

# Skagit River Impact Partnership Flood Reduction Measures Workshop January 12, 2006

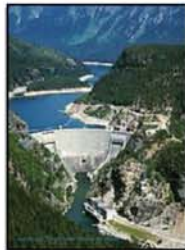


# SKAGIT RIVER BASIN

~  
**PUGET SOUND, WASHINGTON**



Upper Baker Dam



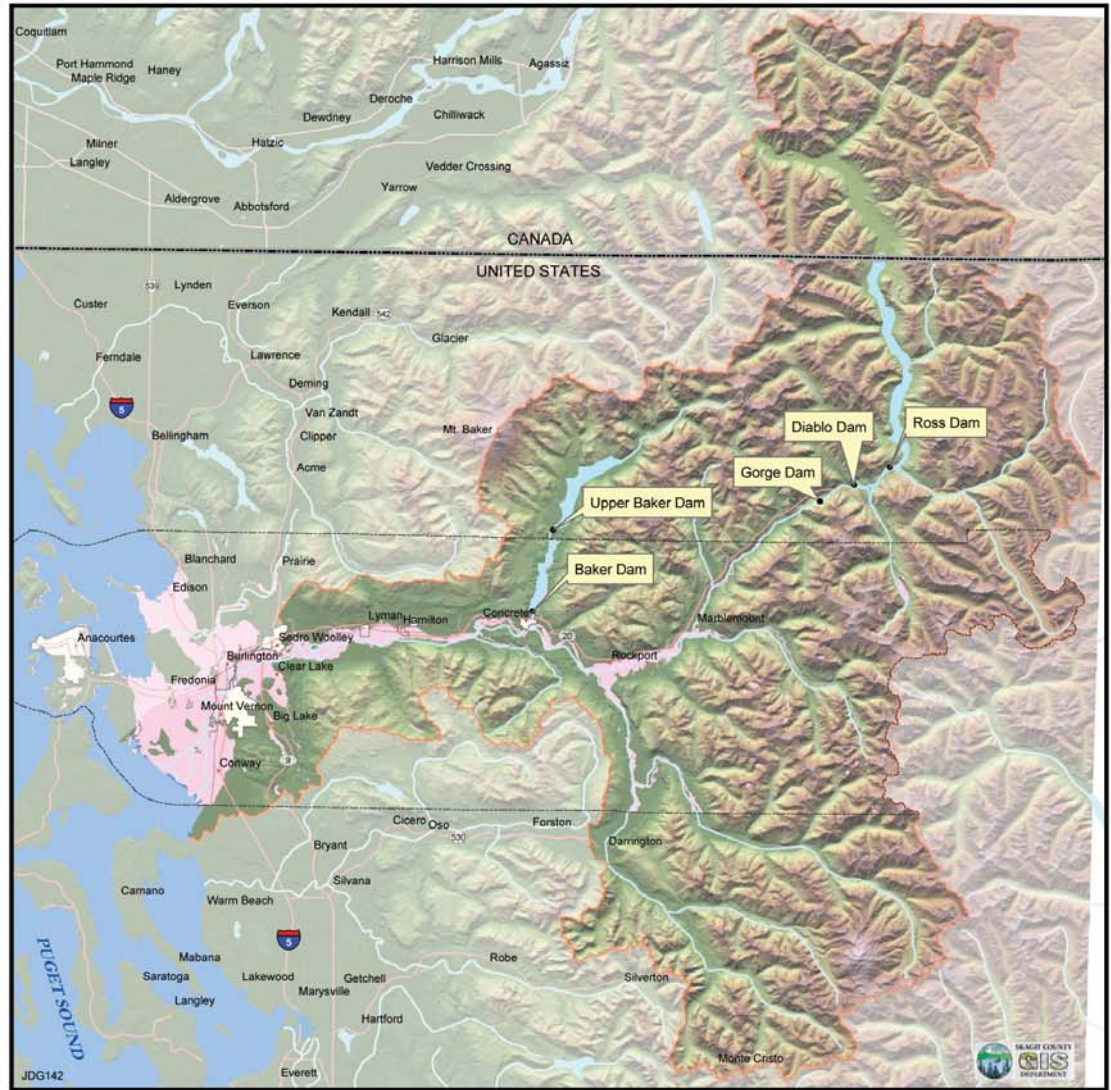
Ross Dam



Lower Baker Dam



Map Printed: June 5, 2003

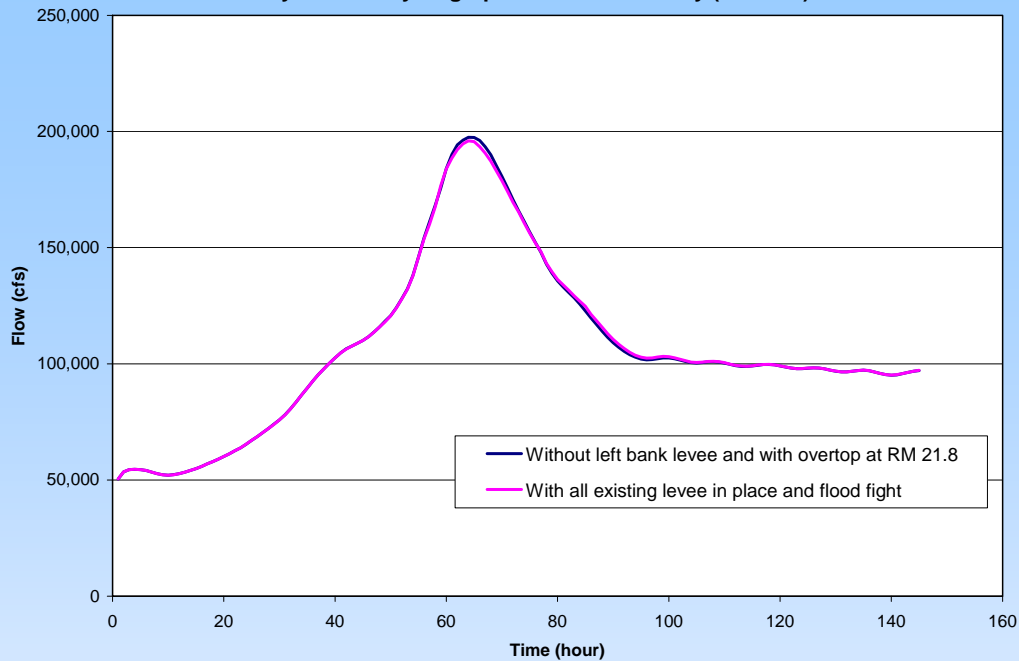


# Recap of Previous Workshops

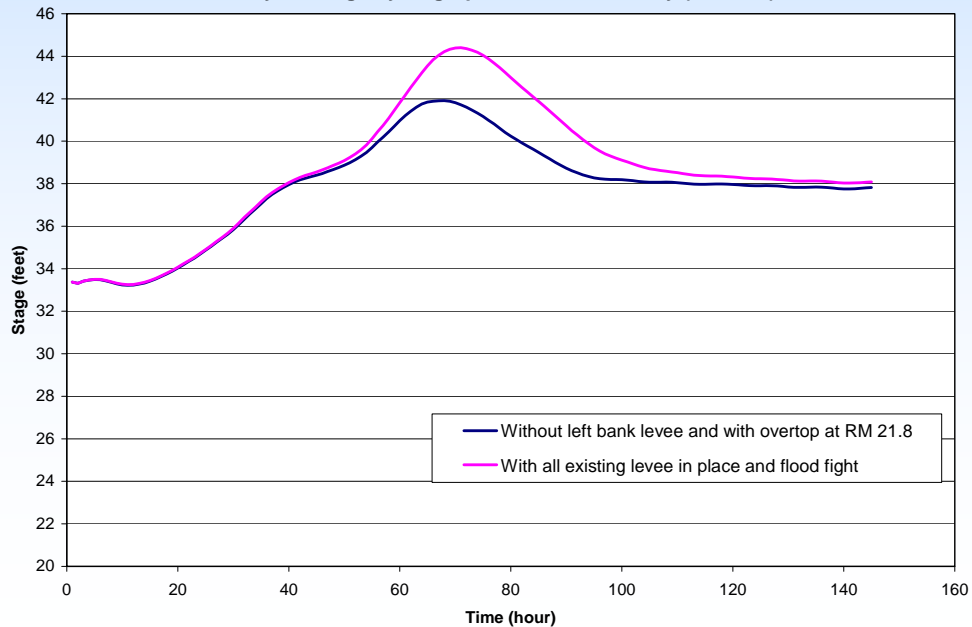
- Regulated Synthetic Flood Hydrographs
- Evaluation of Existing Conditions
- Flood Peak Reduction Potential of Various Measures
- 100-Year Flood Protection Areas/Certified Levee Reaches



100-year Flow hydrographs at Sedro Woolley (RM 22.4)

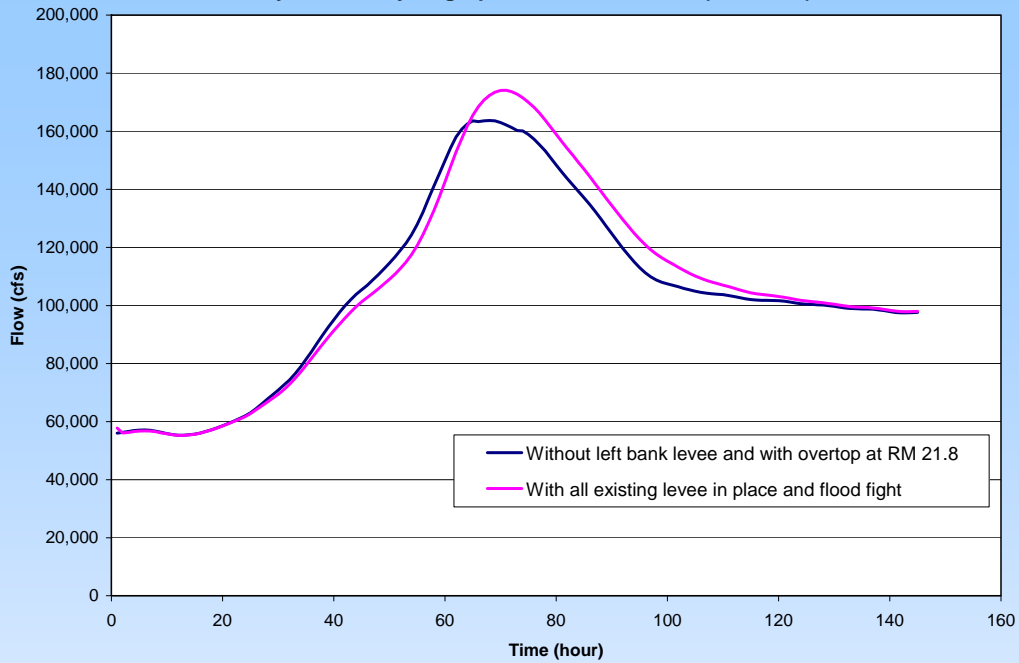


100-year Stage hydrographs at Sedro Woolley (RM 22.4)

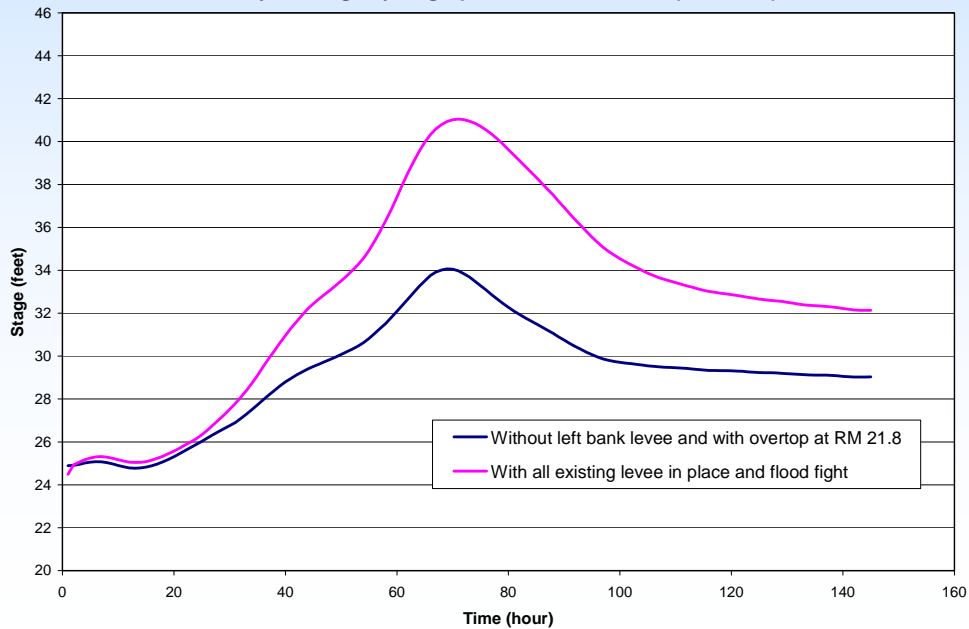


# 100-Year Flood Hydrographs Sedro-Woolley

100-year Flow hydrographs at Mount Vernon (RM 17.05)

