



KING COUNTY  
FLOOD CONTROL  
DISTRICT



King County

# Preparing for Extraordinary Flood Flow on the Green River in 2009

Presentation to the Advisory Committee  
November 19, 2009

*Protecting public safety, the regional economy and critical infrastructure.*

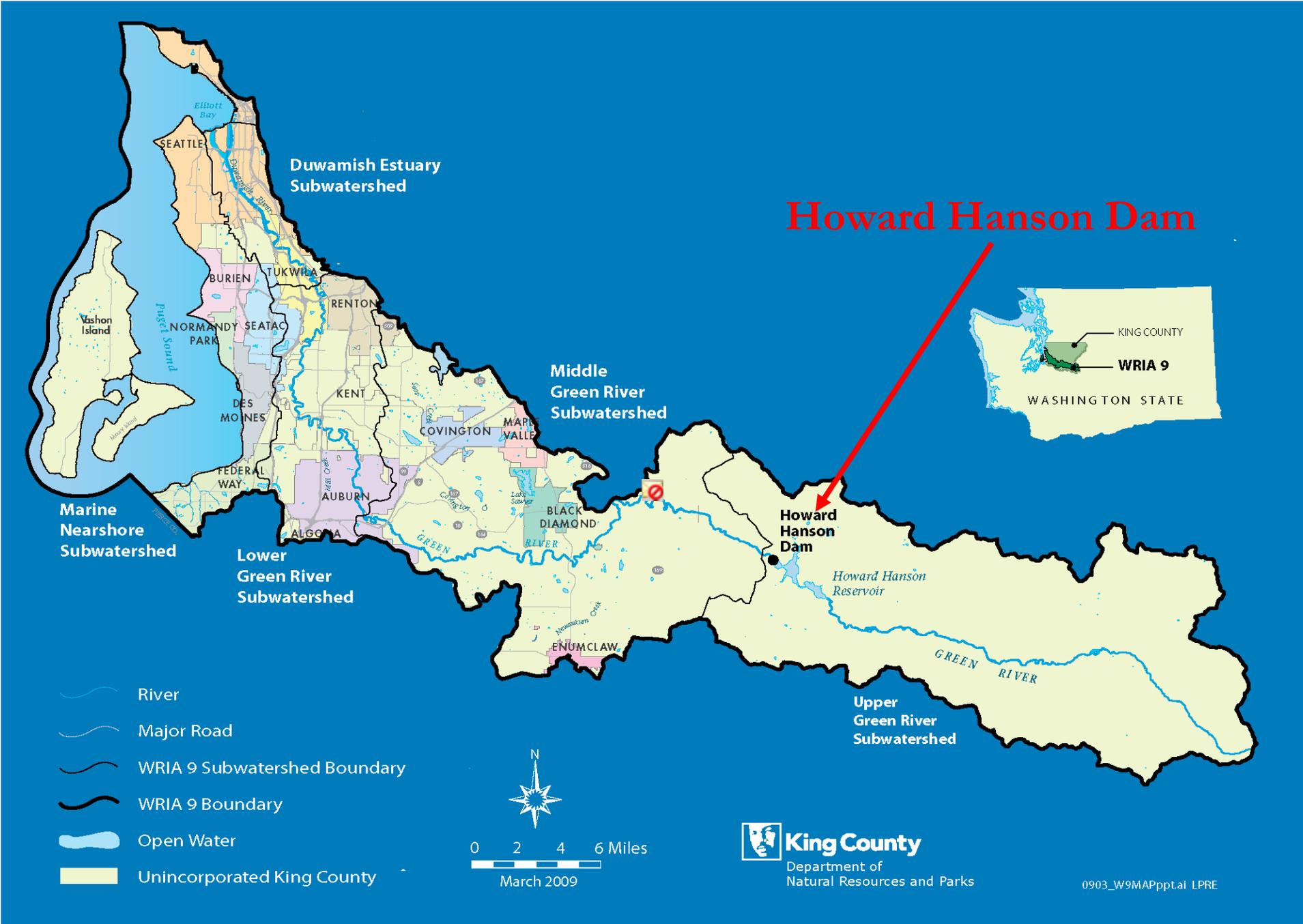
# Presentation Overview

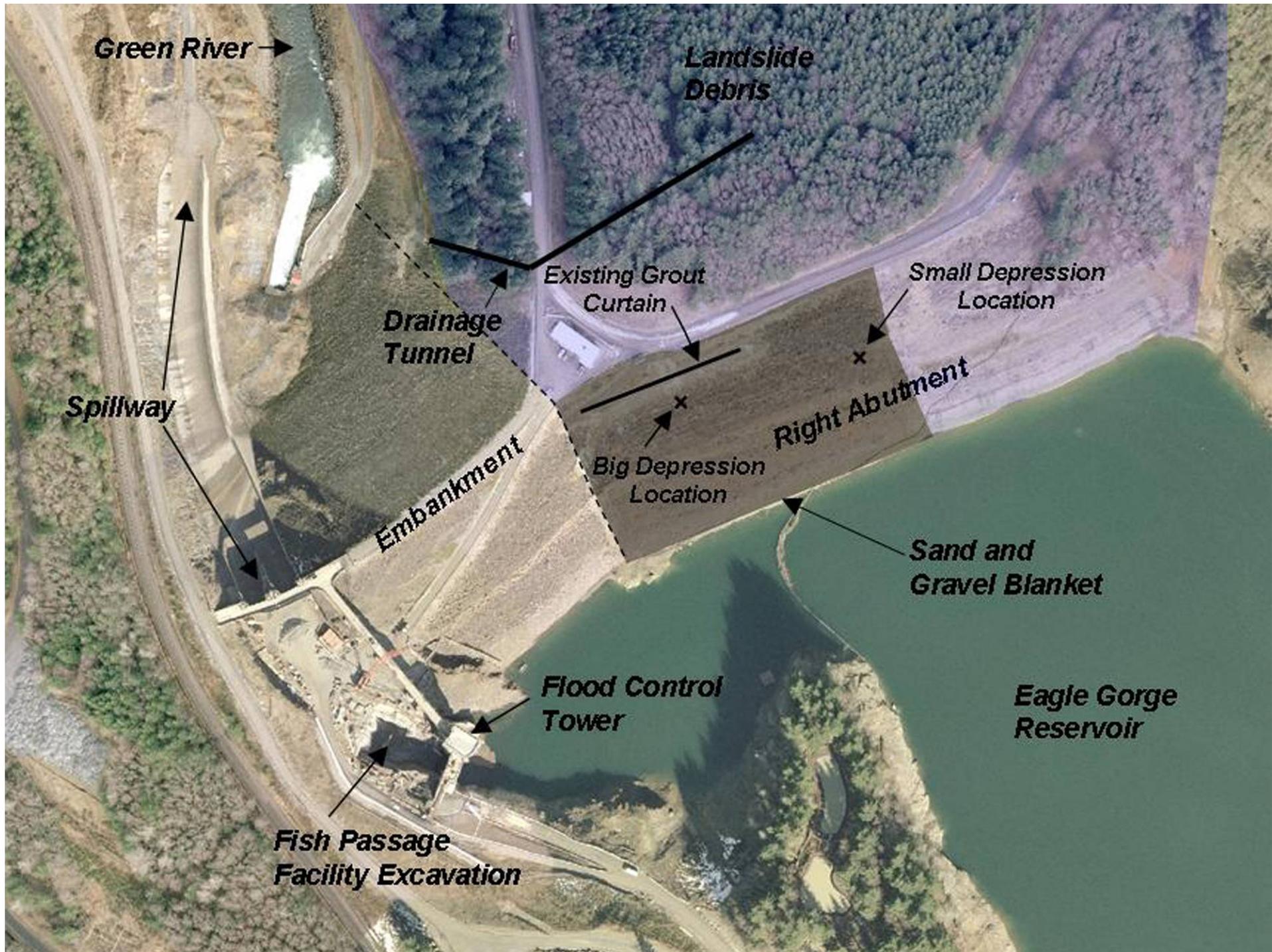
- Overview of Howard Hanson Dam Situation
- Technical Analyses to Develop Temporary Containment Options
- Implementation of Temporary Containment Structures
- FCD Support for Planning, Outreach, and Communications

# Overview

## USACE Howard Hanson Dam

- Howard A. Hanson Dam is a U.S. Army Corps of Engineers flood control dam
- Designed, built, operated and maintained by the U.S. Army Corps of Engineers (operational since 1962)
- Primary purposes are flood control in the winter, fish enhancement in the summer, and water supply







