Friant-Kern Canal Subsidence

May 18, 2017

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Discussion Items

1. Friant-Kern Canal Subsidence Issues
2. HEC-RAS Model Update
3. Existing Conditions Model
4. Preliminary Results
5. Next Steps

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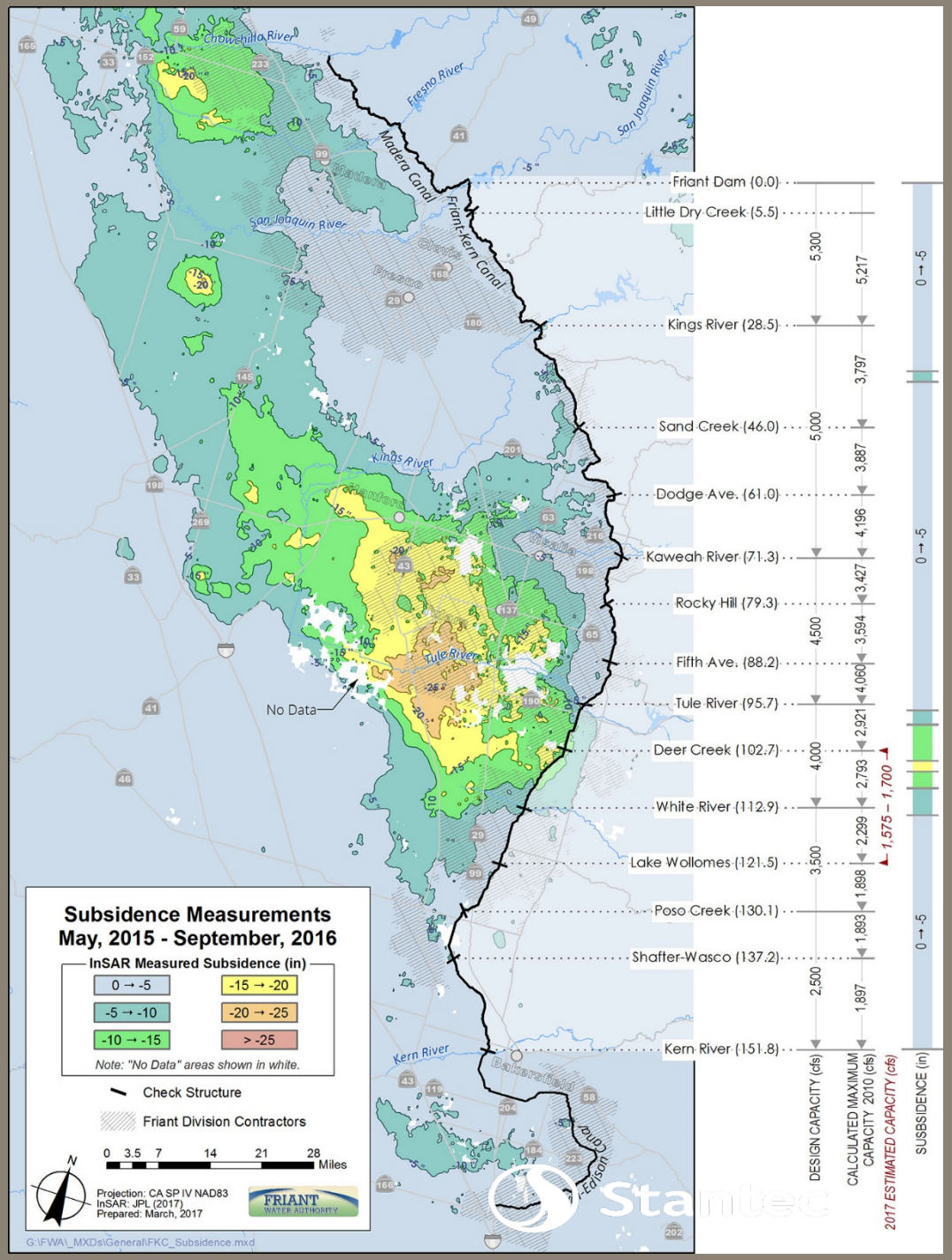
1 Friant-Kern Canal Subsidence Issues

- History of Subsidence
- Continued Subsidence
- Other Issues



1 Friant-Kern Canal Subsidence Issues

- January of this year 1,900 cfs saw water on 5 county bridges in area
- Water surface above bridge low chord at Ave 96, Rd 208, Ave 88, Ave 80, Rd 192

