Discover the Power of the Bending Weir!

Bending Weir Retrofit Allows Clyde to Maximize Stormwater Capture

Ohio Stormwater Conference
May 11, 2018

Richard Lesiecki, PE, LEED AP

City of Clyde

- Population 6,221 (2016)
- 5.09 square miles total area
- 30 minute drive from Sandusky, approximately 20 miles southwest
- Home of the Whirlpool Corporation, world's largest washing machine manufacturing plant
- Approximately 30% of sewers are combined.
- WWTP design
  - Average Daily Flow of 1.9 MGD
  - Maximum Daily Flow of 4.8 MGD
- Three interceptors bring influent to WWTP
  - 18" and 24" gravity lines
  - 8" force main
  - Raccoon Creek is the receiving stream

Project Background

- Consent Decree entered into December 1, 2004: to be compliant with the last combined sewer overflow (CSO) located at the WWTP.
- Long Term Control Plan developed in response to Consent Decree in September 2007. Supplemented with an EQ Basin Report in April 2014.
- LTCP objective: 4 CSO's per year or less.
- Per NPDES permit, complete construction and attain operation of an EQ basin by December 30, 2015.
- CSO screening facility constructed in December 2004 capable of ¼" screening of flows up to 16 MGD.
- 16 MGD equals a 2 year one-hour storm event.
- In 2010 to 2013, city had an average of 18 CSO events discharging over a total of 24 days per year.
- Flow analysis determined a 500,000 gallon EQ basin would yield 3.75 CSO events over 10 days per year meeting Consent Decree requirements.
- City requested a 1,000,000 gallon EQ basin to achieve even better performance.
- Available land at WWTP limits EQ basin footprint.
- Collection system and WWTP hydraulic limitations very tight.

Project Alternatives

1. Using a traditional overflow weir to control storage capacity

   Remove existing siphon screen from CSO structure

   Construct a new diversion structure with flow thru screening mechanism and traditional overflow weir downstream of existing structure

