AN ECONOMICAL RIVER INTAKE PUMP STATION

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Overview

- Introduction
- Water Supply
- Intake Constraints
- Unconventional Intake Design
- Modifications to Design after Construction Submittals
- Resolution of Operational Issues
- Conclusions
Trinity Rural Water Supply Corporation

- Located in Trinity, Polk, and Walker Counties
- Serves approximately 1,400 customers
- System previously served by ground water and purchased water from Trinity River Authority (TRA) Trinity Co. Regional System and the City of Trinity
- Additional water not available from TRA Regional System & Trinity. No groundwater of acceptable quality and quantity.
New Source of Supply

- Water rights from Lake Livingston owned by TRA and reserved for local use
- Raw water from Trinity River at headwaters of Lake Livingston
- Plant site located 1-½ mile north of SH 19 crossing of the Trinity River, west of SH 19
Intake Constraints

- Poor soil conditions
- High groundwater table
- Financial limitations
- Decided to try unconventional floating pump station design
Plant Flow Diagram
Soil Profile

0–12’
CLAY, SILTY/SANDY CLAY (CH, CL)

12’–22’
SILTY FINE SAND, FINE SAND (SM, SP)

BELOW 22’
CLAY, CLAYEY SILT (CH, MH)
Unconventional Intake Design

- Submerged intake pipe and intake screen
- Self-priming centrifugal pumps
- Above ground floating platform system
RIVER INTAKE PROFILE
Intake Pump Details

- Lowest available pump setting is 135 ft msl
- Can retain prime to a river level of 106 ft msl
- 100 year flood elevation is 141 ft msl
- Pumps can operate over a 36 ft of variation in river level
HYDRAULIC PROFILE
Modifications to Design After Construction Submittals

- The pumps selected by Contractor were significantly heavier than the originally specified pumps.
- Concrete slab on platform was modified to use light weight concrete and reduce slab thickness from 6” to 5”.
Float Test of Platform
Problems Discovered in Testing

- Platform twisting, putting torque on the posts and pipe rollers holding it in place.
- Platform was not level as it was tilting towards the corner where the pumps were placed.
- Therefore, the weight was not evenly distributed across the platform.
- Back to the drawing board.
Initial Configuration
Revised Configuration
Concrete Ballast
Issues in Operation

- Pumps kept losing prime
- Operation at design flow rate of 700 gpm was fine, but unable to reduce the flow rate below 300 gpm
Chlorine Dioxide System
Resolution of Operation Issues

- Pumps kept losing prime – Found that chlorine dioxide injection into pump suction was introducing air. Added electric solution valve and air release valve.

- Operation at design flow rate of 700 gpm was fine, but unable to reduce the flow rate below 300 gpm – Found that flat pump curves caused VFDs to “search” for flow set point. Controls changed to set pump speed instead of flow rate.
Conclusions

- Worked through issues to develop unconventional river intake pump station.
- Saved Trinity Rural WSC an estimated $650,000, about 65% of the original estimated intake pump station cost.
Questions?