San Joaquin River Restoration Program

Mendota Pool Bypass and Reach 2B Improvements Project

Hydraulic and Sediment Transport Modeling Workshop

February 12, 2015 1:30 pm – 4:30 pm

SJRECWA Office

Agenda

1. Introductions
2. Mendota Pool Bypass and Reach 2B Project Overview
3. Conceptual Hydraulic Design
4. Sediment Transport Modeling
    1. Degradation / Aggradation
    2. Water Surface Elevation Changes
5. Floodplain Inundation Analysis
6. Input
7. Next Steps

Katrina Harrison

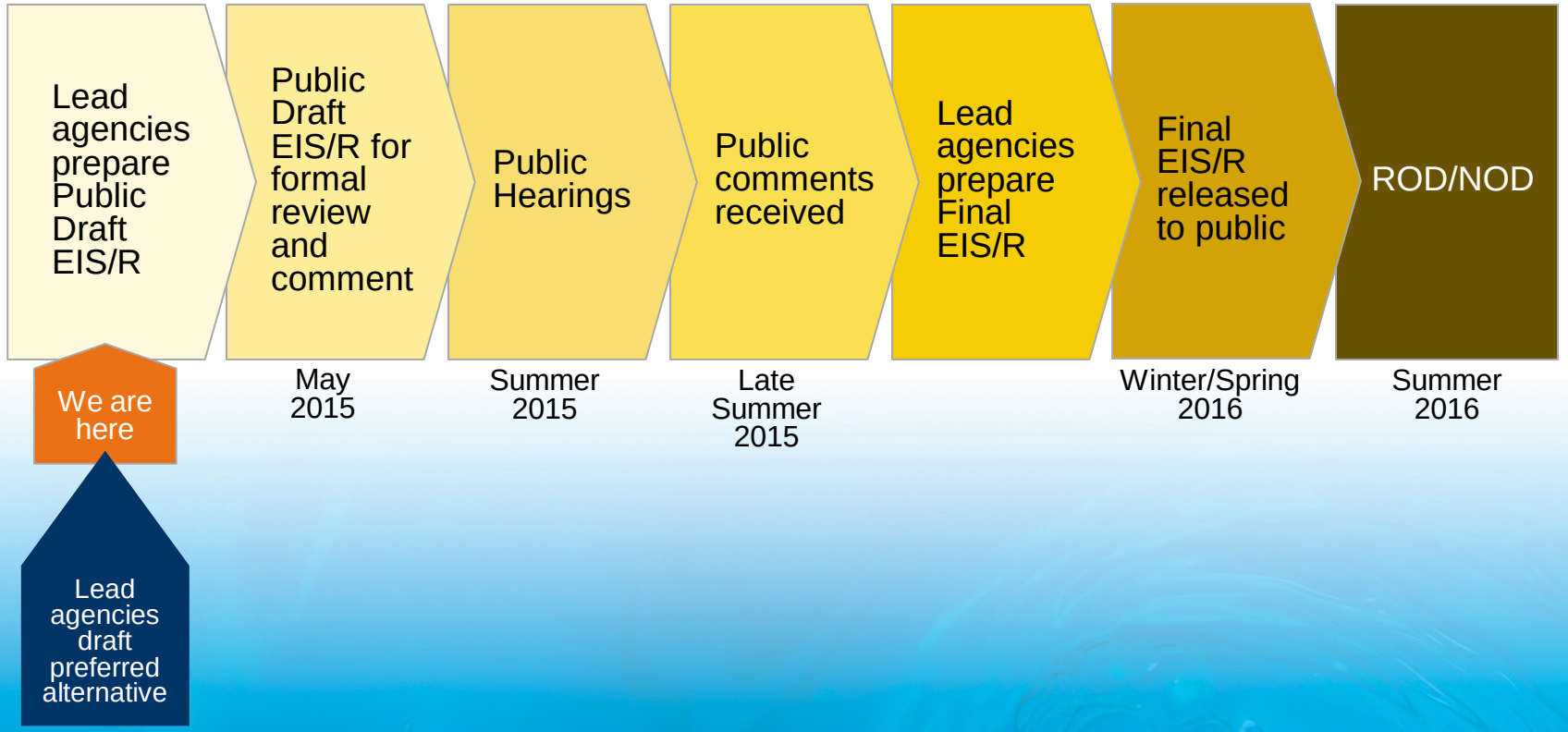
MENDOTA POOL BYPASS AND REACH 2B PROJECT UPDATES

Reach 2B EIS/R Status

- Working on adminstrative drafts of EIS/R
- Public Draft EIS/R Anticipated for May 2015 release
- Will contain a preferred alternative

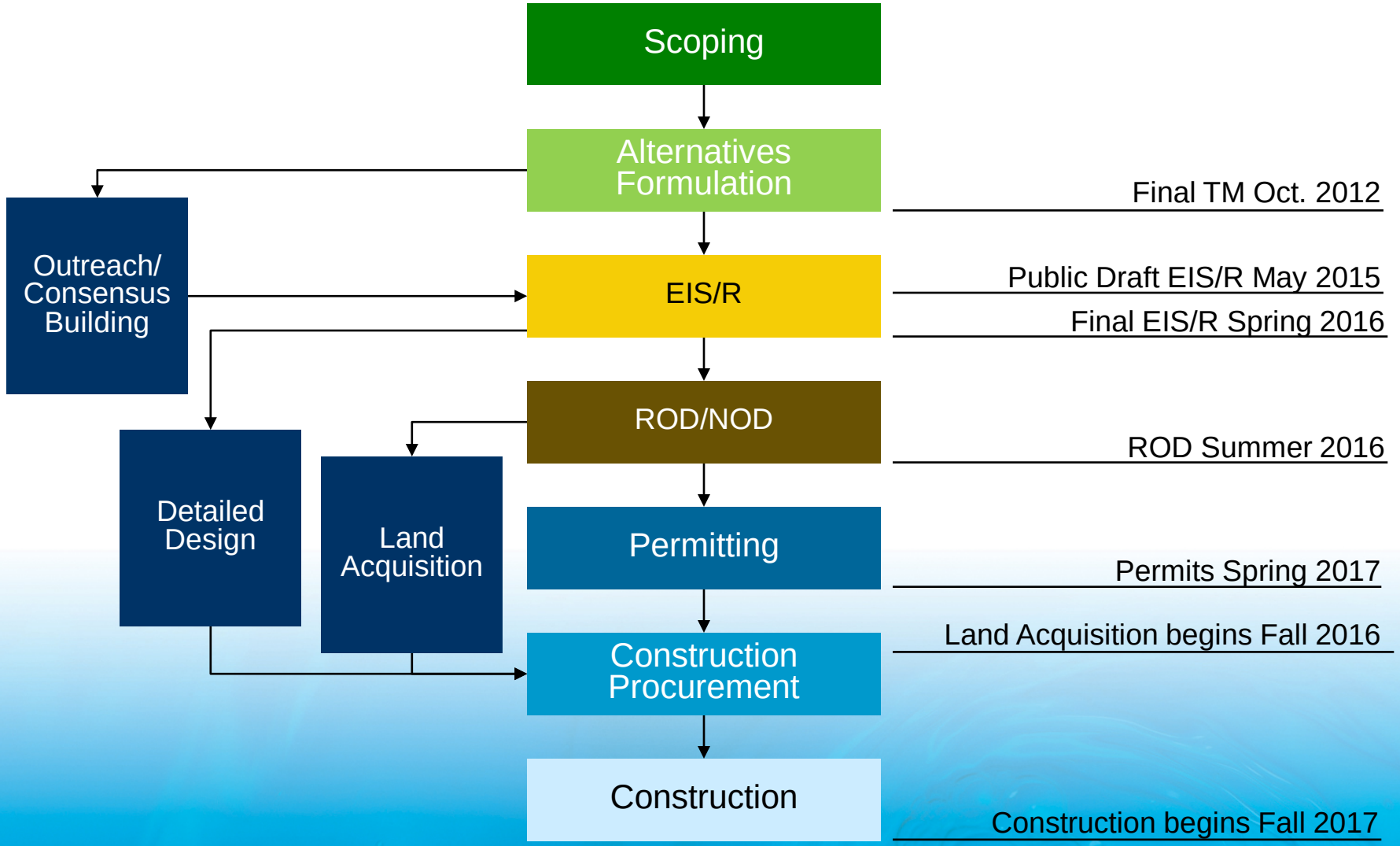
Reach 2B Project Update

EIS/R Process and Schedule



Reach 2B Project Update

Project Process and Schedule



Reach 2B Project Alternatives

- Four Alternatives presented in the Reach 2B Project Description TM
  - Compact Bypass with Narrow Floodplain and South Canal
  - Compact Bypass with Wide Floodplain and Bifurcation Structure (will be modified to become Preferred Alternative)
  - Fresno Slough Dam with Narrow Floodplain and Short Canal
  - Fresno Slough Dam with Wide Floodplain and North Canal

Reach 2B Preferred Alternative

- Based on landowner consensus based alternative
- Updated based on discussions with landowners and more information about infrastructure
- Tentatively Preferred Alternative:
  - Compact Bypass
  - Modified levee alignment – between narrow and wide
  - Bifurcation Structures for delivery to Mendota Pool

Reach 2B Preferred Alternative

- Fresno Slough Dam
  - Reduces Mendota Pool Volume
  - Changes to Operation
  - Mendota Dam recently repaired
- Compact Bypass
  - Landowner Consensus-Based Alternative
  - Larger floodplain
  - Same Delta Mendota Canal / Mendota Pool operations

- Public comment to date indicates Compact Bypass is Preferred

Reach 2B Preferred Alternative

- Narrow Levee Alignment
  - Minimizes land out of production
  - Landowner Consensus-Based Alternative
- Wide Levee Alignment
  - Maximizes fish habitat

- Some landowners willing to sell land outside of Narrow Levee Alignment
- Preferred Levee Alignment is Narrow, with areas landowners are willing to sell
- Slightly (~20 acres) smaller than Wide Levee Alignment

Reach 2B Preferred Alternative

- South or North Canal Options
  - Create access issues to farms – would require bridges
  - Take land out of production away from the river
  - Could move river side of the Chowchilla Bifurcation Structure downstream
    - Minimizes fish obstacles
    - Impacts flood operations
- Bifurcation Structures
  - Minimize land out of production

- Public comment to date indicates Bifurcation Structures are preferred

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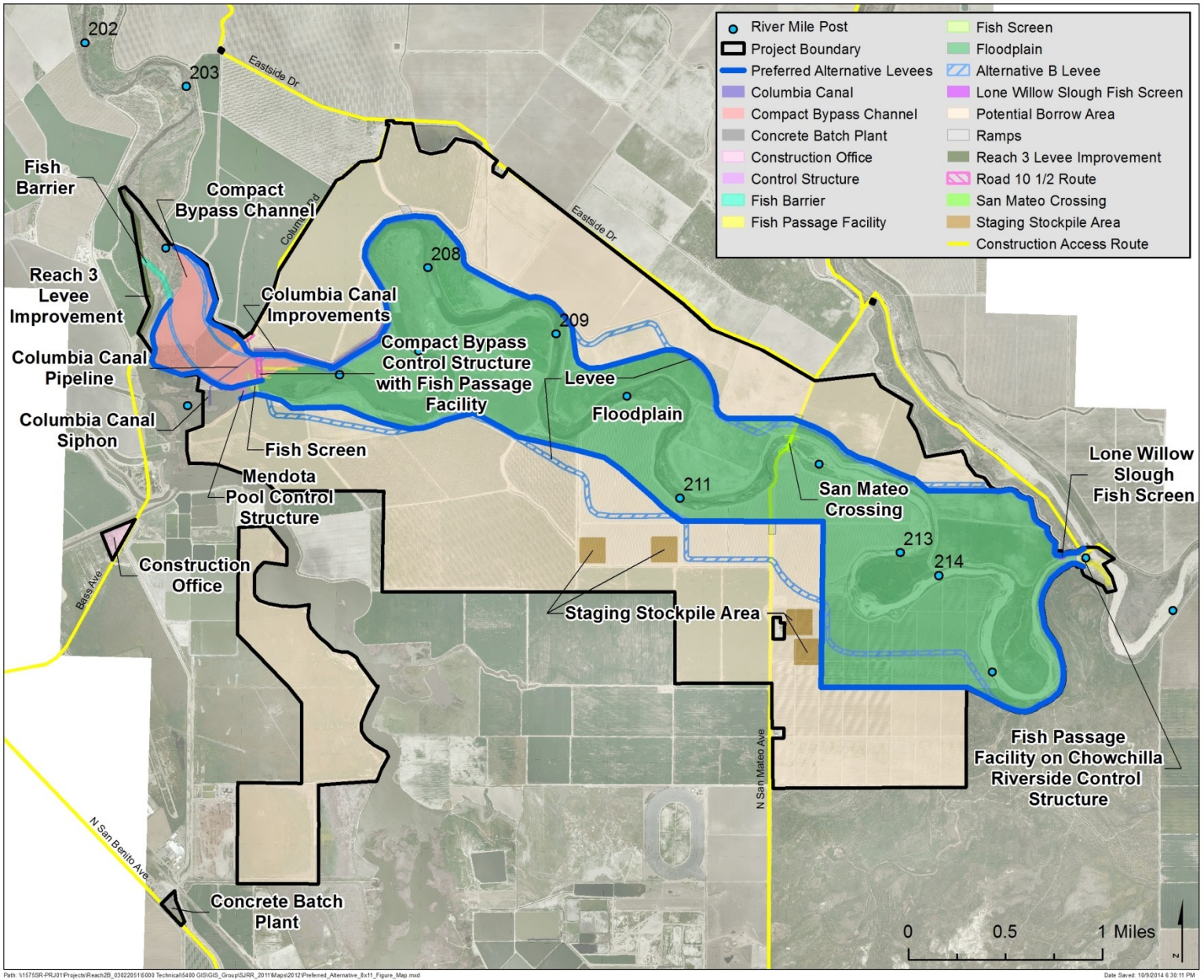
Reach 2B Preferred Alternative



Reach 2B Construction Schedule

- Must sequence project due to funding stream
- Preliminary schedule, based on Framework for Implementation:
  - Compact Bypass and structures to be constructed first
    - 2017 start
  - Reach 2B Levees second
    - 2020 start
- Design currently ongoing for Compact Bypass

Reach 2B Design Process

- Now: Compact Bypass Hydraulic Design
- March – Summer 2015: Levee and Structure Design for the Compact Bypass
- Fall 2015: Start work on 60% design

- No detailed designs and plans completed yet.