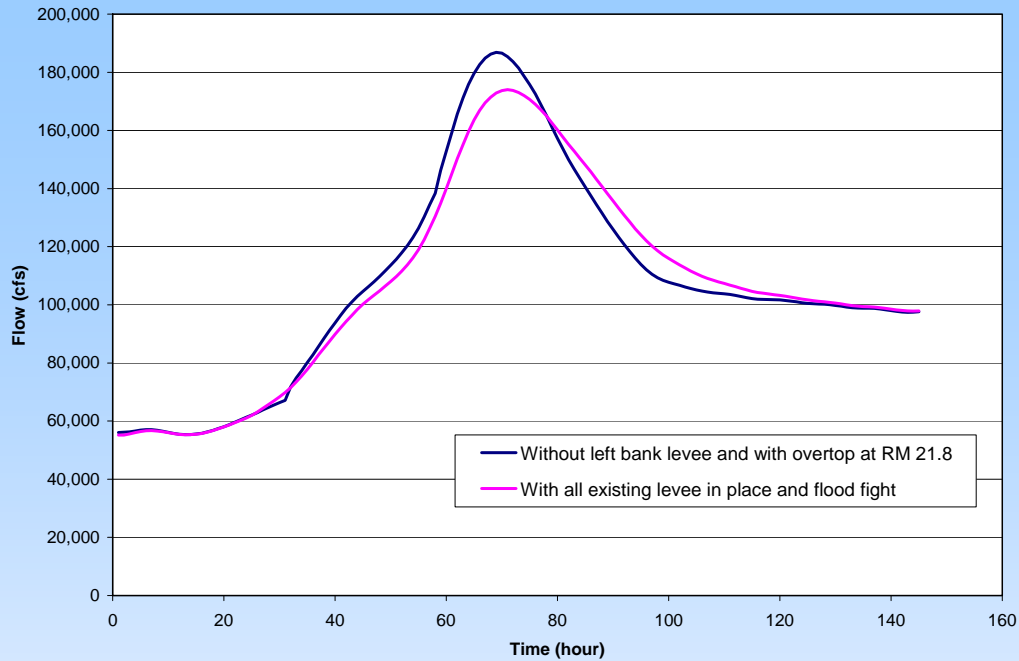


100-year Stage hydrographs at Mount Vernon (RM 17.05)

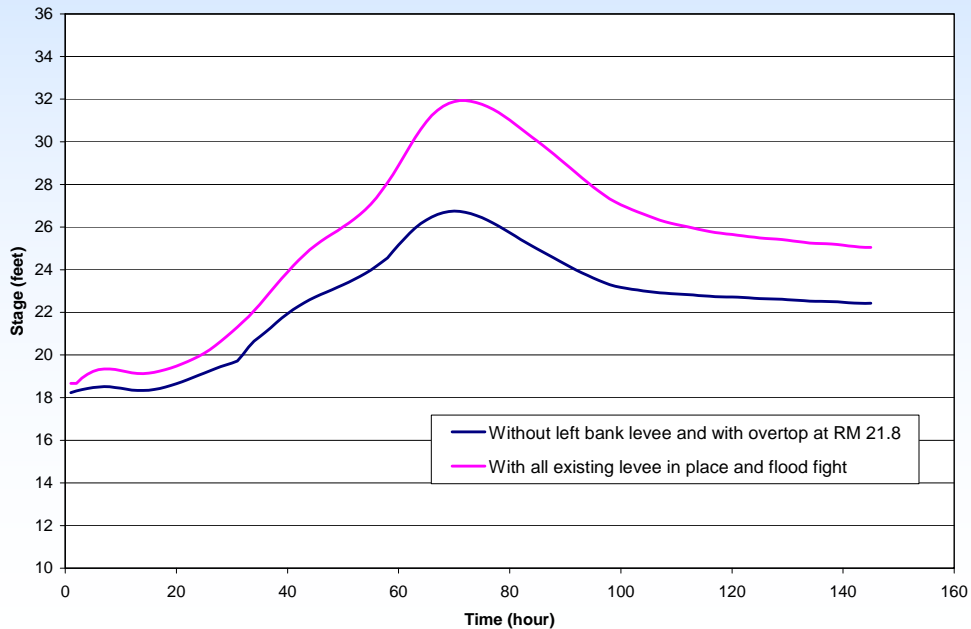


# 100-Year Flood Hydrographs Mount Vernon Gage

100-year Flow hydrographs at Downstream of Division Street Bridge (RM 12.84)

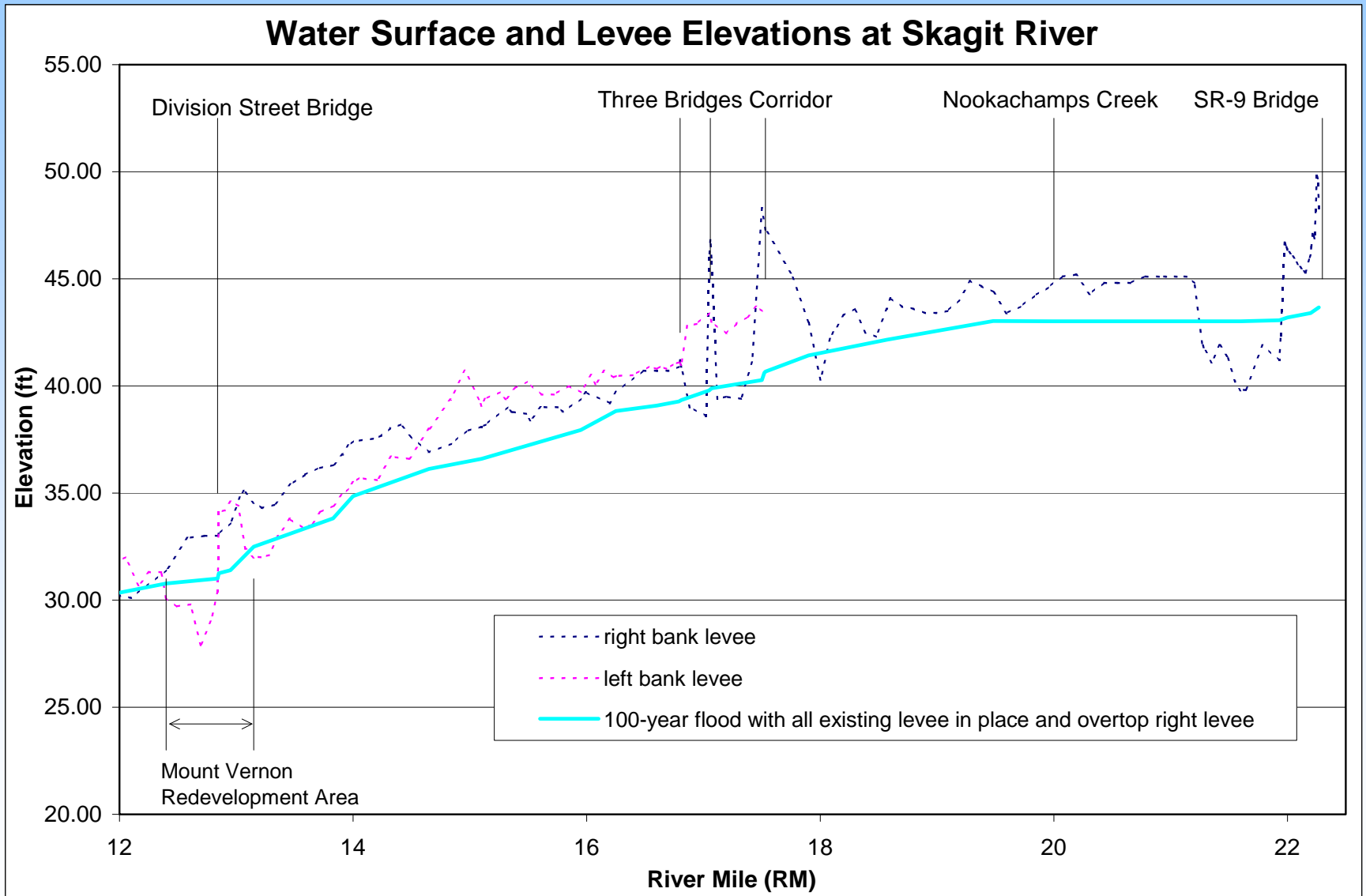


100-year Stage hydrographs at Downstream of Division Street Bridge (RM 12.84)



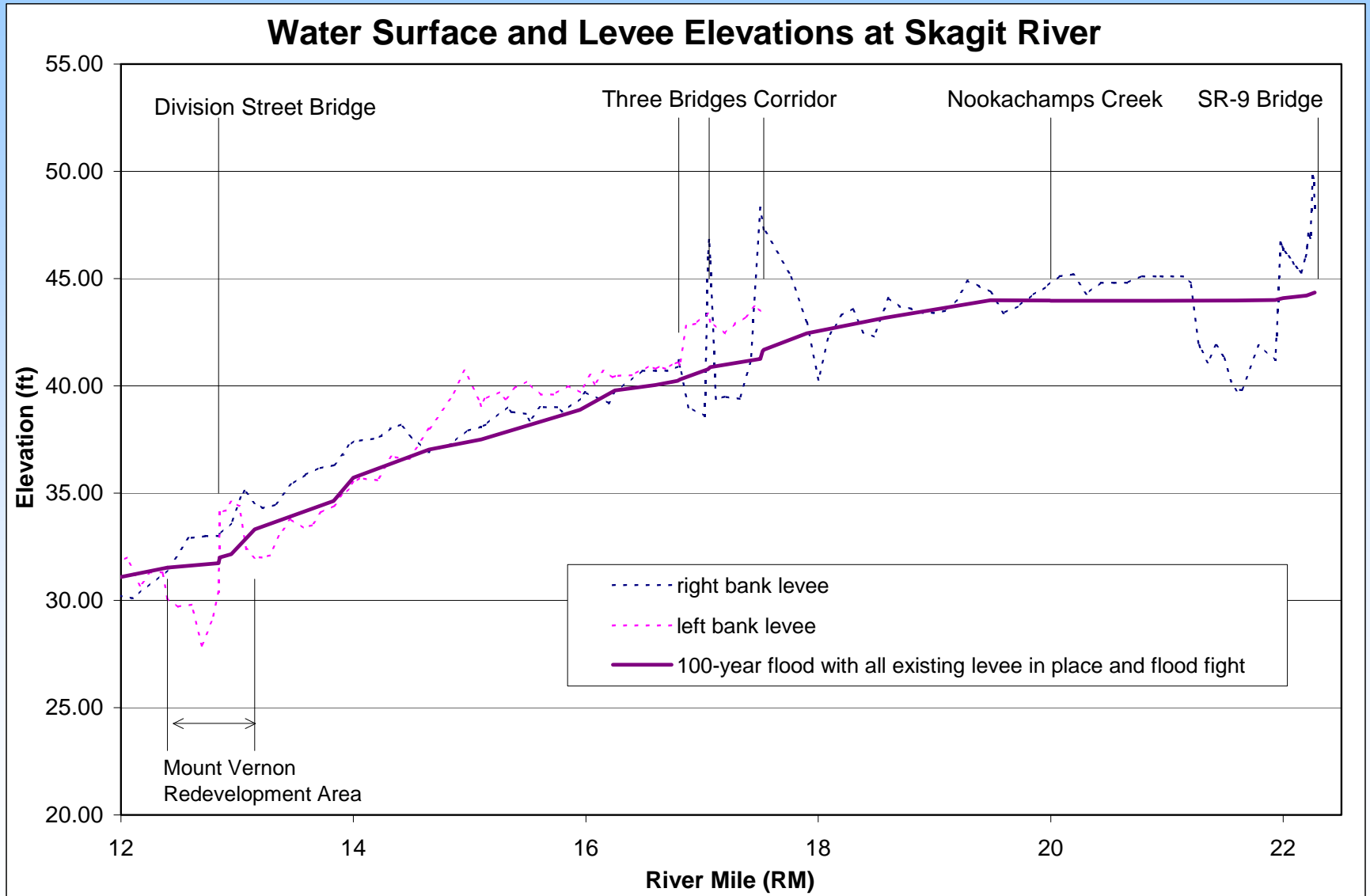
# 100-Year Flood Hydrographs Division Street Bridge

