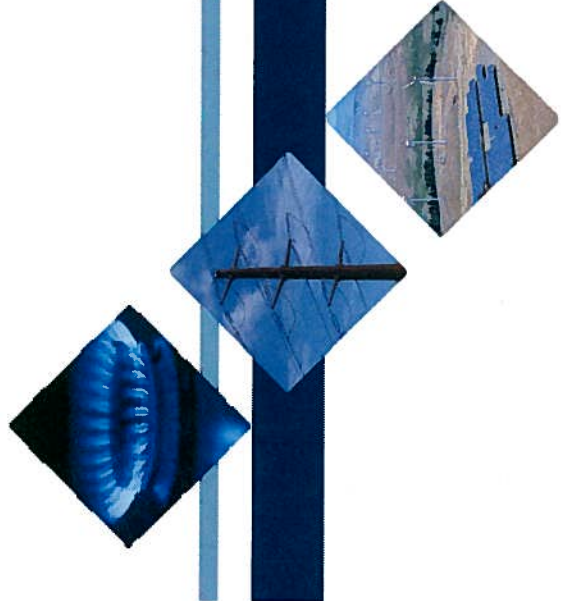




# Update on Puget Sound Energy's Green River Flood Preparations

*Presented to the*  
Washington Utilities and Transportation Commission  
October 15, 2009



**PUGET SOUND ENERGY**

*The Energy To Do Great Things*

# Planning process: Safety is the priority

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- For PSE, emergency planning and preparedness is a year-round process
  - Severe weather, natural disasters or human-related events
- Flood response plans are an extension of PSE's existing emergency response plans
  - Plan emphasizes all emergency types and concurrent events
- Multi-year flood threat
  - Multiple flood events per storm season and over several years
- PSE is taking extra steps to isolate potential flood impact
  - Advance knowledge allows for pre-flood measures

*Safety of the public and employees is our top priority*

# Green River Valley: Then and now

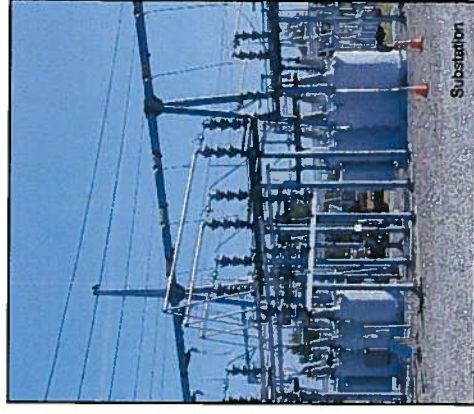


Top left: Kent Valley, 1930s; Bottom left: Kent Valley, 1946 ©PSE; Top right: Kent Valley 2008 from KOMONews.com; Near right: *Seattle Times* photo of King County's Maleng Regional Justice Center in Kent, the large building at lower left, lies in the Green River flood plain

