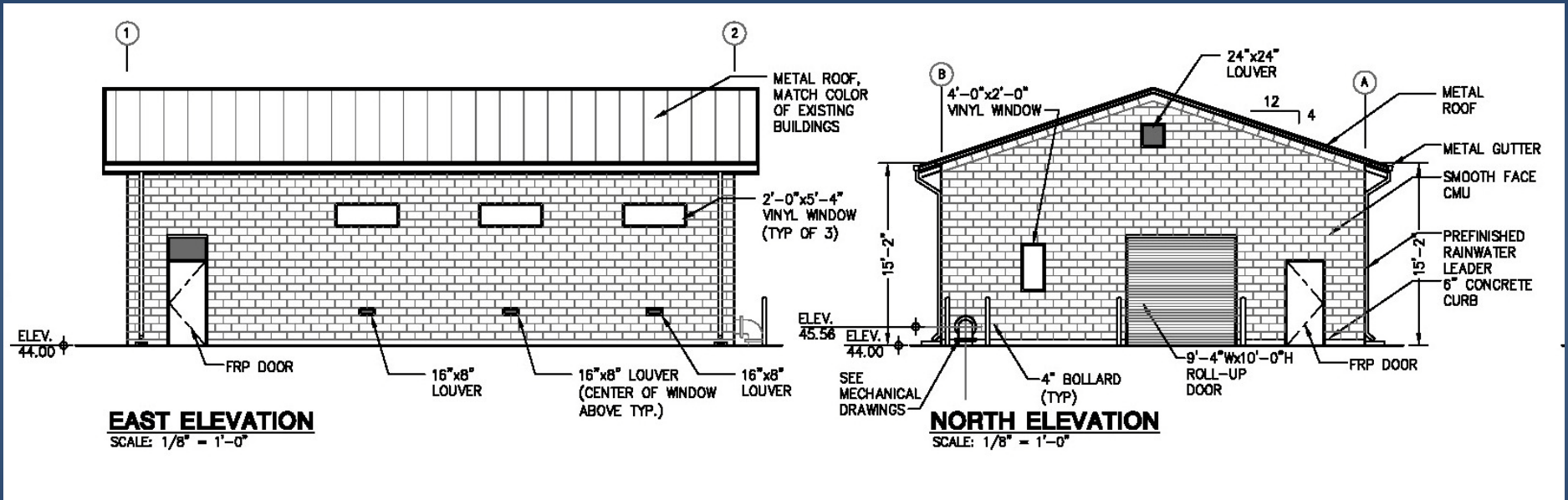
- Storage for domestic demand and fire flow
- Maintain System Pressure
- Maintain Tank Residual



