

# Headworks Facilities Evaluation: Operator-Driven Decision Making



**Greg Gunderson, P.E., ENV SP**

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**GRAFTON**  
Quality. On. Demand.

# Presentation Outline

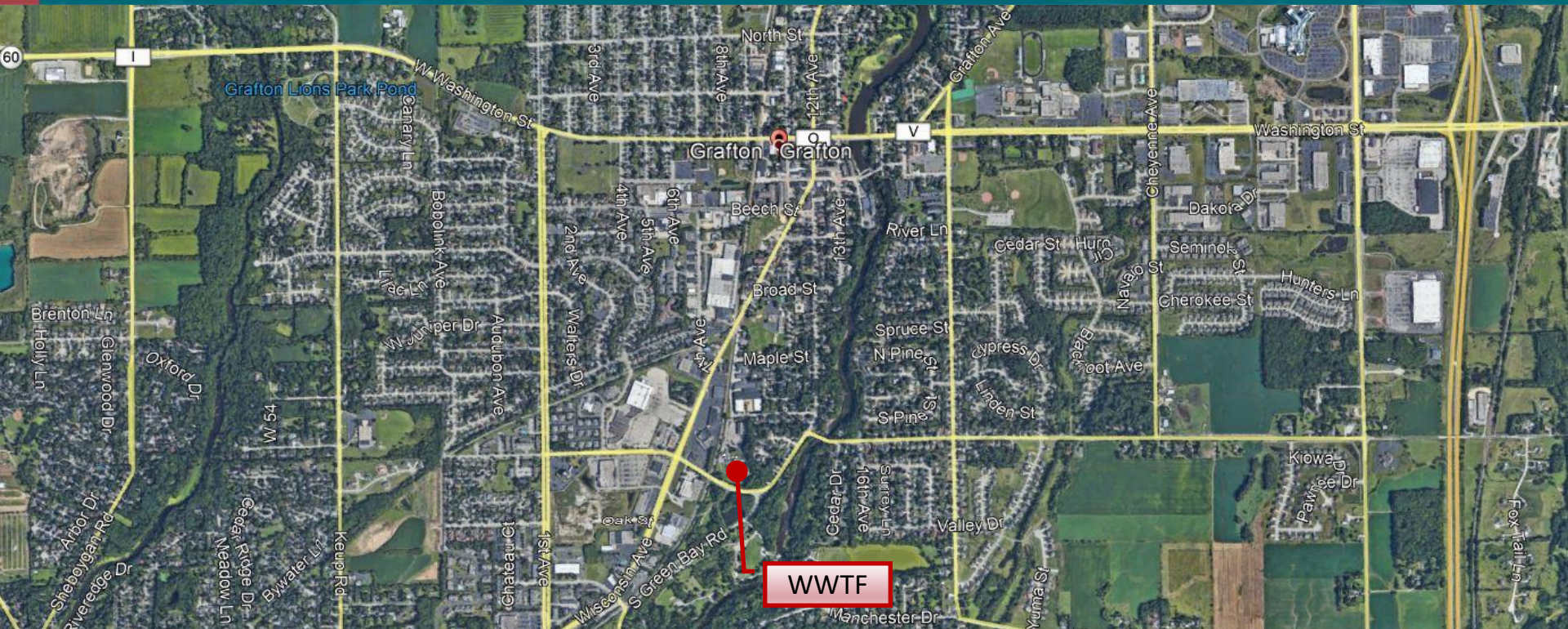


- Project Background
- Equipment 101
- Evaluation Process
  - Planning Approach
  - Selection Criteria
  - Visualization
- Take Home Messages