# 100-Year Water Surface Profile – No Flood Fight

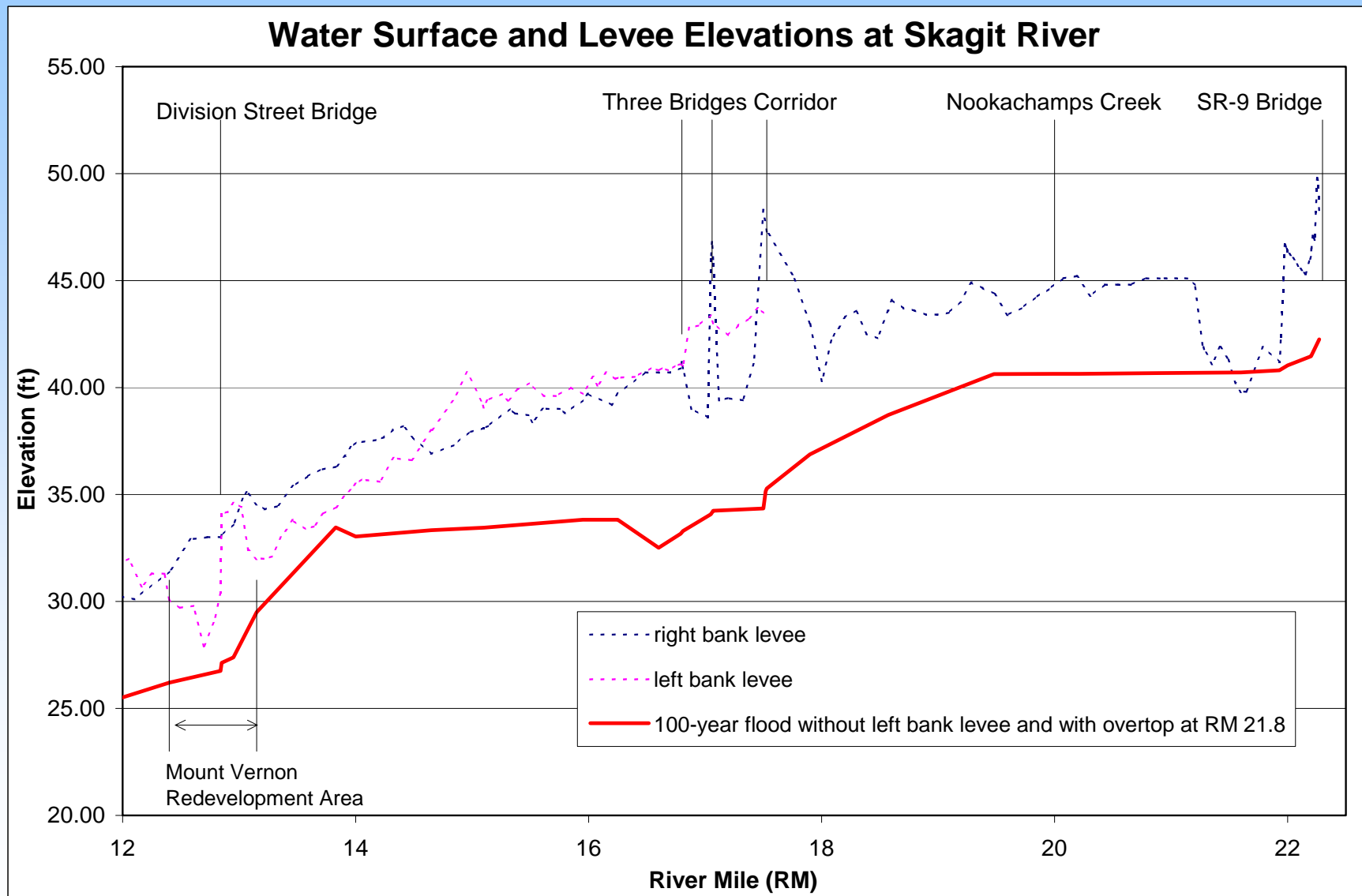




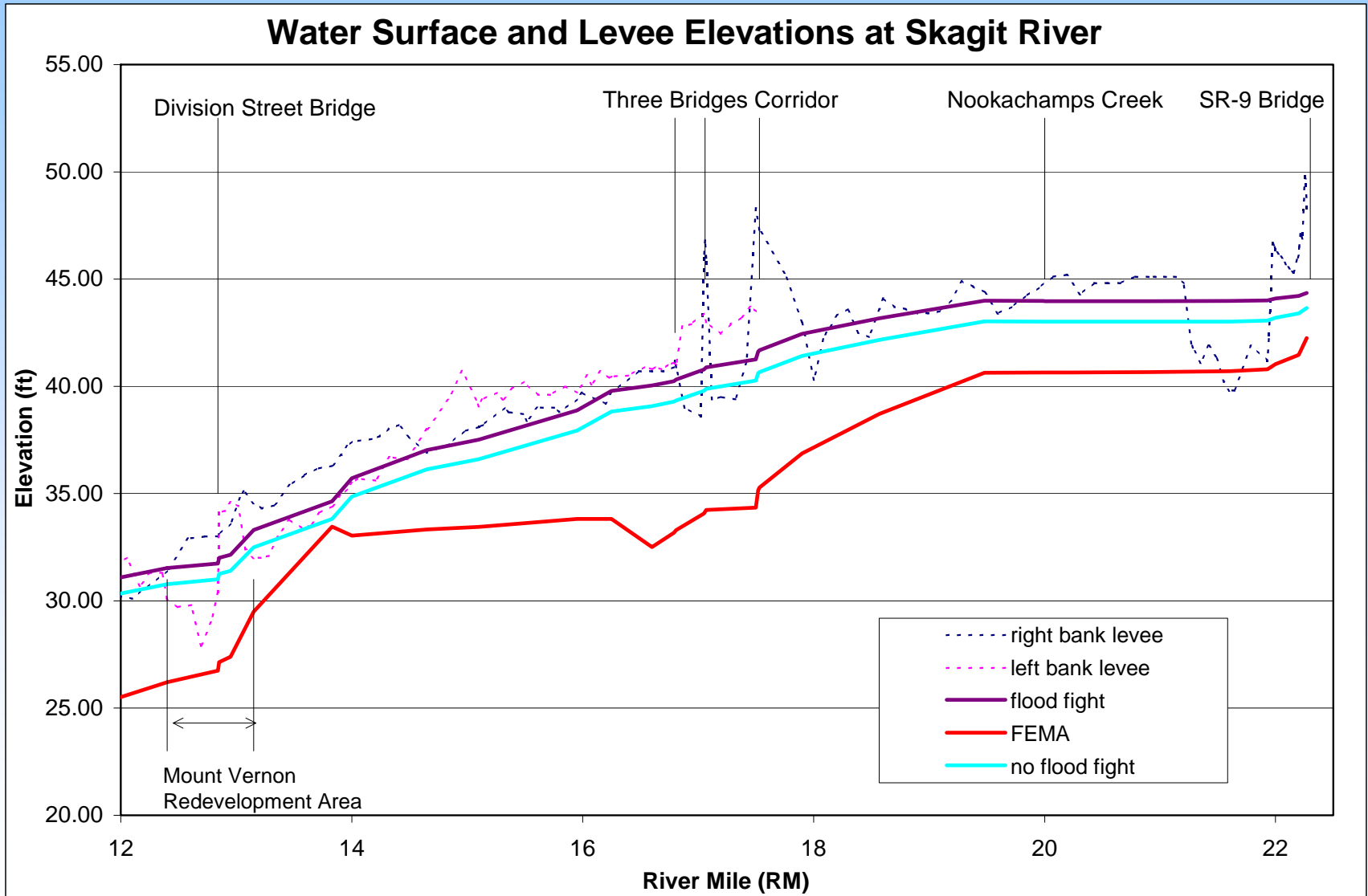
# 100-Year Water Surface Profile – Flood Fight



# 100-Year Water Surface Profile - FEMA



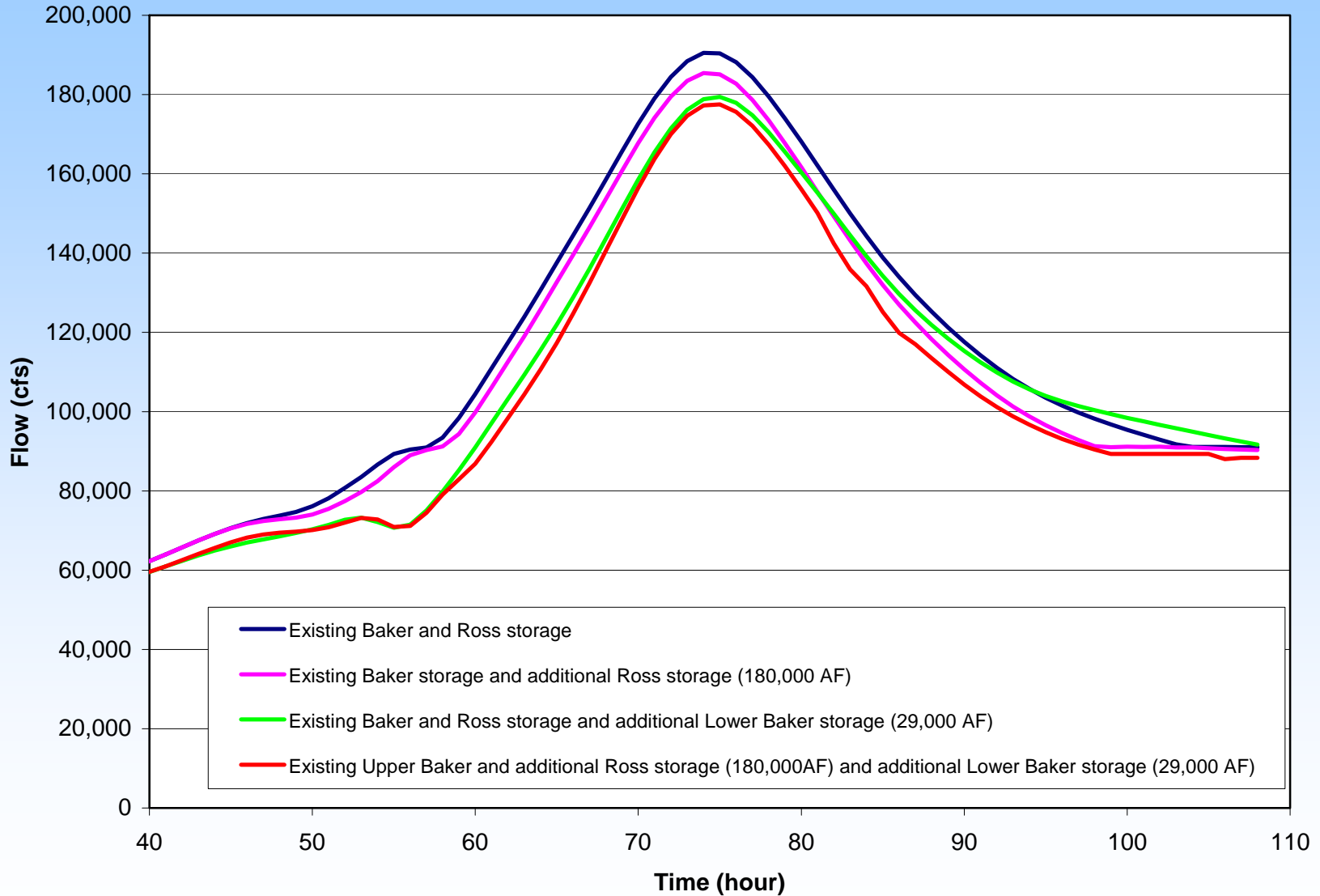
# 100-Year Water Surface Profile



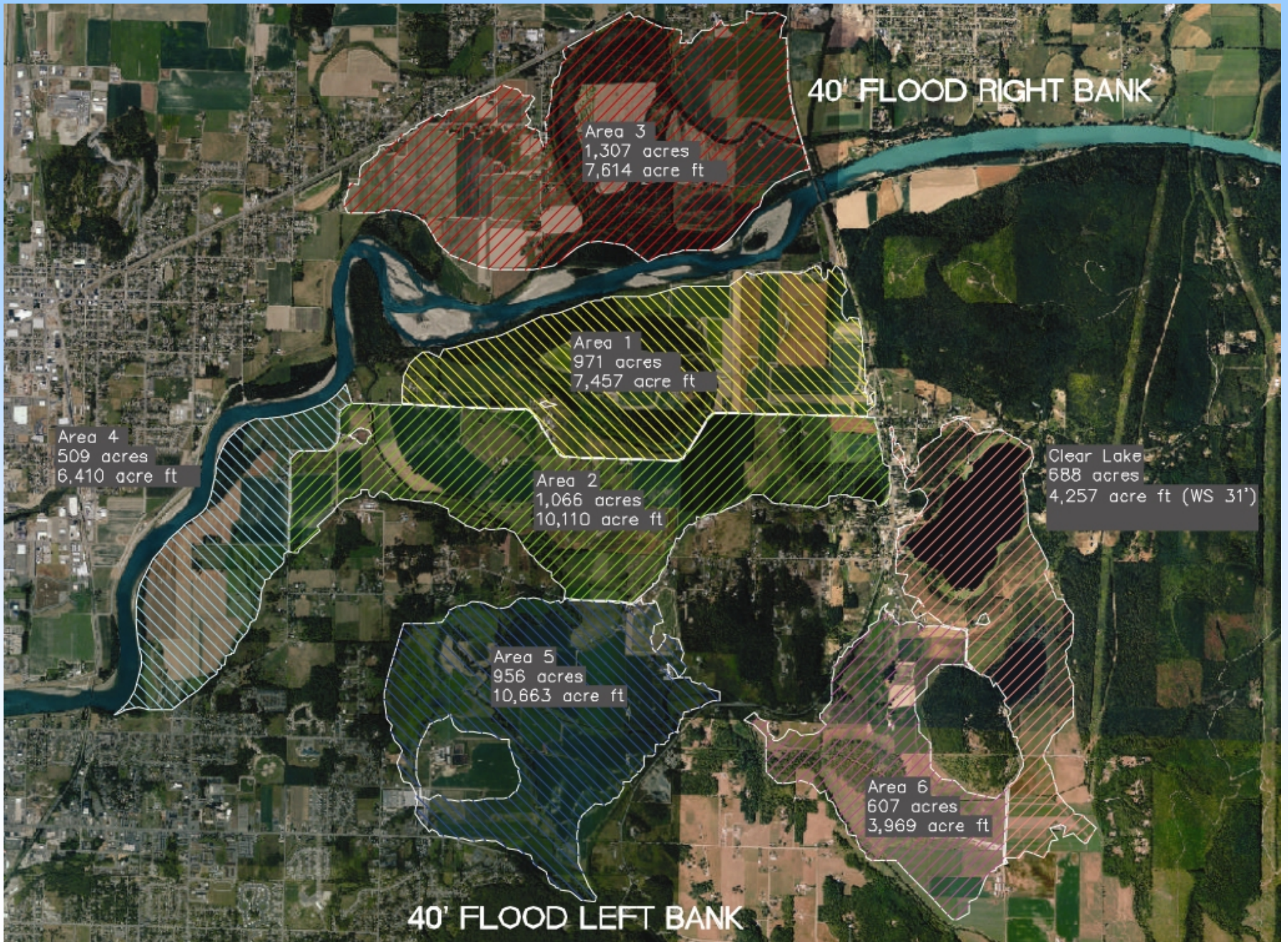
# Methods of Flood Reduction

- ***Minimize Flood Flows***
- Containment
- Hydraulic Efficiency
- Controlled Release