**TW-37**

**TW-35**

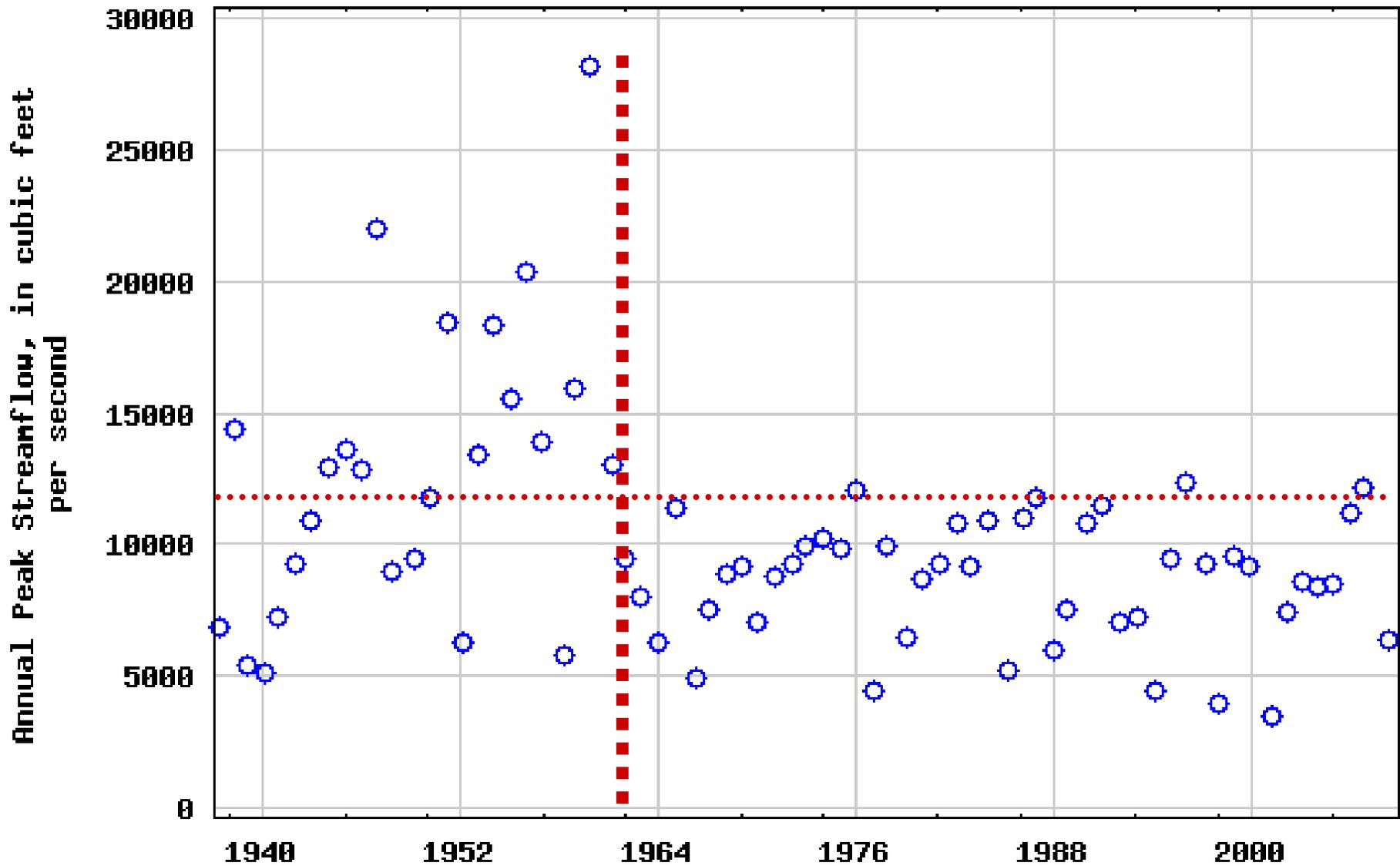
**TW-34**



# Lower Green River Valley



# USGS 12113000 GREEN RIVER NEAR AUBURN, WA

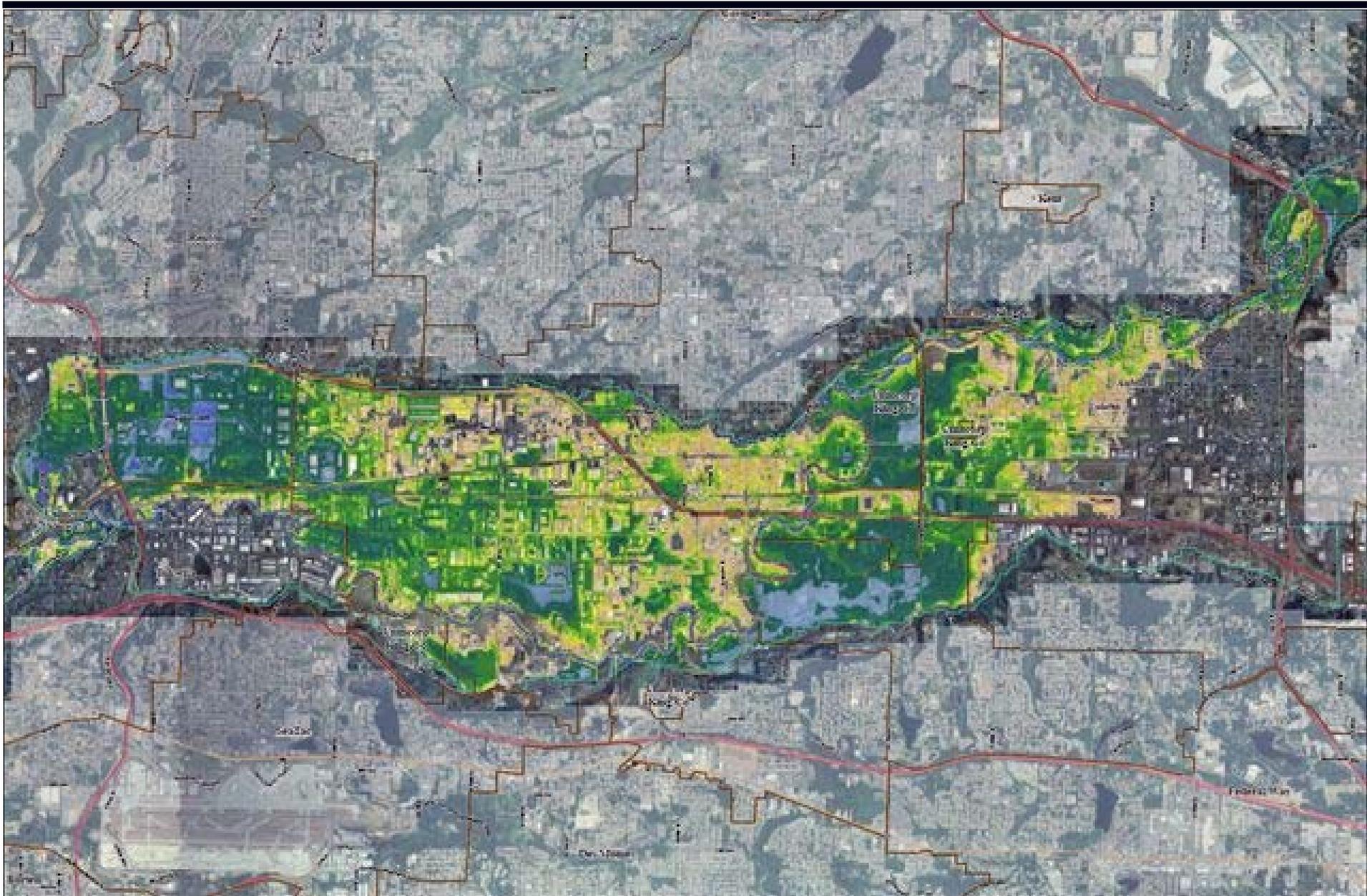


# Technical Analyses: Identifying Emergency Measures for the Lower Valley

- 2007 - Flood Study and Model
- May 2009 - Inundation Maps (Corps)
- June 2009 - Levee overtopping maps
- August 2009 - Impacts of levee raising on flood elevations
- September 2009 - Levee Stability Geotechnical Analyses
- Active BTC Participation throughout







**NOTE: THIS IS AN FLOODING MAP, THIS IS NOT AN EVACUATION MAP**

The water depth data presented in this map is based from a computer model of the Great River. The model used to generate the hydrographs, heights and depths including processes considered to be for King County. While the model is the most comprehensive and current hydrologic model available for the Great River, the model requires assumptions that a particular point on the river and the local conditions or conditions of the River. In addition, because the model and the data used were the product of many sources that there is a risk that the model for prediction. The model assumes there are a grid size of 100 feet in horizontal distance resulting in a 1000 grid based on an existing 1000 resolution map. There is inherent uncertainty in the model, and results should be reviewed with appropriate care.