# Project Background

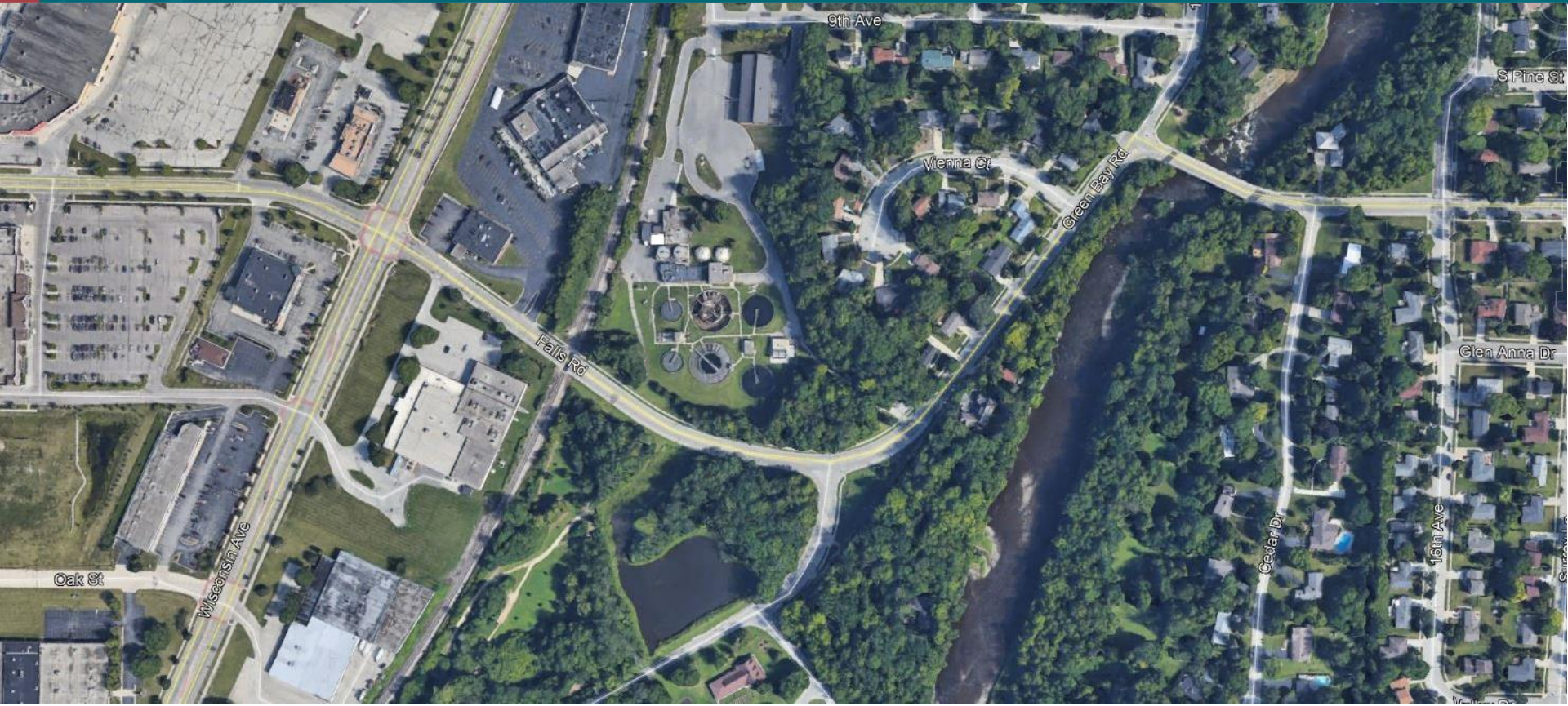
# Project Background

## Village of Grafton WWTF



# Project Background

## Village of Grafton WWTF



# Project Background

## Unit Process Overview



# Project Background

## Facilities Planning



Parameter	Historical	Design (2038)
Avg. Flow (MGD)	1.47	2.15
Peak Flow (MGD)	10.89	11.54
BOD (lb/d)	2,789	4,149
TSS (lb/d)	2,726	4,067
TKN (lb/d)	436	647
TP (lb/d)	64	95

***Approximately 46% Growth Planned***

# Project Background

## Need for Project



- Equipment failure (Capacity, Condition, Performance)
  - Screening
  - Grit
  - Pumping
- Age/Condition of Building
  - Original to Plant (1950's)
  - Lack of adequate space

