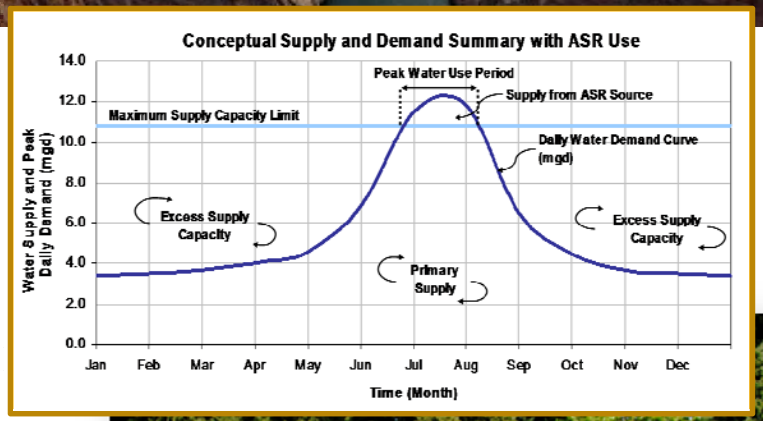
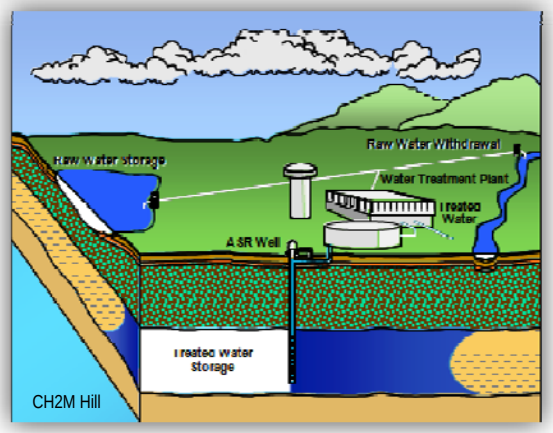
A Bridge for the Future