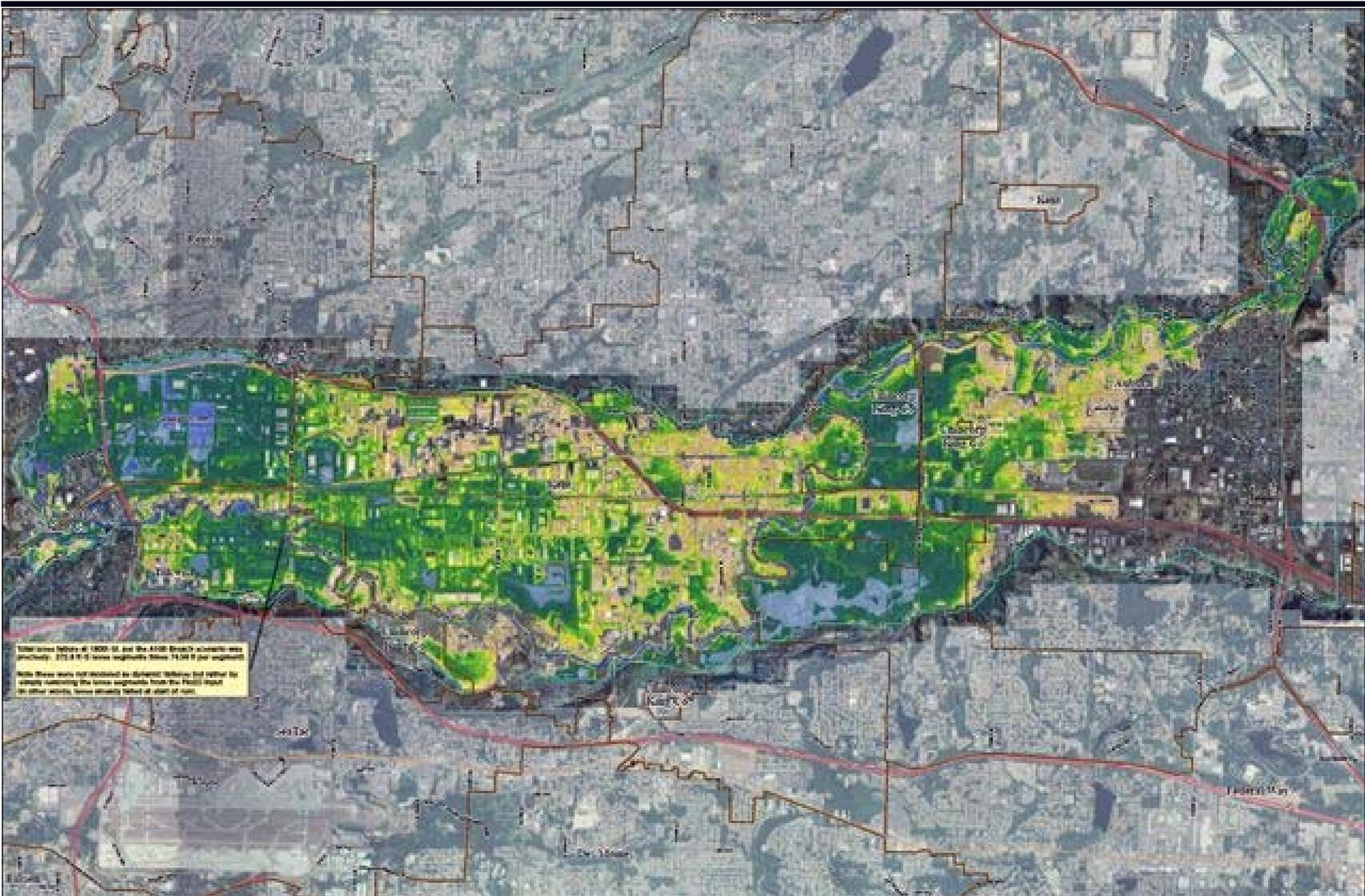


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**Simulated Water Depth for a Peak flow at Auburn Gage of 25,000 cfs**

Project Name: Washington State Water Board Project Number: 10000000000000000000 Revision Number: 10000000000000000000 Revision Date: 10/10/10 10:10:10 Project Team: King County Project Location: King County Project Status: 10000000000000000000	<b>Full Model Output</b>  01 May 2010
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Total water volume of 1,000-15, and the 4,000 ft<sup>2</sup> breach volume was predicted. 273,875.5 cubic feet (100,000 gal equivalent) with these areas not protected by drainage facilities but water is quickly conveying the water southward from the Flood Impact to other nearby areas already filled at start of rain.