# Evaluation Process

## Need for Project

Fine Screening



Grit Removal



Influent Pumping



# Headworks Equipment 101

## Definitions & Overview

# Headworks 101

## Mechanical Screening

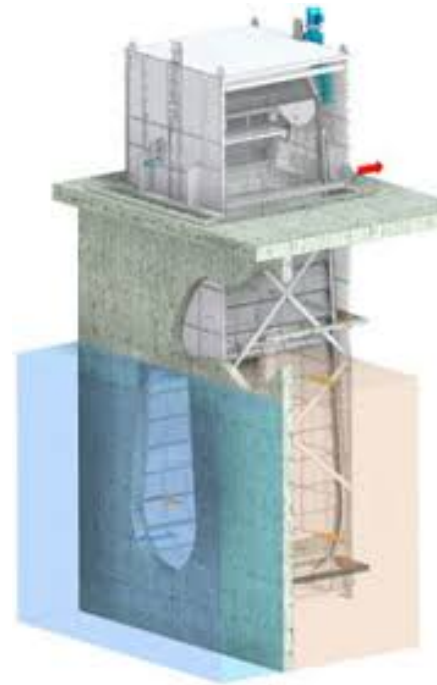
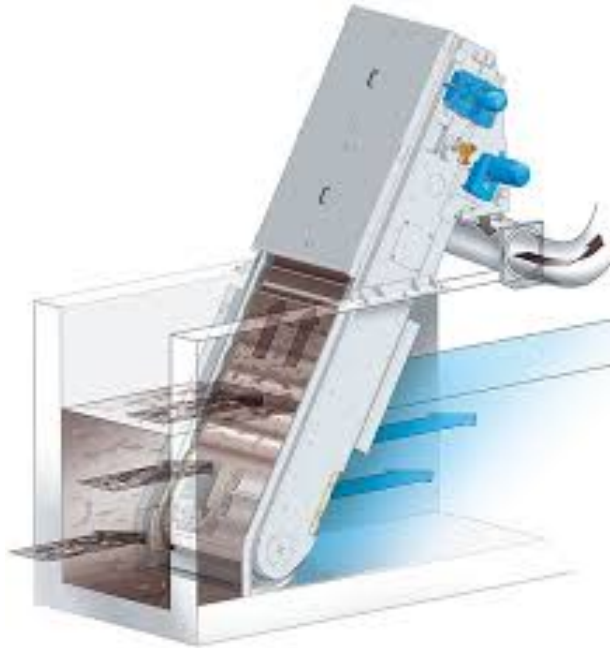


- Collection
  - Fine Screening (1/4" Opening)
  - Not coarse or micro
- Compaction
  - Washing – removal of organics
  - Compaction – water/volume reduction
- Conveyance
  - Auger & Chute

# Headworks 101

## Mechanical Screening

### Perforated Plate Screen (Band Screen)



# Headworks 101

## Mechanical Screening

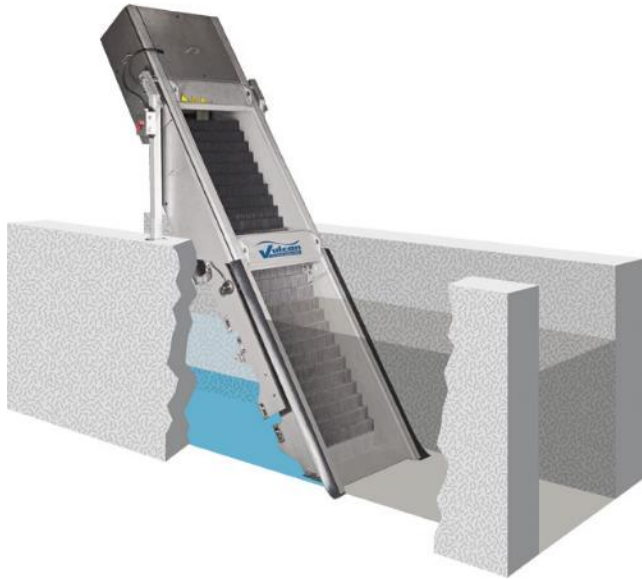
Perforated Plate Screen (Band Screen)



# Headworks 101

## Mechanical Screening

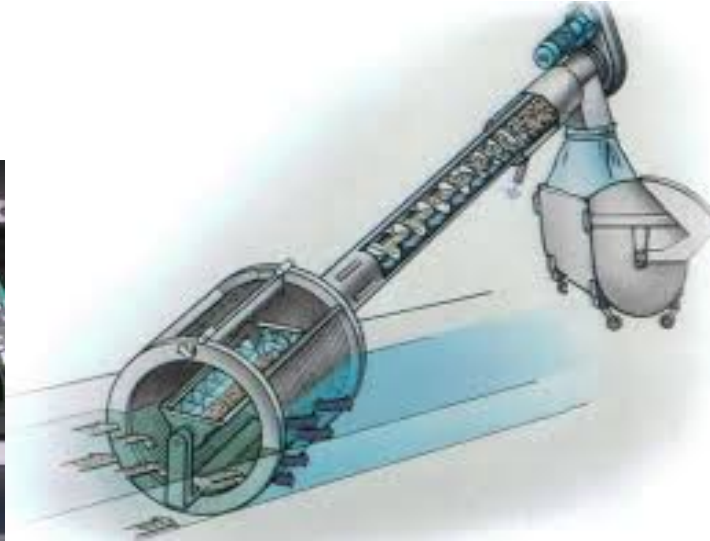
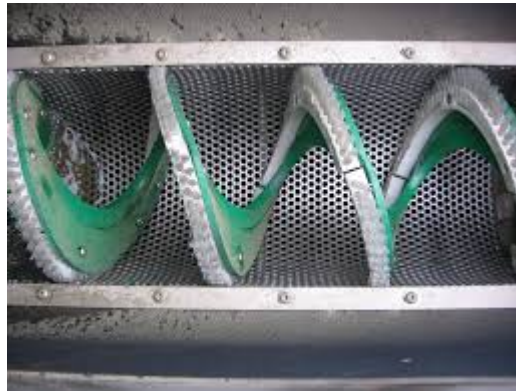
### Step Screen (Stair Screen)