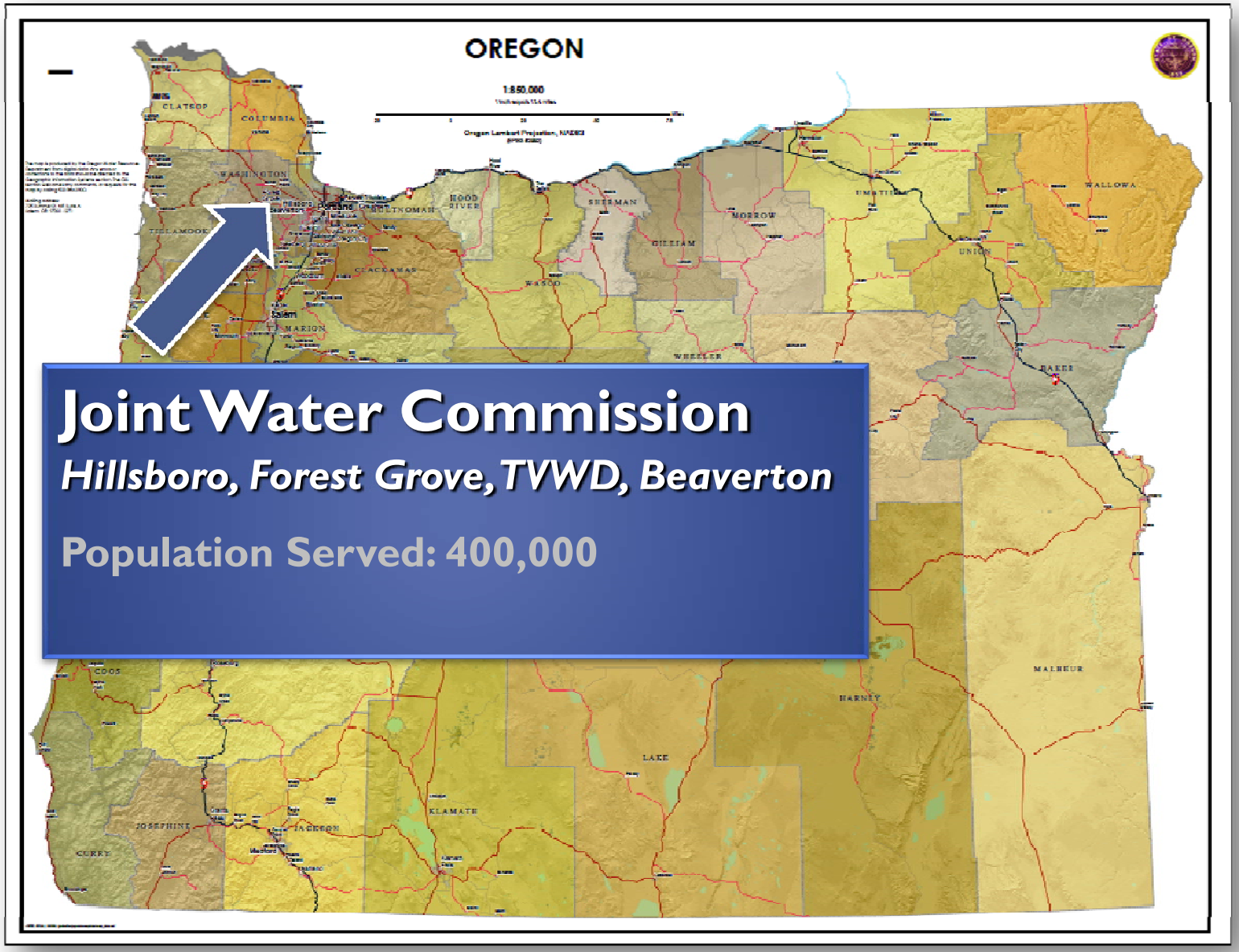
Aquifer Storage and Recovery

PNWS AWWA

May 12, 2010





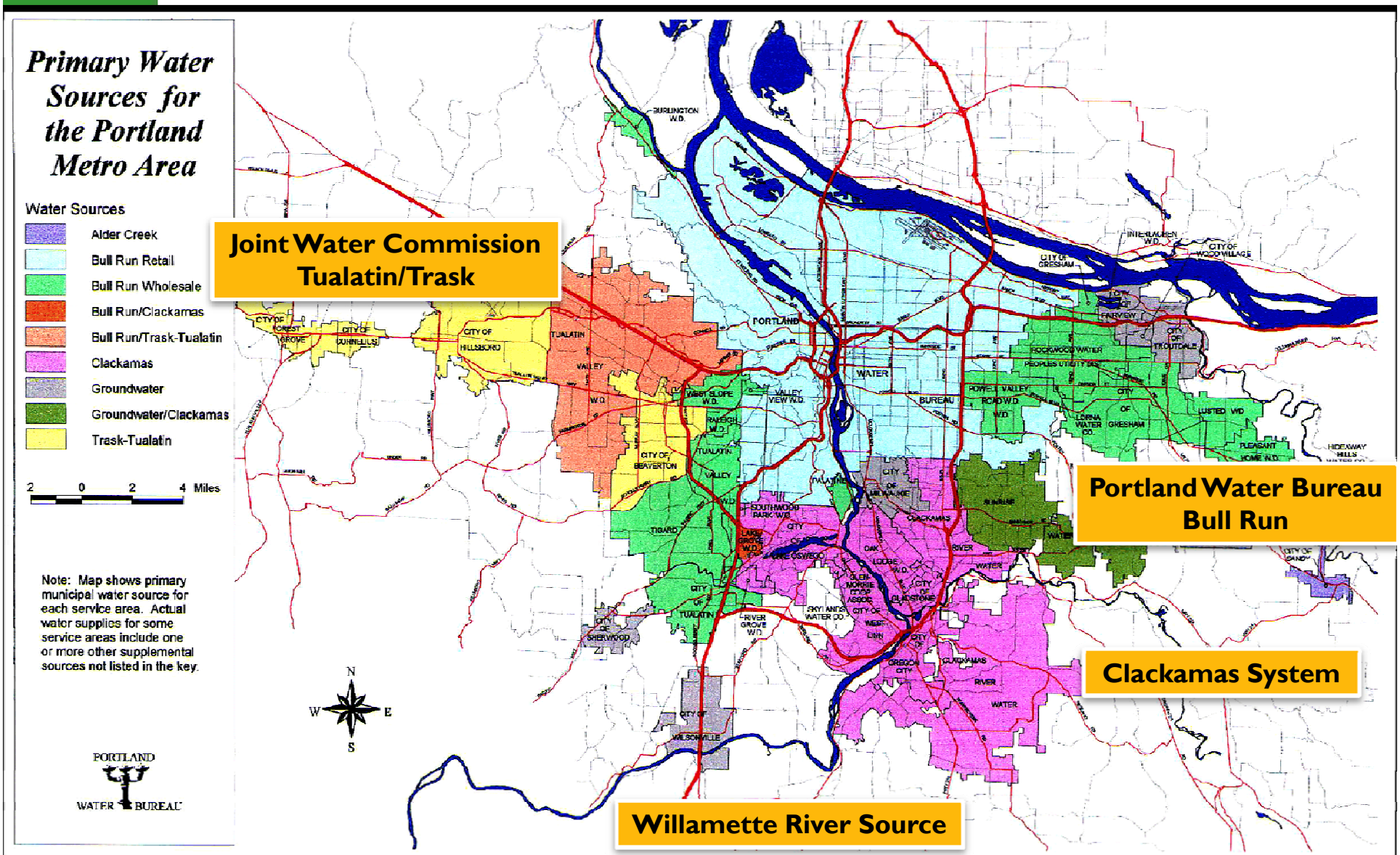


