JBLTP Hydraulic Modeling and Flow Management Study

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Agenda

- Project background, goals, status
- Hydraulic modeling scenarios: Summary and results
- Hydraulic constraints assessment
- Discussion

Project Background

- JBLTP has permitted design capacity of 13 MGD AADF:
  - Plant 1: 9 MGD.
  - Plant 2: 4 MGD.
- Average flows have decreased, but peak flows have increased.
- Unknown peak capacity of Plant 1 and Plant 2.
- Decisions on SOCWA's future investments at JBLTP depend on hydraulics.
- Desire to make informed decisions to:
  - Maximize recent improvements.
  - Plan for JBLTP's future improvement projects.

Project Goals

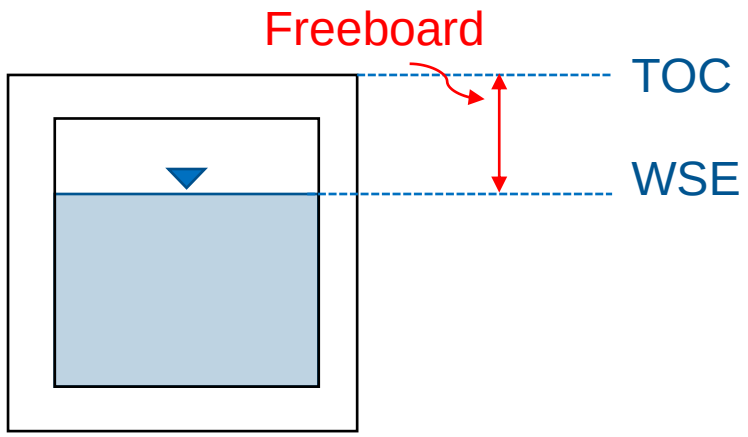
- Develop and provide plant-wide hydraulic model for SOCWA's future analysis of high-level operational input.
- Determine hydraulic capacity of JBLTP:
  - Recent extreme wet weather events (2017 & 2019).
  - Potential changes in flow from upstream member agency plants.
- Determine hydraulic feasibility and/or constraints of select scenarios.
- Identify hydraulic bottlenecks for potential future projects.

Project Status

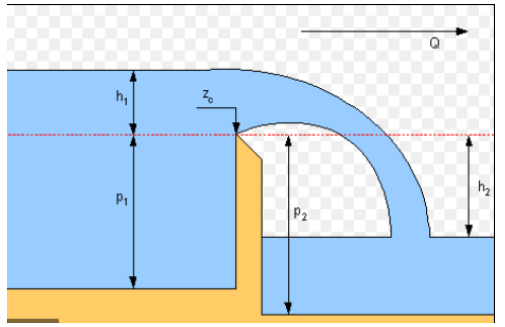
- Data review and plant survey.
- Model development and calibration.
- Scenario development.
- Scenario results and analysis.
- Submit draft Tech Memo and hydraulic model for SOCWA use.
- Run additional scenarios and incorporate comments.
- Submit final Tech Memo and hydraulic model for SOCWA use.

Hydraulics Terminology

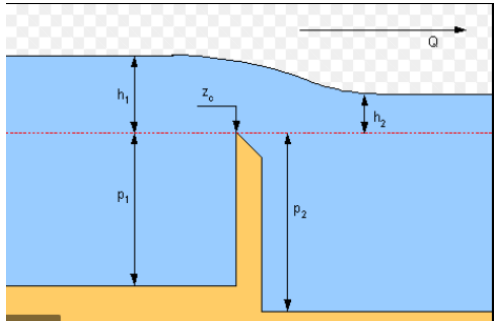
- Freeboard
  - Distance from water surface elevation to top of concrete



- Weir is Free Discharging
  - Downstream water surface is lower than weir crest



- Submerged Weir
  - Downstream water surface is higher than weir crest



Selected Scenarios

Scenario	Scenario Goals
0	Determine max capacity with 12 inches minimum freeboard(3)(4)
1	Mimic Title 22 requirements at Plant 1(1)
2	Mimic Title 22 requirements at Plant 2(1)
3	Determine max combined flow with all units in service(2) (3)
4	Identify where spilling would occur at Plant 1 and Plant 2(3)(4)
5	Determine max combined flow with typical units in service(2)
6	Mimic Effluent Management scenario at Plant 1(1)

Notes:
(1) Maintain 6” free discharge at process weirs and minimum 12” freeboard.
(2) Maintain 2” free discharge at process weirs and minimum 12” freeboard.
(3) All units in service.
(4) Submerged weirs okay.