## Regulated 100-year Flow Hydrographs at Skagit River near Concrete











## Nookachamps Storage Capacity

<b>Elevation</b>	<b>Left Bank (acre-ft)</b>	<b>Right Bank (acre-ft)</b>	<b>Total Storage (acre-ft)</b>
36 ft	19229	2550	21779
40 ft	42866	7614	50480
45 ft	68738	11535	80273



# Methods of Flood Reduction

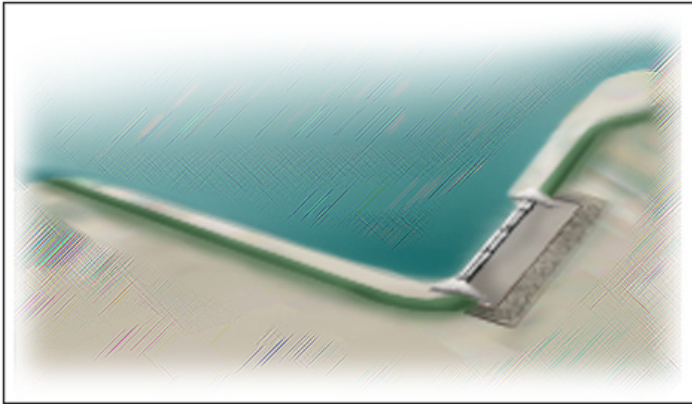
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- ***Containment***
- Hydraulic Efficiency
- Controlled Release

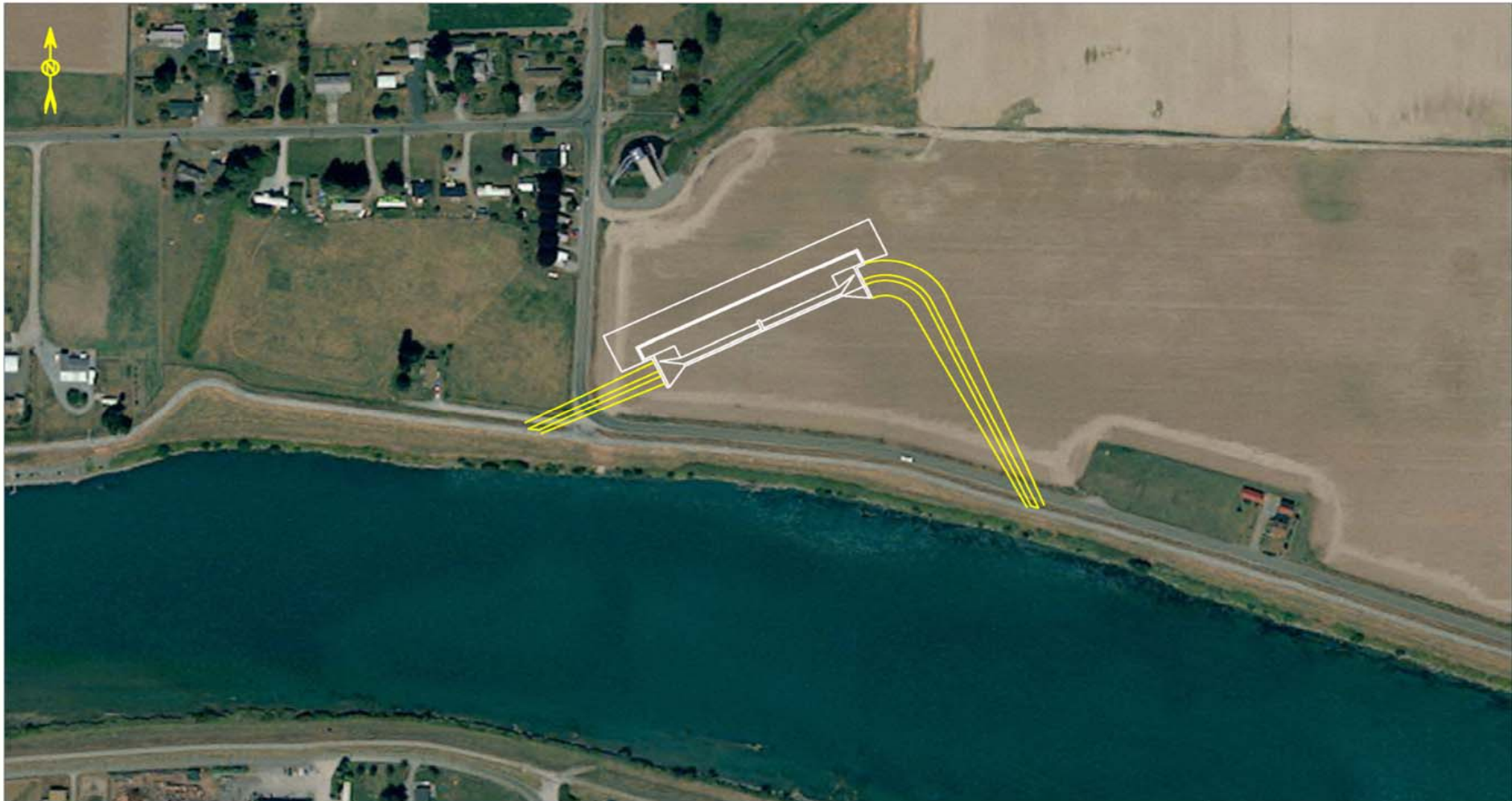
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PRELIMINARY  
8/16/04



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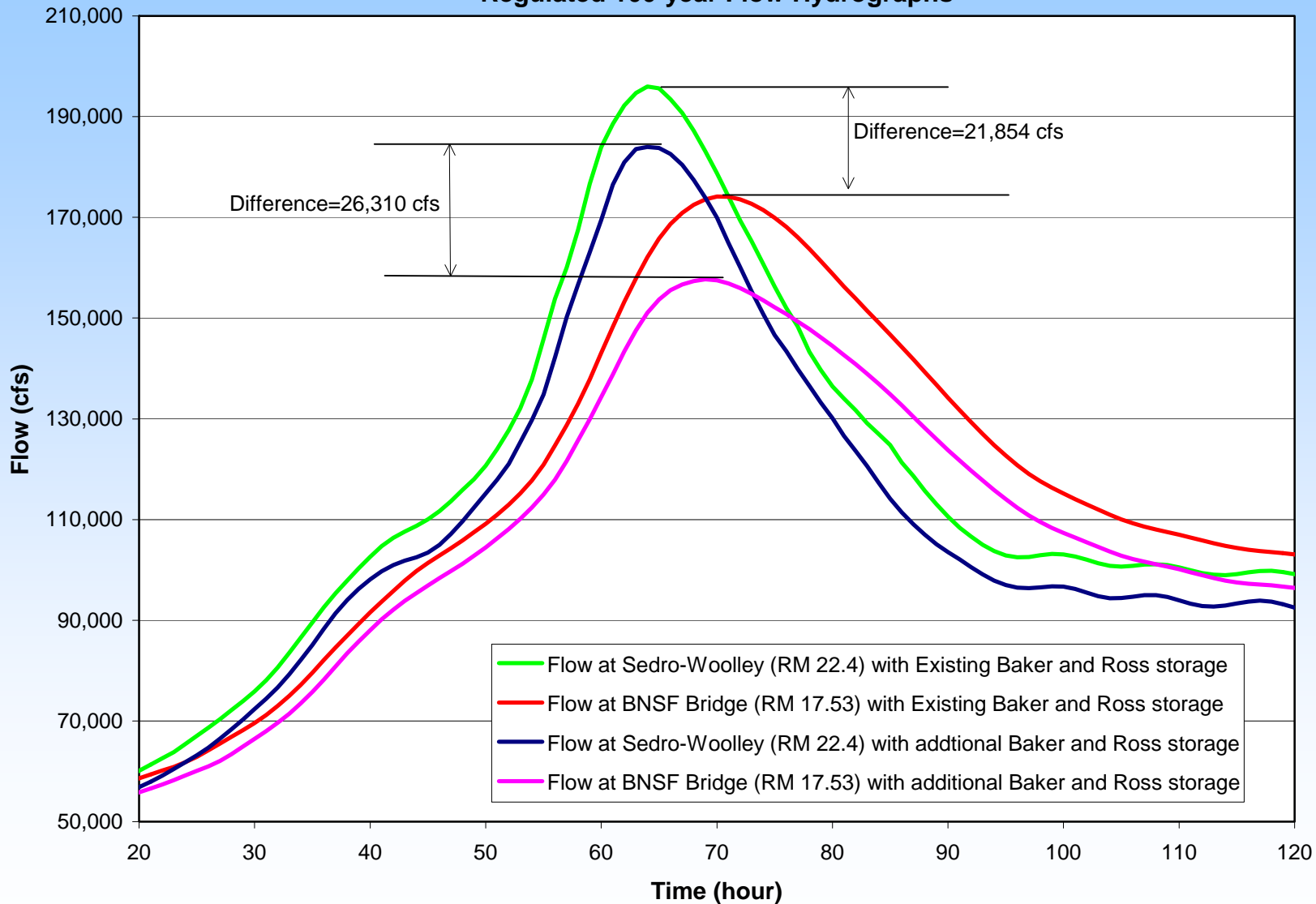
SKAGIT RIVER RELIEF STRUCTURE  
INFLATABLE WEIR ALTERNATIVE

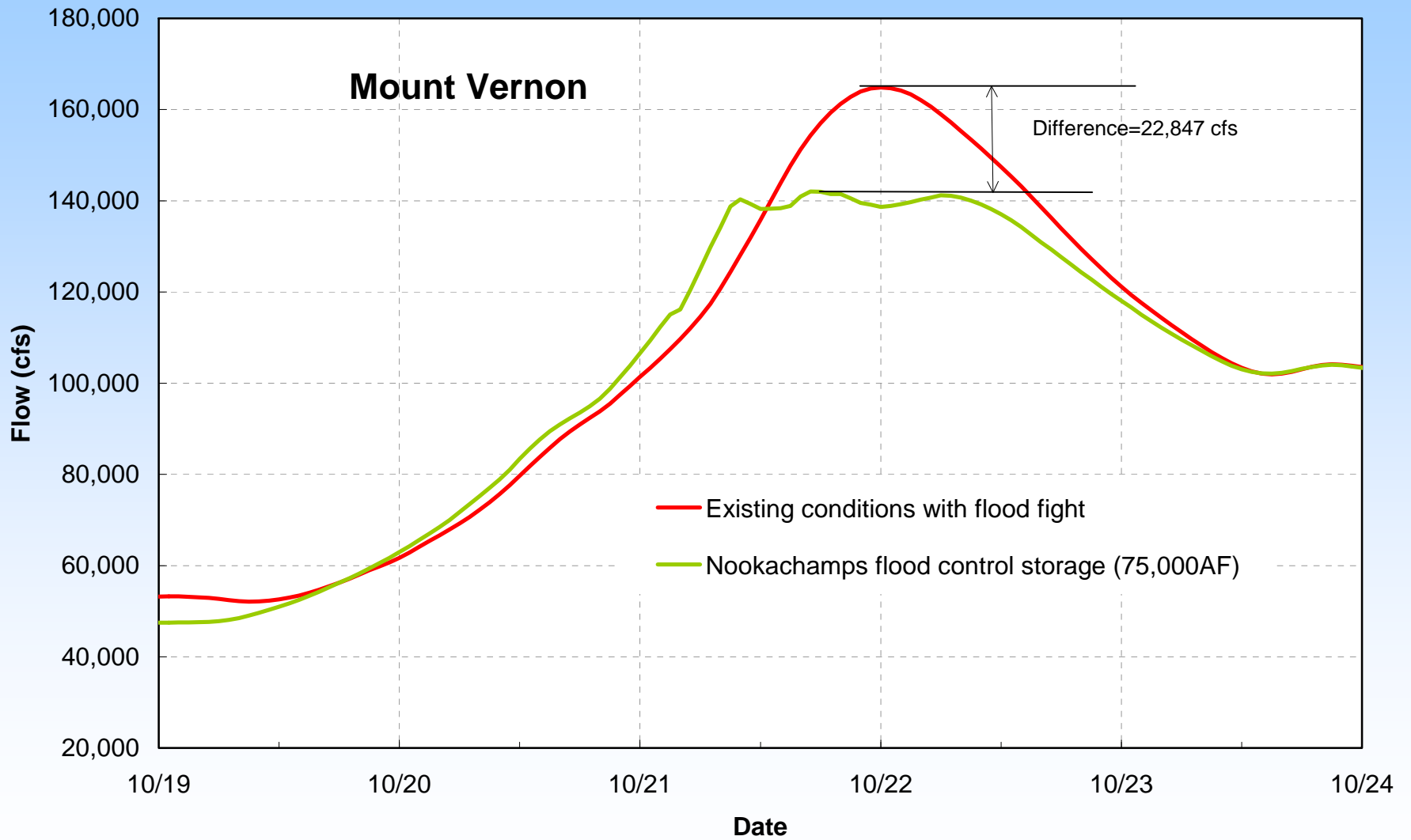




# Regulated Synthetic Flood Hydrographs at Sedro-Woolley and Mount Vernon

### Existing Nookachamps Storage Effects on Flood Peak Regulated 100-year Flow Hydrographs





# Existing Levees – Certification Issue

# Levee Freeboard and Certification

- FEMA Requirements
  - NFIP 100-year flood protection
  - 3 ft freeboard
  - 4 ft freeboard at structures and constrictions
  - Maintenance Plan required
- USACE Requirements
  - 3 ft freeboard
  - or
  - Risk analysis based on engineering evaluation of structural and geotechnical conditions required