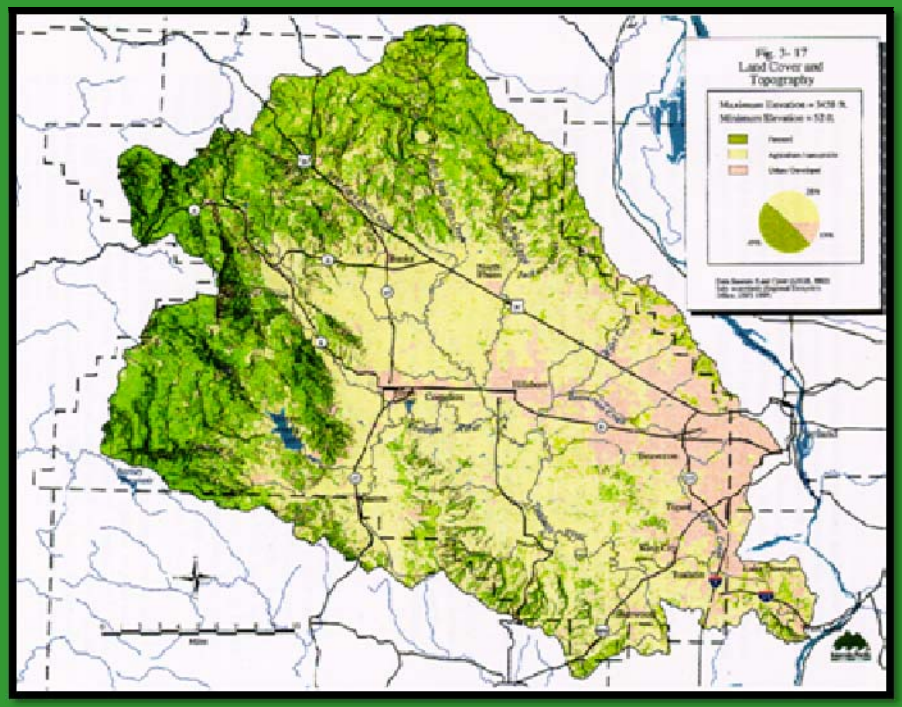
Joint Water Commission

Hillsboro, Forest Grove, TVWD, Beaverton

