An Overview of the Risks of PCBs at US Army Corps of Engineers Hydropower Projects in the Columbia Basin

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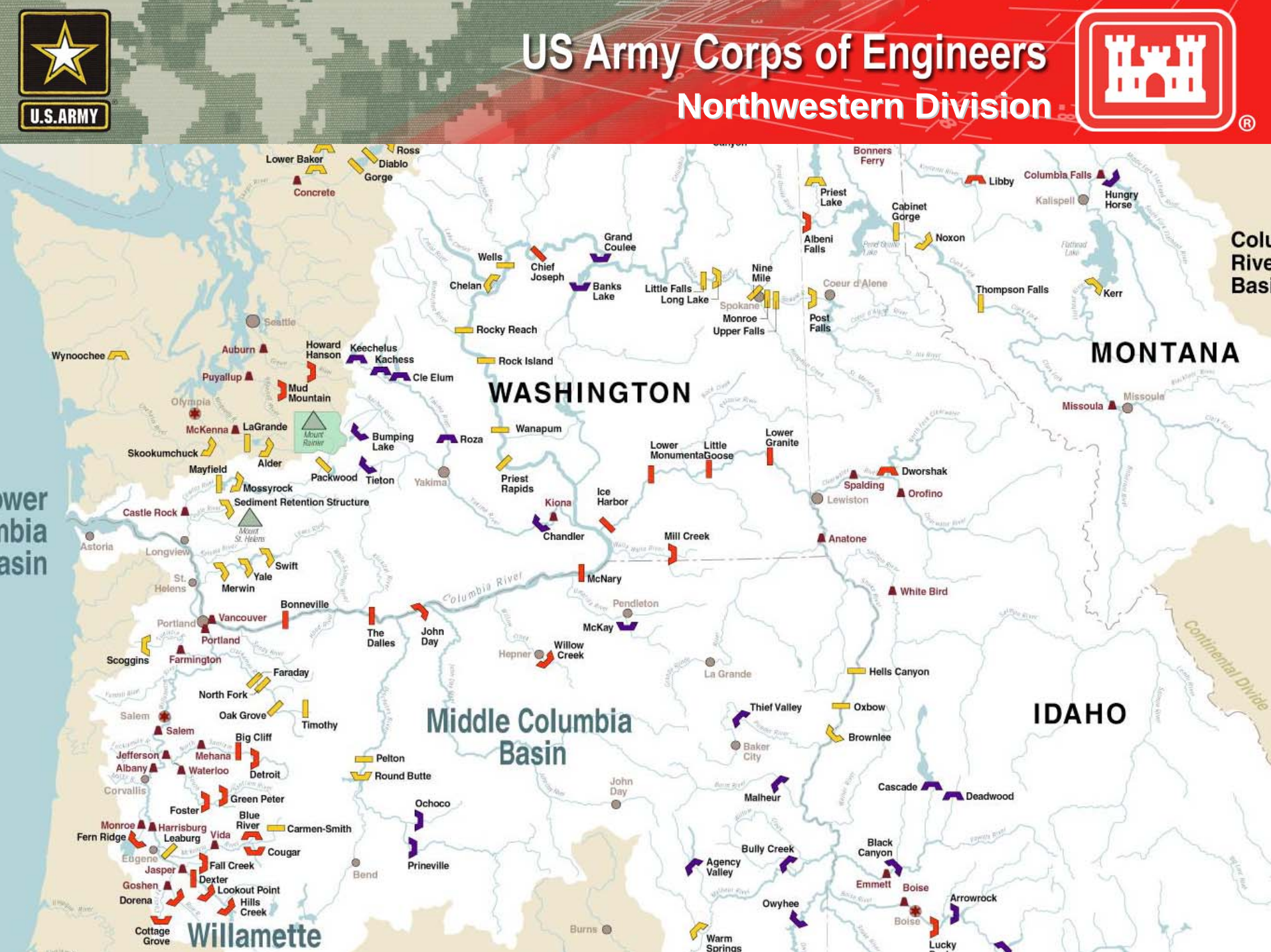
- Overview
  - Gathering Data at the request of EPA
  - For the purpose of this presentation, focus on the Lower Columbia
- Potential Sources of Oils and PCB materials
- Risk and risk reduction
- Recent history
  - Bonneville Dam – Bradford Island
  - The Dalles Dam – Transformer Spill of 2004