Scenario 0: Summary and Results

Summary

- Determine maximum combined flow to maintain 12-inches of freeboard:
  - Freeboard: Minimum 12-inches.
  - Weirs: Submerged okay.
  - All units in service.

Results

- Total flow: 20.7 mgd.
  - Plant 1: 12.7 mgd.
  - Plant 2: 8.0 mgd.

Scenarios 1 and 2

Summary

- Determine maximum flow through each plant to meet Title 22 requirements:
  - Weirs: Minimum 6-inches free discharge.
  - Freeboard: Minimum 12-inches.
  - Select units in service.

Results

- Total flow: 11.2 mgd.
  - Plant 1: 6.9 mgd.
  - Plant 2: 4.3 mgd.

Unit	No. In Service Plant 1	No. In Service Plant 2
Bar Screens	2 of 2	1 of 1
Grit Chambers	1 of 1	1 of 1
Primary Clarifiers	5 of 6	2 of 3
Aeration Tanks	4 of 4	2 of 2
Secondary Clarifiers	8 of 9	3 of 4

Scenario 3: Summary and Results

Summary

- Determine max flow through plant to maintain 2-inches free discharge over all process weirs:
  - Weirs: Minimum 2-inches free discharge.
  - Freeboard: Minimum 12-inches.
  - All units in service.

Results

- Total flow: 16.8 mgd.
  - Plant 1: 9.7 mgd.
  - Plant 2: 7.1 mgd.

Scenario 4: Summary and Results

Summary

- Determine max flow through plant before spilling occurs:
  - Weirs: Submerged okay.
  - Freeboard: 0-inches, WSE is equal to top of concrete.
  - All units in service.

Results

- Total flow: 28.8 mgd.
  - Plant 1: 19.0 mgd.
  - Plant 2: 9.8 mgd.
  - First location at risk: Plant 1 and Plant 2 primary influent channels.
  - Second location at risk: Influent diversion structure.

Scenario 5: Summary and Results

Summary

- Determine max flow through plant with typical number of units in service:
  - Weirs: 2 inches free discharging.
  - Freeboard: 12 inches.
  - Select units in service.

Unit	No. In Service Plant 1	No. In Service Plant 2
Bar Screens	2 of 2	1 of 1
Grit Chambers	1 of 1	1 of 1
Primary Clarifiers	4 of 6	1 of 3
Aeration Tanks	3 of 4	1 of 2
Secondary Clarifiers	8 of 9	2 of 4

Results

- Total flow: 12.1 mgd.
  - Plant 1: 9.0 mgd.
  - Plant 2: 3.1 mgd.

Scenario 6: Summary and Results

Summary

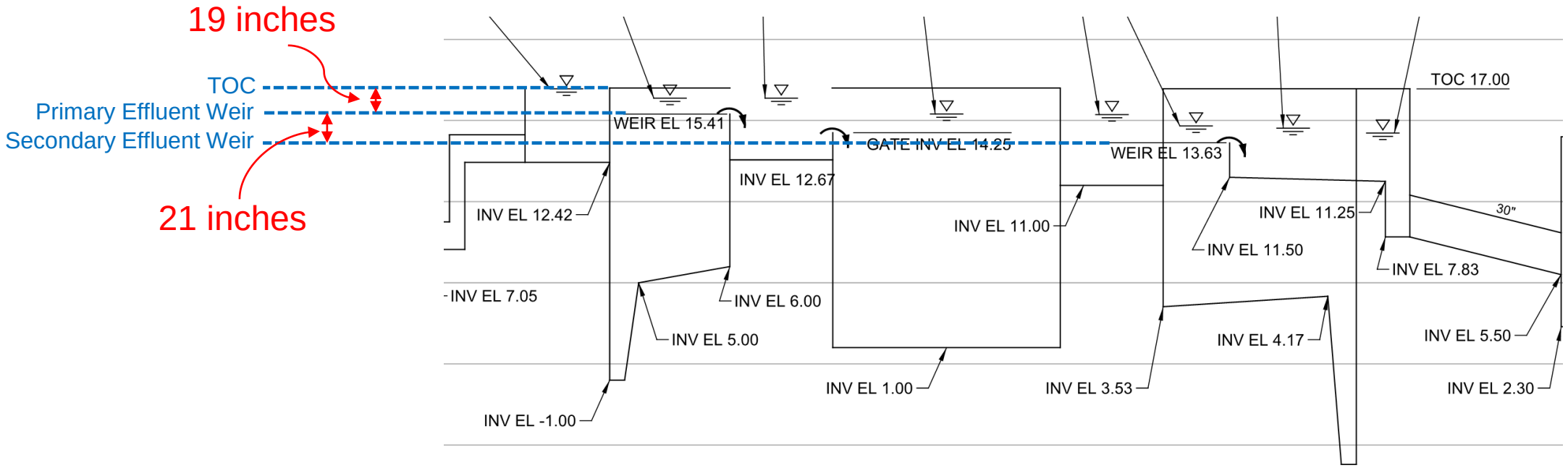
- Determine maximum number of units online at Plant 1 to meet the effluent management scenario of 6.2 mgd:
  - Minimum 6 inches free discharge at process weirs.
  - Minimum 12 inches freeboard.