Population Served: 400,000

Regional Water Supply Sources

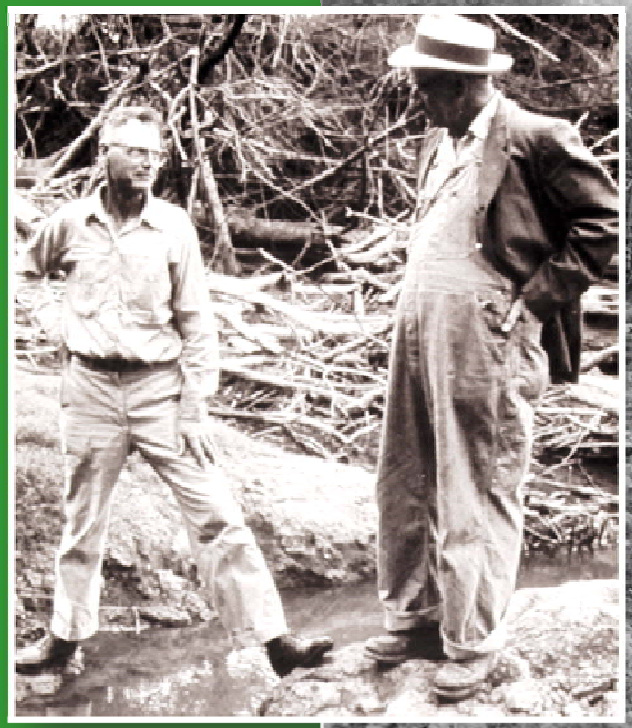




The Joint Water Commission (JWC)