Quick History

- PCB's were first manufactured commercially in 1929 , as a “safer” cooling and insulating fluid for industrial transformers and capacitors.
- PCBs were widely used in a variety of electrical equipment because they do not conduct electricity easily and are not very flammable.
- PCBs were often used in oils, paint, chlorinated rubbers, plastics, sealants and caulking, adhesives, glues and tapes

PCBs at Corps of Engineers - FCRPS Dams

- PCBs were historically used in transformer oils and other electrical equipment
- In 1969, upon recognizing the need to reduce the risks for PCBs, the Corps began removal of PCB equipment and/or fluids from the dams.


US Army Corps of Engineers
Northwestern Division
U.S.ARMY
Lower Baker
Ross
Diablo
Gorge
Concrete
Bonners Ferry
Priest Lake
Libby
Columbia Falls
Kalispell
Hungry Horse
Cabinet Gorge
Albeni Falls
Noxon
Grand Coulee
Wells
Chief Joseph
Chelan
Banks Lake
Little Falls
Long Lake
Nine Mile
Spokane
Monroe
Upper Falls
Coeur d'Alene
Post Falls
Thompson Falls
Kerr
Seattle
Rocky Reach
Wynoochee
Auburn
Howard Hanson
Keechelus
Kachess
Cle Elum
Rock Island
Puyallup
Mud Mountain
WASHINGTON
MONTANA
Olympia
Missoula
McKenna
LaGrande
Mount Rainier
Bumping Lake
Roza
Wanapum
Lower Monumental
Little Goose
Lower Granite
Skookumchuck
Alder
Mayfield
Packwood
Tieton
Yakima
Priest Rapids
Mossyrock
Sediment Retention Structure
Spalding
Dworshak
Orofino
Lewiston
Castle Rock
Kiona
Ice Harbor
Chandler
Mill Creek
Anatone
Astoria
Longview
Swift
Yale
Merwin
St. Helens
McNary
White Bird
Columbia River
Bonneville
Pendleton
Vancouver
Portland
The Dalles
John Day
McKay
Scoggins
Farmington
Hepner
Willow Creek
La Grande
Hells Canyon
Faraday
North Fork
Thief Valley
Oxbow
Salem
Oak Grove
Timothy
Middle Columbia Basin
IDAHO
Big Cliff
Brownlee
Jefferson
Mehana
Albany
Waterloo
Detroit
Baker City
Pelton
Round Butte
Corvallis
John Day
Malheur
Cascade
Deadwood
Green Peter
Foster
Ochoco
Monroe
Harrisburg
Blue River
Carmen-Smith
Fern Ridge
Leaburg
Vida
Cougar
Bully Creek
Black Canyon
Eugene
Agency Valley
Jasper
Fall Creek
Prineville
Bend
Emmett
Boise
Dexter
Goshen
Lookout Point
Owyhee
Arrowrock
Dorena
Hills Creek
Boise
Cottage Grove
Willamette
Burns
Warm Springs
Lucky
Continental Divide

Oil at FCRPS Hydropower Projects

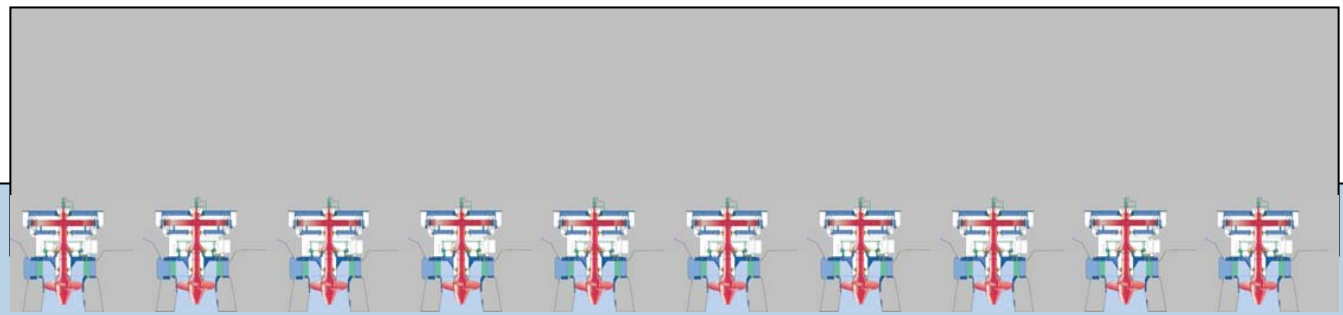
- The 3 largest sources of oil at FCRPS hydropower projects include:
  - Turbines
    - Kaplan (up to 7,000 gallons per unit)
    - Francis (Up to 4,000 gallons per unit)
  - Turbine Oil Storage Rooms (up to 200,000 gallons per dam)
  - HV Transformer Oil (6,000 - 16,000 gallons per unit)
- Measures in place to contain oil