# Headworks 101

## Mechanical Screening

### Spiral Screen



# Headworks 101

## Mechanical Screening

### Bar Screen (Chain/Rake)



# Headworks 101

## Grit Removal



- Phases
  - Collection
  - Classification/Washing
  - Conveyance
- Types (Collection)
  - Forced Vortex
  - Multiple-Tray Vortex
- Types (Washing)
  - Classifier
  - Washer

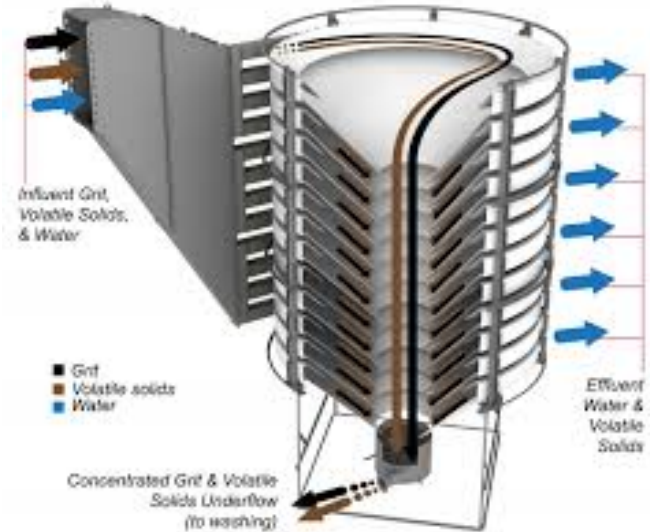
# Headworks 101

## Grit Removal

Forced Vortex



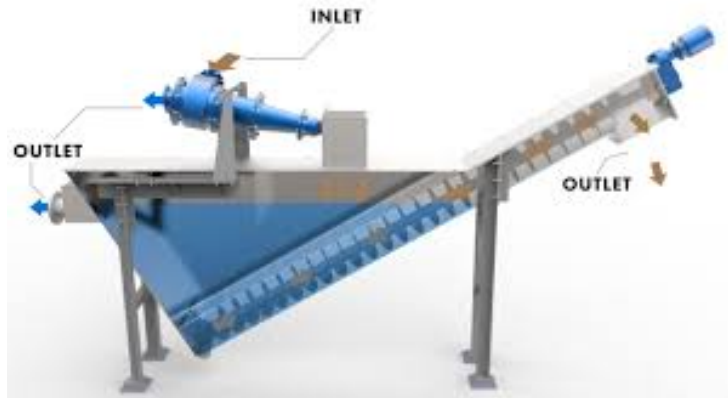
Multiple-Tray Vortex



# Headworks 101

## Grit Removal

Classifier



Washer



# Evaluation Process

## Approach & Criteria

# Evaluation Process

## Planning Approach



- Communication & Collaboration
- Whose project is this?
- Engineer is the guide
- Meaningful meetings
- Input from all stakeholders
  - Administration
  - Lead Foreman
  - Experienced Staff
  - Mechanic
- Visualization

# Evaluation Process

## Selection Criteria

### 1. **Application**

- New vs. Retrofit, Temporary Operations, capacity

### 2. **Quality of Equipment**

- Performance, Robustness, References, etc.

### 3. **O&M Requirements**

- Regular maintenance, wear parts, power/water use

### 4. **Quality of Provider**

- MFR/Rep

### 5. **Ancillary Equipment**

- Controls/SCADA



# Evaluation Process

## Selection Criteria



- Application
  - New or Retrofit – May limit your options (hydraulics)
  - Flow Range – what type is best for my design flow?
  - Temporary Operations
    - New vs. Retrofit
    - Staffing
- Price

# Evaluation Process

## Selection Criteria



### Quality of Equipment

- Performance
- UK Water Industry Research Testing (UKWIR) Reports
- Materials of Construction
  - Robustness
  - 304/316SS, HDPE, carbon steel
- References/Experience
  - What do other operators think?
  - How does it hold up?
  - Comparable installations?
- Moving Parts (quality of bearings, chains, etc.)