Reach 2B Design Public Input

- Technical Workshops at key decision points in the design process

- Summer 2015 Workshop anticipated on structure design

Blair Greimann

COMPACT BYPASS HYDRAULIC DESIGN

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Managing Water in the West

Compact Bypass Grading Options

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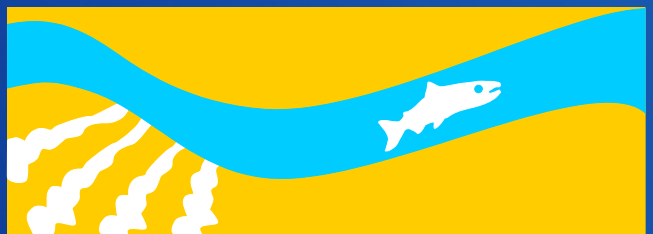
U.S. Department of the Interior
Bureau of Reclamation

SAN JOAQUIN RIVER
RESTORATION PROGRAM



Background

- Hydraulic and Revegetation Design previously done at Appraisal Level
- Now we are progressing to the early design phases.
- Designing for the Compact Bypass first as it will be constructed first. The first major design decision in the Compact Bypass is the elevation of the flow control structure at its upstream end.
- There will be more opportunities for future input and review
- Looking to choose the elevation of the structure in the next month

Outline

- Conceptual Hydraulic Designs
  - Grade Control Options
- Sediment Transport Modeling Results
  - Bed Changes
  - Water Surface Elevation Changes
- Floodplain Inundation Analysis
  - Wetted Width Changes
  - Tradeoffs

CONCEPTUAL DESIGNS

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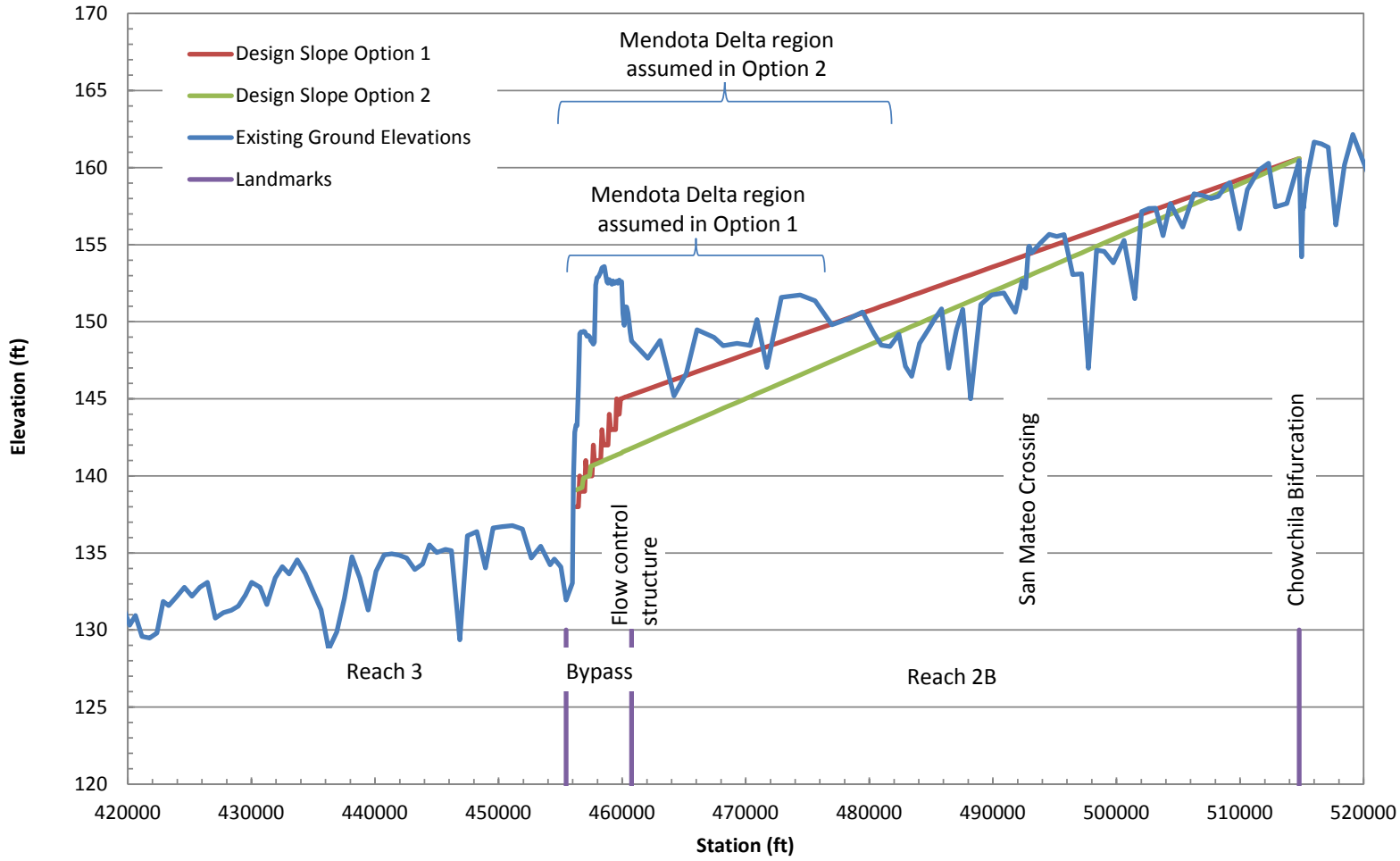
Design Criteria

1. Pass all life stages of Chinook salmon, pass sturgeon and pass other native species upstream and downstream through the Mendota Bypass project area.
2. Promote survival of the species through development of appropriate and sustainable habitat.
3. Create a bypass channel around Mendota Pool to ensure conveyance of at least 4,500 cfs through Reach 2B to Reach 3. This improvement requires construction of a structure capable of directing flow down the bypass and allowing the Secretary to make deliveries of San Joaquin River water into Mendota Pool when necessary.
4. Maintain current flood conveyance capacities in Reach 3.
5. Minimize both construction and maintenance cost.
6. Create a sustainable stream profile that minimizes long term sediment imbalances within the project area

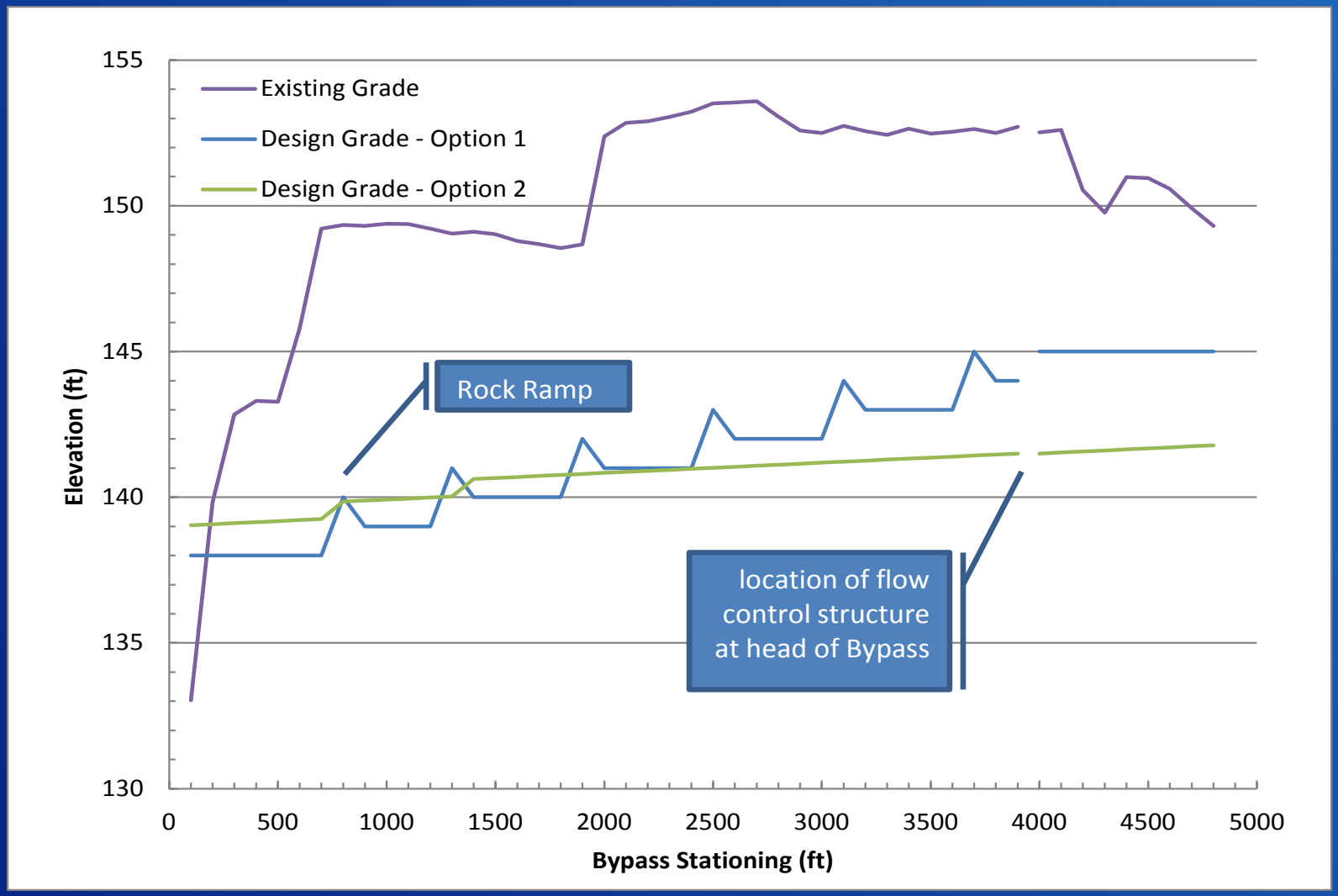
Design Options for Grading

- **Option 1: Grade Control Profile**
  - **Stabilization of the Compact Bypass with 6 one-foot grade control structures**
- **Option 2: Natural Stream Profile**
  - **Two one-foot channel stabilization features**
  - **Allows for more erosion in Reach 2B and deposition in Reach 3**
- **Both options include a gated flow control structure at upper end of Compact Bypass to divert flows from San Joaquin into Mendota Pool**