**NOTE: THIS IS AN IMAGINATION MAP, THIS IS NOT AN EVACUATION MAP!**  
 The water depth data presented in this map is subject to a computer model of the Green River. The model used for the data was developed using available hydrologic and hydraulic data available to date for the Green River. While the model is the best representation available, it may not accurately represent the actual conditions. The model does not account for the possibility of a catastrophic event such as a dam failure or a levee breach. The model is based on the 1988 100-year flood data. In addition, the model does not take into account the possibility of a future reservoir flow that is not included in the model. The model does not take into account the possibility of a future reservoir flow that is not included in the model. The model does not take into account the possibility of a future reservoir flow that is not included in the model. The model does not take into account the possibility of a future reservoir flow that is not included in the model.



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**Simulated Water Depth for a Peak flow at Auburn Gage of 25,000 cfs and Levee Failure at 180th St.**

Contract Number: W85500-94-1-0000  
 Contract Title: Flood Hazard Study  
 Contract Date: 10/00/94  
 Contract Status: 10/00/94  
 Project Name: Flood Hazard Study  
 Project Number: W85500-94-1-0000  
 Date of Publication: February 1998

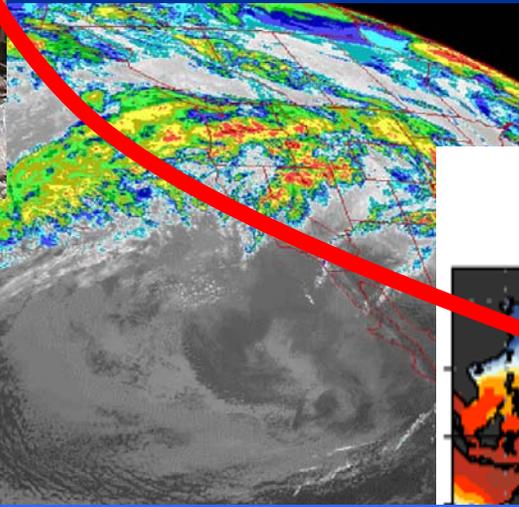
Full Model Extent  
  
 01-0000-0000

# Maps Reflect Major Assumptions

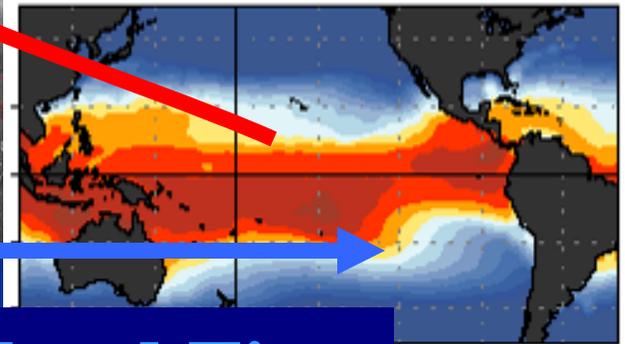
- Inflow to Reservoir
- Performance of Dam
- Local Inflow (below dam)
- Performance of Levee System