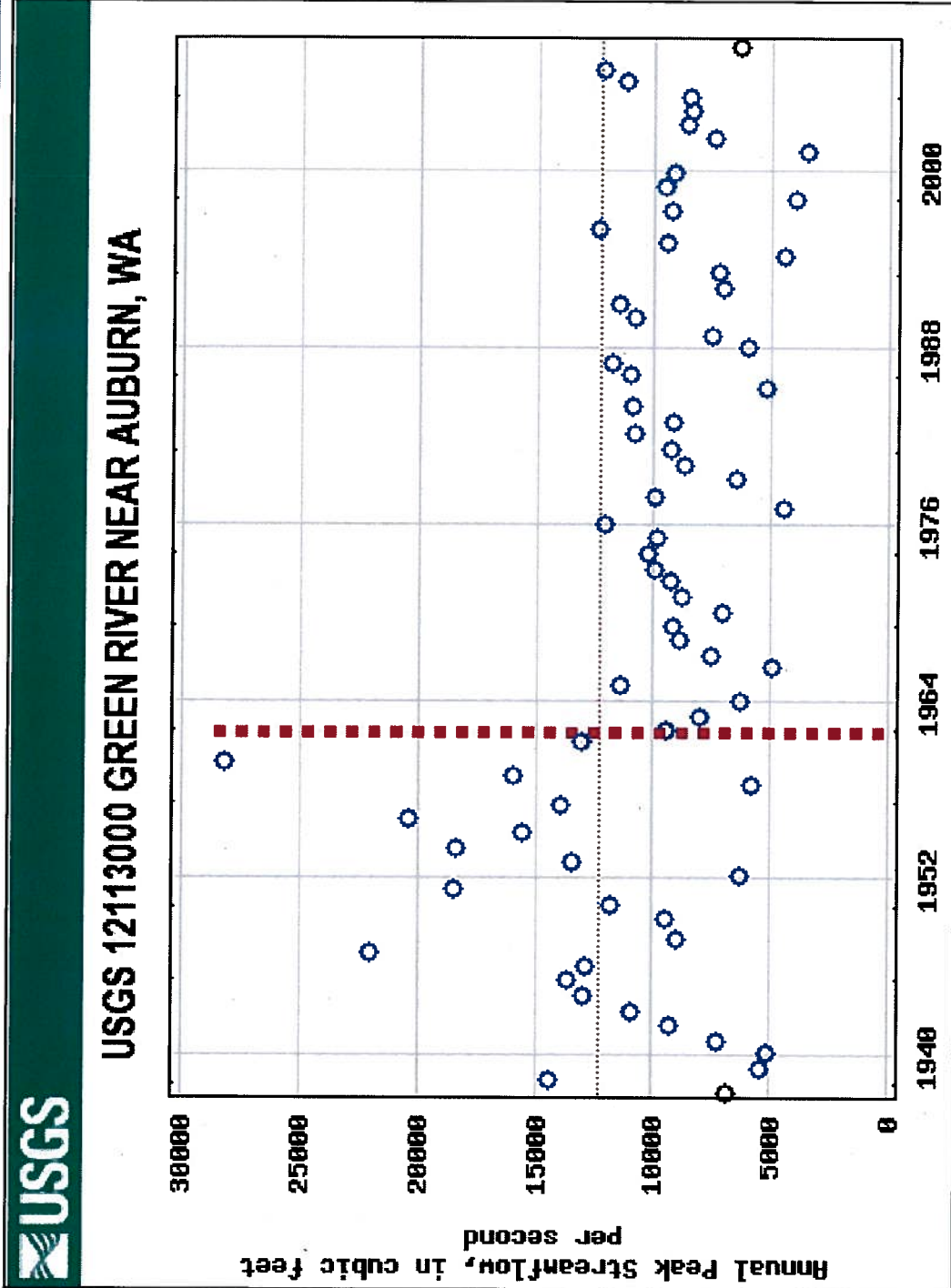


# PSE in the Lower Green River Subwatershed

- Major facilities and critical infrastructure
  - South King Service Center – 200 employees
  - 35 transmission and distribution substations
  - More than 1,000 miles of natural gas and electric infrastructure
- Customers
  - 36,000 natural gas
  - 76,400 electric
- Other community critical infrastructure, including government, hospitals, telecommunication and data centers, airports