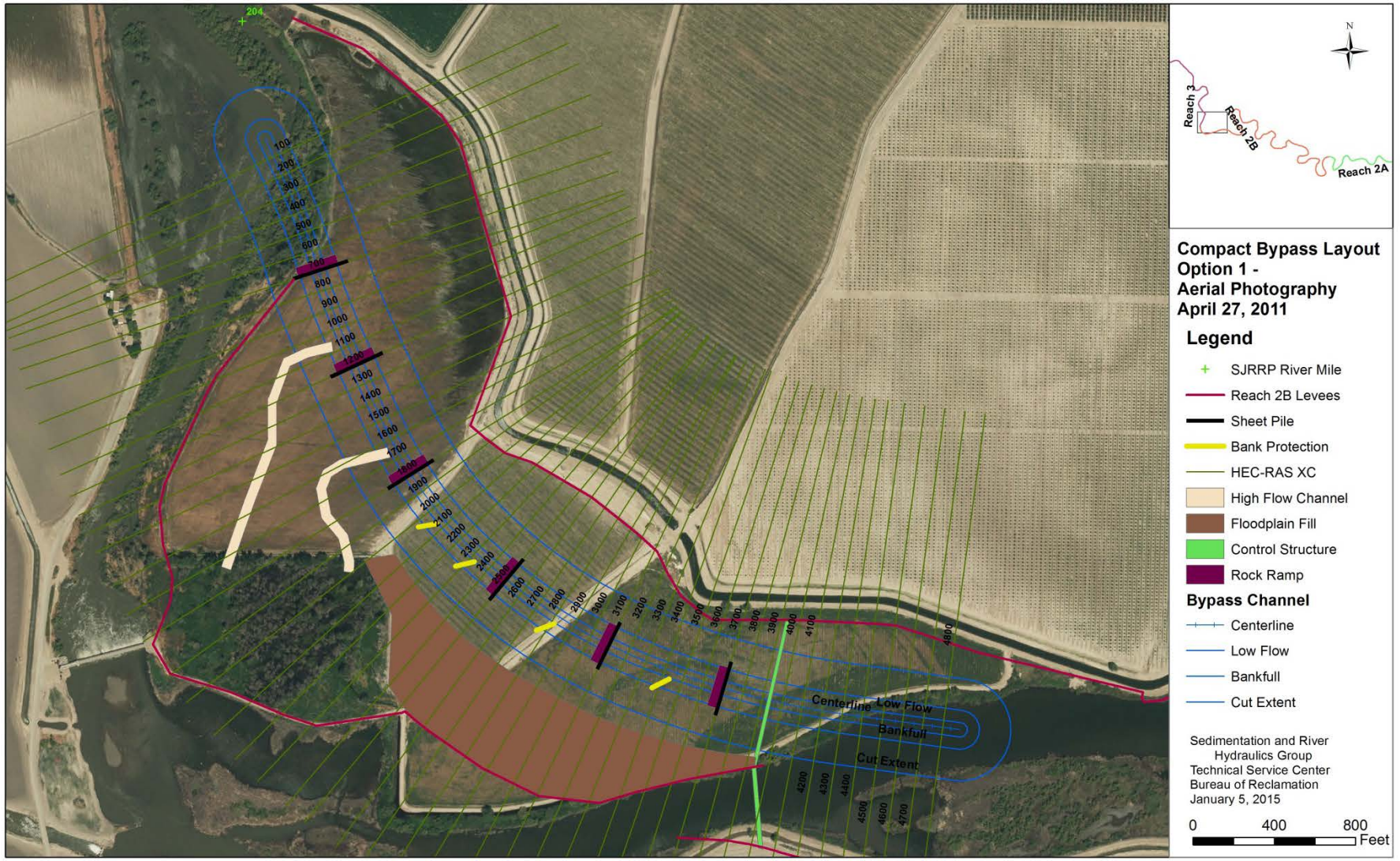
Design Option Profiles



Design Option Profiles



Option 1



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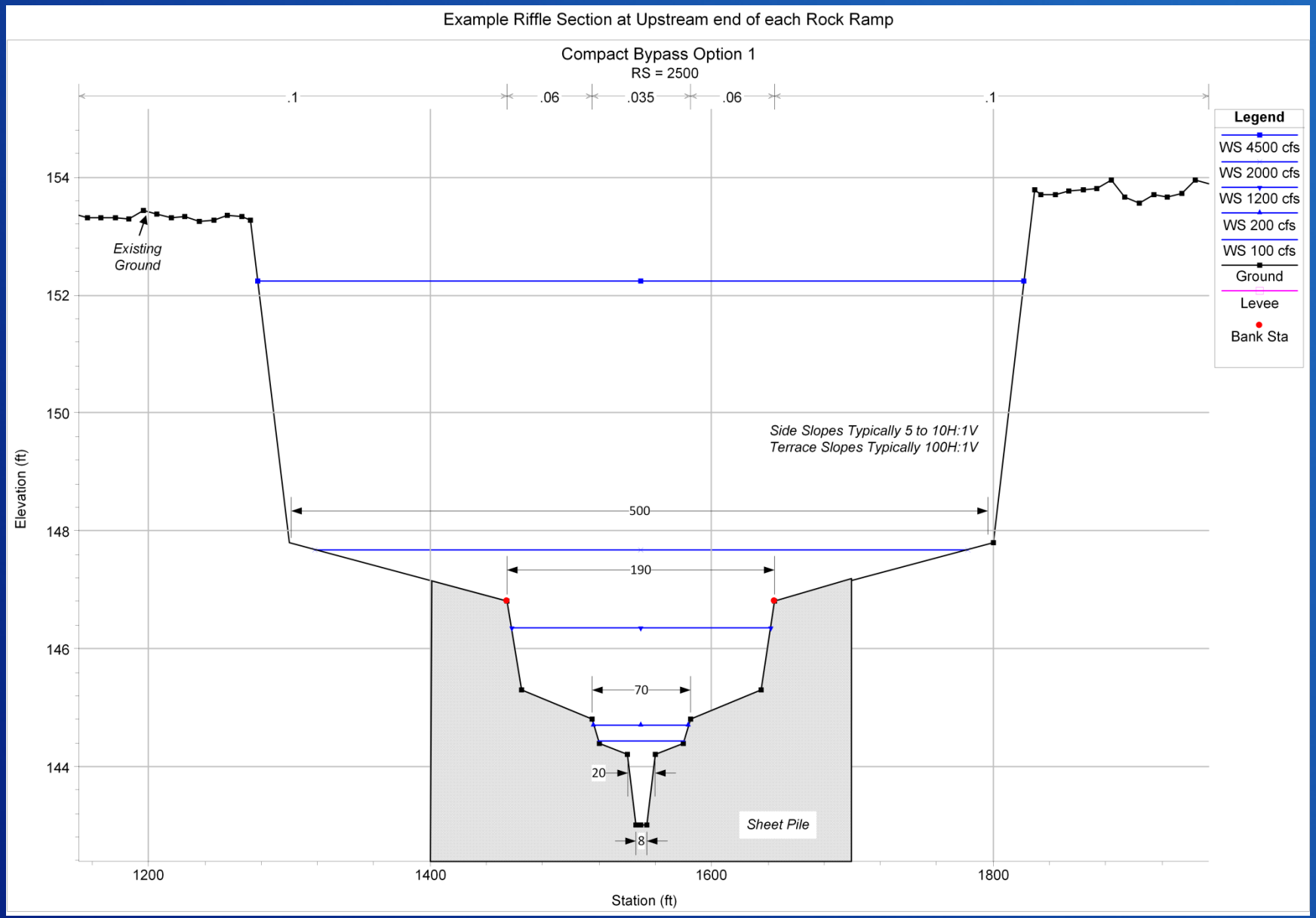
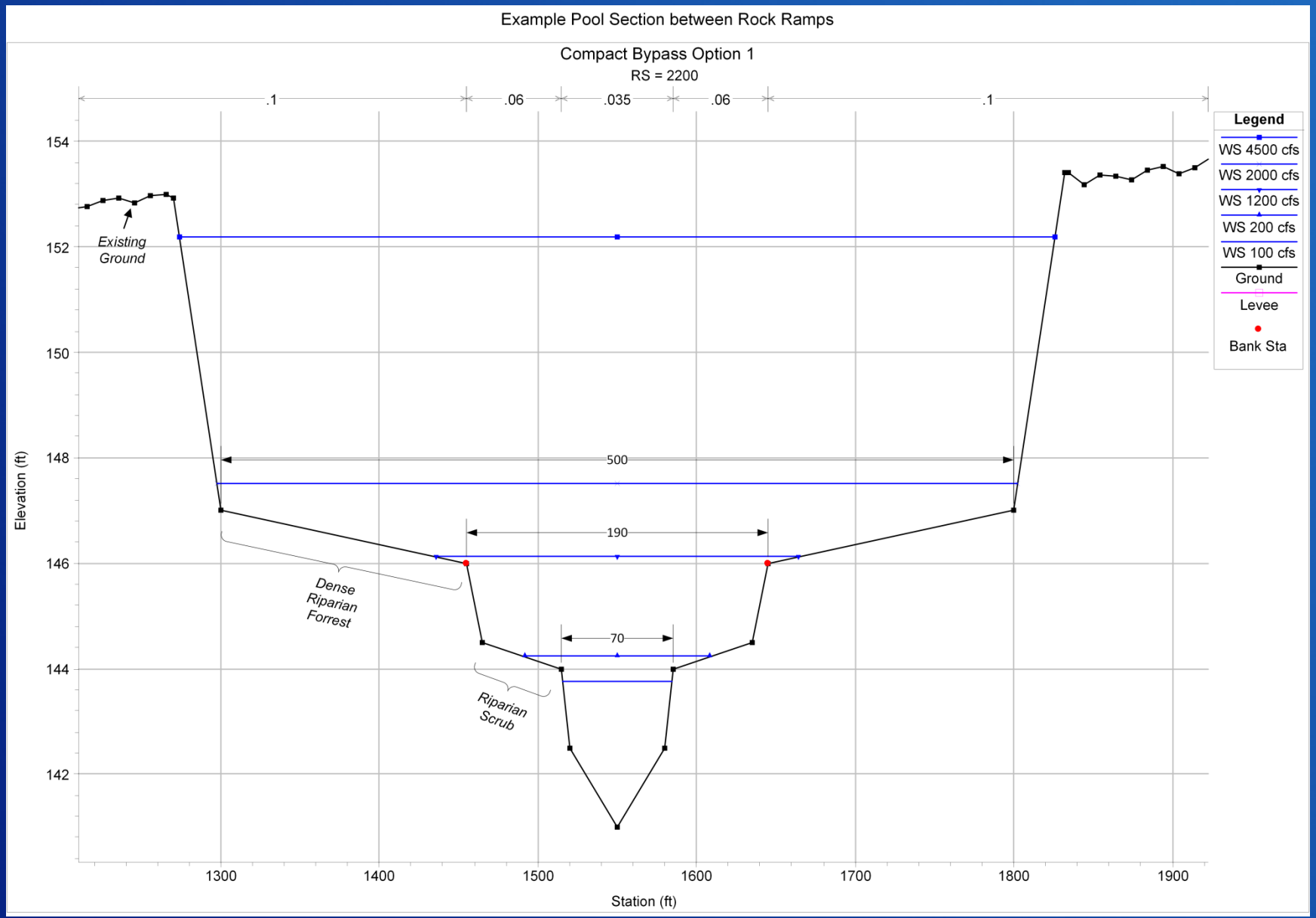

Example Riffle Section at Upstream end of each Rock Ramp
Compact Bypass Option 1
RS = 2500
.1
.06
.035
.06
.1
Legend
WS 4500 cfs
WS 2000 cfs
WS 1200 cfs
WS 200 cfs
WS 100 cfs
Ground
Levee
Bank Sta
Existing Ground
Side Slopes Typically 5 to 10H:1V
Terrace Slopes Typically 100H:1V
500
190
70
20
8
Sheet Pile
Elevation (ft)
154
152
150
148
146
144
1200
1400
1600
1800
Station (ft)