Cities of Hillsboro, Forest Grove, Beaverton, and Tualatin Valley Water District

Historical Tualatin River Issues: Low Streamflow & Over Use



Before Scoggins Dam

JWC System

Barney Reservoir

US Bureau of Reclamation Hagg Lake/ Scoggins Reservoir

JWC Water Treatment Plant

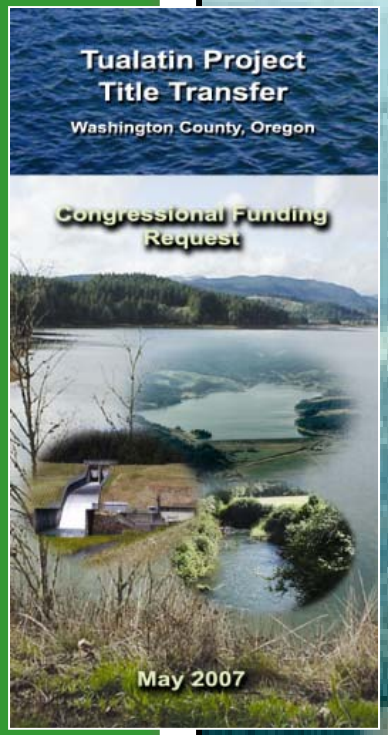
USBR Springhill Pumping Plant

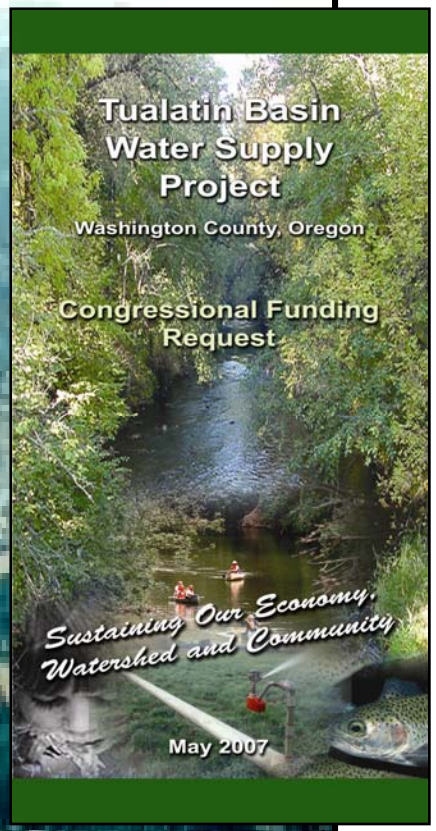
Fern Hill 20 MG Reservoir Nos. 1 & 2

Northside Transmission Line

Southside Transmission Line

Tualatin Basin Water Supply Project

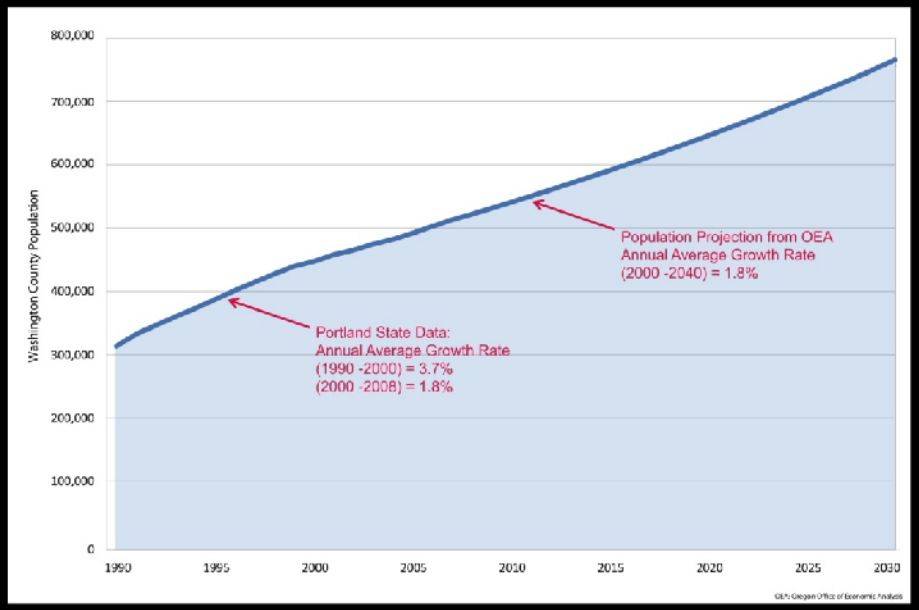




Sustaining Our Economy, Watershed and Community