Results

- Bar screens: 1 of 2.
- Grit tanks: 1 of 1.
- Primary clarifiers: 4 of 6.
- Aeration tanks: 2 of 4.
- Secondary clarifiers: 6 of 9.

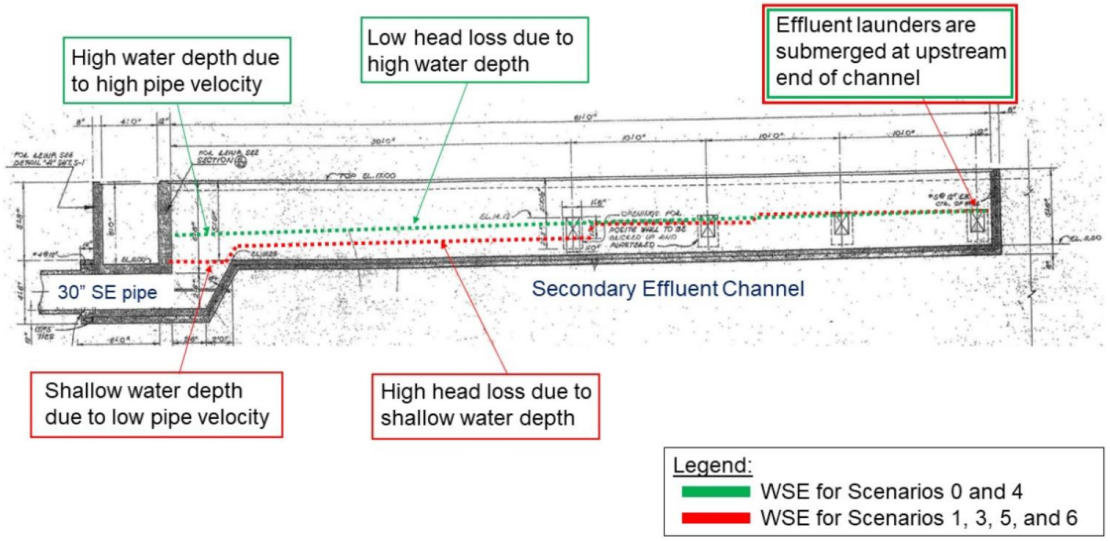
Hydraulic Constraints Assessment

- Primary Influent Channel:
  - Limited freeboard caused by existing weir and TOC elevations.
  - If more freeboard or flow through plant is needed, raising walls could be evaluated.