Preliminary Draft, Subject to Change

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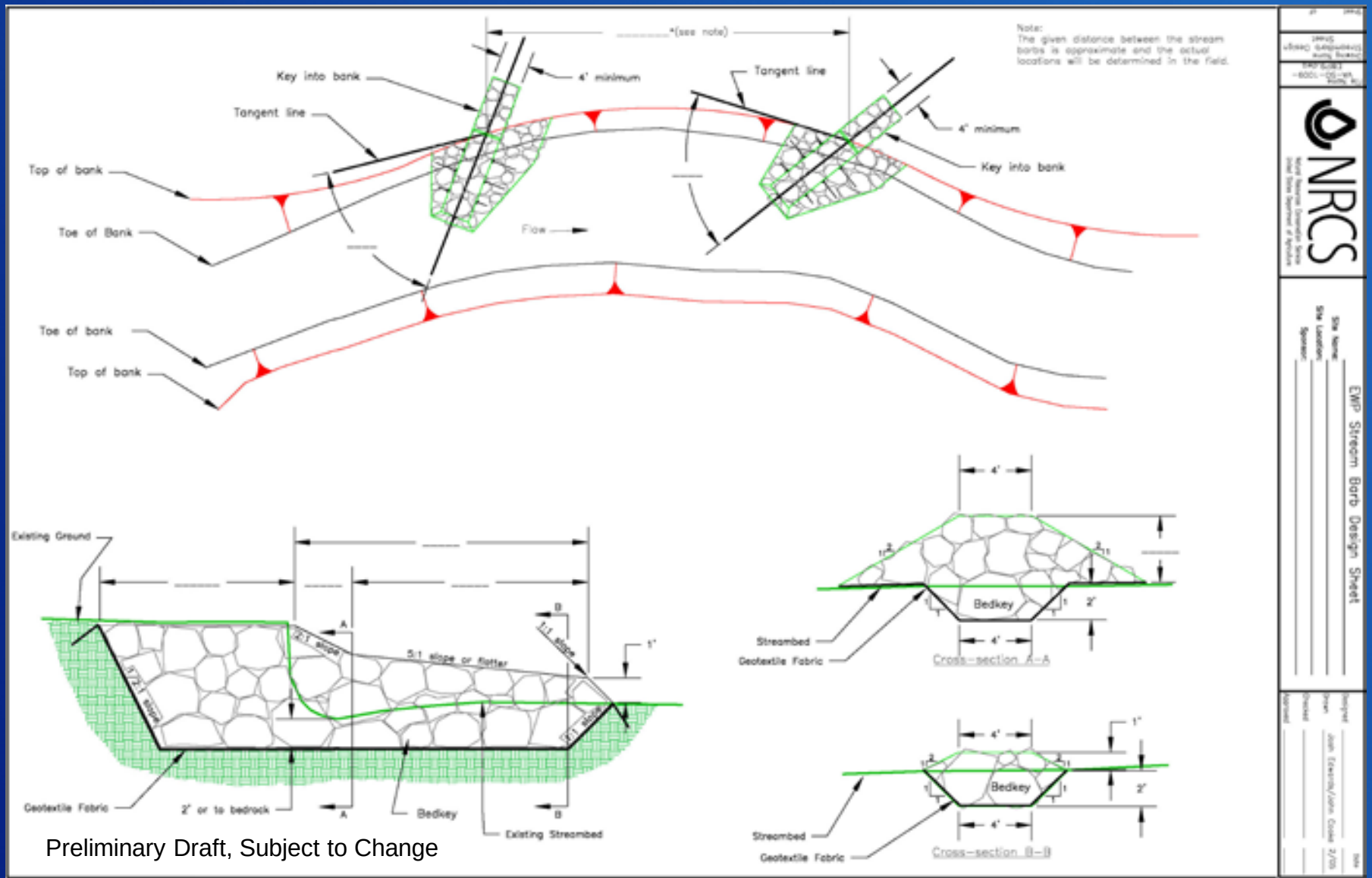
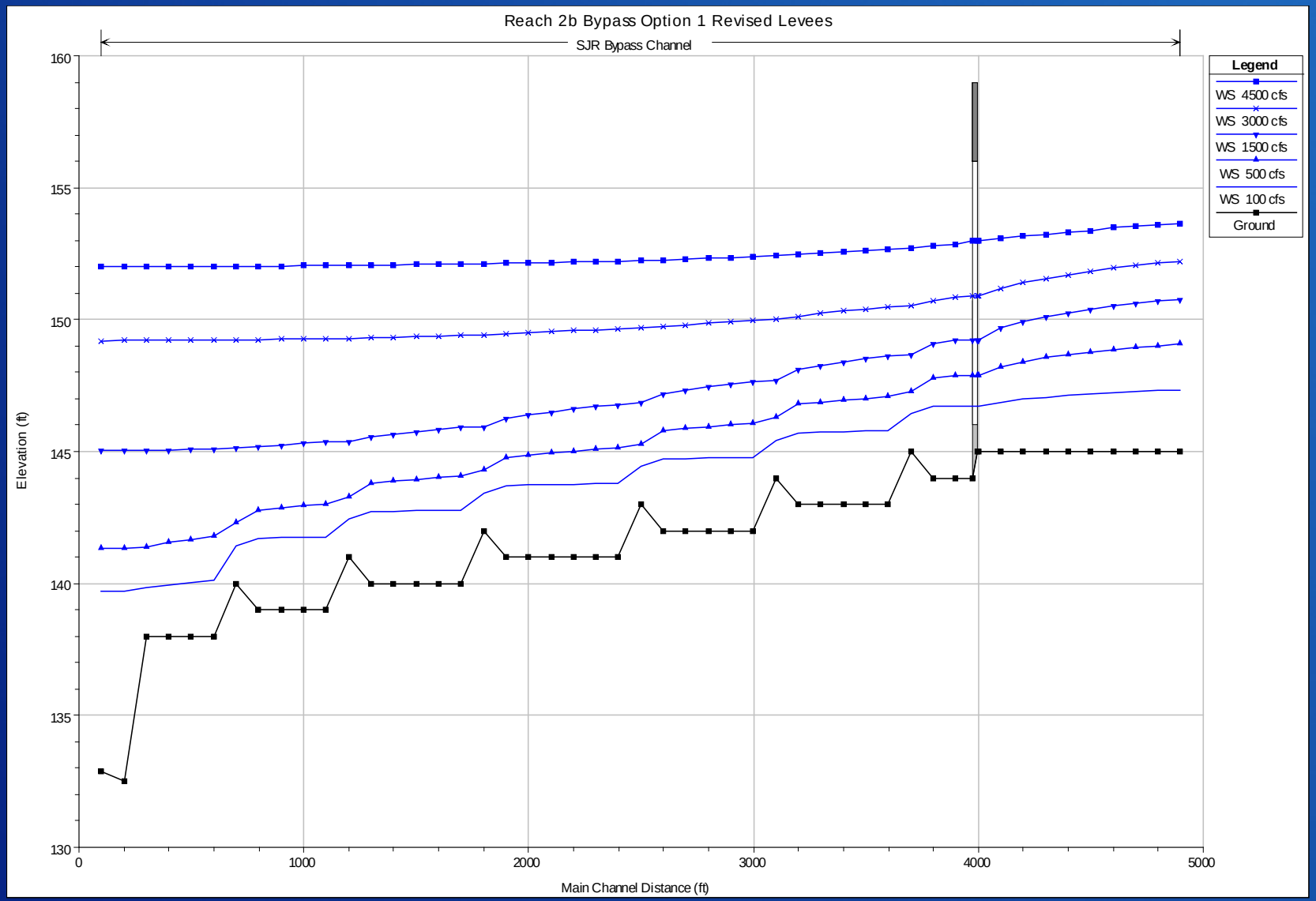
Option1: Rock Vanes for Bank Protection



Preliminary Draft, Subject to Change

Option1: Rock Ramps for Grade Control - example

Option 1: Initial Water Surface Profile



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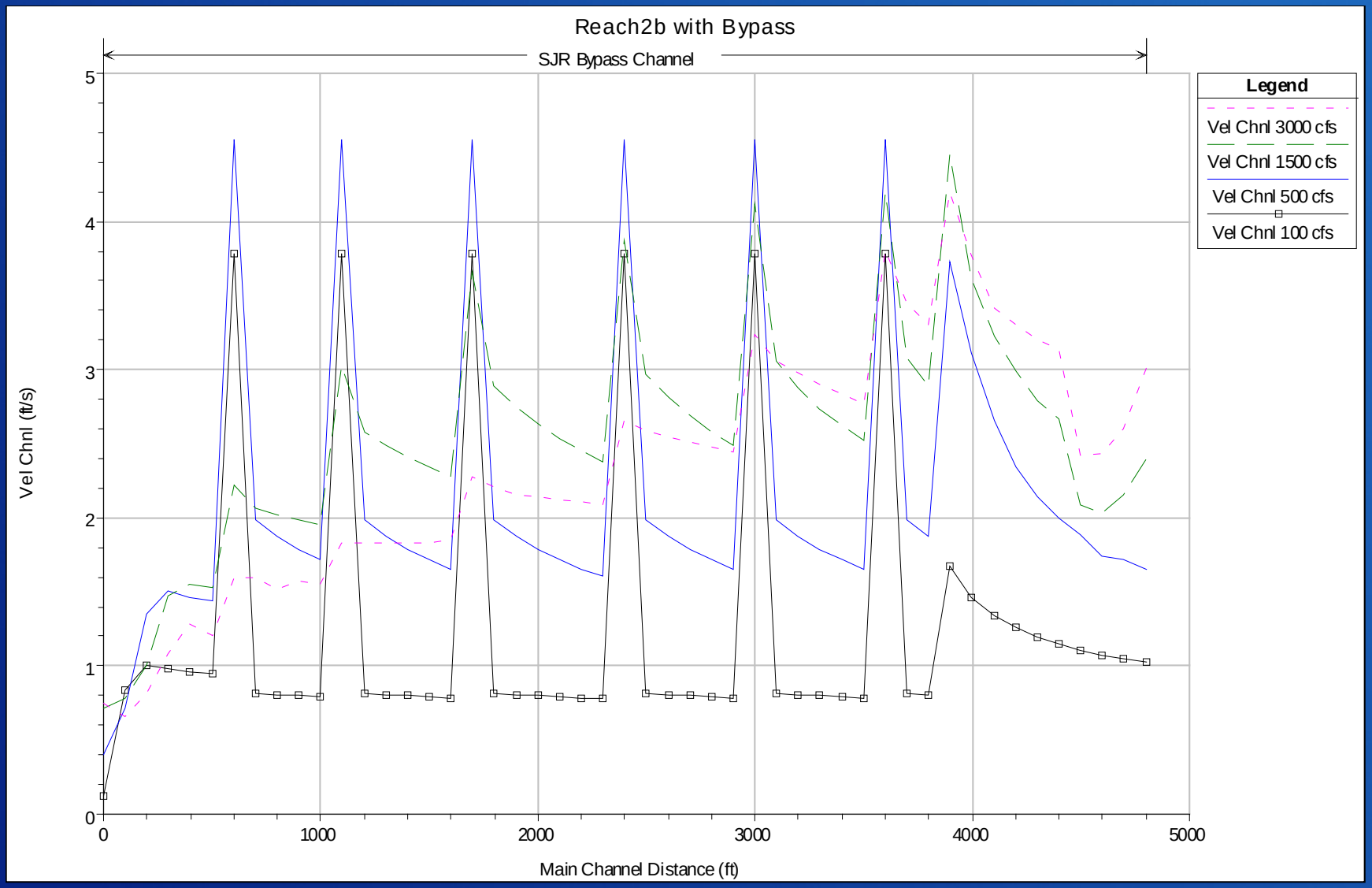
Option 1: Initial Channel Velocities



Preliminary Draft, Subject to Change

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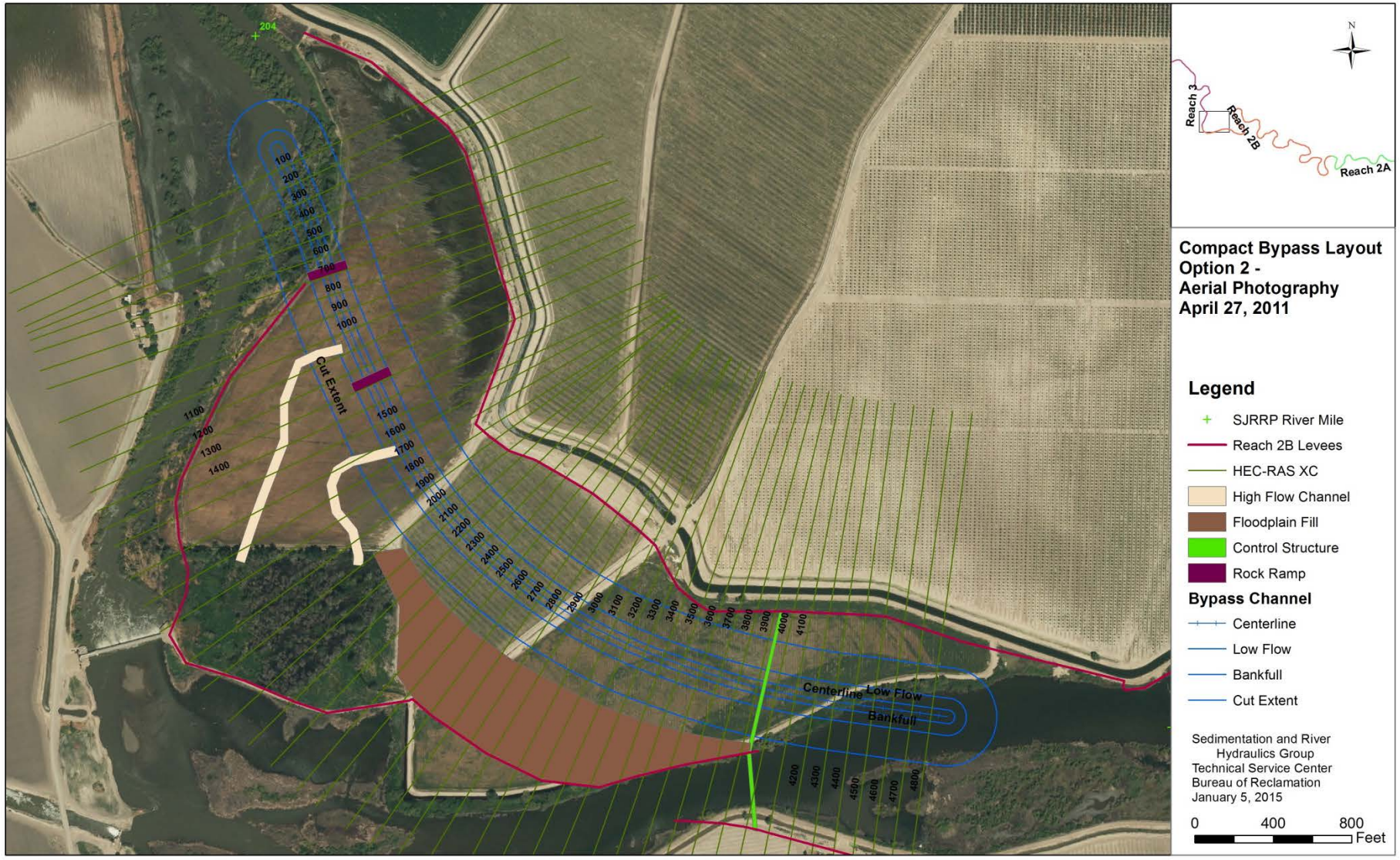
Option 2