January high flows

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2 HEC-RAS Model Update

- HEC-RAS Model prepared for Capacity Restoration Feasibility Study
- Adjusted for subsidence based on survey information from 2010
- Goal was to determine corrective actions to bring flow to Design Normal Capacity and Design Maximum Capacity
- Determined the locations that required raising the lining

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2 HEC-RAS Model Update

- 2017 Benchmark survey completed by Reclamation
- Using 2017 Benchmarks, Friant Water Authority surveyed canal inverts and points of interest between Fifth Avenue and Poso Creek Check
- Approximately 3.25’ of subsidence in some areas since 2010 survey

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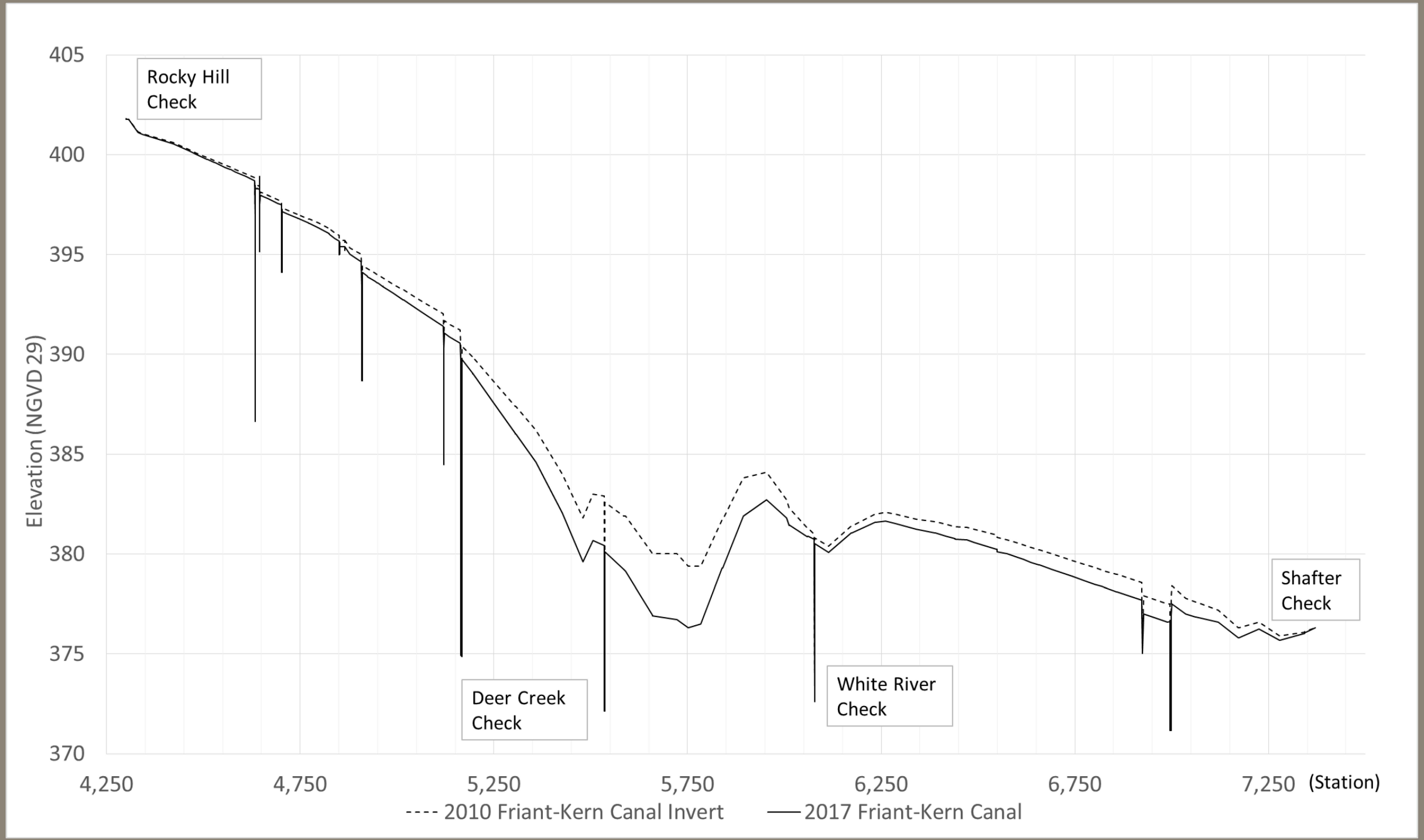
Rocky Hill Check
Deer Creek Check
White River Check
Shafter Check
405
400
395
390
385
380
375
370
Elevation (NGVD 29)
4,250
4,750
5,250
5,750
6,250
6,750
7,250
(Station)
2010 Friant-Kern Canal Invert
2017 Friant-Kern Canal