   Construct basin deeper than existing influent lines to achieve 1 MG capacity

   Disadvantages: New diversion structure with enclosure needed

   Plant will have to manually handle screenings from new screen

   Pumping of EQ basin required to empty due to depth

2. Using a bending weir to control storage capacity

   Modify existing CSO structure to accept upflow screen and bending weir

   Construct basin shallower than existing influent line to achieve 1 MG capacity

   Advantages: New diversion structure and enclosure not needed

   No additional handling of screenings required

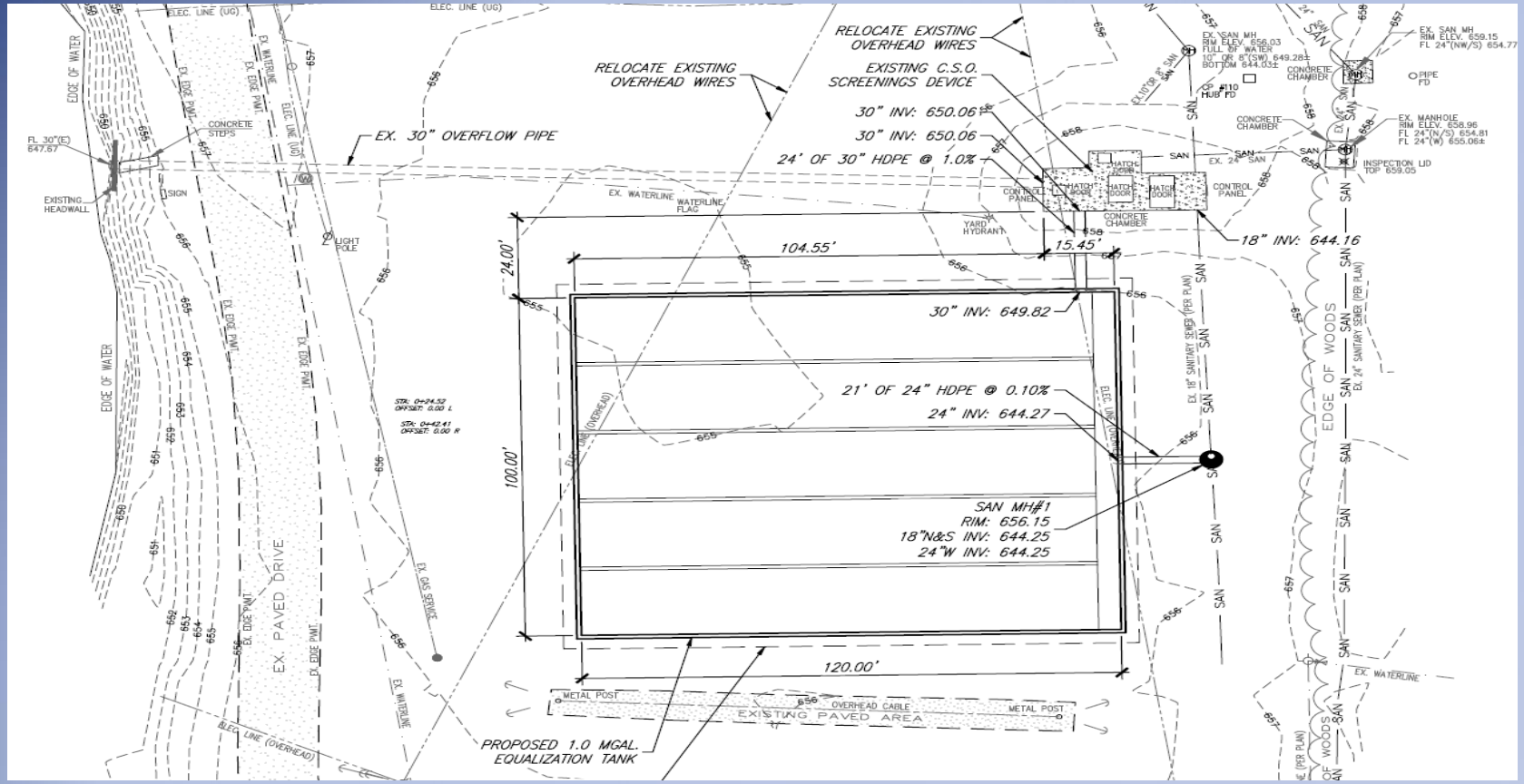