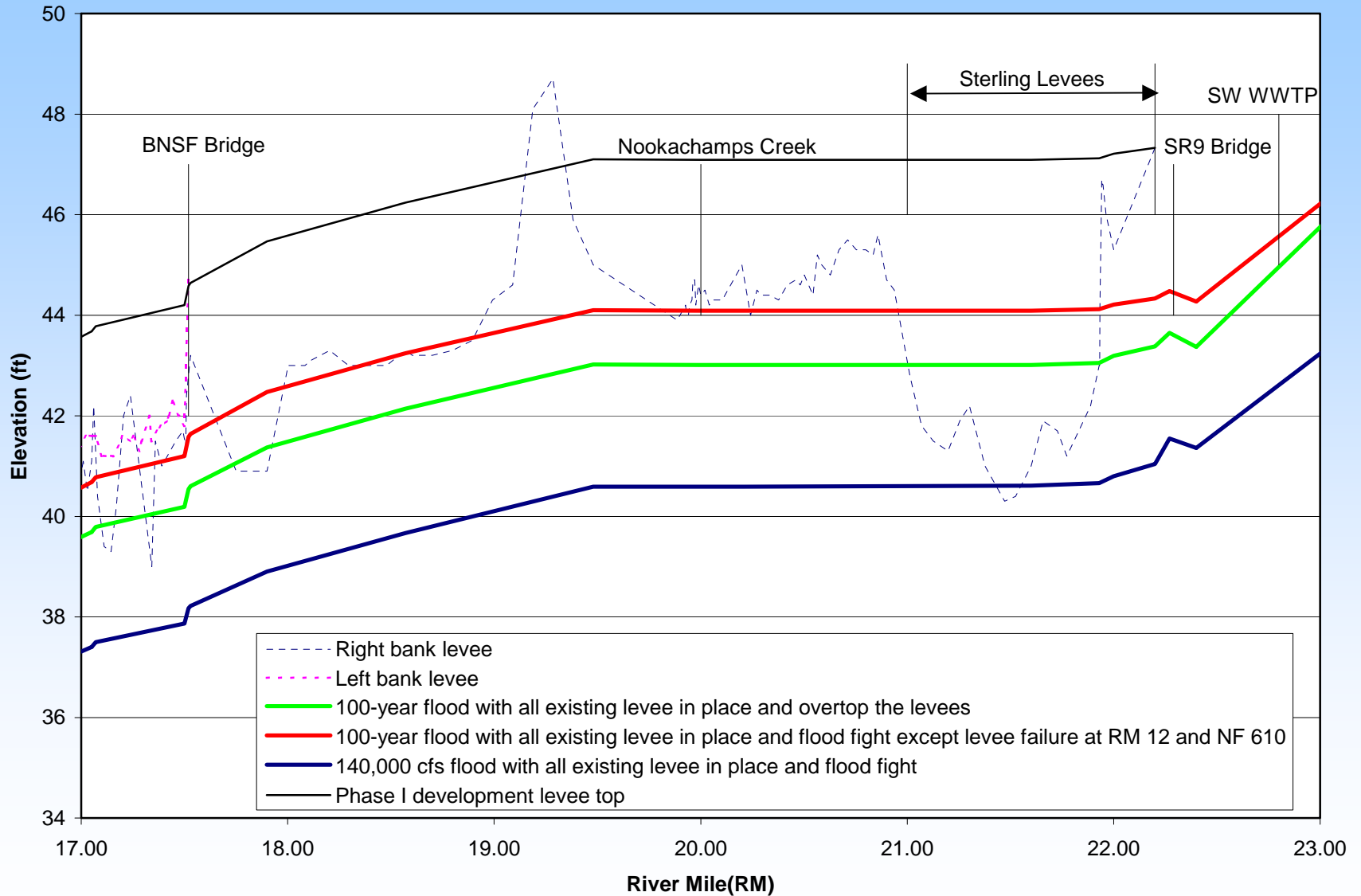
# 100-Year Flood Peak Reduction Potential

Location	Peak Flow – Existing Conditions	Measure	Peak Flow Reduction	Peak Flow – Best Potential Conditions
Above Concrete		Ross (180 KAF)	5,000 cfs	
		Lower Baker (29 KAF)	11,000 cfs	
		Optimized Upper/Lower Baker & Ross	16,000 cfs	
Concrete	192,300 cfs			176,000 cfs
Between Concrete & Sedro-Woolley		Cockreham Island (5 KAF)	5,000 cfs	
Sedro-Woolley	196,300 cfs			175,000 cfs
Between Sedro-Woolley and Mt. Vernon		Nookachamps Existing Storage	22,000 cfs	
		Nookachamps Control Storage (Francis Road 45 KAF)	14,000 cfs	
Mt. Vernon	174,200 cfs			139,000 cfs
Between Mt. Vernon and Division St. Bridge		Big Bend Storage (5 KAF)	3,000 cfs	
		Levee Set-Back Storage (2 KAF)	1,000 cfs	
Division St. Bridge	174,200 cfs			135,000 cfs

## Presentation of Measures

- Mount Vernon Floodwall (WWTP) Protection
- DD #17 Levee Alignment Between BNSF and I-5 Bridges  
Anacortes Water Treatment Plant Ring Dike  
Levee/Fill Alignments North of Mount Vernon Westside Bridge
- DD #12 Levee Alignment  
Sterling Levee  
Sterling Overflow/Conveyance Area
- Nookachamps Storage
- Water Surface Control Structures
- Sedro-Woolley WWTP Ring Dike
- Baker and Ross Storage Potential
- Level of Design/Cost Estimate
- Prioritization of Remaining Measures List