3 Existing Conditions Model: Update and Assumptions

- Added bridge decks into the model based on drawings from Reclamation
- Adjusted cross sections for subsidence based on survey information
- Linear Interpolation for subsidence between surveyed points
- Steady-state flow model

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4 Existing Conditions Model: Calibration

- Input gate operations, and flows from January 18th, 2017 SCADA reports
- Adjusted loss factors at each check structure
- Adjusted friction factor in the canal
- Visual Inspections at Check Structures to validate results

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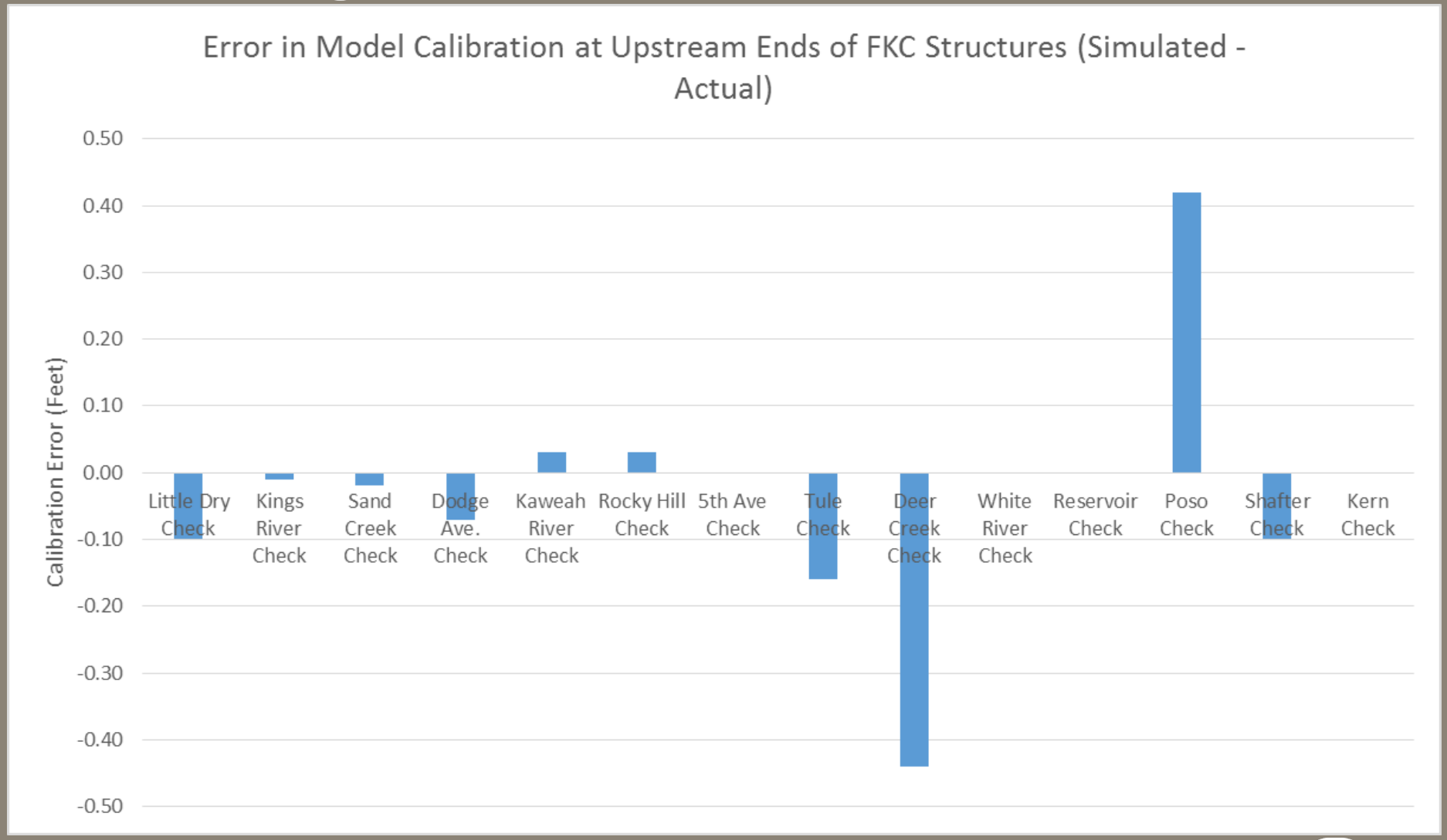
3 Existing Conditions Model: Calibration