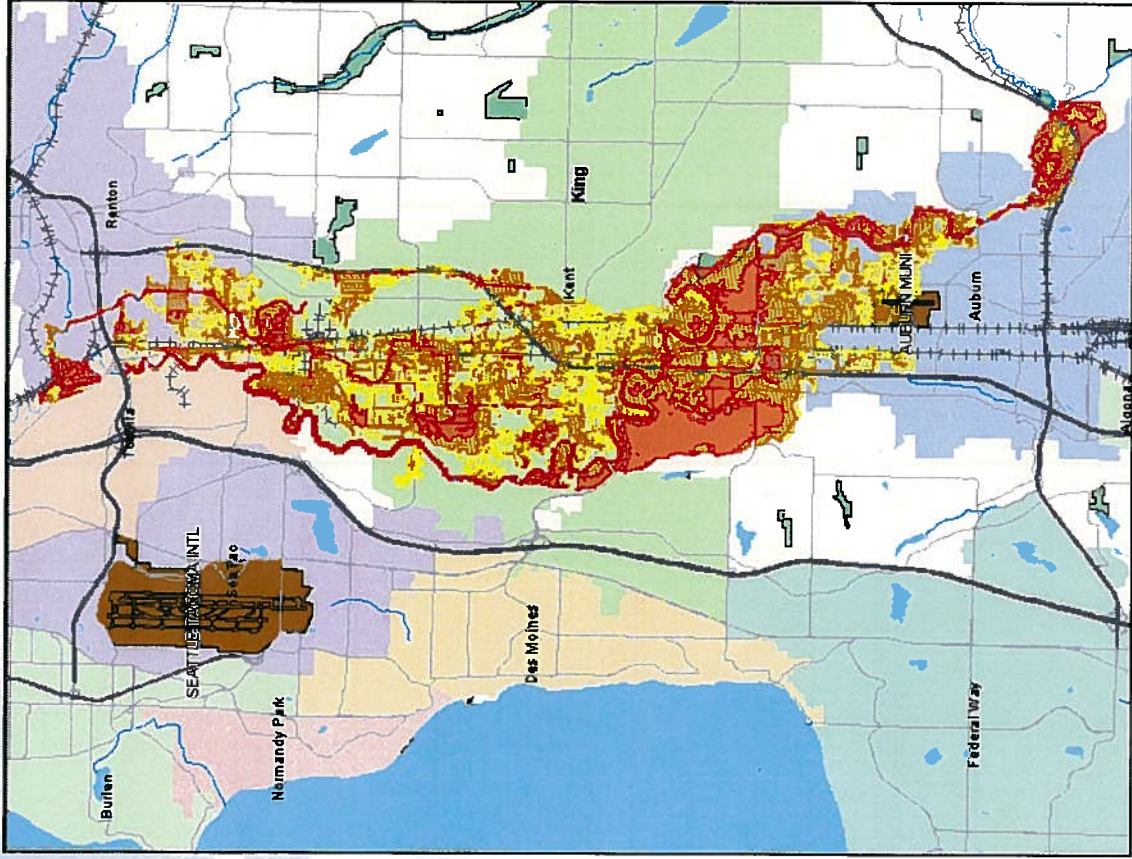


# Green River historical flow rates (1937-present)



Green River levees overtop at 12,900 cubic feet per second (cfs). [1 cfs = about 450 gallons per minute]  
The Howard Hanson Dam has prevented area flooding since its installation in the early 1960s.