204
100
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1900
2000
2100
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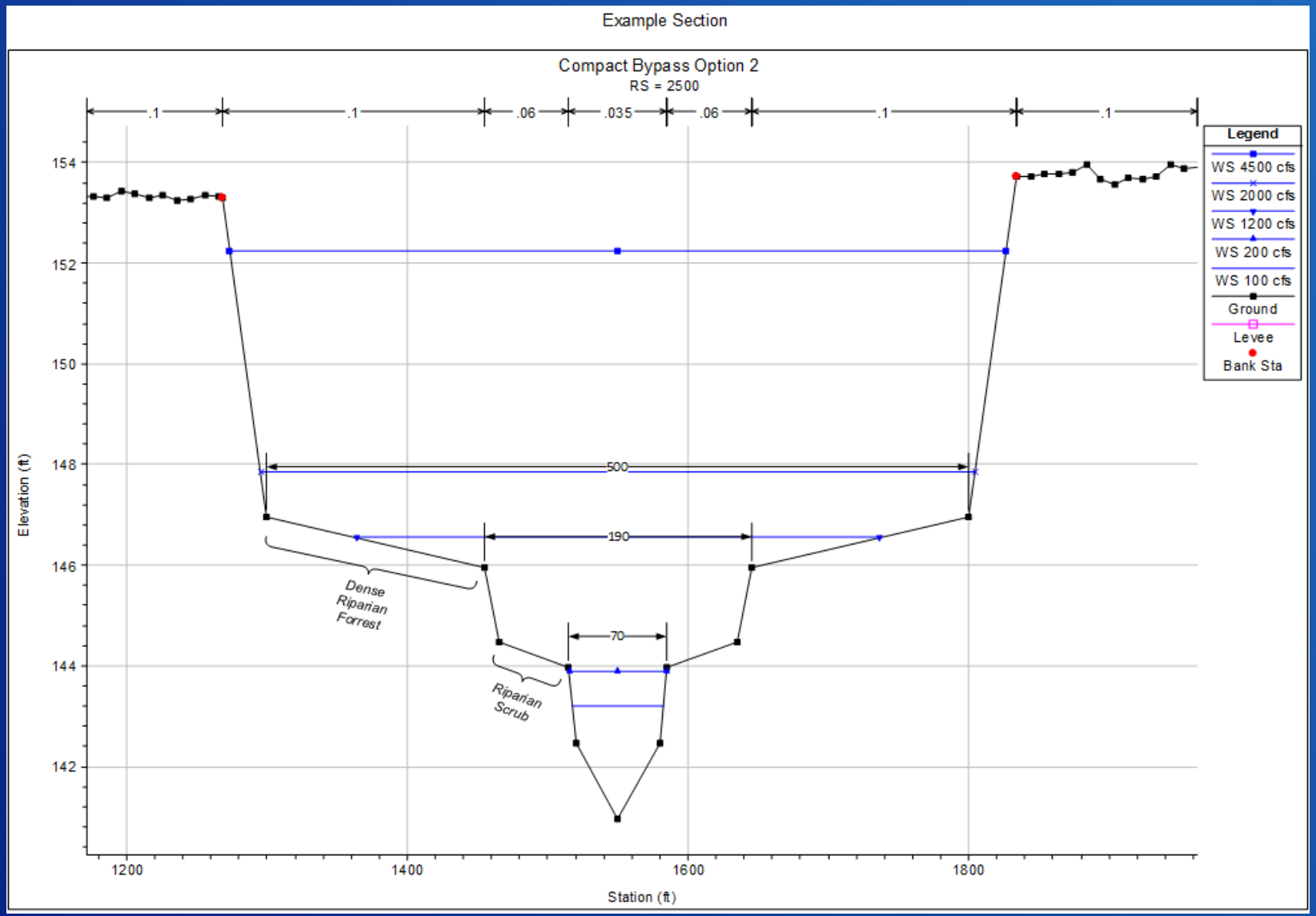
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400
4500
4600
4700
4800
Cut Extent
Centerline
Low Flow
Bankfull
N
Reach 3
Reach 2B
Reach 2A
Compact Bypass Layout
Option 2 -
Aerial Photography
April 27, 2011
Legend
SJRRP River Mile
Reach 2B Levees
HEC-RAS XC
High Flow Channel
Floodplain Fill
Control Structure
Rock Ramp
Bypass Channel
Centerline
Low Flow
Bankfull
Cut Extent
Sedimentation and River
Hydraulics Group
Technical Service Center
Bureau of Reclamation
January 5, 2015
0
400
800
Feet

Option 2: Typical Cross Section



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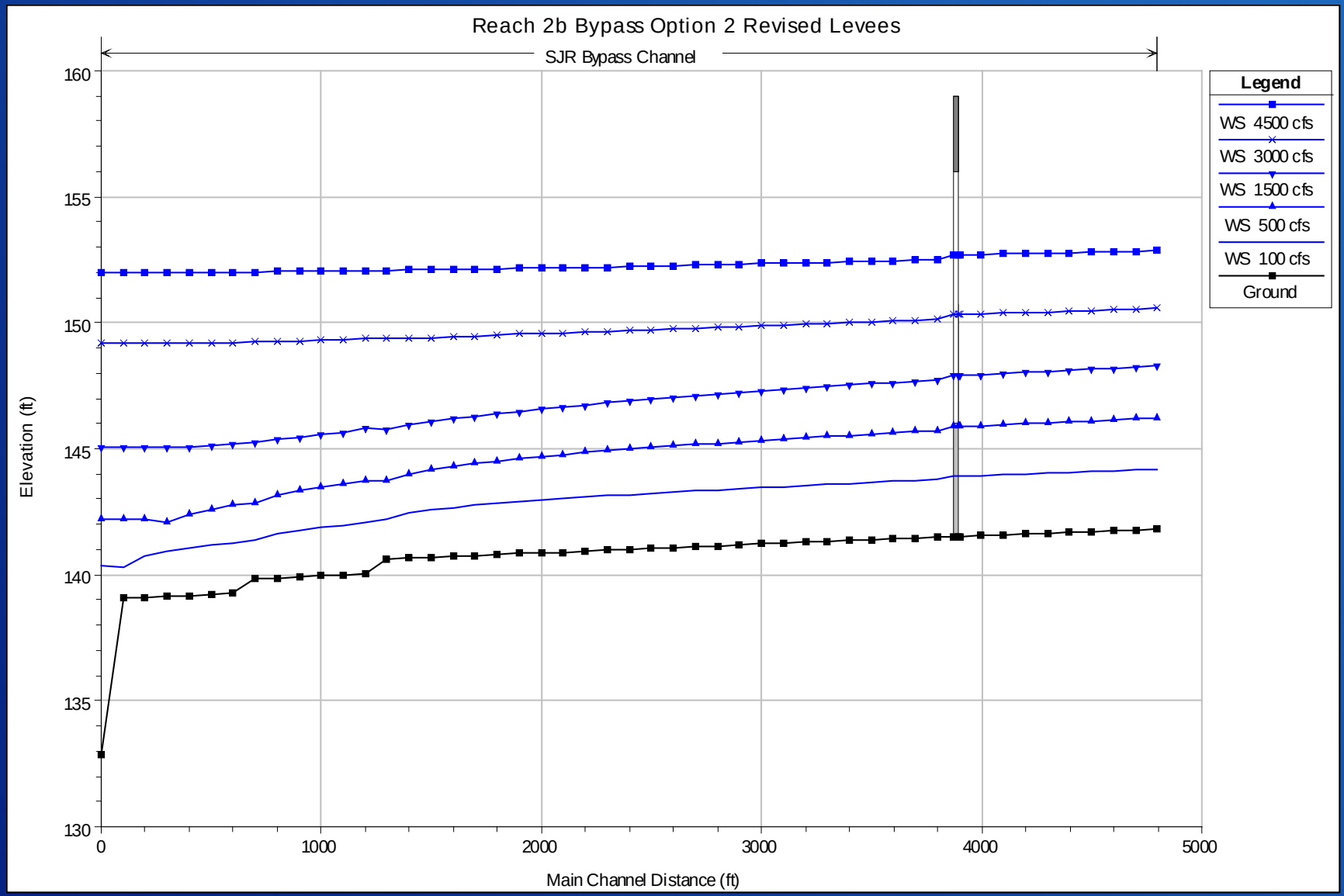
Option 2: Initial Water Surface Profile



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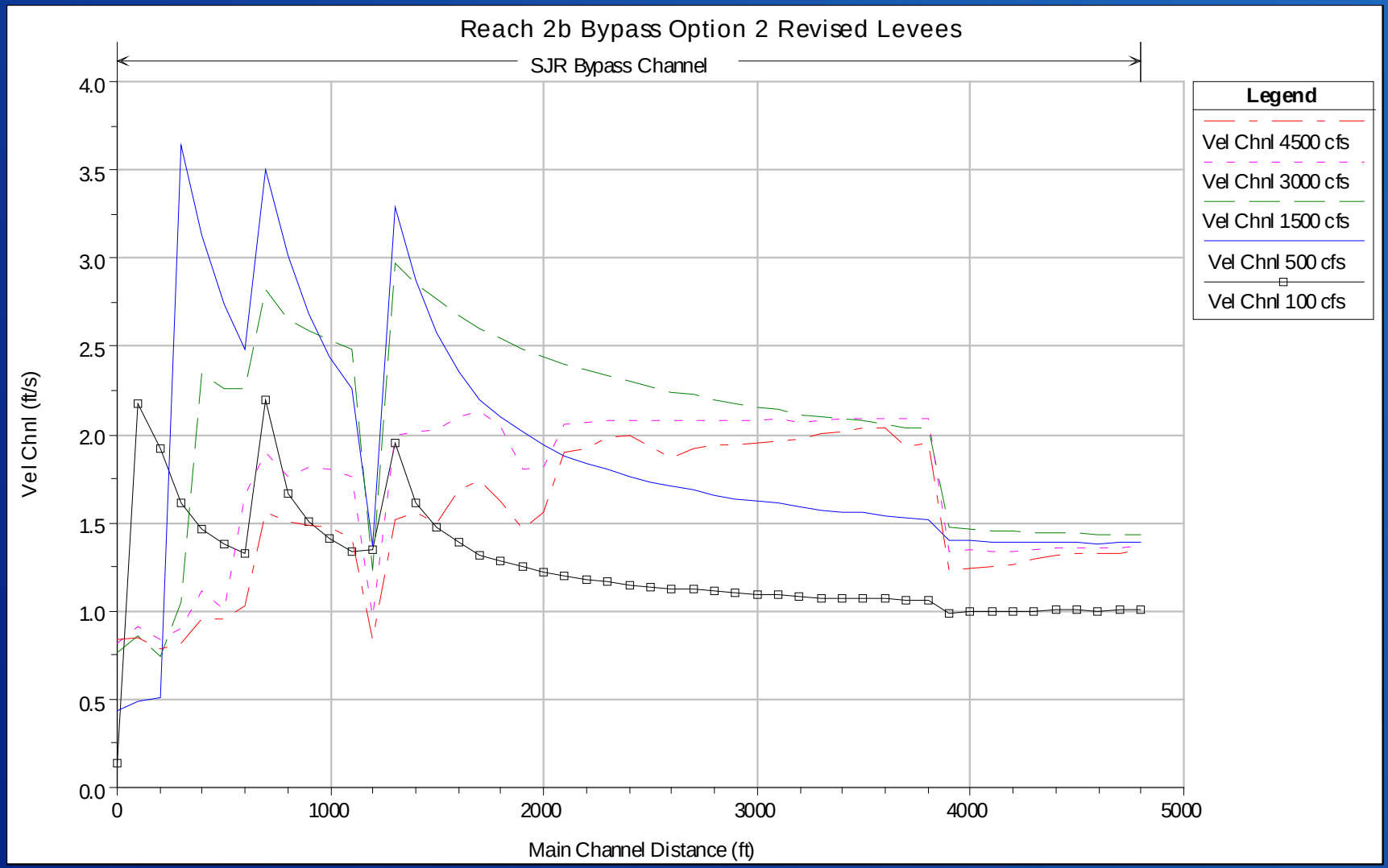
Option 2: Initial Channel Velocities