- TSCA Categories of equipment
  - > 500 ppm = PCB Equipment
  - 50-500 ppm = PCB Contaminated
  - 1-49 ppm = Non-PCB

Reportable Spills for the FCRPS 2008

Date	Spill	Location	Probable Cause	To Water	Extent
22-Jan-08	Turbine Oil	Lower Monumental Dam	Turbine bearing maintenance	179	600 gallons total, likely 179 to the river
3-Oct-08	Turbine Oil	Dworshak Dam	turbine bearing cooler	80	Max potential of 500 gallons
1-Nov-08	Hyd Oil	The Dalles Dam	Underwater Drilling Equipment	77	70-77 Gallons to the river, most contained
5-Feb-08	Turbine Oil	The Dalles Dam	Turbine unit 21	25	approximately 25 gallons
24-Apr-08	Boat Fuel	Bonneville Dam	Capsized Boat	19.99	less than 20 gallons
17-Jan-08	Turbine Oil	The Dalles Dam	Turbine bearing oil filter failure	14.99	less than 15 gallons to the river
17-Mar-08	Gas and Oil	Dworshak Dam	Sunken boat	9.99	Less than 10 gallons of gasoline and oil
26-Nov-08	Hyd Oil	Ice Harbor Dam	Tainter Valve Leak	6	Cracked Weld
18-Oct-08	Turbine Oil	Ice Harbor Dam	Overfill of Turbine Unit	5	5 gallons to the water
27-Mar-08	Hyd Oil	McNary Dam	Fish Screen Motor	<1	Less than 5 gallons
27-May-08	Oil	Bonneville Dam	Spillway Gate Hoist	<1	less than 1 gallon
27-Mar-08	Oil	Lower Monumental Dam	RSW Installation	<1	Approximately 1 quart
17-Mar-08	Oil	Bonneville Dam	Boat exhaust	<1	Unknown - Sheen was observed
31-Mar-08	Oil	Foster Dam	Crane Leak	<1	1 cup of hydraulic oil
18-Nov-08	Hyd Oil	The Dalles Dam	Underwater Drilling Equipment	<1	Less than 1Gallon to the river, most contained
1-Oct-08	Oil	Chief Joseph Dam	Sump pumped	<1	~2-3 ounces to the river
1-Mar-08	Oil	Bonneville Dam	Crane may have leaked oil	<1	Teaspoon or less
26-Sep-08	Hyd Oil	Chief Joseph Dam	Broken Seal - Leased Crane	<1	~1 QT to the deck - 0 to the water
20-Nov-08	Grease	Lookpoint Dam	Spillway grease leaked	<1	Grease melted onto deck, rain washed in
21-Nov-08	Lube	Big Bend Dam	Replaced equipment?	<1	Sheen reported but very light
2-Dec-08	Oil	Little Goose Dam	Construction Activity	<1	Unknown sheen
15-Dec-08	Oil	The Dalles Dam	Construction Activity	<1	Less than 1Gallon to the river, most contained