   Shallower basin cheaper to construct

   Basin empties by gravity, no pumping required

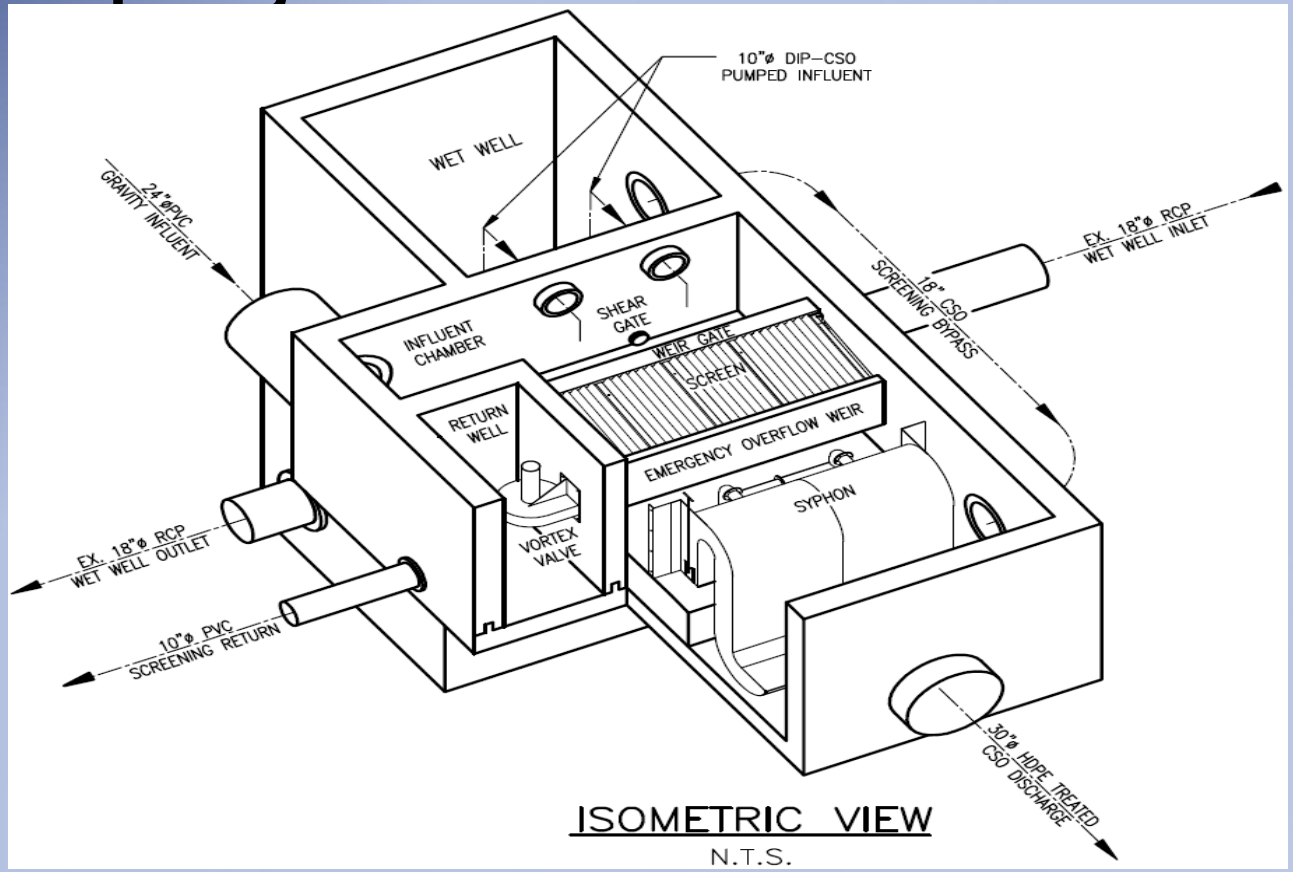
Project Scope

- Construct 1,000,000 gallon EQ basin: 120’ x 100’ by 14’-16’ deep
  - Tipping bucket flushing system
- Modify existing CSO diversion structure
  - Remove existing siphon screen
  - Install upflow screen prior to EQ basin influent line
  - Install bending weir to control basin water level
- Preliminary treatment building modifications:
  - Remove existing bar screens and replace with rotating drum fine screens
  - Increase influent channel width from 3’-0” to 3’-6”
  - Add solids screen conveyor
  - Install rolling door