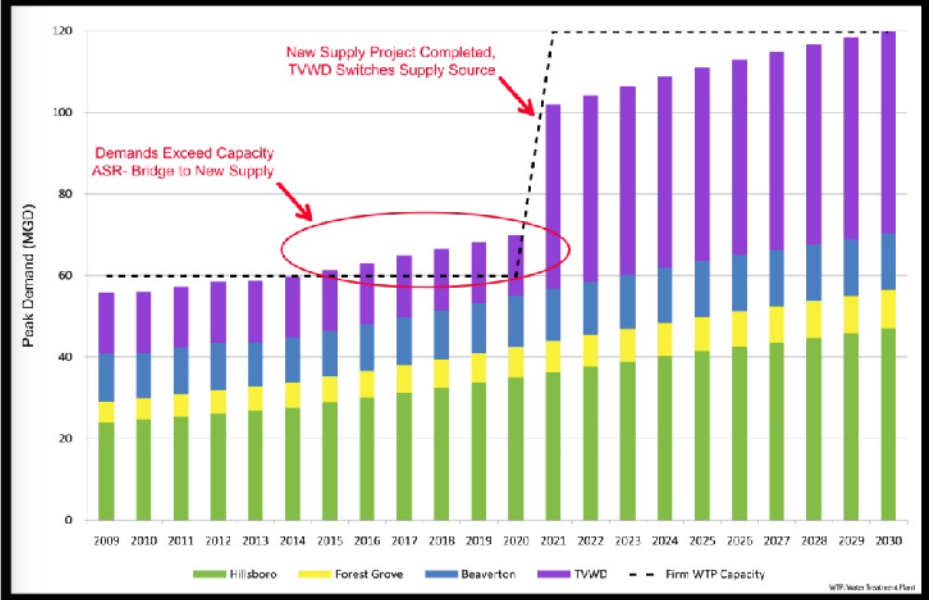
Tualatin Basin
Water Supply Project

JWC Population Projections



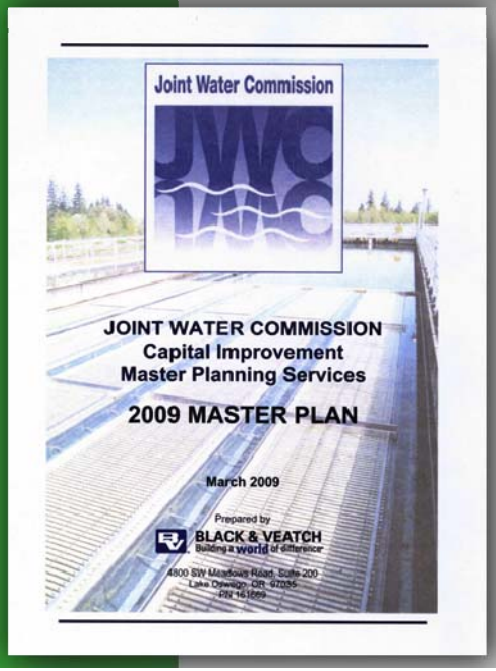
- JWC members regularly review and assess their service population projections for regional water demand and infrastructure planning efforts.

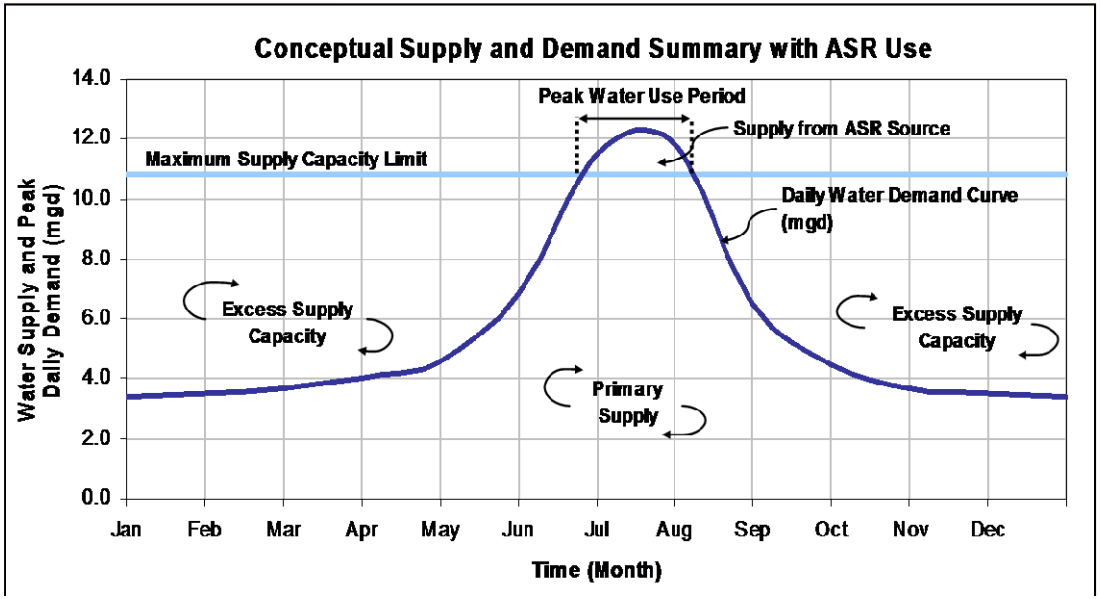
JWC Peak Day Demand Projections



- JWC estimates that water demands will exceed our water treatment capacity before new water supplies and facilities are developed.
- An aquifer storage and recovery (ASR) program has been identified to meet this additional need in the short-term using existing infrastructure.