### Water Surface and Levee Elevations at Skagit River





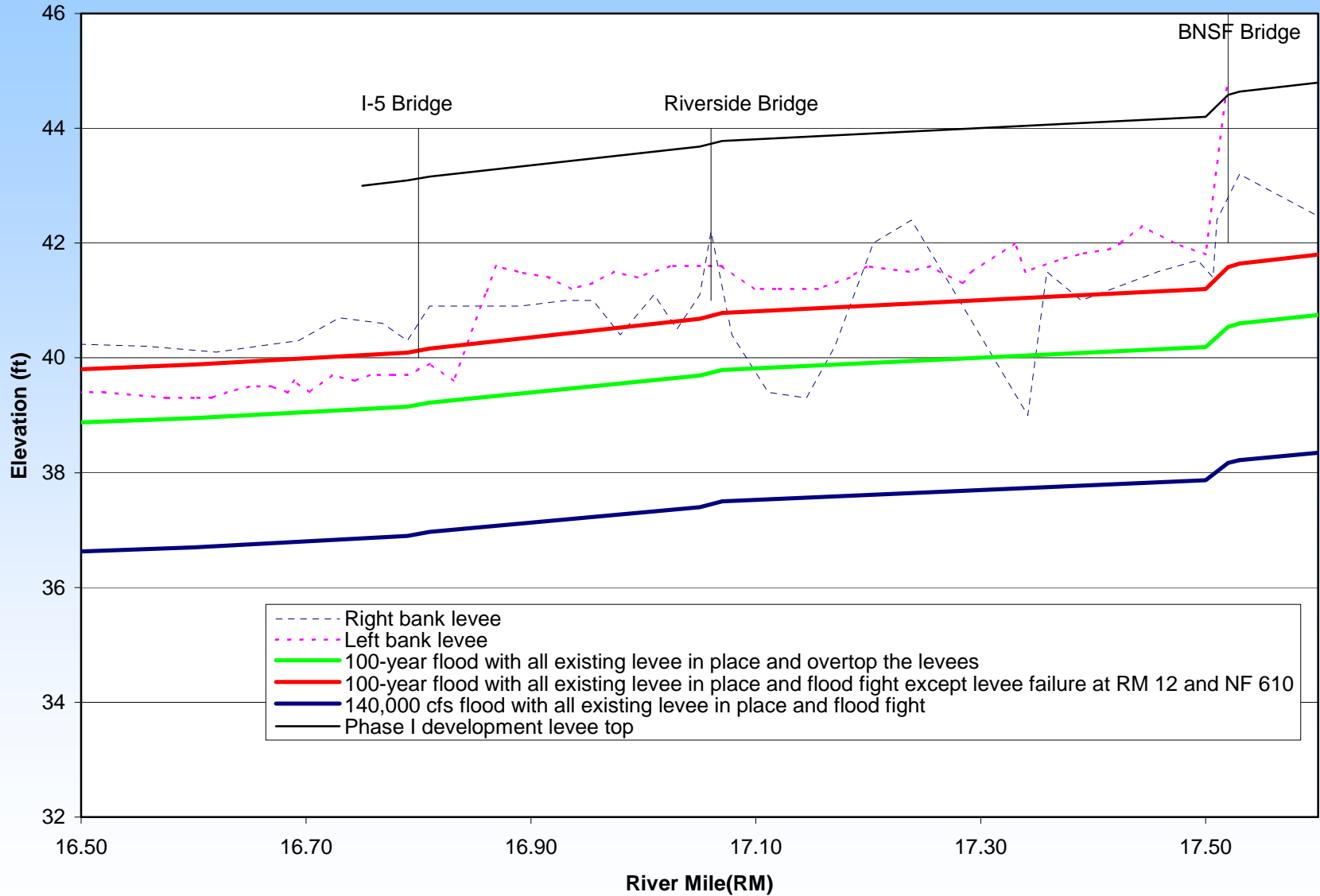


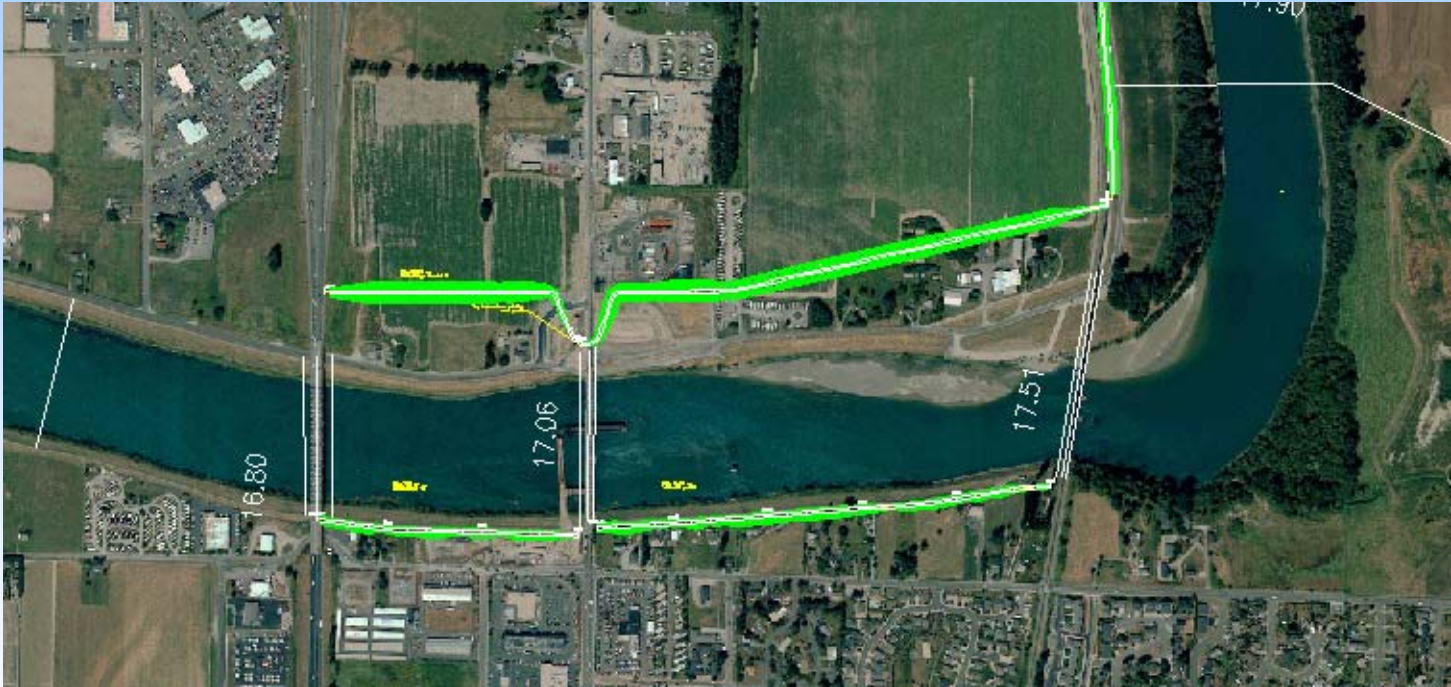




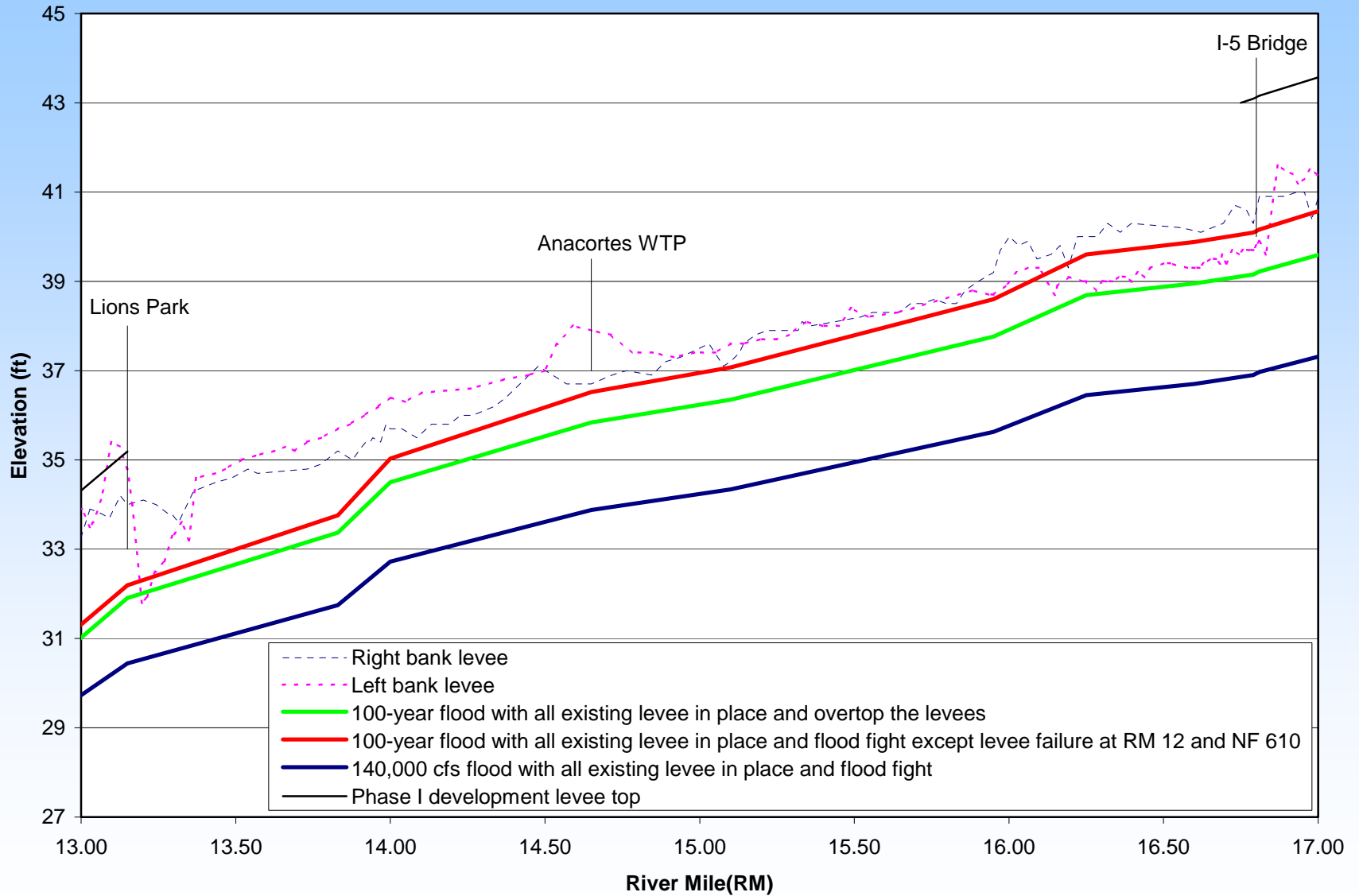


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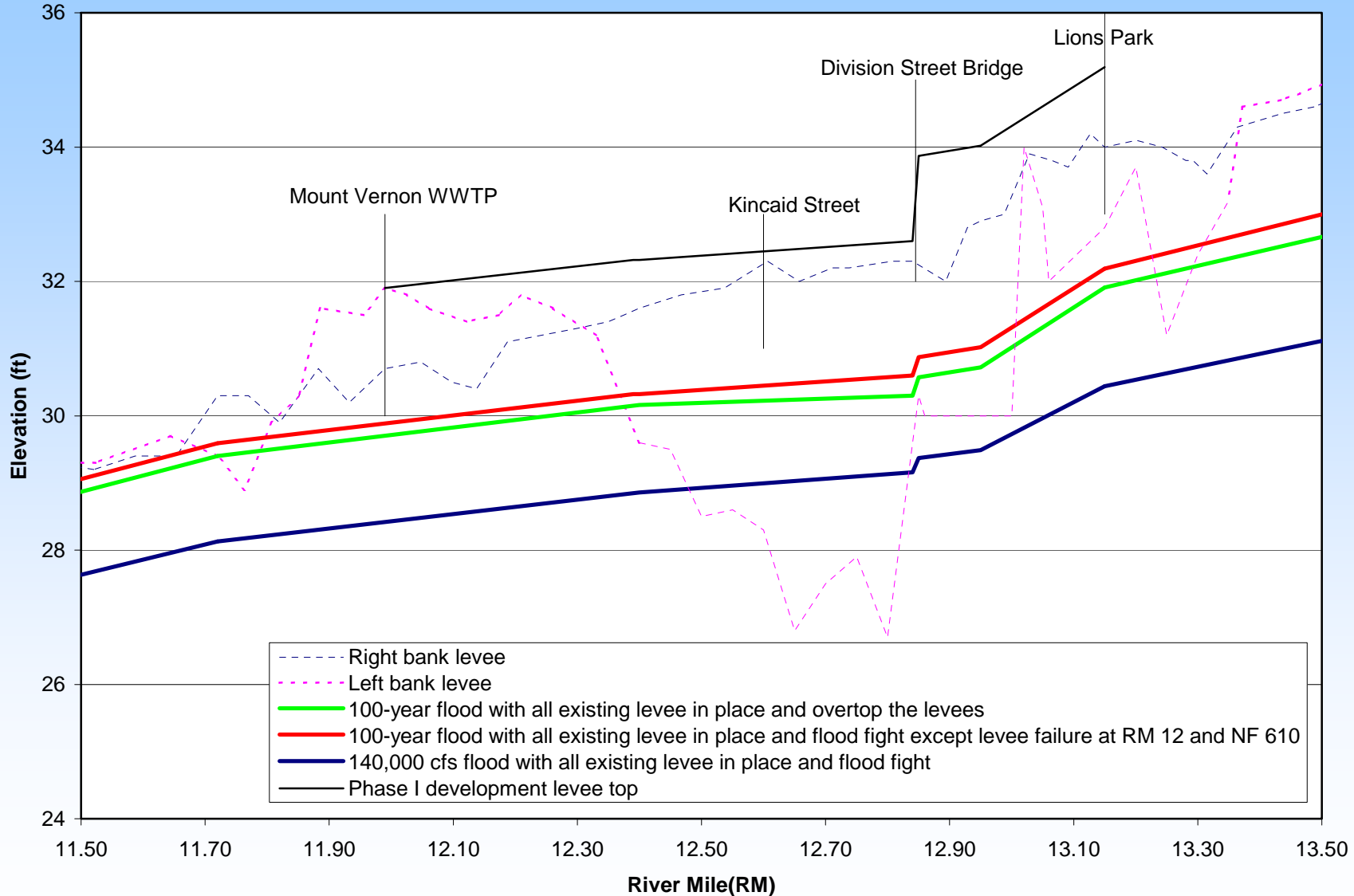
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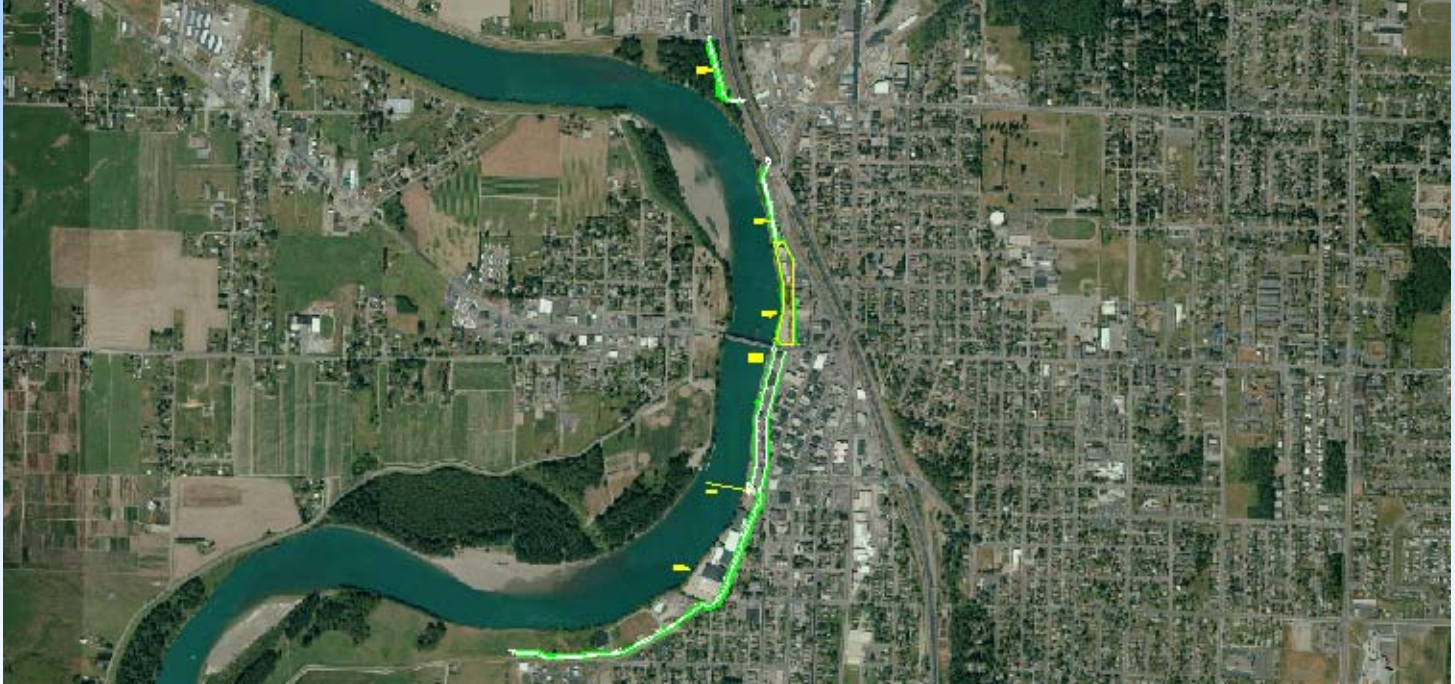