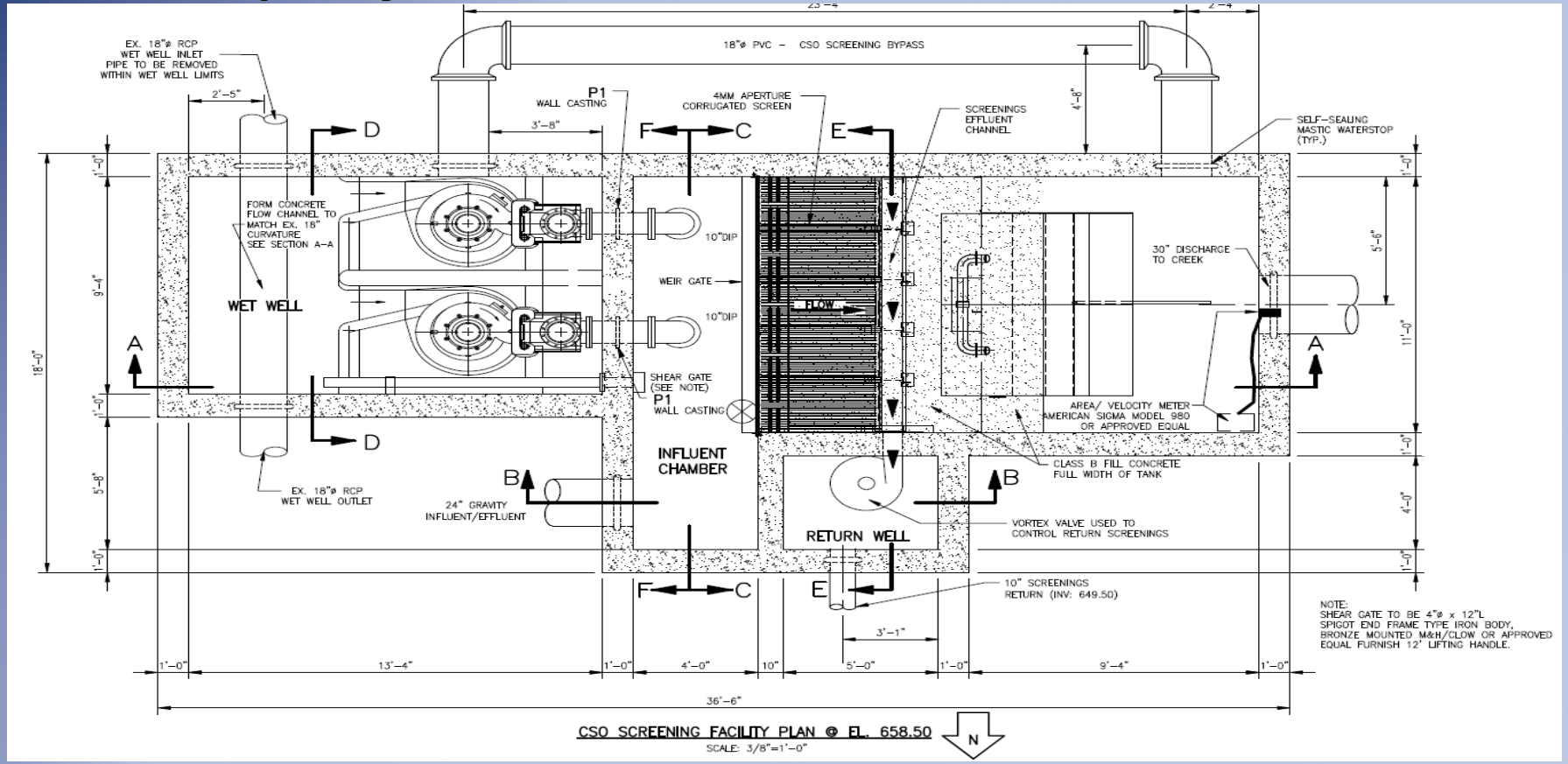
WWTP Site Plan



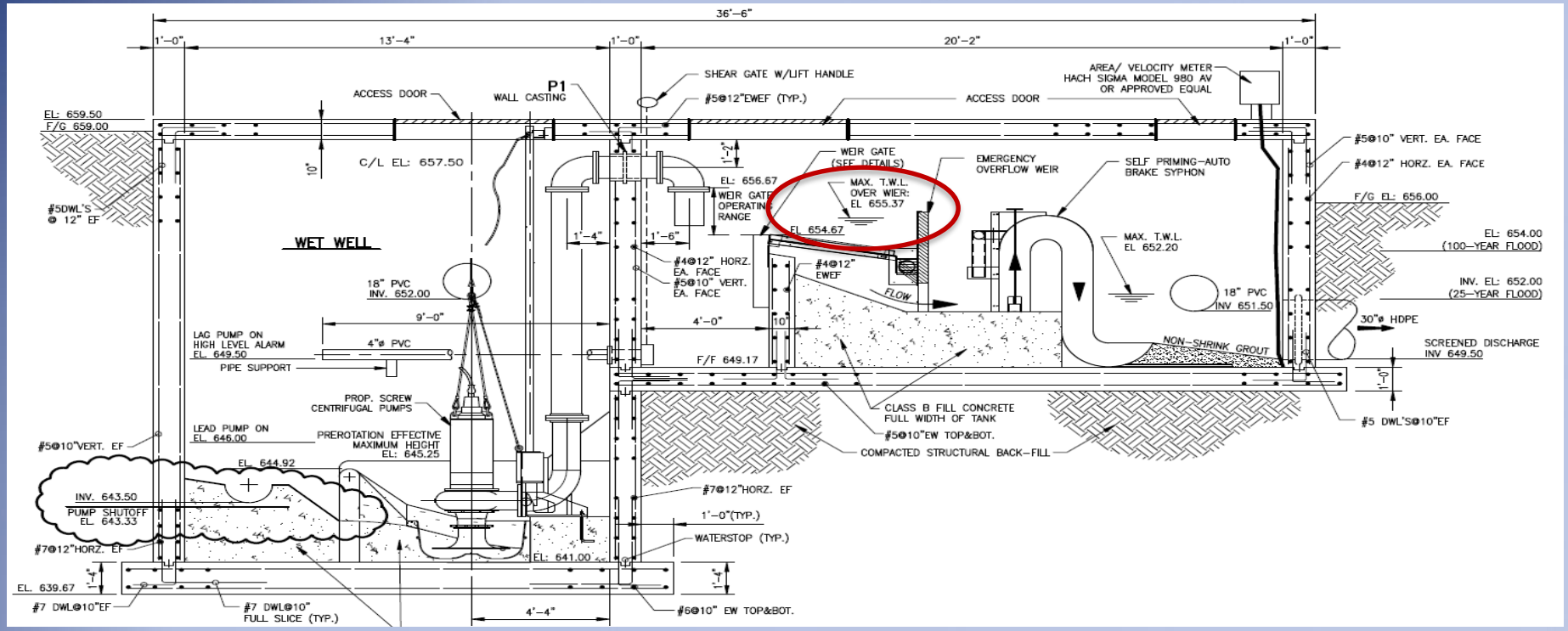