# Potential system impact – 17,600 cfs flow

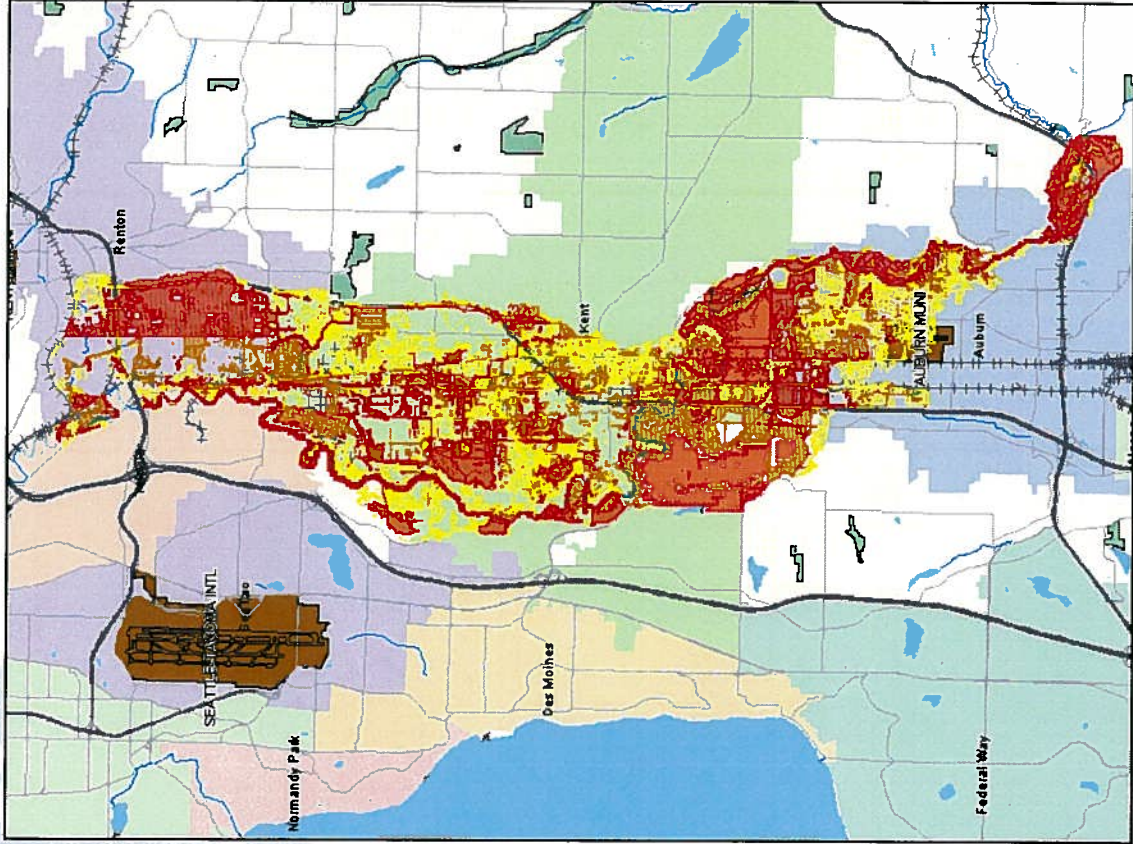


17,600 cfs Flow – Natural Gas	
3,335	Customer meters (expected to see some level of flooding)
2	Limit stations (one will be taken out of service in advance of lowest flood level)
16	Pressure regulating stations (expected to see some level of flooding)
6	Bridge crossings (pipelines attached to bridges crossing the Green River)
20	Miles of high pressure natural gas pipeline (in flood area)
103	Miles of intermediate pressure natural gas pipeline (in flood area)

17,600 cfs Flow – Electric	
14,877	Residential customer meters (may experience outage)
4,860	Small commercial customer meters (may experience outage)
28	Large commercial industrial customer meters (may experience outage)
2	Transmission substations (surrounded by water)
16	Transmission lines (traversing flooded areas)
8	Distribution substations (water within fenced area)
53	Individual distribution circuits (surrounded by water)
2	Customer substations (potentially impacted by water)
87	Padmount switches (potentially impacted by water)
980	Padmount transformers (surrounded by water)



# Potential system impact – 25,000 cfs flow



25,000 cfs Flow – Natural Gas	
5,500	Customer meters (expected to see some level of flooding)
2	Limit stations (one will be taken out of service in advance of lowest flood level)
20	Pressure regulating stations (expected to see some level of flooding)
6	Bridge crossings (pipelines attached to bridges crossing the Green River)
24	Miles of high pressure natural gas pipeline (in flood area)
120	Miles of intermediate pressure natural gas pipeline (in flood area)
25,000 cfs Flow – Electric	
25,407	Residential customer meters (may experience outage)
8,025	Small commercial customer meters (may experience outage)
55	Large commercial industrial customer meters (may experience outage)
3	Transmission substations (water inside fenced area)
17	Transmission lines (traversing flooded areas)
10	Distribution substations (water inside fenced area)
64	Individual distribution circuits (potentially impacted by water)
5	Customer substations (water inside fenced area)
212	Padmount switches (potentially affected by water)
1,755	Padmount transformers (potentially affected by water)

# Influences on our flood response abilities

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- Access to roads, bridges
- Telecommunications
- Access authorization
- Fuel availability
- Other agency response, including public health
- Availability of jurisdictional inspectors and private contractors for damage assessment / repair on customer equipment