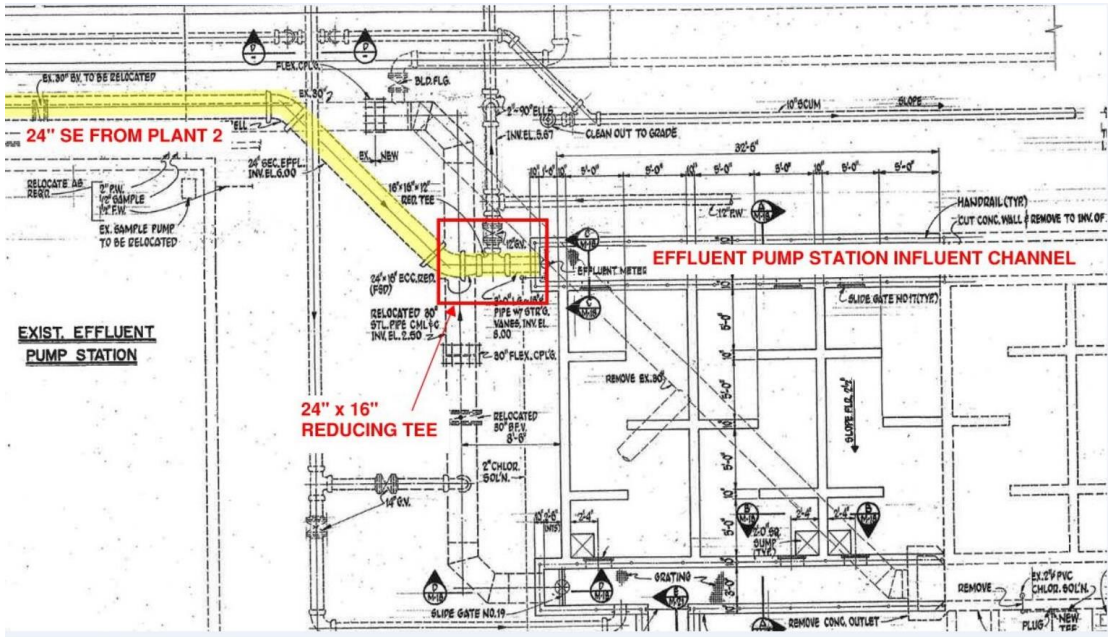


Hydraulic Constraints Assessment

- Plant 1 Secondary Effluent Channel Configuration

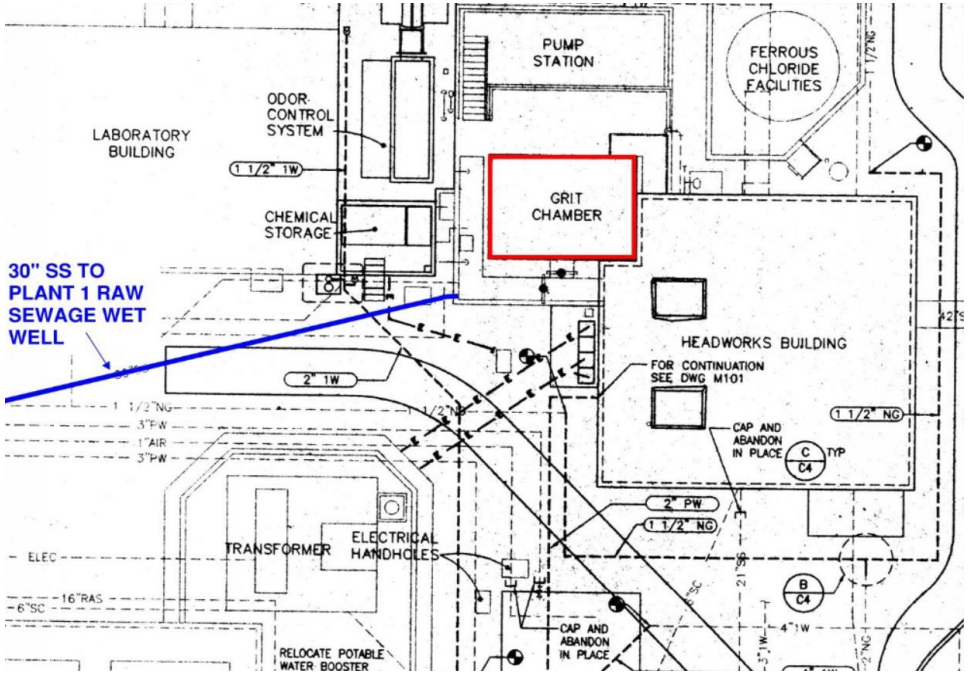


- Plant 2 Secondary Effluent Pipe

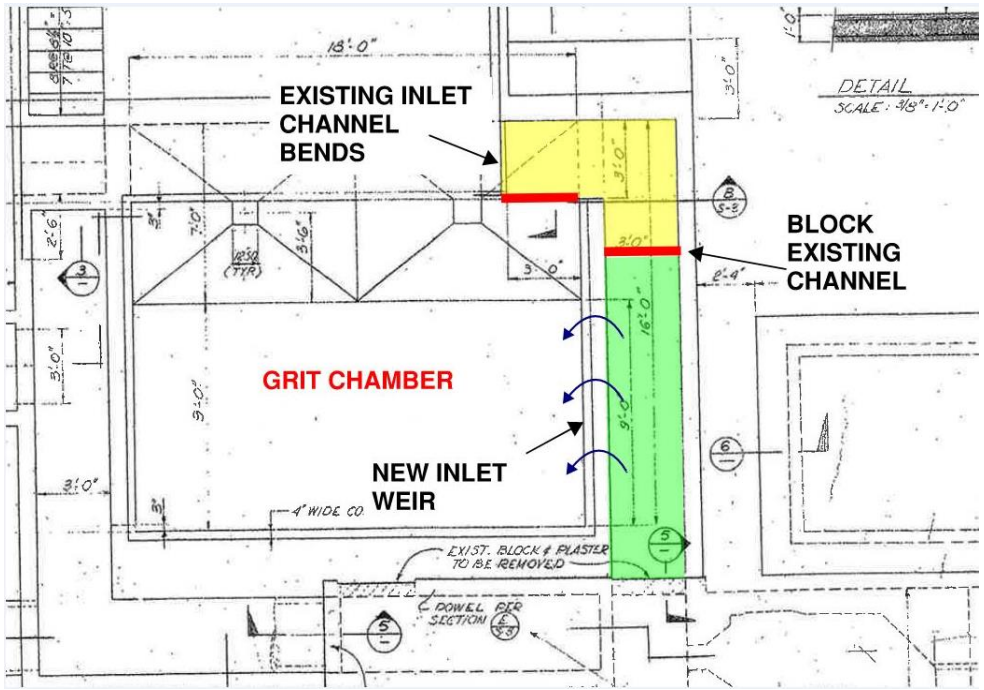


Hydraulic Constraints Assessment

- Plant 1 30-inch Raw Sewage Pipe



- Plant 1 Grit Chamber Influent Channel



Discussion

- Comments/Questions?
- Any additional scenarios of interest?

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Additional Reference

// Scenarios Results Summary

Scenario	Scenario Goals	Plant 1 Max Flow (MGD)	Plant 2 Max Flow (MGD)	Combined Plant Max Flow (MGD)
0	Determine max capacity with 12 inches minimum freeboard(3)(4)	12.7	8.0	20.7
1	Mimic Title 22 requirements at Plant 1(1)	6.9	-	11.2
2	Mimic Title 22 requirements at Plant 2(1)	-	4.3	
3	Determine max combined flow with all units in service(2)(3)	9.7	7.1	16.8
4	Identify where spilling would occur at Plant 1 and Plant 2(3)(4)	19.0	9.8	28.8
5	Determine max combined flow with typical units in service(2)	9.0	3.1	12.1
6	Mimic Effluent Management scenario at Plant 1(1)	6.2	-	-

Notes:
(1) Maintain 6” free discharge at weirs and minimum 12” freeboard.
(2) Maintain 2” free discharge at weirs and minimum 12” freeboard.
(3) All units in service.
(4) Submerged weirs okay.

Hydraulic Constraints Assessment

- Primary Influent Channel:
  - Limited freeboard caused by existing weir and TOC elevations.
  - If more freeboard or flow through plant is needed, raising walls could be evaluated.

- Secondary Effluent Pipe:
  - Generates high headloss.
  - Plant 1: Significant reconfiguration and construction would be required.
  - Plant 2: Upsizing 16-inch section could increase Plant 2 flow by 1 mgd.

Hydraulic Constraints Assessment

- Plant 1 30-inch raw sewage pipe:
  - Undersized for peak flow, appropriately sized for average flow.
  - Upsizing would improve freeboard at influent junction box, but does not improve overall plant capacity unless downstream constraints are addressed.
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- Plant 1 grit chamber influent channel:
  - Generates high headloss.
  - Influent channel could be revised to reduce headloss and improve grit capture.
  - Does not improve overall plant capacity unless other constraints are addressed.