Pre-project Diversion Structure



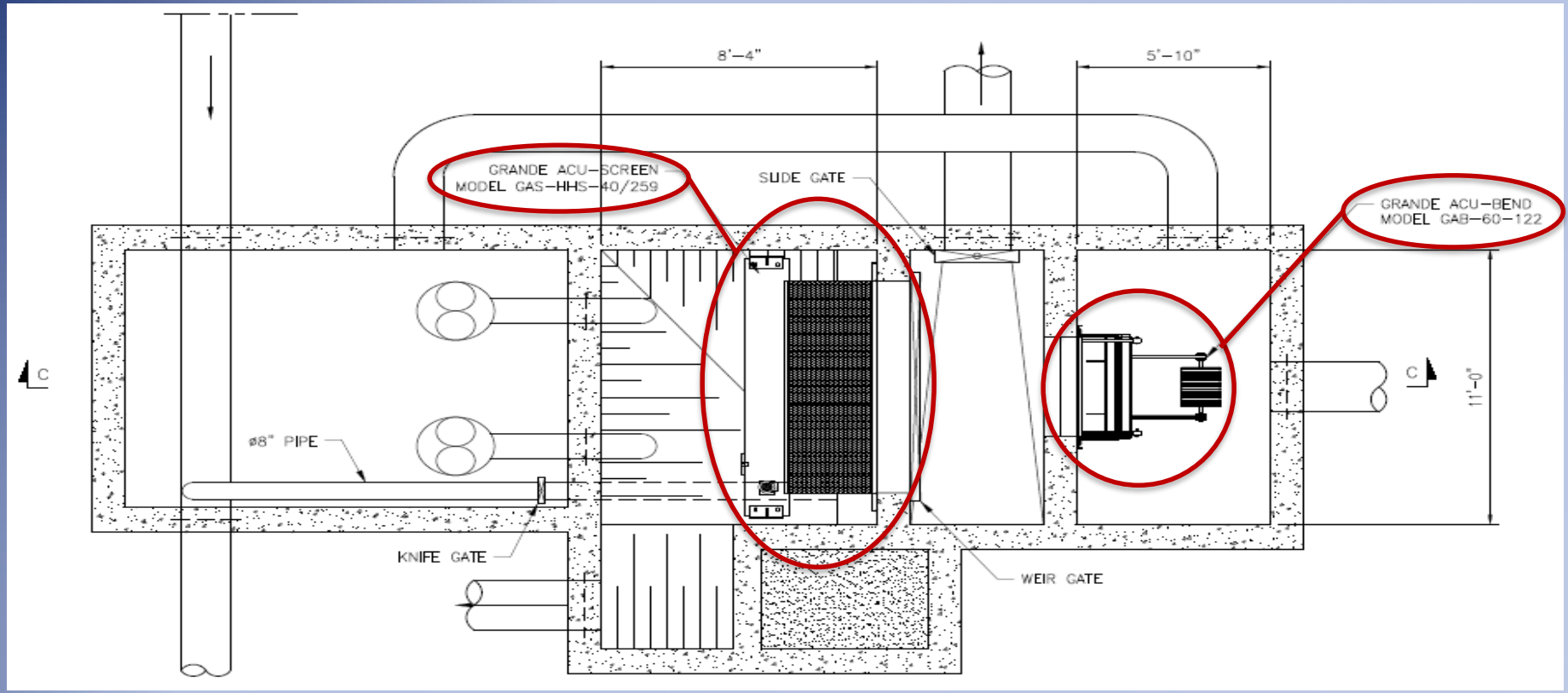
Pre-project Diversion