# Forecast Dilemma

Confidence



**EL NIÑO**  
**Jan-Mar 1998**

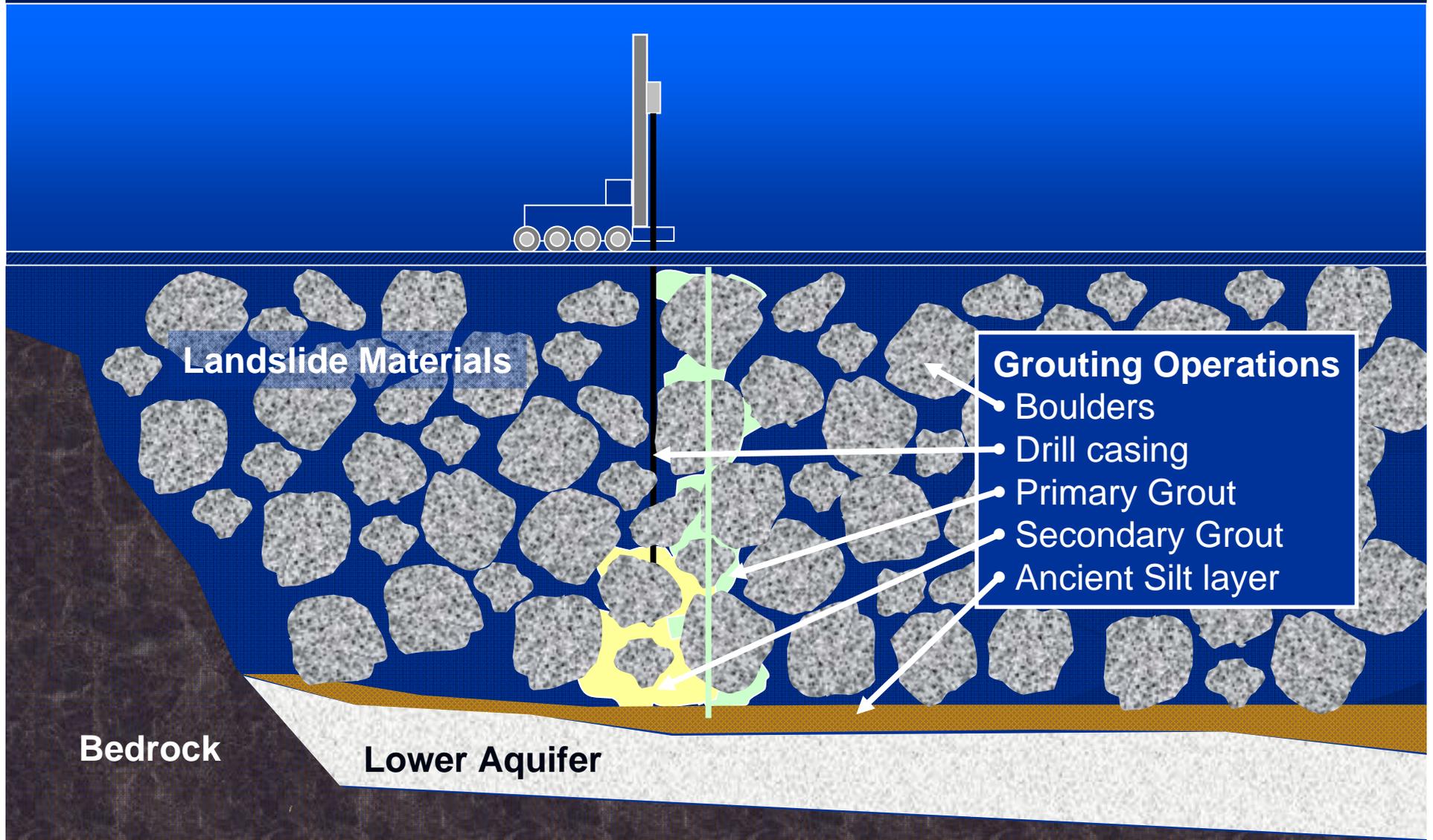


Lead Time

# Flood Risk Reduction Actions

- HHD Grout Curtain – USACE
- Levee Raising and Pump Stations (\$8.4M)
  - FCD
  - Cities
  - USACE
- Outreach and Communications
- Regional Emergency Response Planning Efforts
- Expert Review of Green River Strategy