SEDIMENT TRANSPORT MODELING RESULTS

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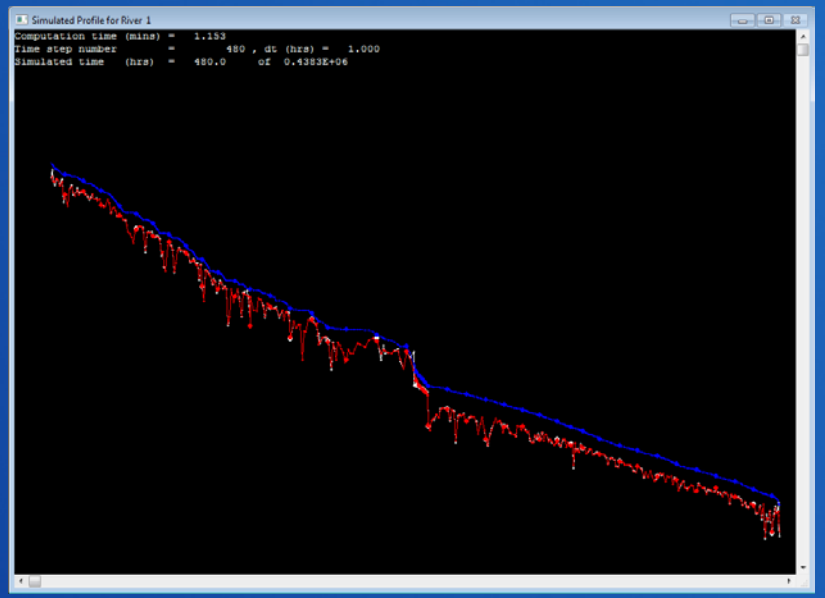
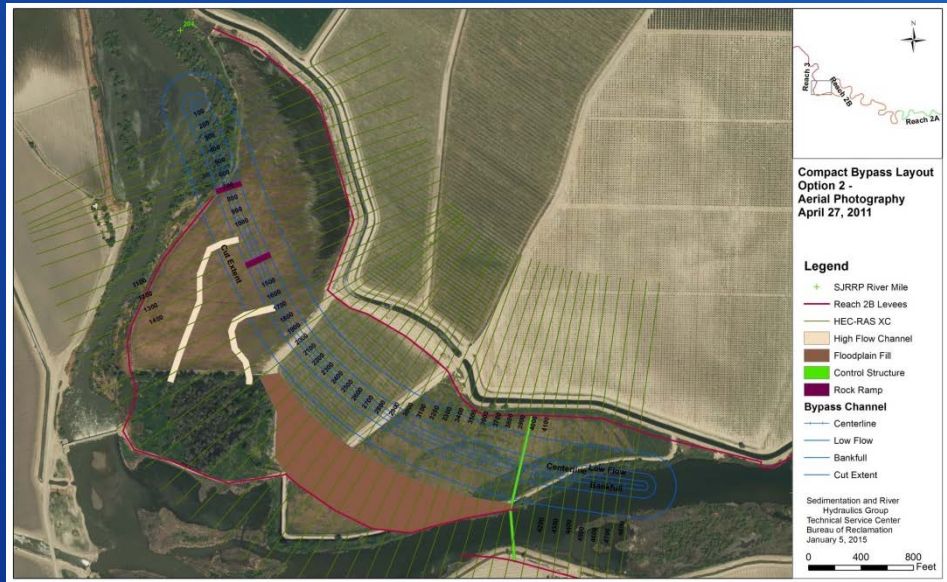
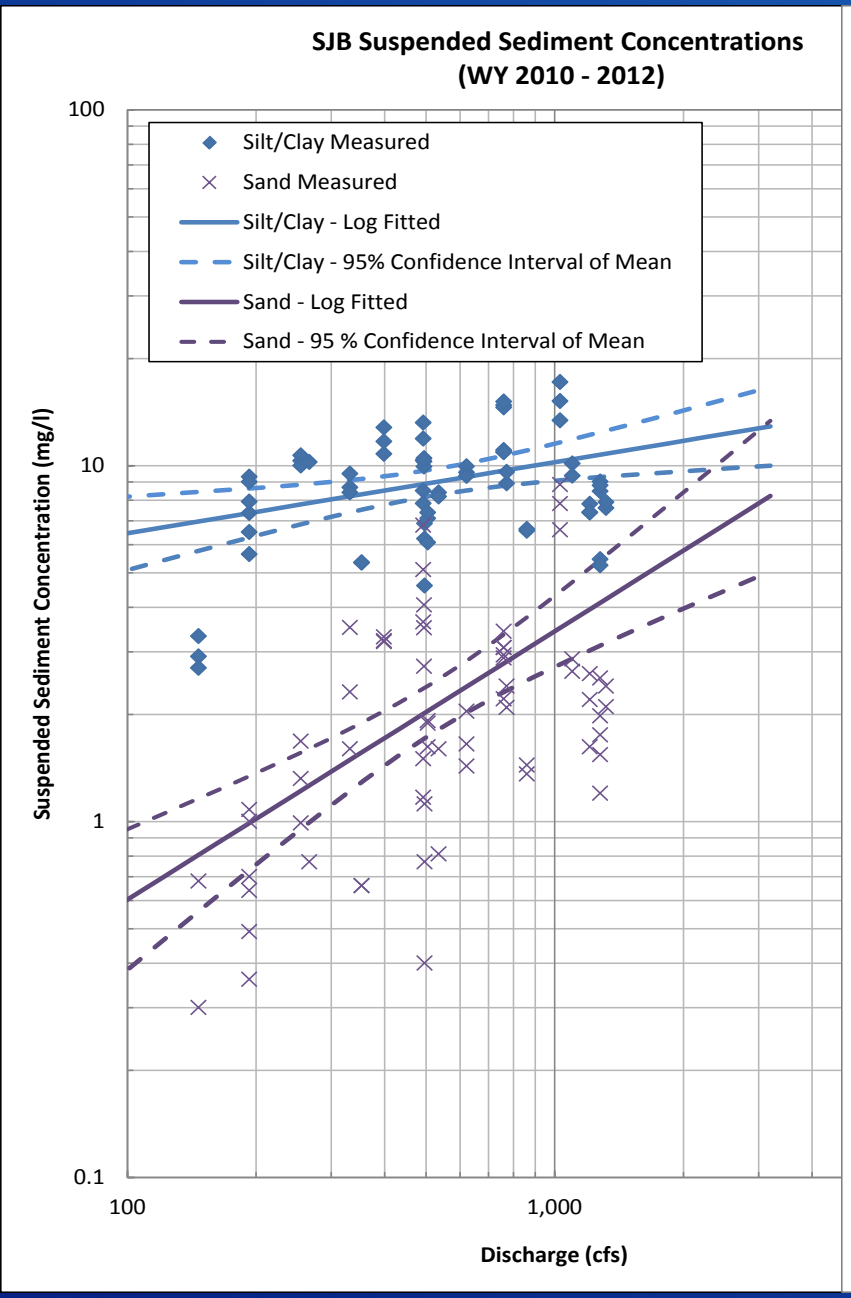
Sediment Transport Modeling

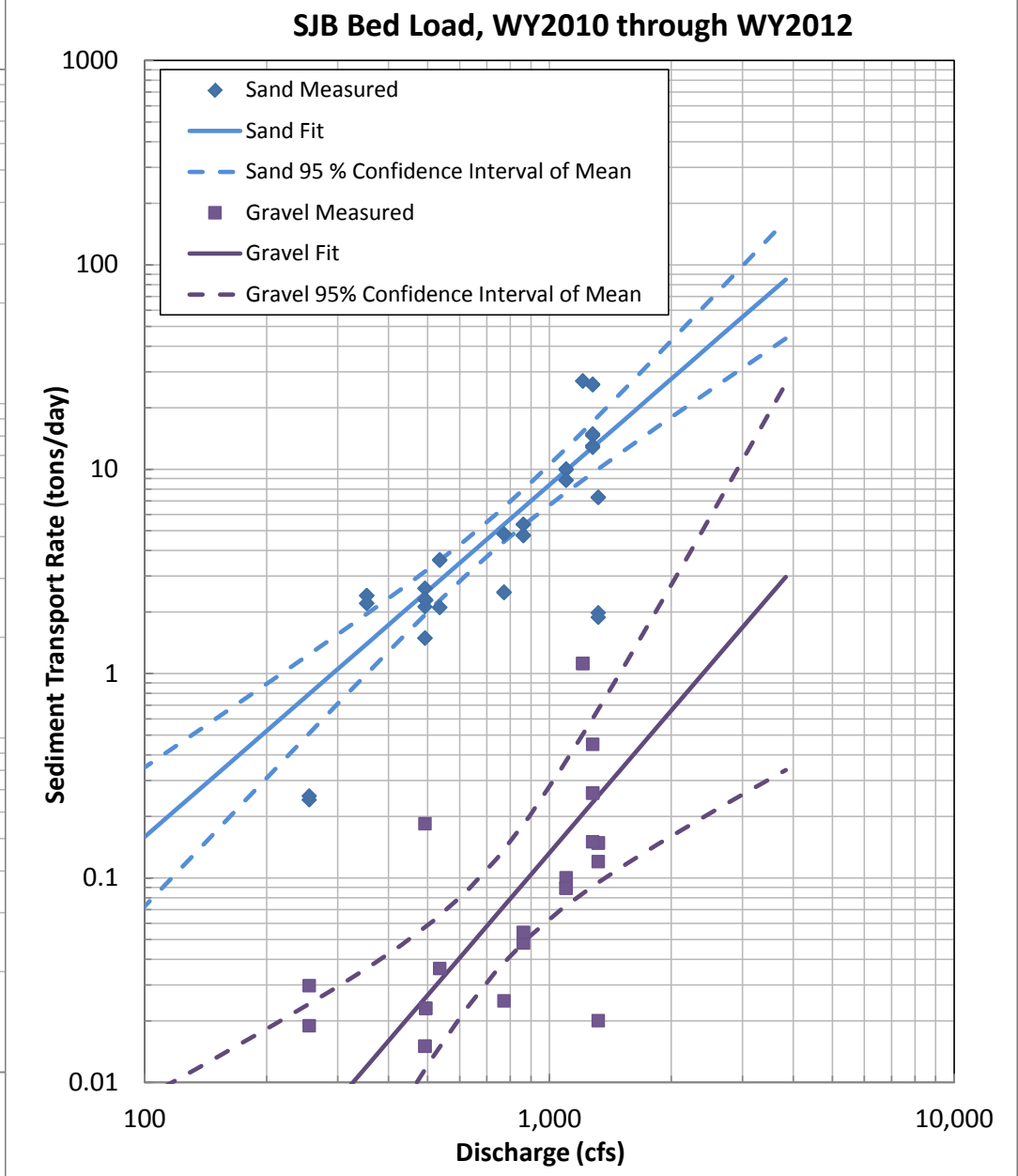
- SRH-1D
- Cross section based simulation
- 50-year simulation
- Reach 2A through Reach 3
- Used simulated flows under SJRRP conditions



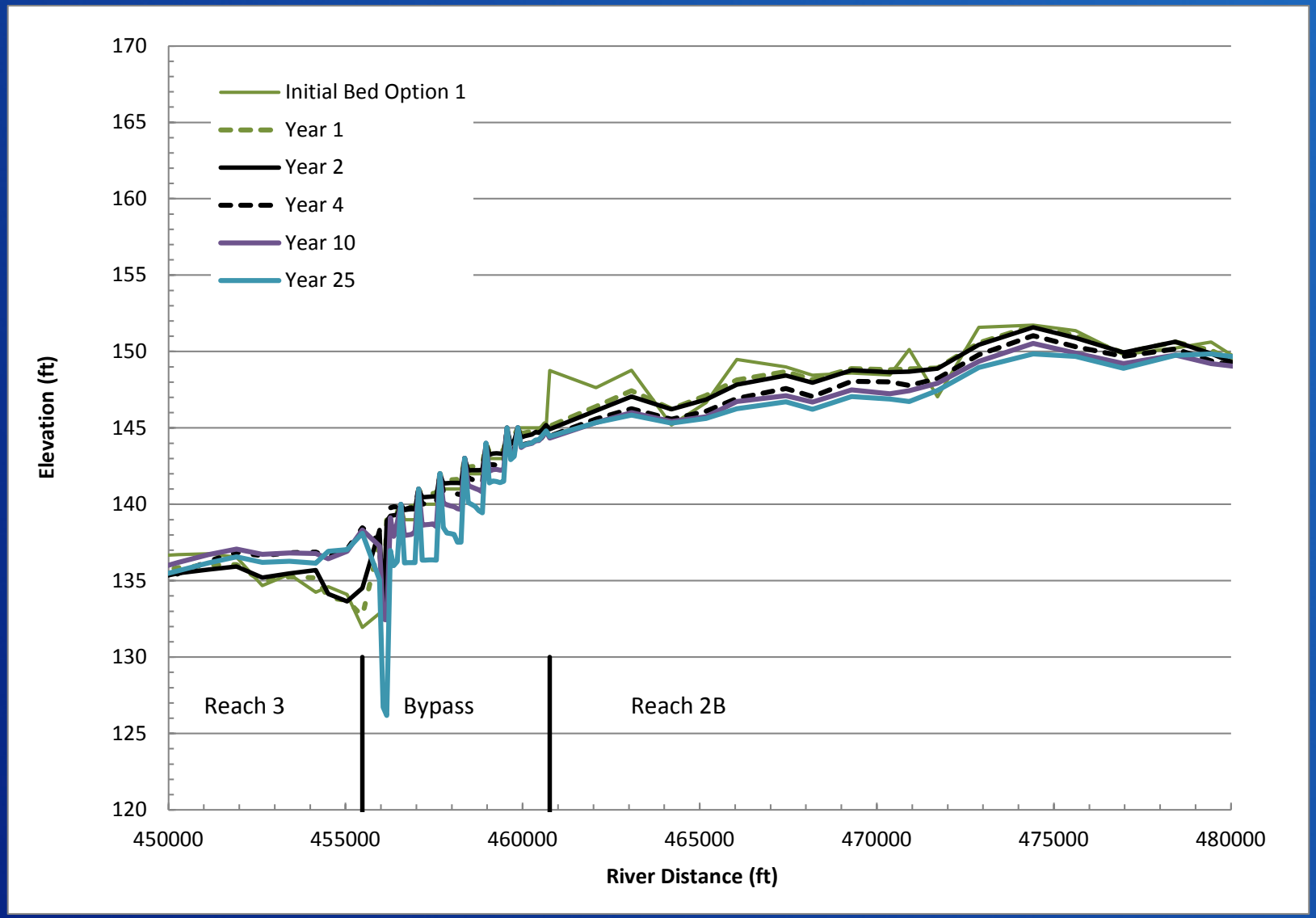


http://www.usbr.gov/pmts/sediment/model/srh1d/index.html


SJB Suspended Sediment Concentrations
(WY 2010 - 2012)
Silt/Clay Measured
Sand Measured
Silt/Clay - Log Fitted
Silt/Clay - 95% Confidence Interval of Mean
Sand - Log Fitted
Sand - 95 % Confidence Interval of Mean
Suspended Sediment Concentration (mg/l)
100
10
1
0.1
100
1,000
Discharge (cfs)