Structure Plan



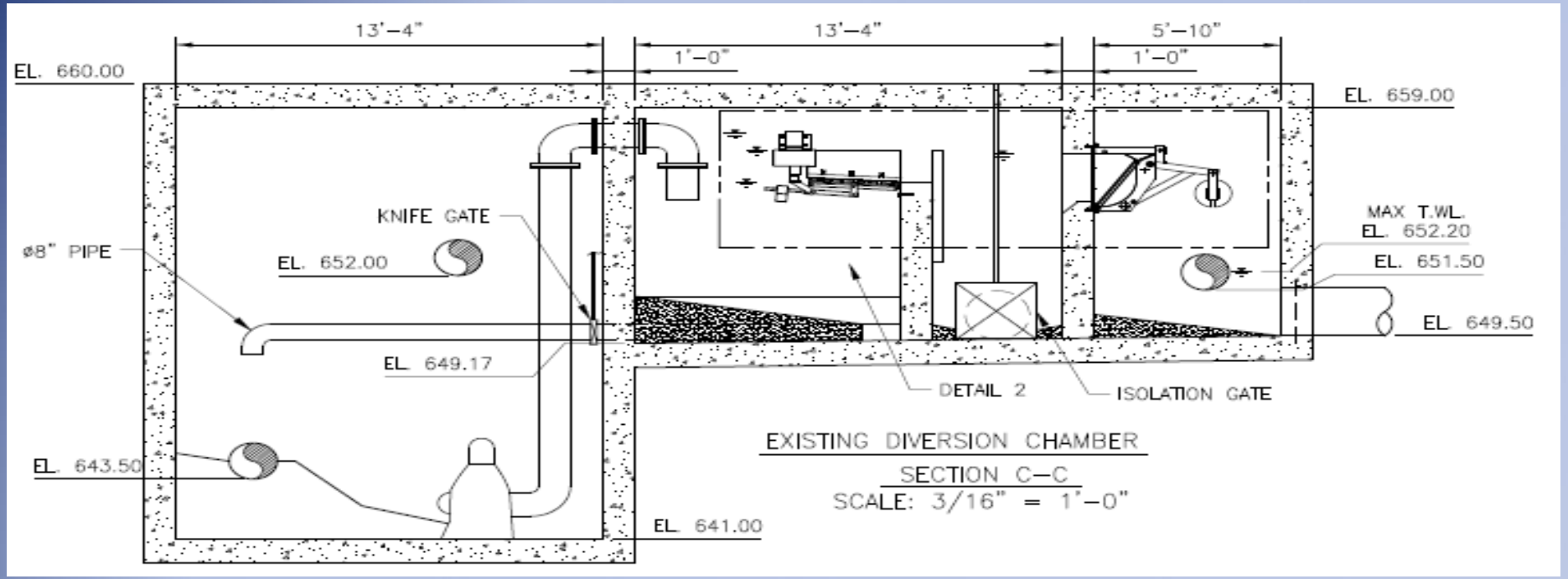
Pre-project Diversion Structure Elev.