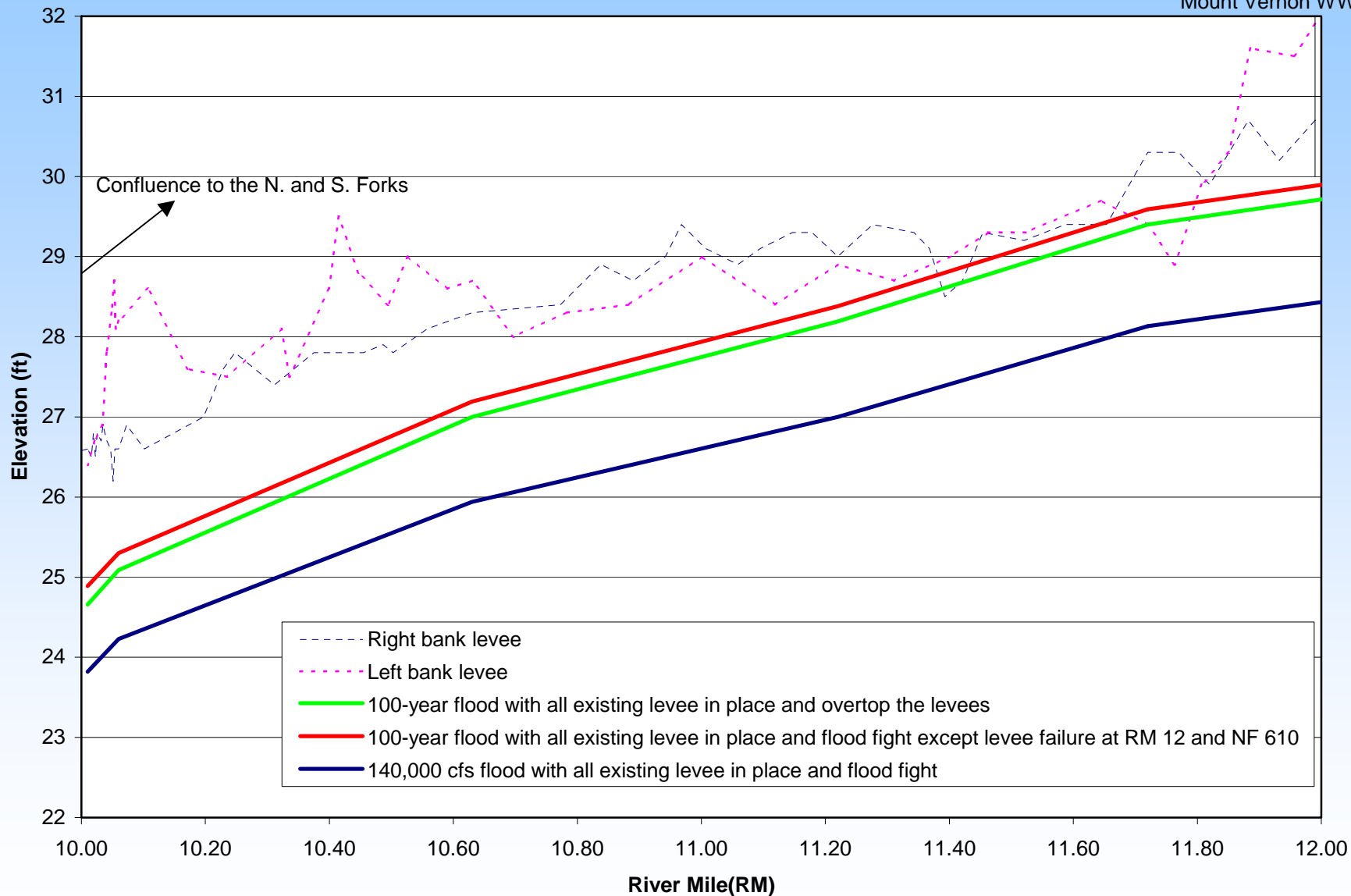
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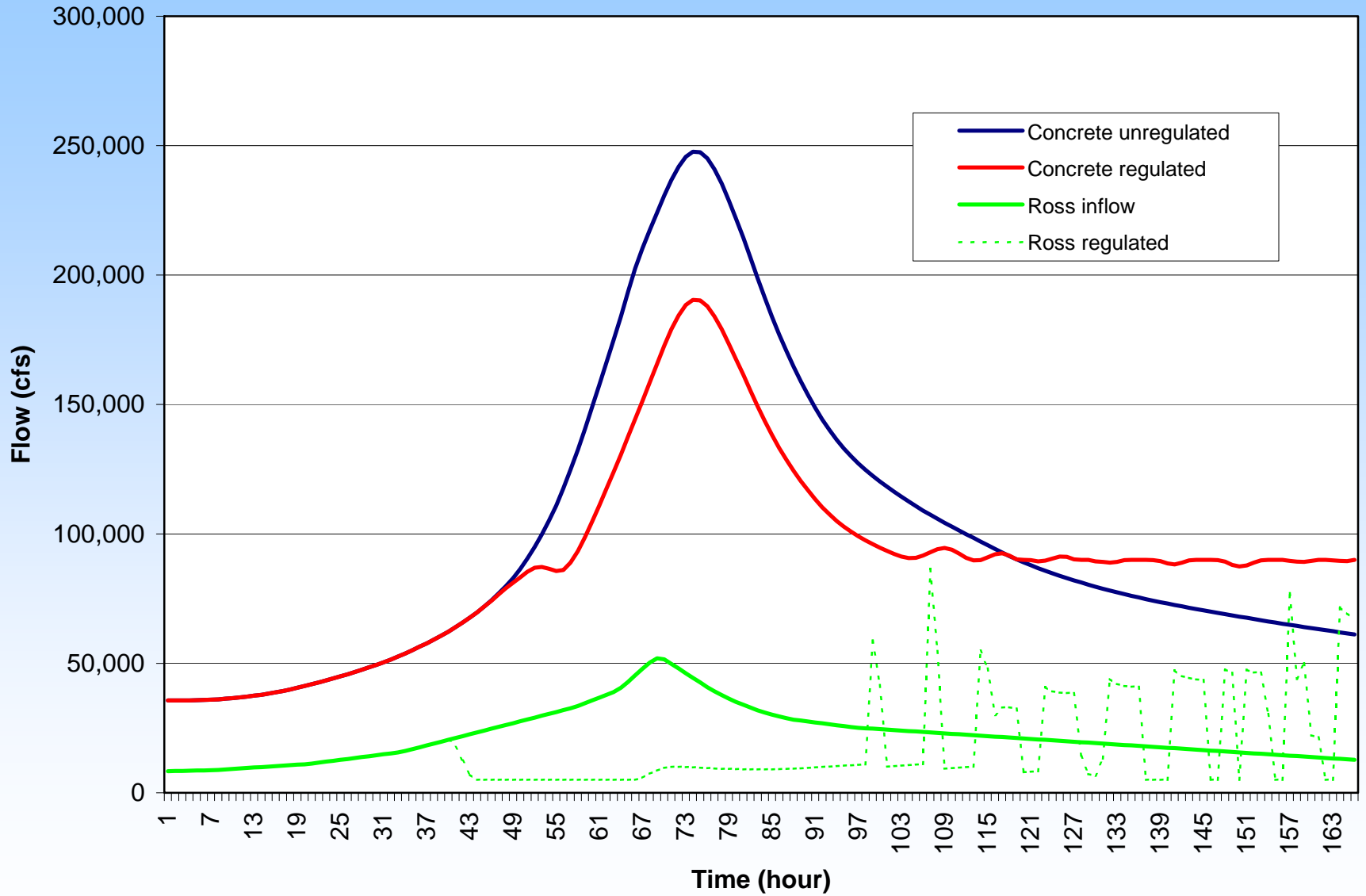
Mount Vernon WWTP



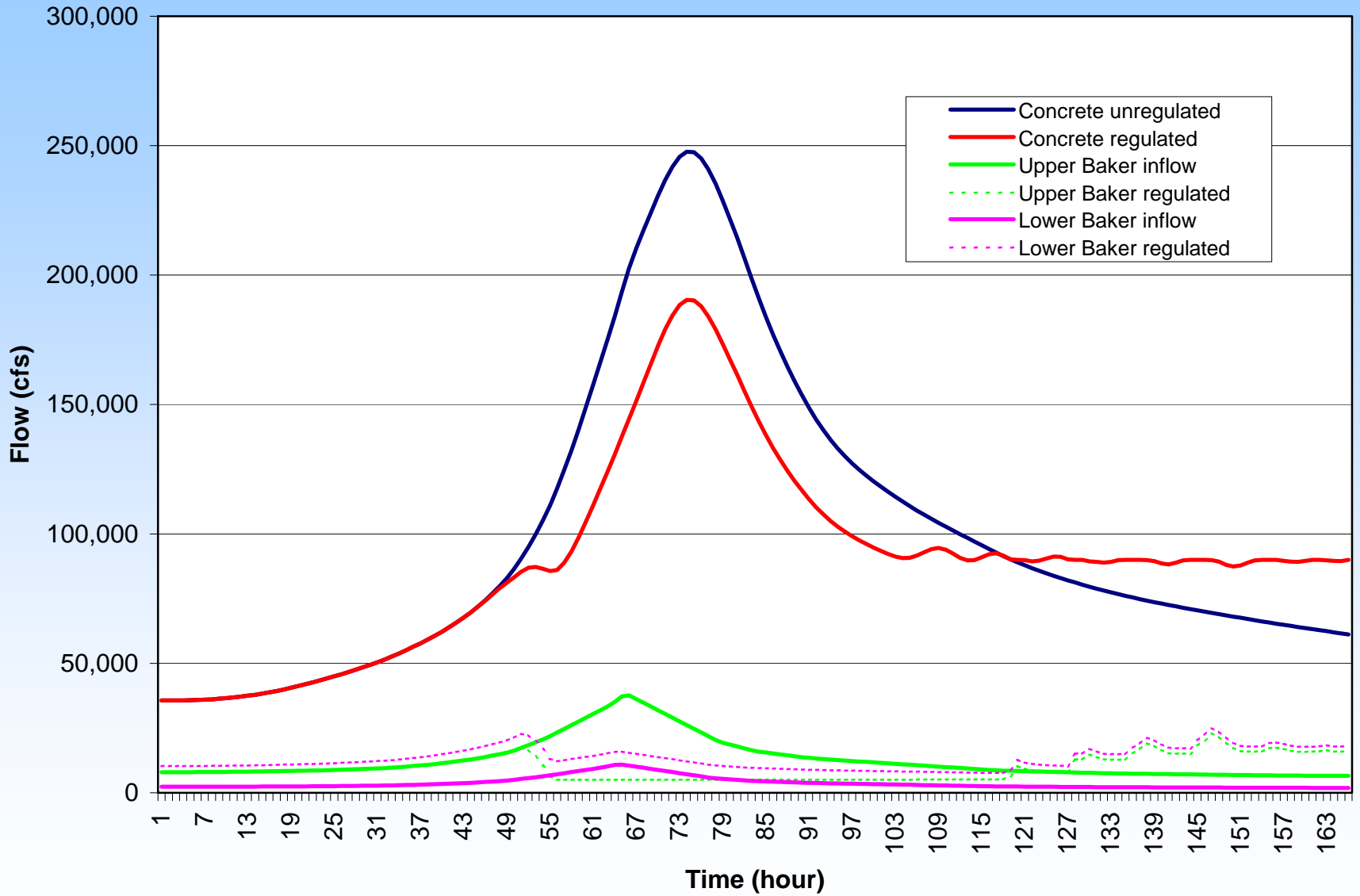
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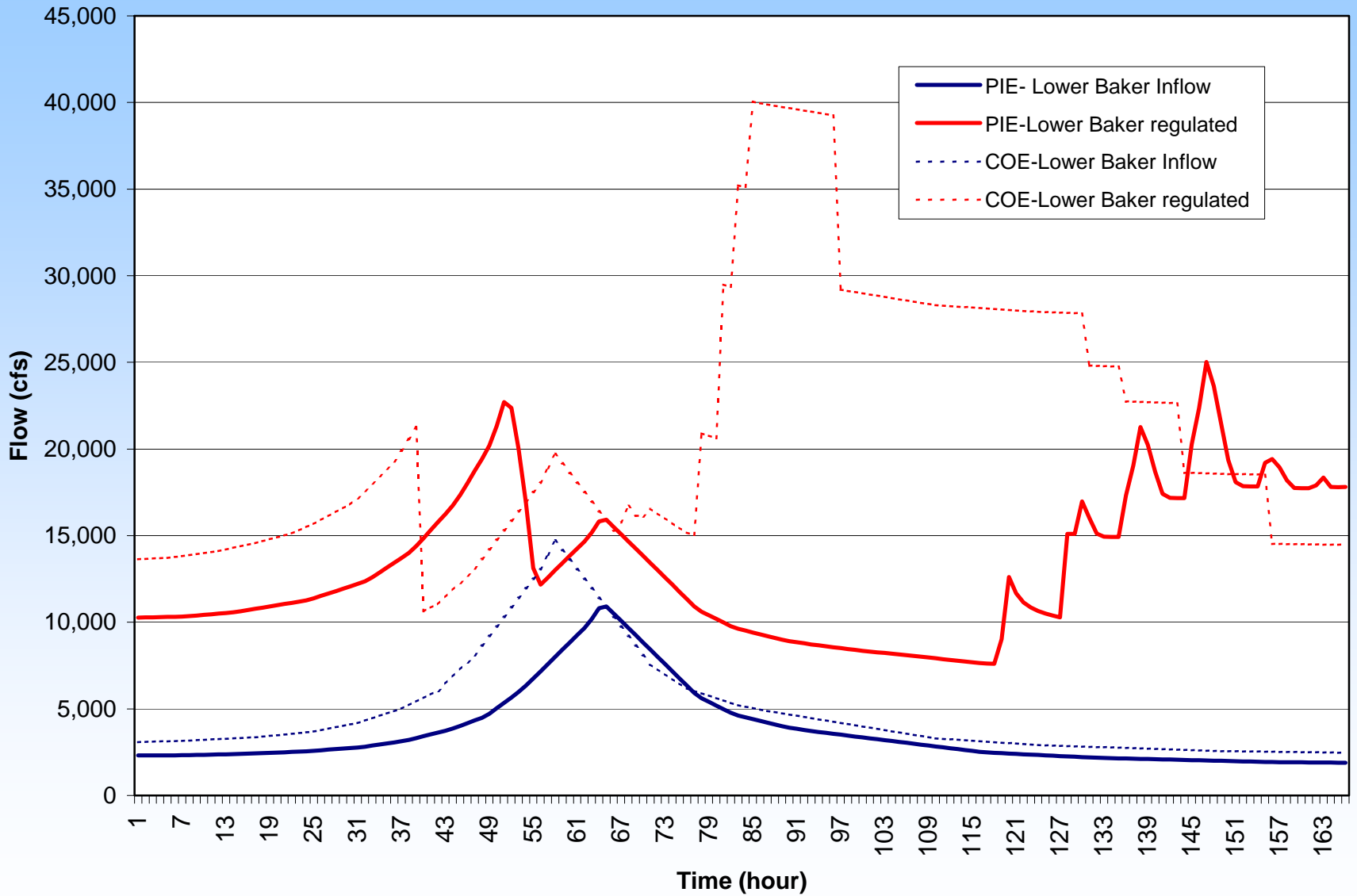
### Flow Hydrographs for 100-year Flood