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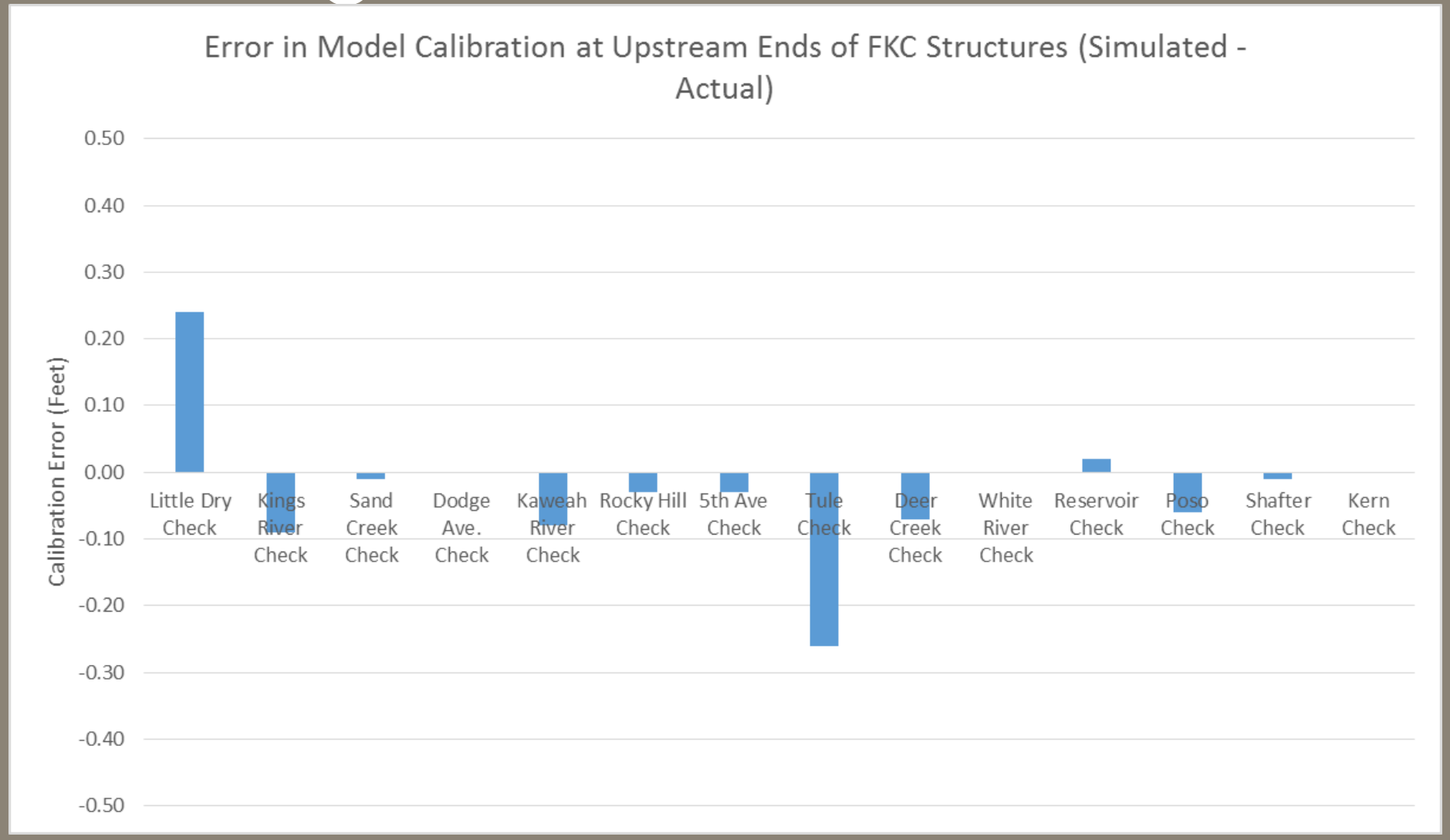
3 Existing Conditions Model: Calibration