SJB Bed Load, WY2010 through WY2012
Sand Measured
Sand Fit
Sand 95 % Confidence Interval of Mean
Gravel Measured
Gravel Fit
Gravel 95% Confidence Interval of Mean
Sediment Transport Rate (tons/day)
1000
100
10
1
0.1
0.01
100
1,000
10,000
Discharge (cfs)

Future Bed Elevations Changes: Opt 1



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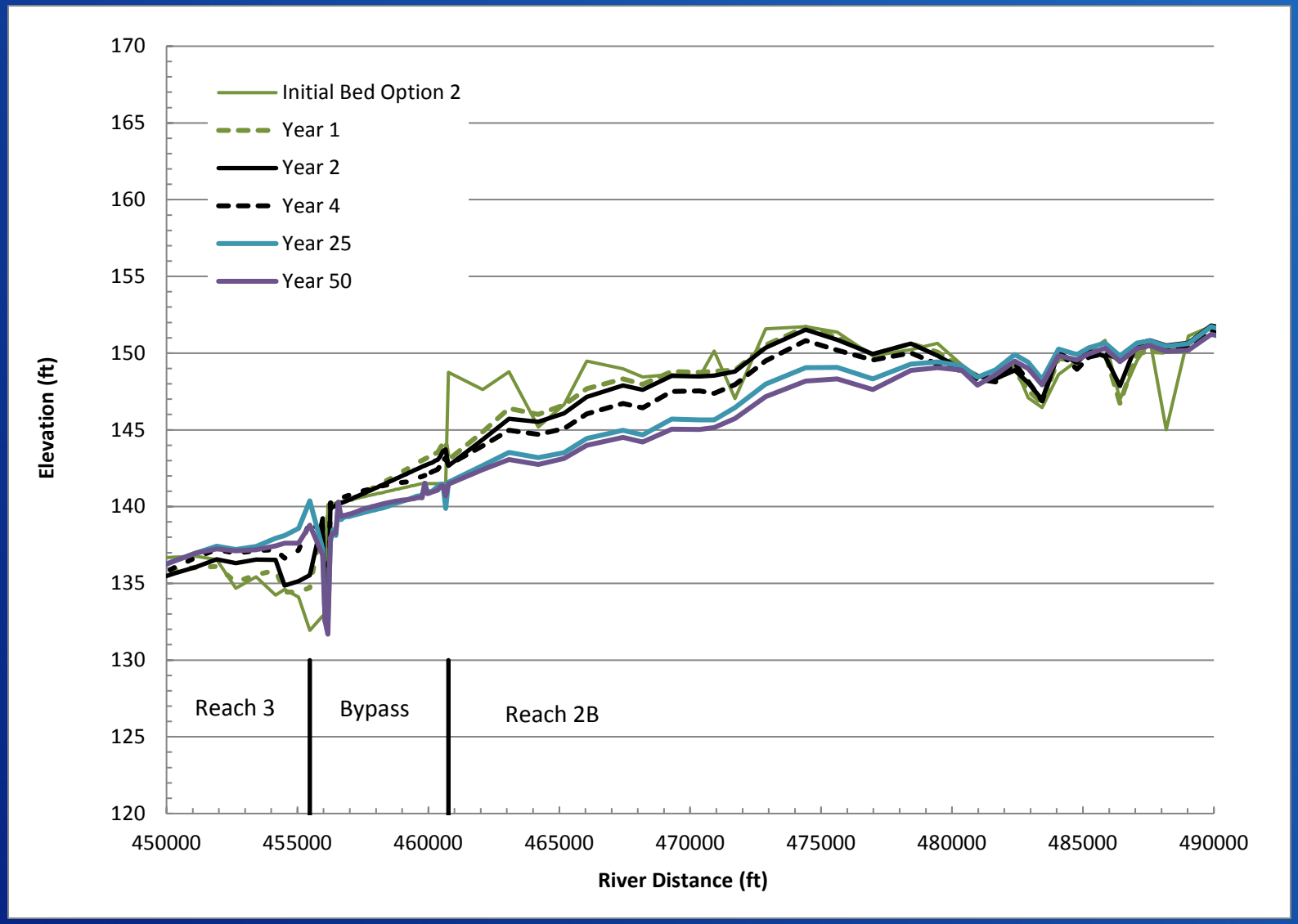
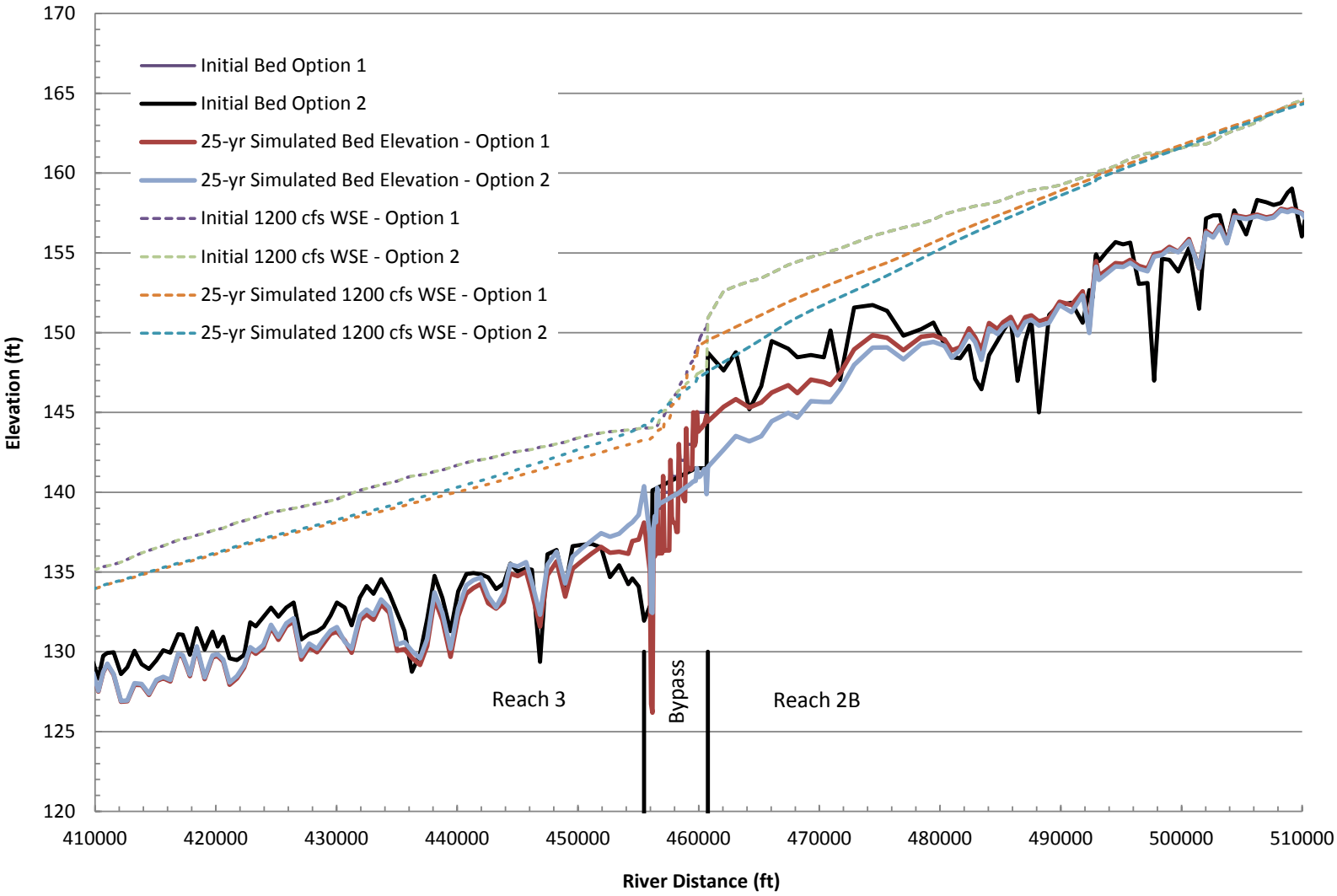
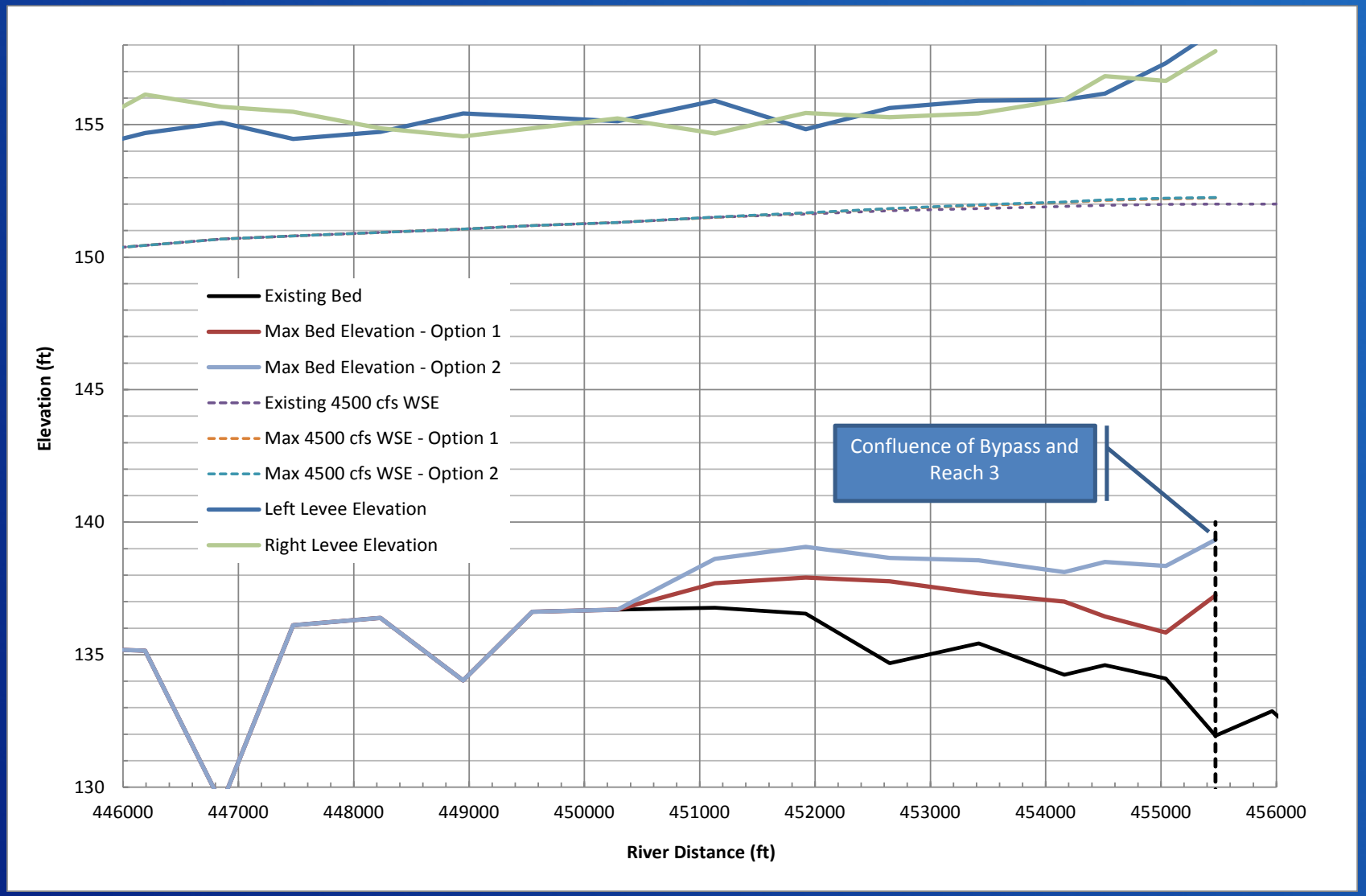
Future Bed Elevations Changes: Opt 2



Future Bed Elevation Changes



Changes to Water Surface Elevation in Reach 3



Simulations do not indicate that 4500 cfs will encroach into the 3 feet of freeboard

Preliminary Draft, Subject to Change

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Sediment Transport Modeling Results

- Some deposition 0.7 to 1 mile downstream from Compact Bypass / Reach 3 intersection
- Reach 3 is eroding in the long-term due to increase in flows under SJRRP
- 0.23 foot increase in water surface elevation from Scenario 1
- 0.25 foot increase in water surface elevation from Scenario 2
- Still 3 feet of freeboard

Sediment Transport Modeling Results

- Maximum WSEL Change of 3 inches
- 3 foot of freeboard maintained on all levees
- Entire area of deposition is added to EIS/R
- Possible levee improvements to increase height by a few inches included in EIS/R
- May or may not need levee improvements with more refined design