# USACE Grout Curtain Construction



November 19, 2009

Slide Courtesy USACE, Seattle District <sup>18</sup>

# Examples of Overtopping



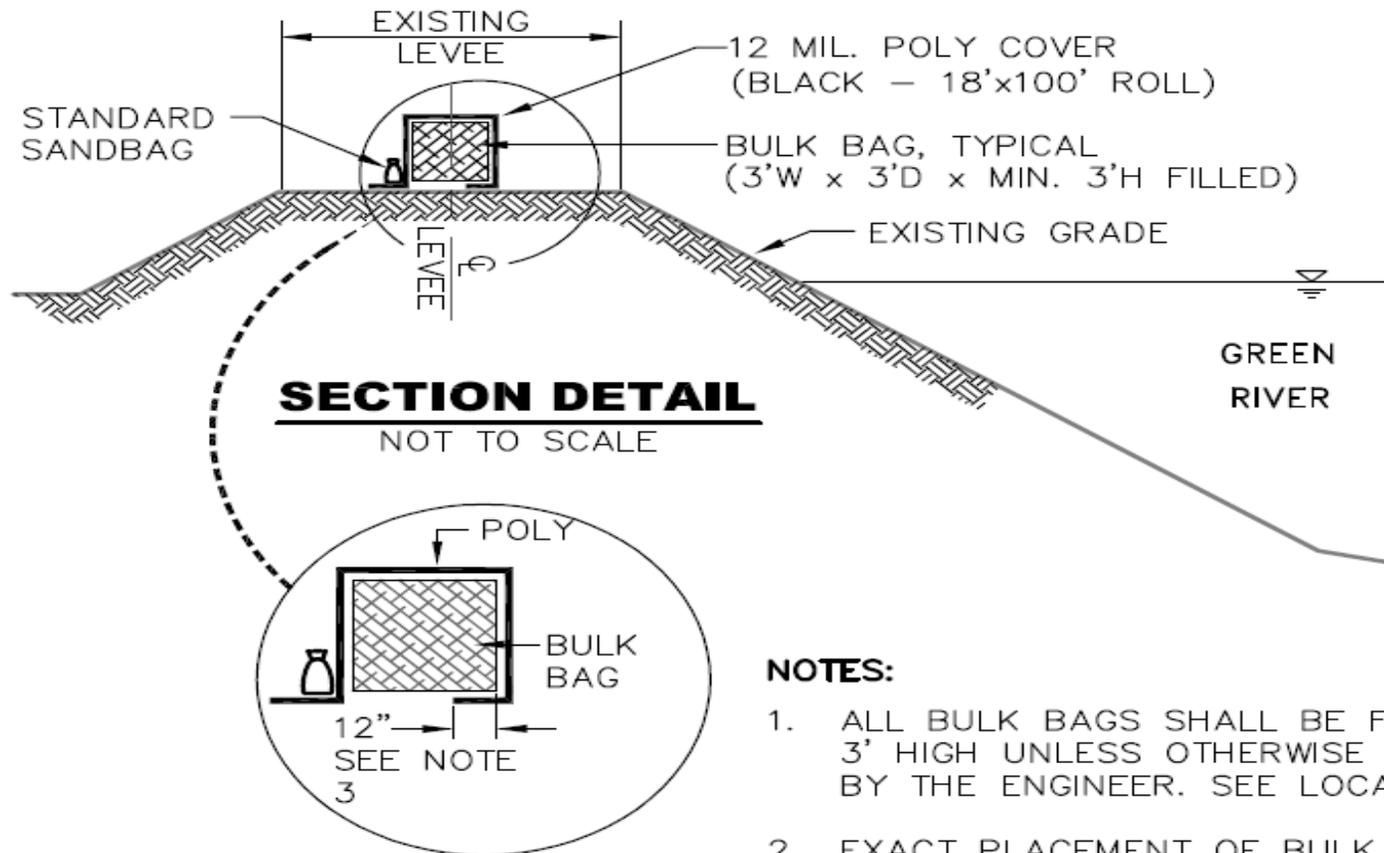
Mason Thorson Extension  
Middle Fork Snoqualmie River  
Wednesday, January 7, 2009

November 19, 2009



SR 202 Overtopping and  
Substantial Damage

# Green River Levee Raising



## NOTES:

1. ALL BULK BAGS SHALL BE FILLED TO MINIMUM 3' HIGH UNLESS OTHERWISE NOTED OR DIRECTED BY THE ENGINEER. SEE LOCATION MAPS.
2. EXACT PLACEMENT OF BULK BAGS SHALL BE AS DIRECTED IN THE FIELD BY THE ENGINEER.
3. EDGE OF POLY UNDERNEATH BOTTOM BULK BAG SHALL NOT BE MORE THAN 12" FROM OUTSIDE FACE OF THE BAG, AS SHOWN.



# Black River Pump Station



- Outlet channel containment
- Electrical generators
- Fuel
- Debris control
- Back-up pumps

# Outreach and Planning

- Direct mailings to 170,000 addresses
- Extensive media coverage
- Public meetings, community groups, businesses
- Support for regional preparedness planning

November 19, 2009

**Green River Flooding**  
**ARE YOU READY?**  
Prepare now for a higher risk of flooding

**PREPARE NOW**

1. Make an emergency plan for your family, pets or livestock.
2. Assemble an emergency kit.
3. Buy flood insurance now – it takes 30 days to take effect. [www.floodsmart.gov](http://www.floodsmart.gov)
4. Get a radio and keep fresh batteries.

**IN THE EVENT OF A FLOOD**

1. Monitor area news.
2. Move vehicles and equipment to higher ground.
3. Do not walk or drive through standing water or closed roads.
4. Listen for alerts about evacuation notices and routes. Heed evacuation instructions.
5. Bring medications and supplies with you.
6. Relocate animals and livestock, if needed.

**KING COUNTY FLOOD CONTROL DISTRICT**

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[www.kingcounty.gov/floodplans](http://www.kingcounty.gov/floodplans)

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# Expert Review

- Panel of 8 external experts
  - Licensed Engineers, geotechnical experts, floodplain management experts
- Review Green River Flood Risk Reduction Strategy in light of Howard Hanson Dam operational changes
- Recommendations due end of November



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Questions?