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5 Preliminary Results

- Using January 18th Data approximately 1,900 cfs through Deer Creek Check
- Water on 5 bridges below Deer Creek Check
- Using calibrating model tried to push the design normal flows in the canal with all gates open
- Reduced flows until passed from Rocky Hill to Shafter Check

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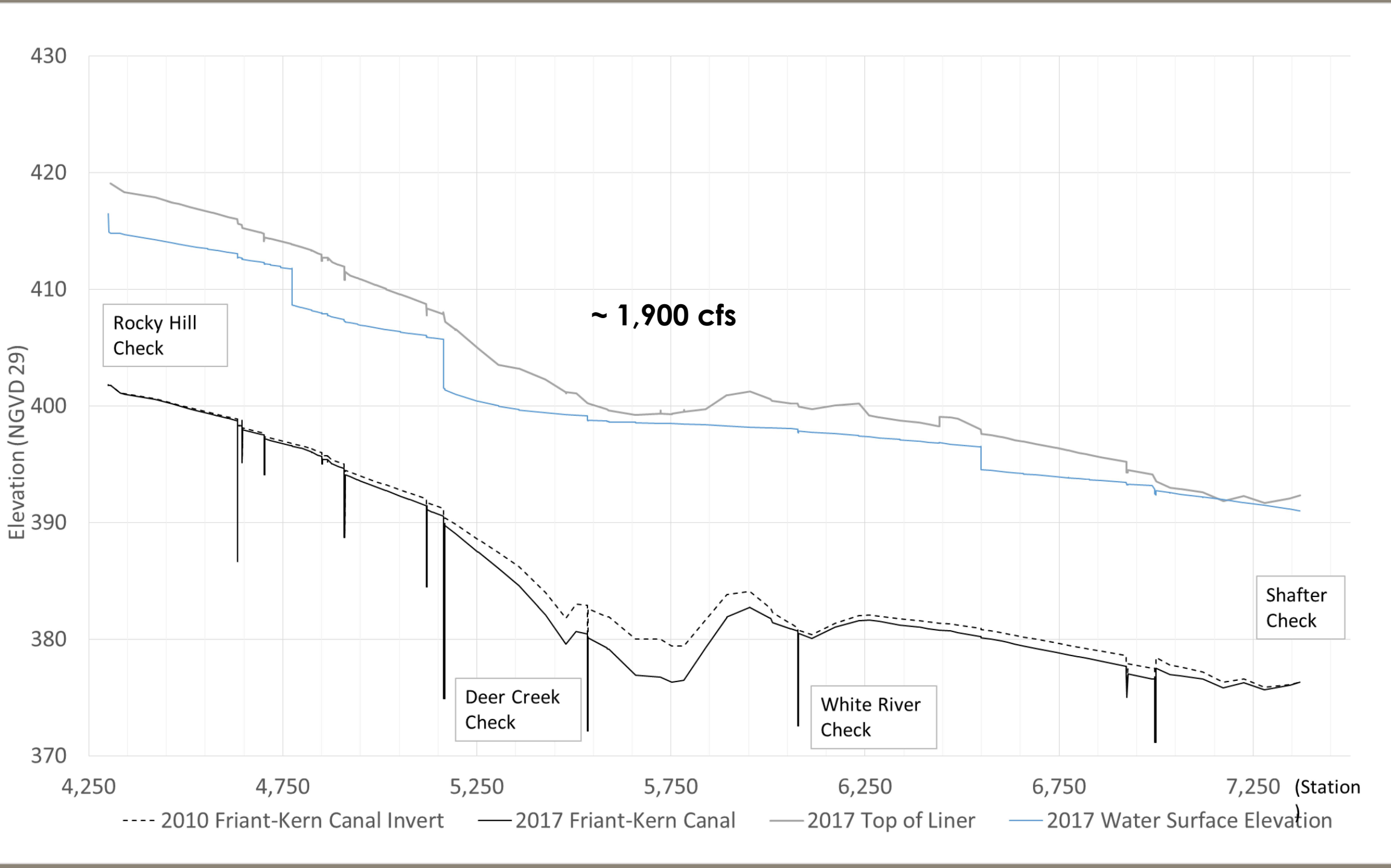
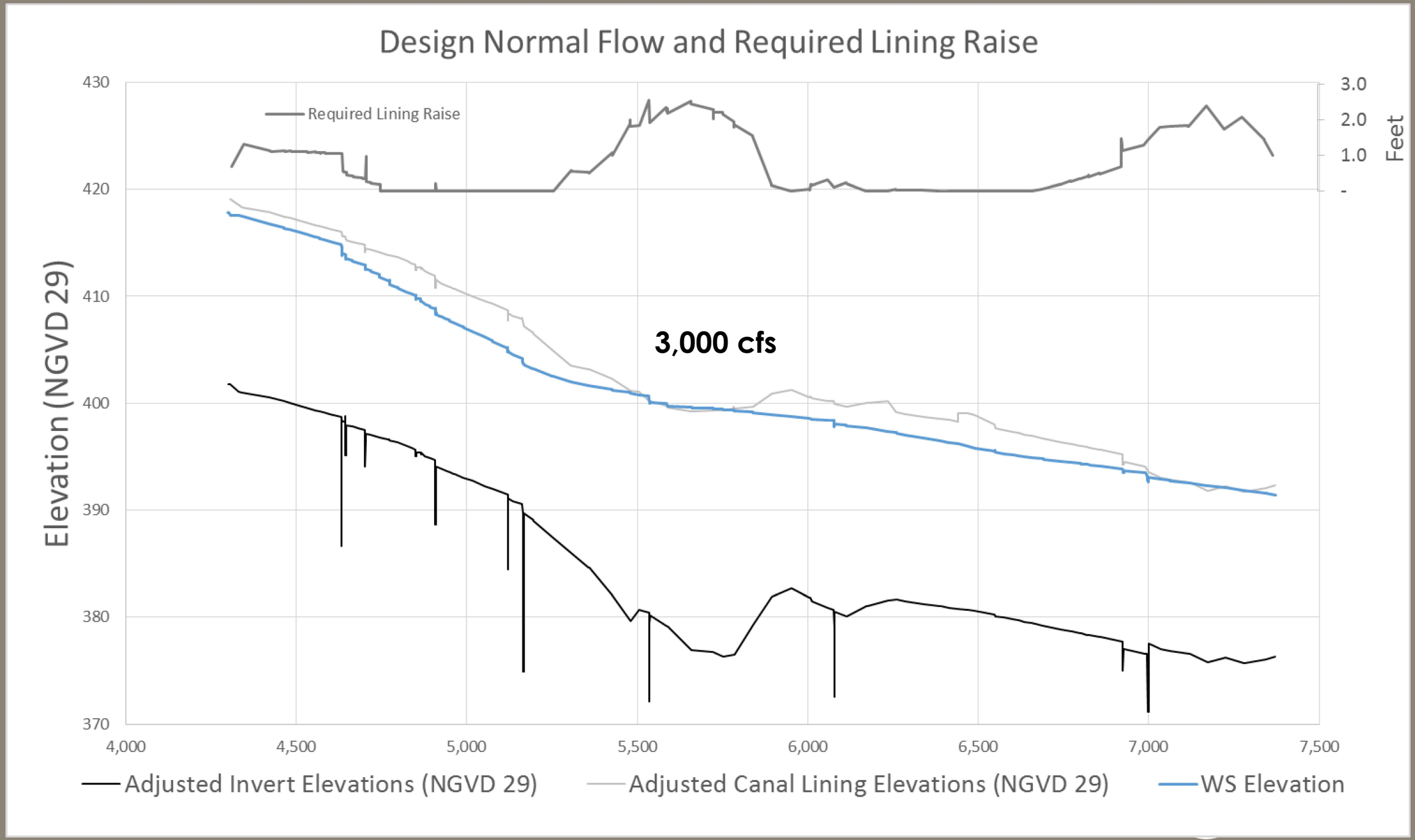
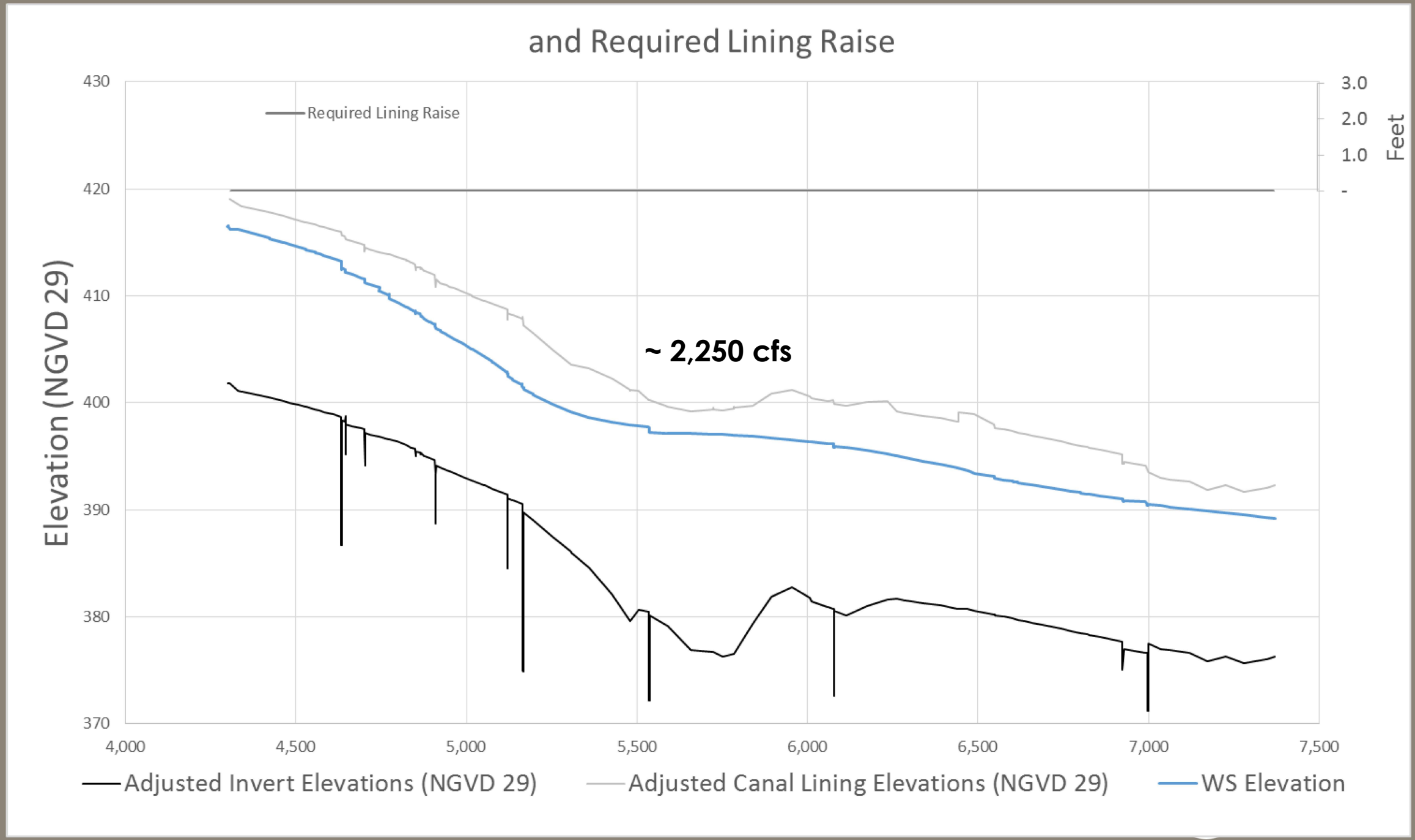

430
420
410
400
390
380
370
Elevation (NGVD 29)
~ 1,900 cfs
Rocky Hill Check
Deer Creek Check
White River Check
Shafter Check
4,250
4,750
5,250
5,750
6,250
6,750
7,250
(Station)
2010 Friant-Kern Canal Invert
2017 Friant-Kern Canal
2017 Top of Liner
2017 Water Surface Elevation


Design Normal Flow and Required Lining Raise
Required Lining Raise
3,000 cfs
Elevation (NGVD 29)
Feet
430
420
410
400
390
380
370
3.0
2.0
1.0
-
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
Adjusted Invert Elevations (NGVD 29)
Adjusted Canal Lining Elevations (NGVD 29)
WS Elevation


and Required Lining Raise
Required Lining Raise
~ 2,250 cfs
Elevation (NGVD 29)
Feet
430
420
410
400
390
380
370
3.0
2.0
1.0
-
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
Adjusted Invert Elevations (NGVD 29)
Adjusted Canal Lining Elevations (NGVD 29)
WS Elevation

6 Next Steps

- Short-term solutions
  - Reoperation
  - Recirculation
  - Tulare County Coordination
- Long-term solutions
  - Bridge Modifications
  - Phased Capacity Correction

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Questions