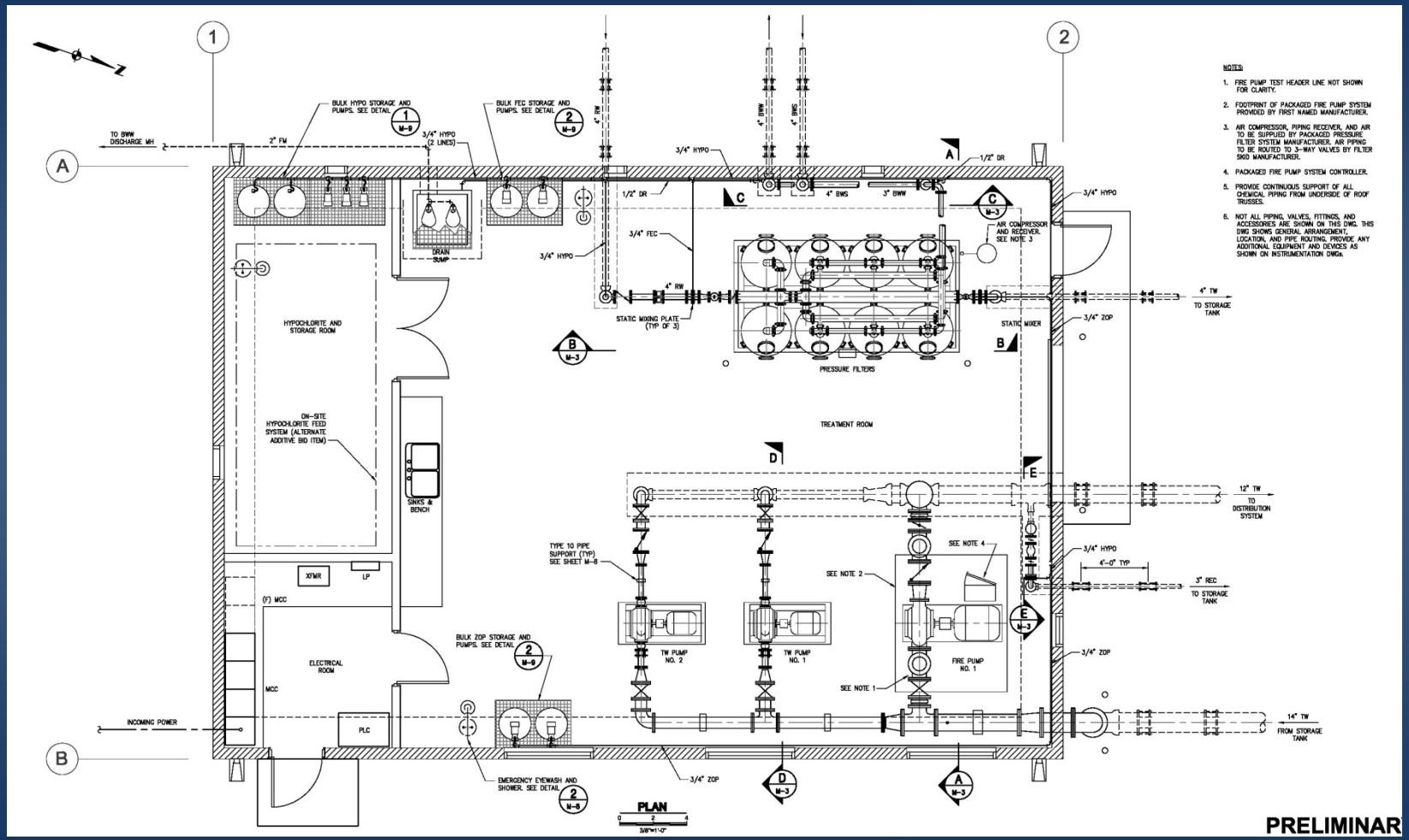
Site Plan


(E) GATE
8" SD (TYP)
DRAINAGE DITCH (TYP) SEE DETAIL 2 C-2
SANDBAG HEADWALL (TYP OF 4) SEE DETAIL 3 C-2
OUTFALL STRUCTURE SEE DETAIL 1 C-8
DRAINAGE BASIN SEE DETAIL 1 C-2
42.65
42.2
41.84
42.08 (E)
42.38 (E)
41.0
42.5
44.2
44.3
44.3
44.4
PAD TRANSFORMER AND BOLLARDS (BY OTHERS)
TREATMENT BUILDING FF=44.0
(E) SHED
STORAGE TANK FF=45.0
REMOVE (E) TREE
BOLLARD (TYP)
RETAINING WALL SEE SHEET S-13
NOTE 1
DRAINAGE SWALE (TYP)
45
PLAN
0 10 20 30
1"=20'