FLOODPLAIN INUNDATION CHANGES

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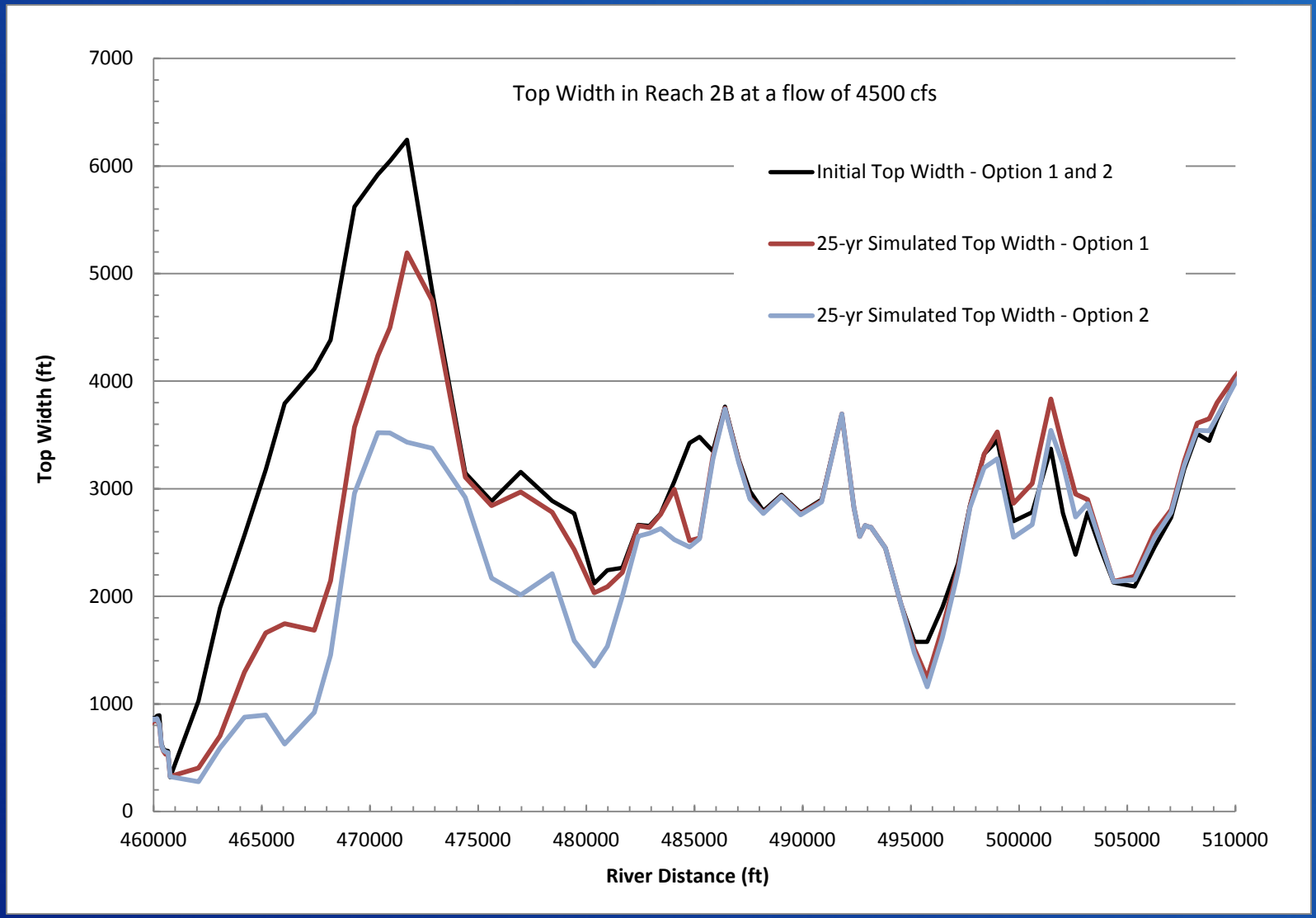
Hydraulic Modeling

- 1D Hydraulic Modeling
- Top Width as correlary for floodplain area
- Erosion 3.5 miles to 4 miles upstream in Reach 2B

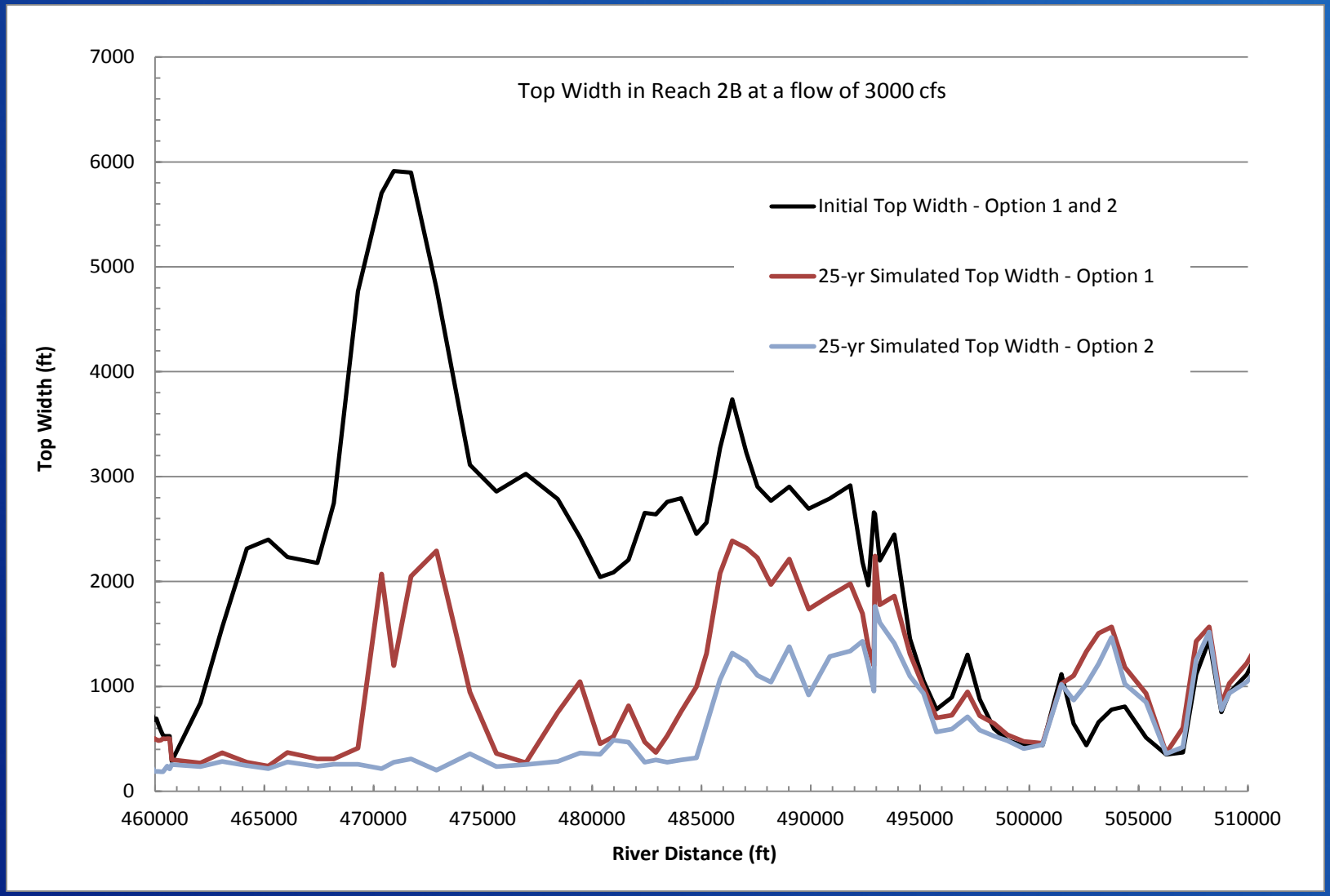
- Lower portion of Reach 2B is currently Mendota Pool
- Returning the average river gradient will decrease inundation

Changes to Inundation in Reach 2B



RECLAMATION

Changes to Inundation in Reach 2B



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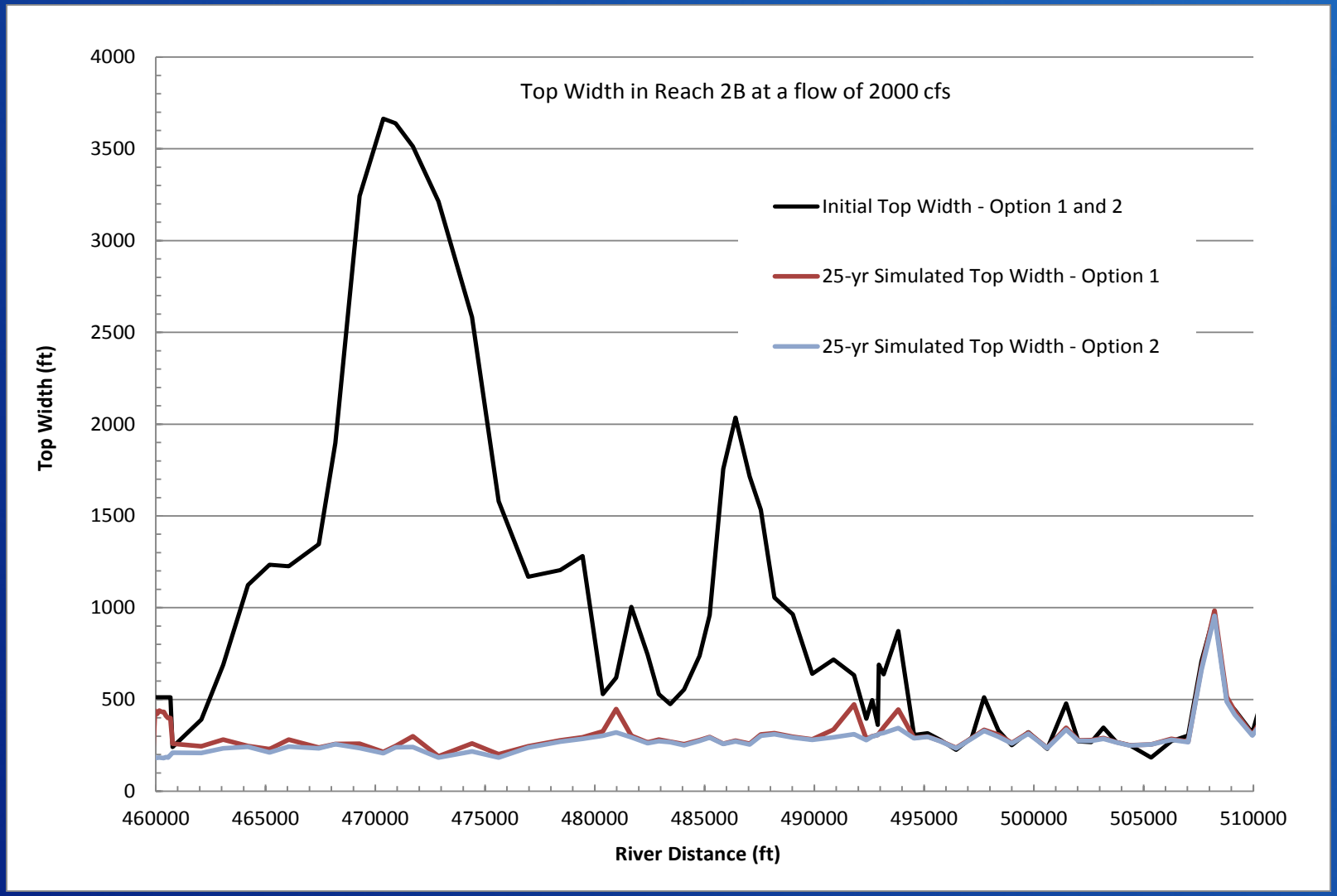
RECLAMATION

Changes to Inundation in Reach 2B



Potential methods to increase floodplain habitat

- Increase floodplain excavation and contouring to create high flow channels and lower floodplain surfaces.
- Increase roughness in Compact Bypass and Reach 2B to increase water surface elevations.
- Operating or design of the gates at the upstream end of the Bypass to increase water surface elevations in Reach 2B.
- Increase in the quality of floodplain habitat

Floodplain Inundation

- **144 acres of suitable habitat needed in Reach 2B based on Minimum Floodplain Habitat Area Report (December 2012)**
- **Will do 2D hydraulic modeling of proposed option and verify we still meet required suitable habitat**

Comparison between Options 1 and 2

- Option 1
  - More certainty in channel geometry
  - Less erosion of bed in Reach 2B
  - Additional maintenance of grade control structures will be necessary
  - Higher channel velocities in Compact Bypass
    - More bank erosion, and more bank protection necessary
    - More difficult upstream fish passage

Comparison between Options 1 and 2

- Option 2
  - Reduced construction and maintenance cost of grade control structures
  - Lower channel velocities
    - Less bank erosion, reduced need for bank protection
    - Better upstream fish passage
  - Additional erosion of channel in Reach 2B lowering water surface elevations and reducing floodplain inundation
  - Will likely still require one or two small grade control structures within Compact Bypass
  - Uncertainty in channel transition period after initial excavation

All

INPUT FROM ATTENDEES

Questions?

Thank You

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