Walkthrough of Bonneville Dam PH1
Turbines

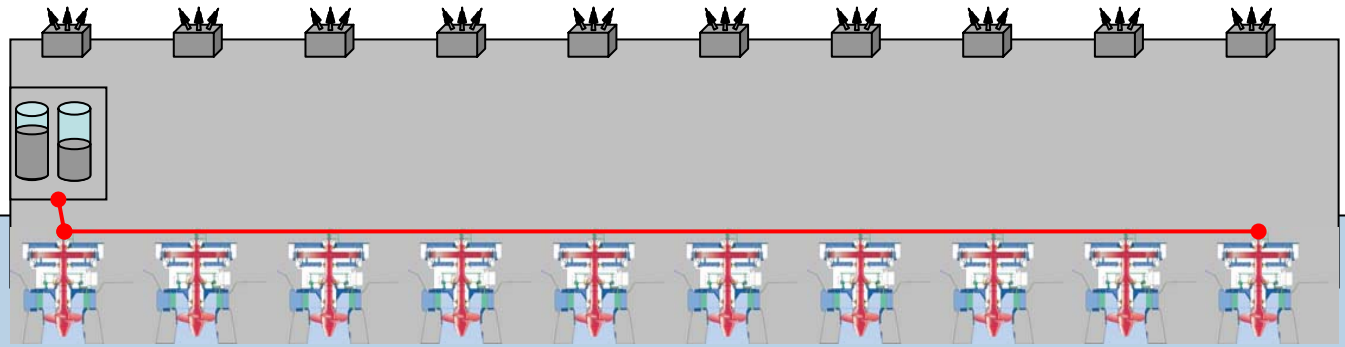


10 Turbine Units at Bonneville Powerhouse 1
Total Volume of Oil for Governors and Hub = ~ 160,000 gallons
Concentration of PCBs = 0ppm

Walkthrough Of Bonneville Dam PH 1
Oil Storage

9 Oil Storage Tanks
Total Volume of Oil Stored = ~85,000 gallons
Concentration of PCBs = 0ppm

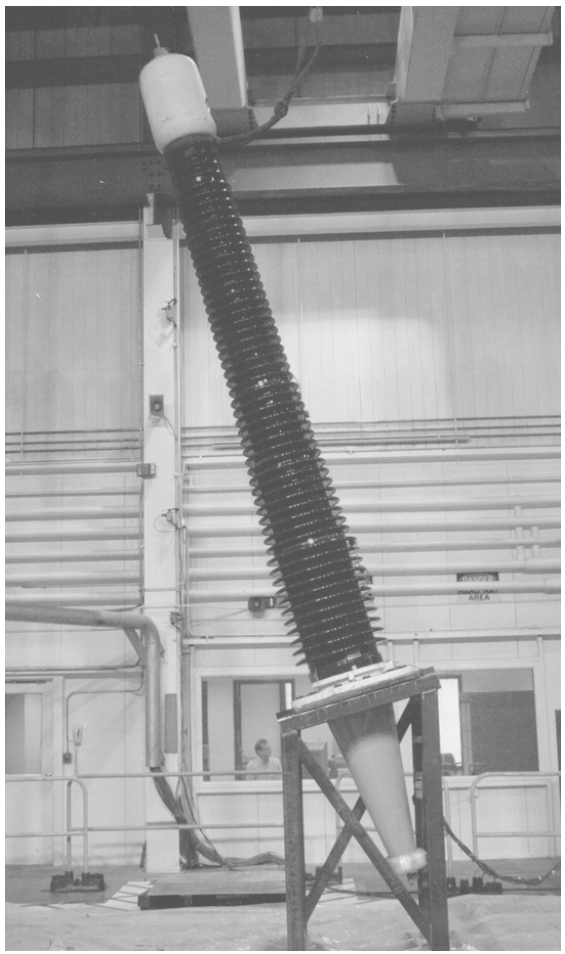
Walkthrough Of Bonneville Dam
Large Transformers



5 Transformer Banks with 3 phases at Bonneville Powerhouse 1
Total Volume of Oil for Transformers = ~ 80,000 gallons
Concentration of PCBs = Nondetected (at 2ppm level) as tested 1995-2006

The Dalles Dam		
Transformers Tested in 2003	Detected Levels of PCBs (Detection Limit = 2ppm)	
2638-1	ND	
2638-2	ND	
2638-3	ND	
2638-4	2	
7023790	9	Replaced 2005-06
7023791	8	Replaced 2005-06
7023792	5	Replaced 2005-06
140791	ND	
140792	ND	
140793	ND	
140794	ND	
140795	ND	
140796	ND	
140797	ND	
140798	ND	
140799	ND	
140800	ND	
140801	ND	
140802	ND	
140803	ND	
140804	ND	
140804	ND	
140806	3	
140807	3	
140808	2	
H409355	ND	
H409356	ND	
H409357	ND	
H409358	ND	
6948659	ND	
6948659	ND	