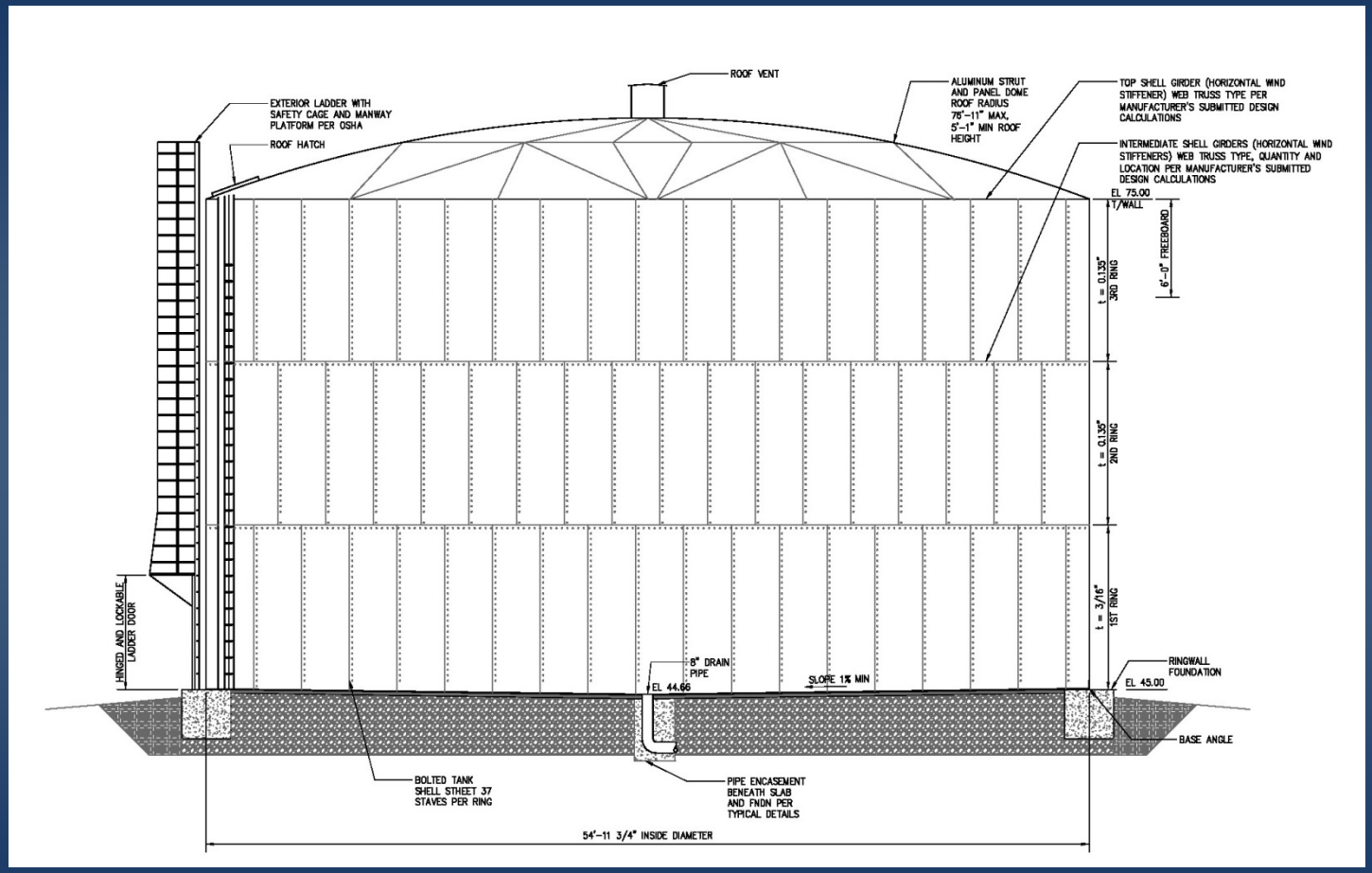
Treatment Building



Treatment Building



Storage Tank



Structured Bid Package

- Base bid
- Additive alternatives
- Funding trade offs

Benefit/Need

Cost

Conclusions

- Obtaining water rights requires patience
- Design for site conditions
- Keep it simple
- Think of back-ups for all systems
- Cost/Gallon does not scale for small plants
- Numerous non-technical challenges