# Evaluation Process

## Selection Criteria



- Operation & Maintenance
  - How often does it need to be greased? Are they below water?
  - What are the wear parts?
  - How much power does it use?
- Ancillary Equipment
  - Do I need to upgrade my water reuse system?
  - How extensive of a SCADA system is needed?

# Evaluation Process

## Selection Criteria

### MECHANICAL SCREEN

**AUTOMATIC** OFF MANUAL START 1 CYCLE

**DIFF. LEVEL** OPERATION MODE INTERVAL

PARKED POSITION  
 PARKED POSITION FAILURE  
 HIGH INFLUENT FLOW

INTERVAL SETPOINT: 0 MIN  
NEXT RUN IN...: MIN  
ADDITIONAL RUN: 5 MIN  
CYCLE DELAY: 30 SEC  
CYCLE COUNT: 0

DIFF. LEVEL: 4.5 IN  
RUN: 16.0

CYCLES: 0 DAILY, 0 ACCUMULATIVE

### WASHING PRESS COMPACTOR

**AUTOMATIC** OFF **MANUAL** CANCEL

INITIATE BATCH: 15  ACTIVE  HIGH FLOW  JAM

REPEAT: 6

**STEP 1:** SCREW FORWARD VALVE 1 OPEN  
**STEP 2:** SCREW STOPPED VALVE 1, VALVE 2 OPEN 0 SEC  
**STEP 3:** SCREW REVERSE VALVE 1, VALVE 2 OPEN  
**STEP 4:** SCREW STOPPED VALVE 2 OPEN 0 SEC  
**STEP 5:** SCREW FORWARD VALVE 1 OPEN  
**STEP 6:** SCREW FORWARD VALVE 1 OPEN  
**STEP 7:** SCREW FORWARD  
**STEP 8:** SCREW STOPPED VALVE 3 OPEN 0 SEC  
**STEP 9:** SCREW STOPPED VALVE 4 OPEN 0 SEC

BATCHES: 54 DAILY, 54 ACCUMULATIVE

VALVE 1 SPIRAL SHAFT  
**AUTOMATIC** OFF  
 REQUIRED OPEN

VALVE 2 WASHING ZONE  
**AUTOMATIC** OFF  
 REQUIRED OPEN

VALVE 3 DEWATERING ZONE  
**AUTOMATIC** OFF  
 REQUIRED OPEN

VALVE 4 DRAIN PAN  
**AUTOMATIC** OFF  
 REQUIRED OPEN

### MECHANICAL SCREEN M-6-1-1

SCADA CONTROL AVAILABLE (REMOTE HOA'S IN AUTO)

**AUTOMATIC** OFF MANUAL

REQUIRED  RUNNING  RUN FAILURE

### WASHING PRESS COMPACTOR M-6-3-1

SCADA CONTROL AVAILABLE (REMOTE HOA'S IN AUTO)

**AUTOMATIC** OFF **MANUAL**

REQUIRED FORWARD  RUNNING FORWARD  RUN FORWARD FAILURE  
 REQUIRED REVERSE  RUNNING REVERSE  RUN REVERSE FAILURE

# Evaluation Process

## Selection Criteria



- Quality of Providers
  - Is the local representative knowledgeable?
  - Do they claim to be the 'best'?
  - How knowledgeable are the application engineers?
  - Who is going to service the equipment?
  - Warranty – will they stand behind it?
  - Did you check their references?
  - Do they have single point of responsibility?
  - What is their delivery time?

# Evaluation Process

## Selection Process

- Reference Check
  - Installation List
- Hit the Road
  - New & Old installations
  - Talk to the operators
- Trade Shows
  - WEFTEC
  - WWOA
  - WRWA



# Evaluation Process

## Selection Process

- Evaluation Matrix
- Selection Options
  - Pre-Procurement
  - Base Bid Equipment w/ Alternates
  - Open Bid (required multiple designs)
- Funding requirements



# Evaluation Process

## Selection Process

- What did the Village select?
  - Perforated Plate Screen & Washing Press
    - Huber
  - Mechanical Vortex Grit Collection
    - Smith & Loveless
  - Vortex Grit Washer
    - Huber
  - Dry-Pit Submersible Pumps
    - Flygt
- Base Bid Procurement Method



# Visualization

What will it look like?

# Visualization Design Model



# Visualization Design Model



# Visualization Design Model



# Visualization Virtual Reality



# Take Home Message

What should I remember?

# Evaluation Process

## Selection Process

- Own the Project
- Take Site Visits
- Be confident in manufacturer & supplier
- Utilize visualization tools