High Voltage Bushings



High Voltage Bushings and PCBs

- Bonneville 1 (Completed 1938)
  - Bushings were replaced in the 1980's (Stamped <1ppm PCB on nameplate)
- Bonneville 2 (Completed 1982)
  - Not all Bushings are "known" for concentrations
  - Spare bushings (Stamped <1ppm PCB on nameplate)
- The Dalles (Completed 1960)
  - All bushings presumed to have a concentration of greater than 50ppm
- John Day (Completed 1971)
  - A small number were tested and determined to have a concentration of 125ppm, therefore all (13) are assumed to be <125 ppm.
- Bushings may contain (up to) a gallon of oil

Other Potential Sources of Oils or PCBs at FCRPS Dams

- Other Electricity-Generating Equipment
  - Breaker boxes, Electric vaults, Capacitors, Switches, Etc...

- Non Electricity-Generating Equipment
  - Light Ballasts (~7500 lbs eliminated since 2002)
  - Small Transformers ~100 gallons or less
  - Navigation Lock switches and hydraulics
  - Spillway gate hoists or switches

- Some has been tested, some have not,
- Most suspected and tested equipment has not contained any PCBs

Some Unknowns

- **Paints**
  - Paints manufactured up to about 1975
    - Presently we do not suspect an issue
      - Unknown in the FCRPS
      - 1 known instance occurred in Omaha District

- **Caulks**
  - Used in some buildings from the 1950s through the 1970s.
      - Unknown in the FCRPS

Bottom Line for Current Operations

- Are Corps Hydropower Dams "PCB Free"?
  - No, however:
    - Large oil sources at dams are not regulated as *PCB equipment*
    - Very low or no concentrations
    - Much has been removed

- Does the Corps "know" where all of the *"PCB containing equipment"* might be at Hydropower dams?
  - No, however:
    - We have a good idea where most of it is
    - Any remaining is in small volumes and is typically stable or well contained
    - We assume it is PCB where it is unclear

- Do current operations at Corps Hydropower Dams pose a significant risk of PCB releases?
  - No

Presently Working with EPA

- PCB Equipment at the dams
  - In Use
  - In Storage
- Other PCB containing materials
- Activities to further identify and mitigate any PCB sources