# Flood preparation and response cost estimates

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- Pre-flood
  - System protection and mitigation \$2-4 million
  - Equipment, facilities, inventories (3 years) \$2.5-5 million
- Flood response \$2-5 million/day
- Repair and rebuild Depends on damage

# Planning coordination

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- **External**
  - Coordinating with the Corps and local jurisdictions
  - Participating in Green River Flood Planning Group
  - 12 local community meetings and presentations to date
  - Utilities workshops
    - Aug. 6 – Hosted by PSE
    - Sept. 16 – Hosted by King County
    - Oct. 27 – Hosted by King County
  
- **Internal**
  - Operations (natural gas and electric)
  - Facilities and telecommunications
  - Materials, resources and transportation
  - Communications and messaging
  - Mock drills

# Operations planning: Natural gas

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- Assessed impacts to natural gas system at bridge and possible slide locations
- Prepared isolation plan for natural gas supply system, including removal of natural gas heater at limit station
- Identifying, inspecting, and operating isolation valves on large diameter pipe and bridge crossings
- Identified regulator stations; none appeared to be at risk of washouts
- Identified mobile home customers in flood area for isolation when needed
- Determined and staging material inventory for system repair/rebuild
- Identifying electronic system monitoring and cathodic protection equipment within flood area



# Operations planning: Electric

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- Constructing flood mitigation for two key transmission substations
- Developing contingency plans for the electric transmission system including structures, equipment and facility access
- Constructing flood mitigation at distribution substations (control houses)
- Expanding system automation (SCADA) to add remote operability to key locations
- Developed switching plan to reroute power from valley substations to serve loads from higher elevation substation circuits
- Developed electric system isolation plans for flooded equipment (avoid catastrophic failure of components)

# Facilities and telecommunications planning

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- Identifying alternate locations for housing business units
  - Gas First Response
  - Electric First Response
  - Meter Network Services
  - Materials Management (Central Warehouse, Corporate Fleet)
  - Environmental Services
- Ensuring service provider relocation plans are in place
- Evaluating electronic technology options to allow for quick employee relocation
- Reactivating the Enumclaw Service Center (SE King County)
- Identifying field incident command locations
- Reviewing telecommunications linkages, including those handled by vendors and identifying alternatives

# Materials, resources and transportation planning

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- Moving critical inventory from South King to other locations
- Securing remaining material stock or storing at levels 8 feet above valley floor
- Accumulating inventory of items most likely needed during flood restoration
  - Natural gas regulators
  - Natural gas meters
  - Electric fuse holders and arc chutes (for padmount switch rebuild)
  - Electric padmount switches and transformers
- Limiting inventory that requires special handling
- Identifying and acquiring basic health and safety protective wear
- Reviewing specialized equipment and resource needs and identifying sourcing options
- Moving fleet vehicle inventory to Enumclaw
- Identifying and securing fueling resources



# Communications plan

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- Communicate to employees, customers, government and community leaders, regulators and media
  - Demonstrate preparedness, manage expectations regarding restoration following a flood
- Tactics
  - Presentations at community meetings, emergency preparedness symposiums
  - Direct mail to potentially affected customers
  - Access Center messaging
  - Media relations, news releases, etc.
  - Local advertising and participation in regional King County “Take Winter By Storm” media campaign
  - Articles for employees in Friday Focus, PSEWeb
  - PSE.com special section with instructional videos
  - Ask Andy blog articles, EnergyWise newsletter article

# Safe restoration of service after flooding

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- Restoration can only begin after:
  - Recession of flood water
  - Evaluation of environmental conditions determines it is safe to proceed
  - Safe access to facilities
  - Customer premises rehabilitation / inspections are complete



PSE gas journeyman assessing flood damage ©PSE

# Potential extended restoration effort / time

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- Natural gas – “boots on the ground”
  - Meter by meter, relighting pilot lights
  - Extensive customer interaction and assistance
- Electricity
  - Coordination with gas efforts
  - Inspect and clean substations
  - Significant underground facilities
  - Inspect, clean and repair energy system damage
  - Precautionary steps to safely re-energize equipment



# Questions

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