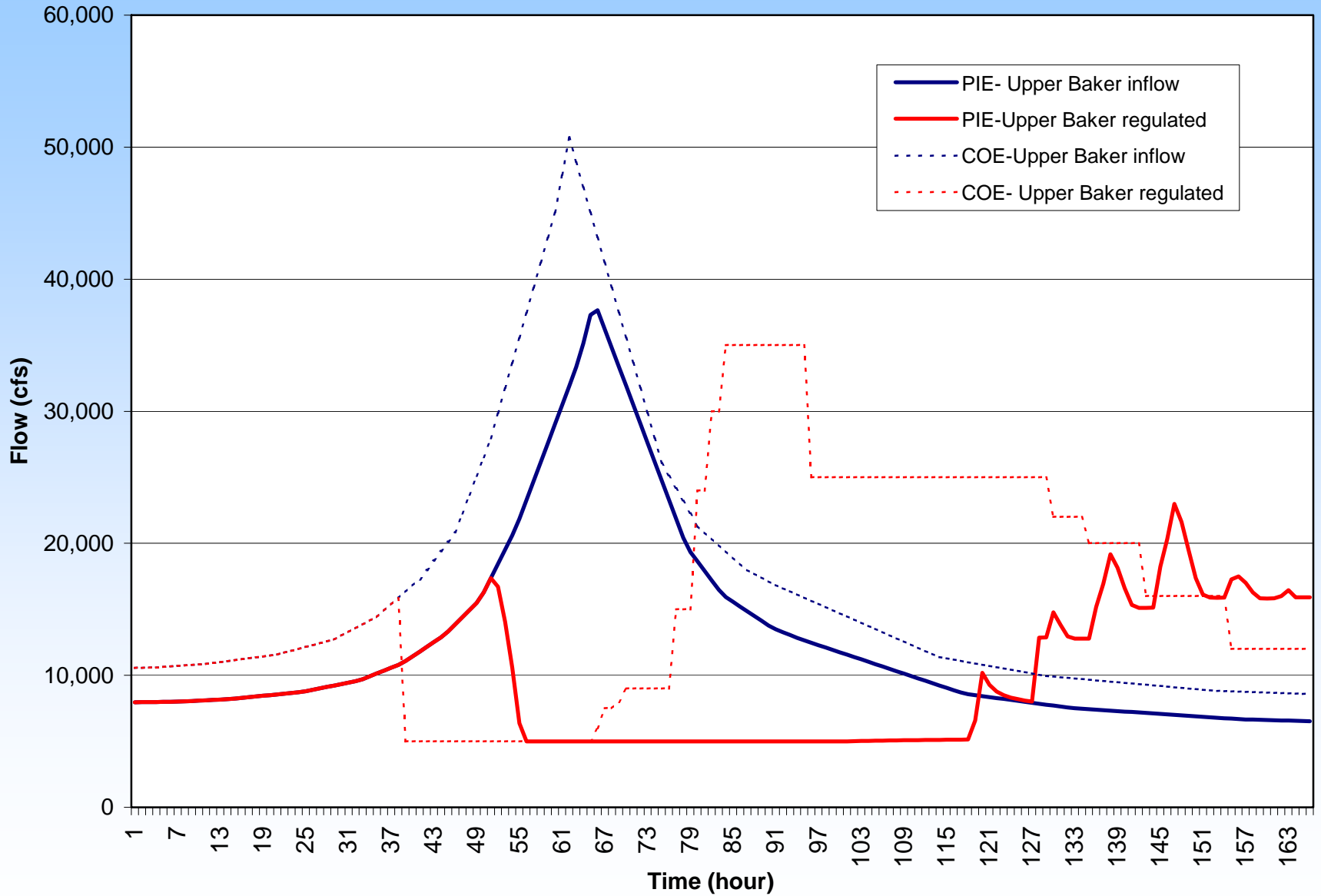
### Flow Hydrographs for 100-year Flood



### Flow Hydrographs for 100-year Flood at Lower Baker

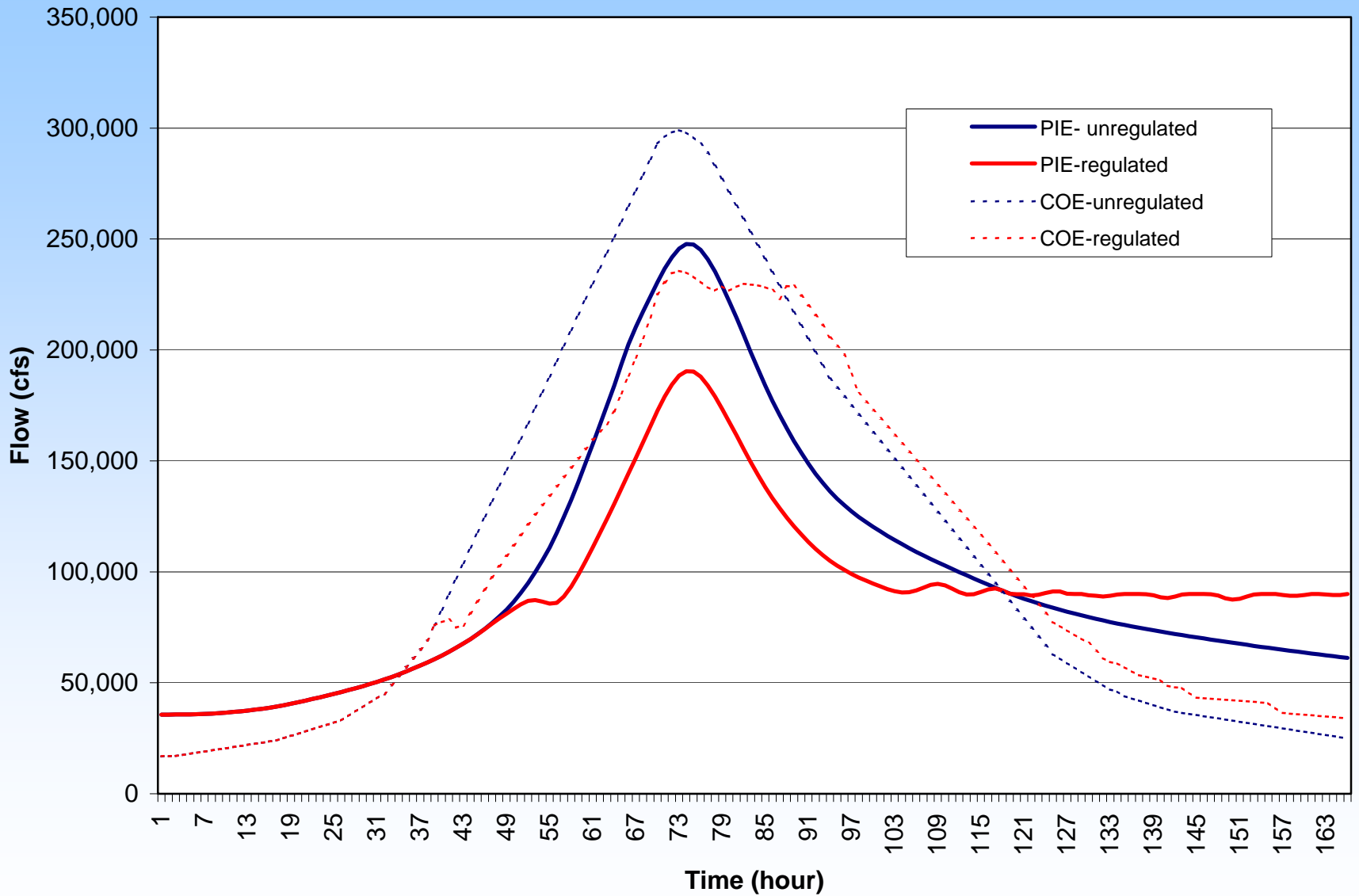


### Flow Hydrographs for 100-year Flood at Upper Baker

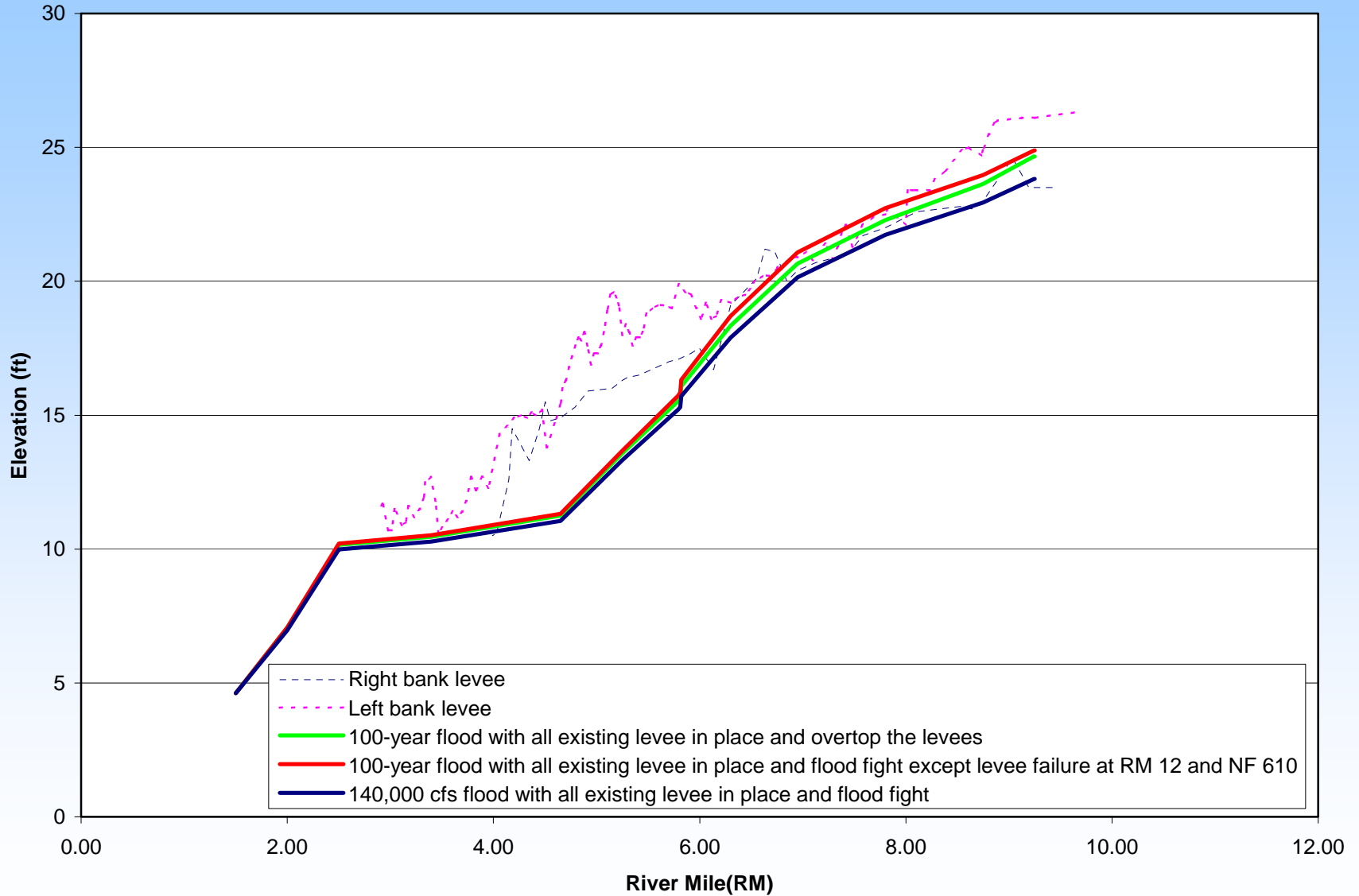




Flow Hydrographs for 100-year Flood at Skagit River near Concrete



### Water Surface and Levee Elevations at South Fork



### Water Surface and Levee Elevations at North Fork