Recent History of PCBs

- Bonneville / Bradford Island CERCLA* Site

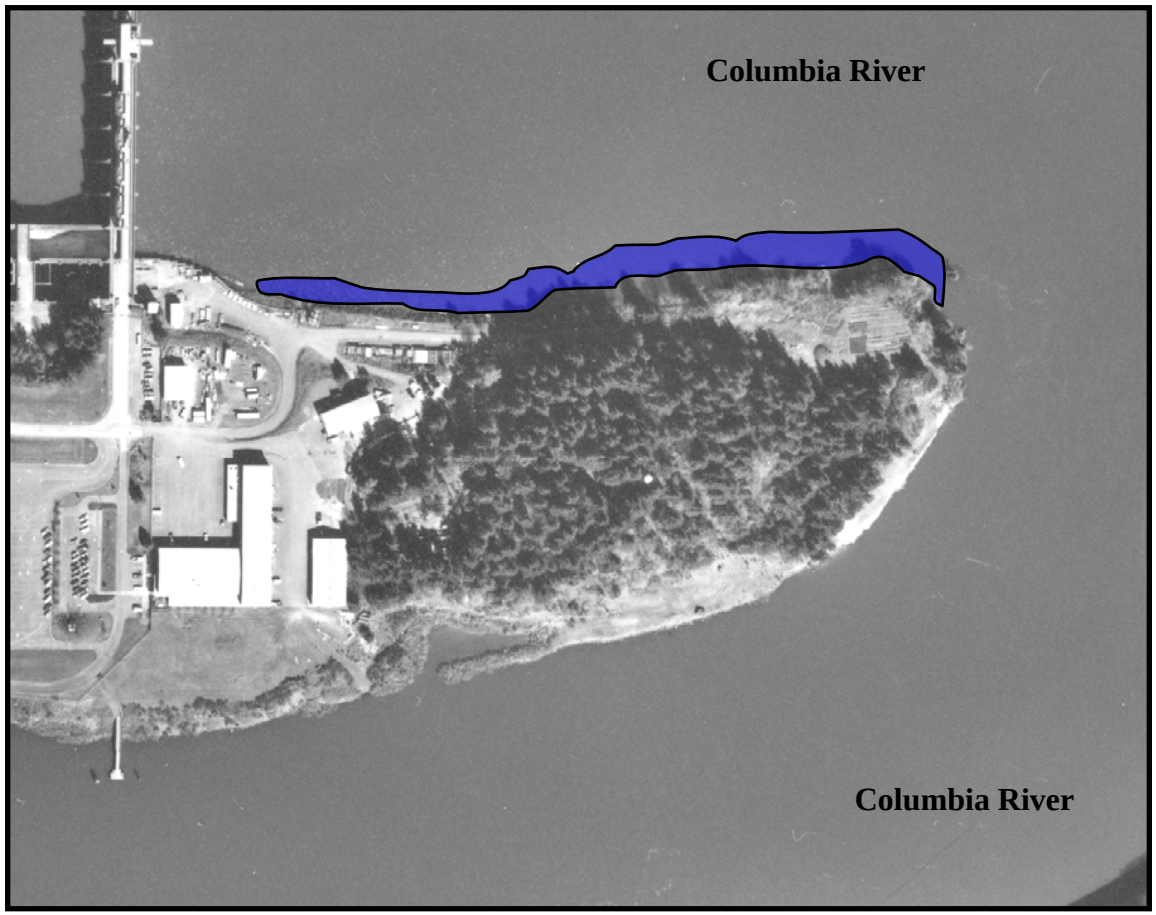
* Comprehensive Environmental Response, Compensation and Liability Act

TECHNICAL ADVISORY GROUP

- OR Department of Environmental Quality
- Tribal (Umatilla, Yakama, Nez Perce, Grand Ronde, Warm Springs and Cowlitz)
- Columbia River Inter-Tribal Fish Commission
- US Fish & Wildlife Service
- National Marine Fisheries Service
- Bonneville Power Administration
- Corps of Engineers (Seattle, Portland)