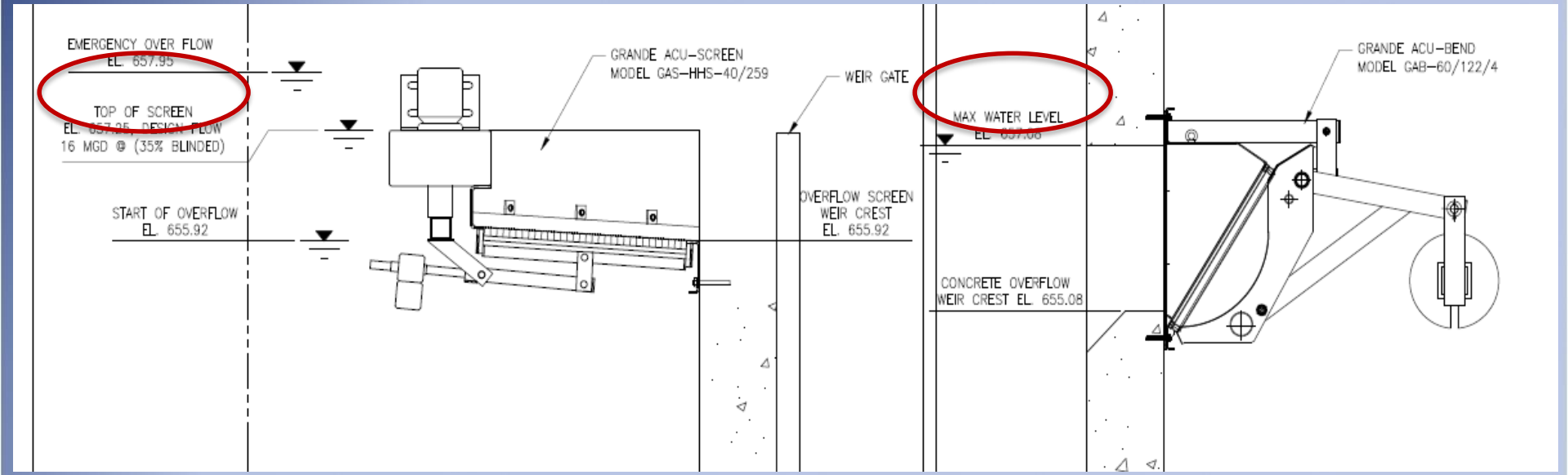
Diversion Structure Retrofit Plan



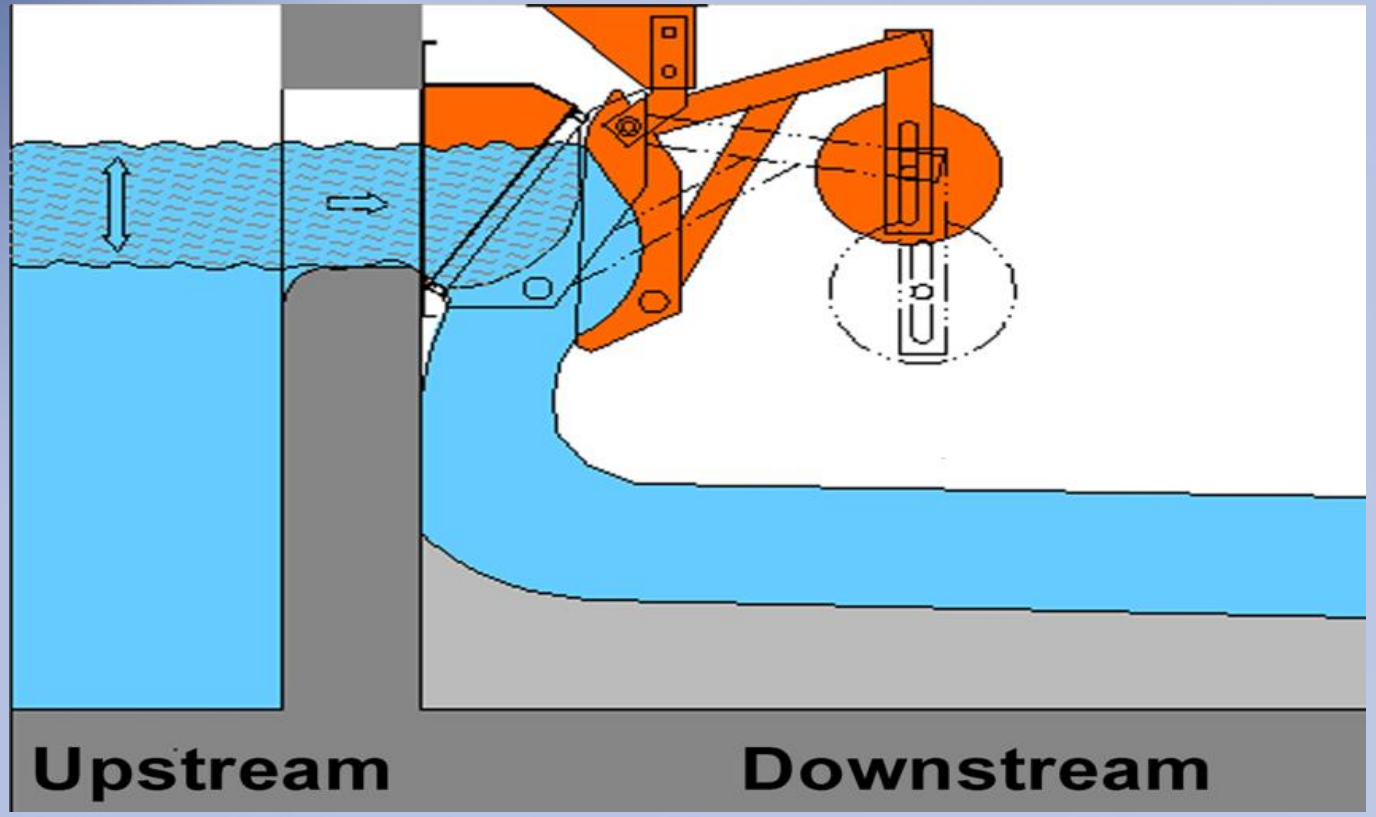
Diversion Structure Elevation



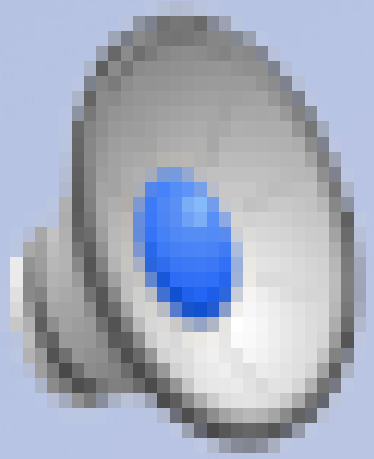
Diversion Structure Detail



ACU-BEND Bending Weir



Bending Weir Animation Video



Tank Drone Picture

Tank Drone Picture

Tank Drone Picture

Bending Weir and Weights in Place

Bending Weir Viewed Thru Hatch

Bending Weir Weights

Upflow Screen

Test Stand Bending Weir Video

Overflow Control

Bending Weirs

Features

- Constant maximum upstream storage level is maintained allowing for full utilization of all available storage volume.
- Lower storage tank construction costs owing to smaller tank volumes.
- Reduction in frequency of overflow discharges to receiving stream.
- The maximum storage level setting may be easily modified after installation of the device.
- Hydraulically ideal shape of the weir flap ensures blockage free discharge.
- Integrated counterweight design eliminates need for separate counterweight structure.
- Easy retrofitting of existing overflows possible (additional storage volume gain or improvement of problematic hydraulic grade line).
- Since it is sealed on all four sides, it acts as a backflow prevention device for flood protection and odor control.