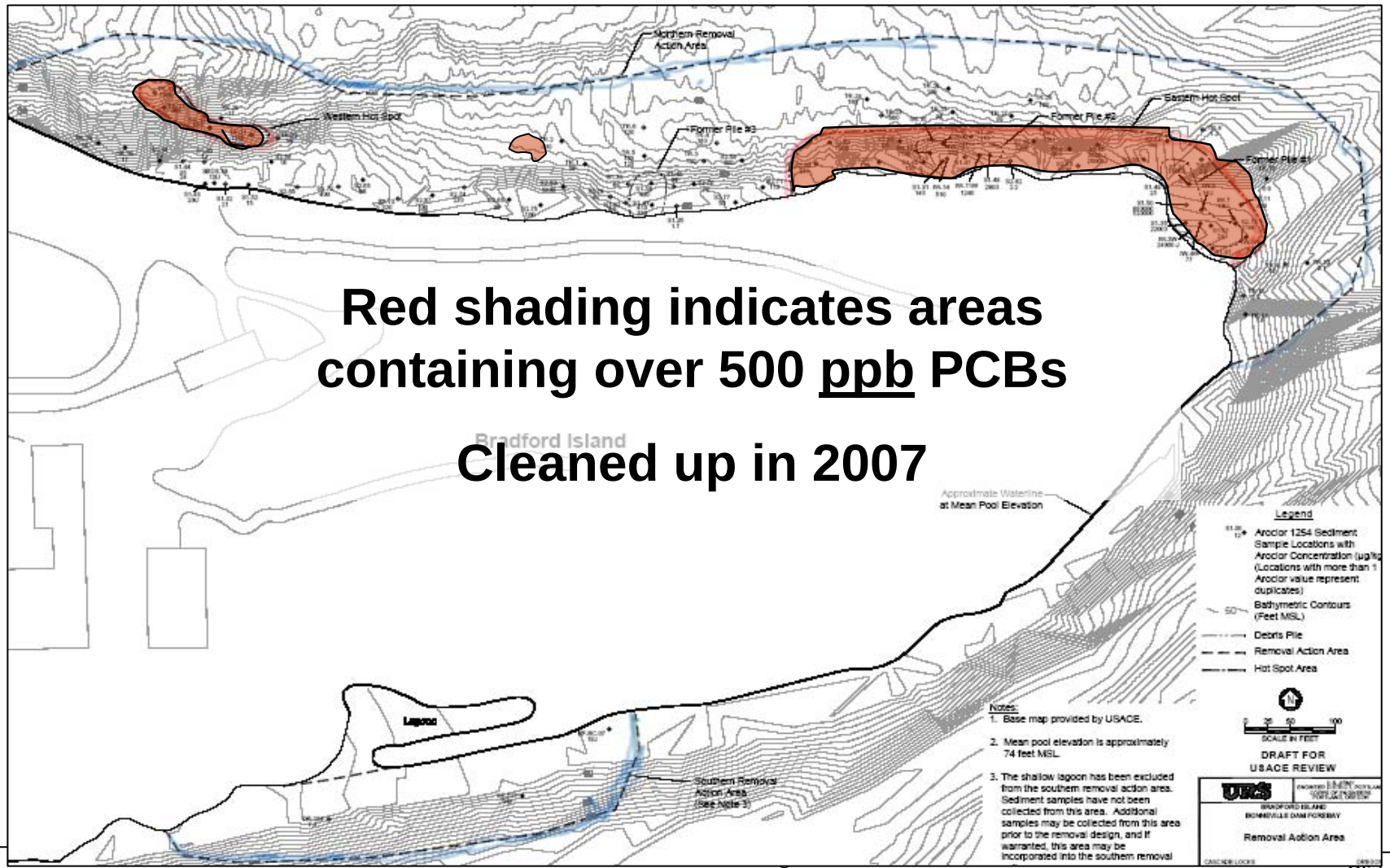
Bonneville Dam

Area of discovered PCBs at Bradford Island



ELECTRICAL EQUIPMENT REMOVED in 2002

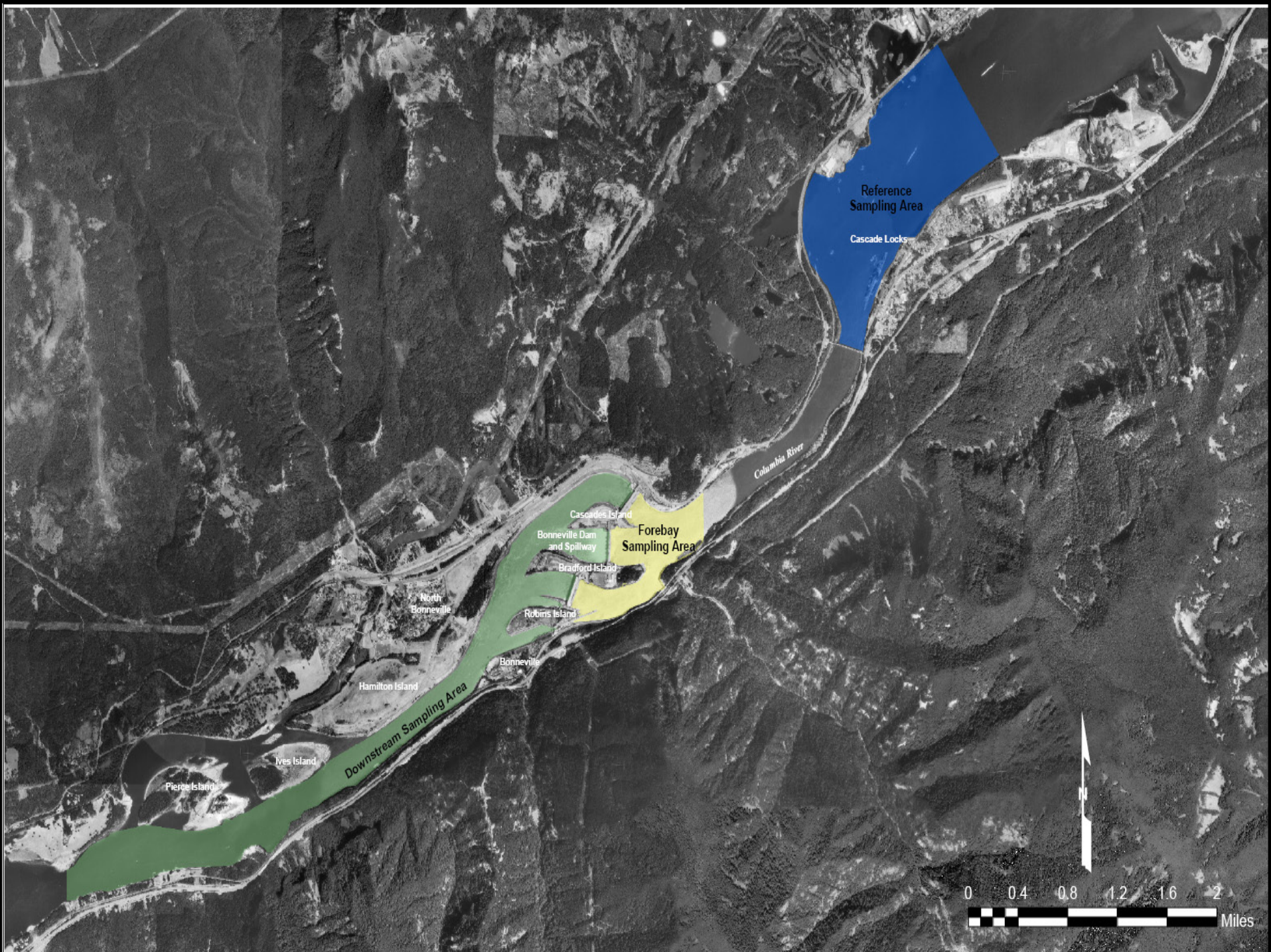
SEDIMENT REMOVAL in 2007



FILTERING BARGES

DIVING BARGE

- **2000 Nov – Discovery of Capacitors in water**
- **2002 Feb – Removal of in-water equipment**
- **2007 – Completed in-water cleanup**
- **2008 – Completed Remedial Investigation Sampling**
- *2009 – Remedial Investigation Report*
  - *Complete Analysis of Samples*
  - *Complete Data Sufficiency Reports*
- **2010 – Complete RI Report and Risk Assessment**
- **2011 - Feasibility Study and Record of decision (ROD)**
- **2012 – Design of clean-up (remedial) actions**
- **2013 – Implement actions**


Reference
Sampling Area
Cascade Locks
Columbia River
Cascades Island
Bonneville Dam
and Spillway
Forebay
Sampling Area
Bradford Island
North
Bonneville
Robins Island
Bonneville
Hamilton Island
Downstream Sampling Area
Ives Island
Pierce Island
N
0
0.4
0.8
1.2
1.6
2
Miles

Total PCB Aroclor Data in Post Removal Samples

	Sediment	Clam	Crayfish	Smallmouth Bass (congener data)
Forebay	*19 samples* 17 non-detect 2 detections ≤ 27 ppb (dry)	*19 samples* 18 samples ≤ 30 ppb 1 sample 120 ppb (wet)	*17 samples* all non-detect	*Presently being analyzed*
Reference	*18 samples* all non-detect	*18 samples* detected in all samples 31 to 39 ppb (wet)	*19 samples* all non-detect	*19 samples* detected in 7 analyzed 22 to 164 ppb (wet)
Eagle Creek Sediment	*2 samples* 1 non-detect 1 detection of 76 ppb (dry)	--	--	--
Downstream Sediment	*6 samples* all non-detect	--	--	--

The Dalles Transformer Spill

- What happened:
  - Transformer failed, oil escaped secondary containment through expansion joints
  - Multi-Agency response, recover actions

The Dalles Transformer Spill

- January 2004
- 1303 gallons of oil spilled
  - 638 gallons recovered
  - 665 gallons unrecovered
- 8.0 ppm PCB

The Dalles Transformer Spill

- What happened since then:
  - Replaced Transformer (T2)
  - All transformer secondary containment is intact and inspected regularly

Bottom Line for Historic Operations

- We occasionally “discover” PCB related issues
- Proactive in fixing issues when we find them