- Virtually maintenance free.
- Leakage Rate has been tested to 0.1 gpm/ft of seal length

ACU-BEND Bending Weir

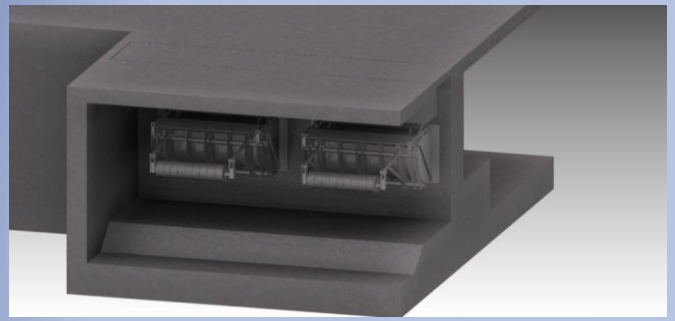
Features

- Integrated counterweight design
- Simple installation
- Maximize in-situ storage
- Constant & easily adjustable operating level
- Reduce overflow frequency
- Improved hydraulic grade line
- Backflow prevention & odor control
- Lower storage tank construction costs owing to smaller tank volumes
- Easy to retrofit into existing installations
- Stainless steel construction

ACU-BEND Bending Weir

Range of Application

- GAB-30 is designed to hold back 12 inches (30 cm) of water over the weir crest
- GAB-90 holds 36 inches (90 cm) of water over the weir crest.
- The units are modular in design with a single unit being up to 20 feet (6 m) long.
- The hydraulic capacity of the ACU-BEND is at least equal to that of a standard overflow weir.



Tank Flush Video

Tank Flush Video

Performance Data

- 2016
  - 2 overflow events totaling 206,916 gallons
- 2017
  - 2 overflow events totaling 1,456,474 gallons
  - EQ basin used 12 times capturing a total of 3,594,703 gallons
- 2018
  - 1 overflow event totaling 446,400 gallons thru the end of March