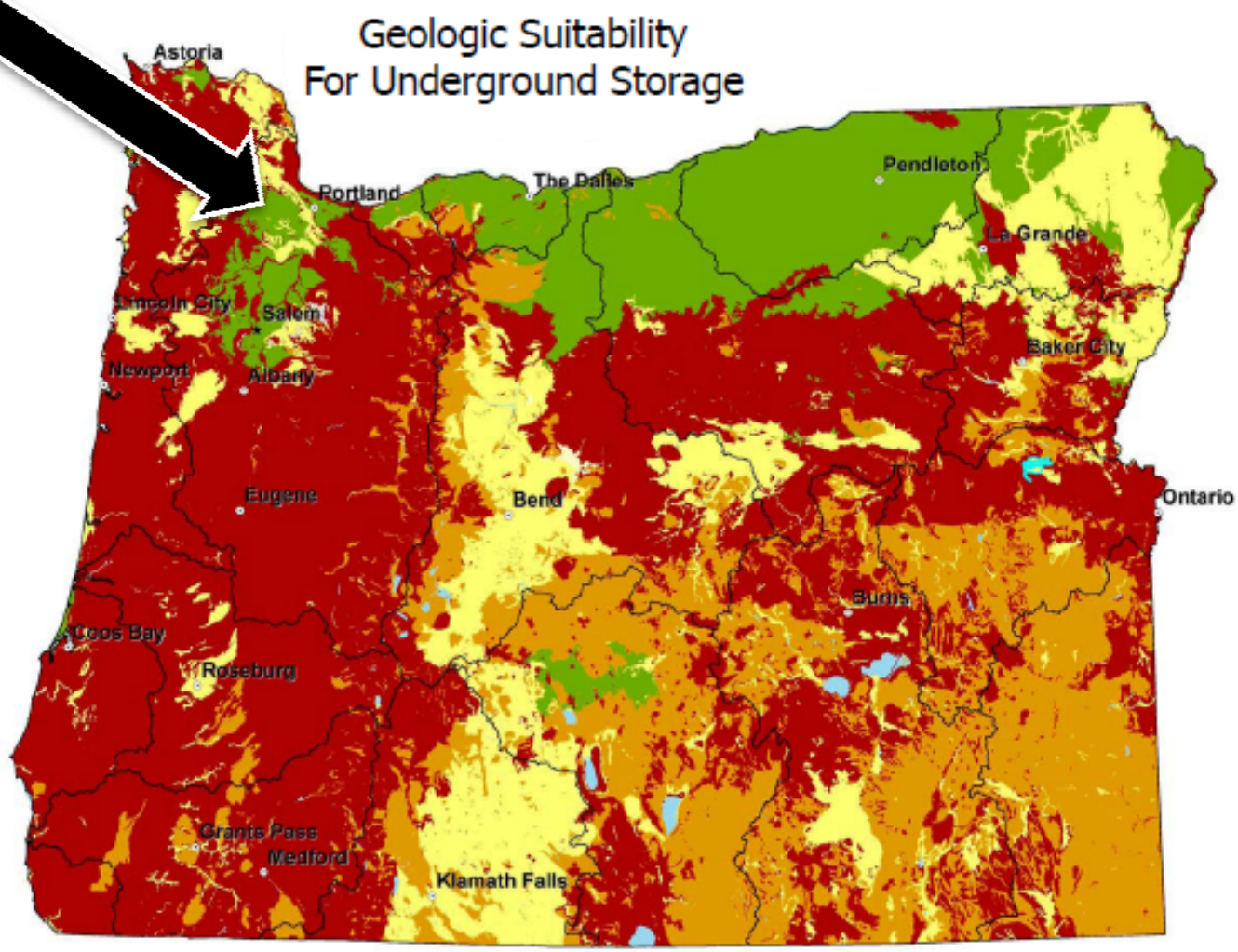
GSI Water Solutions, Inc.





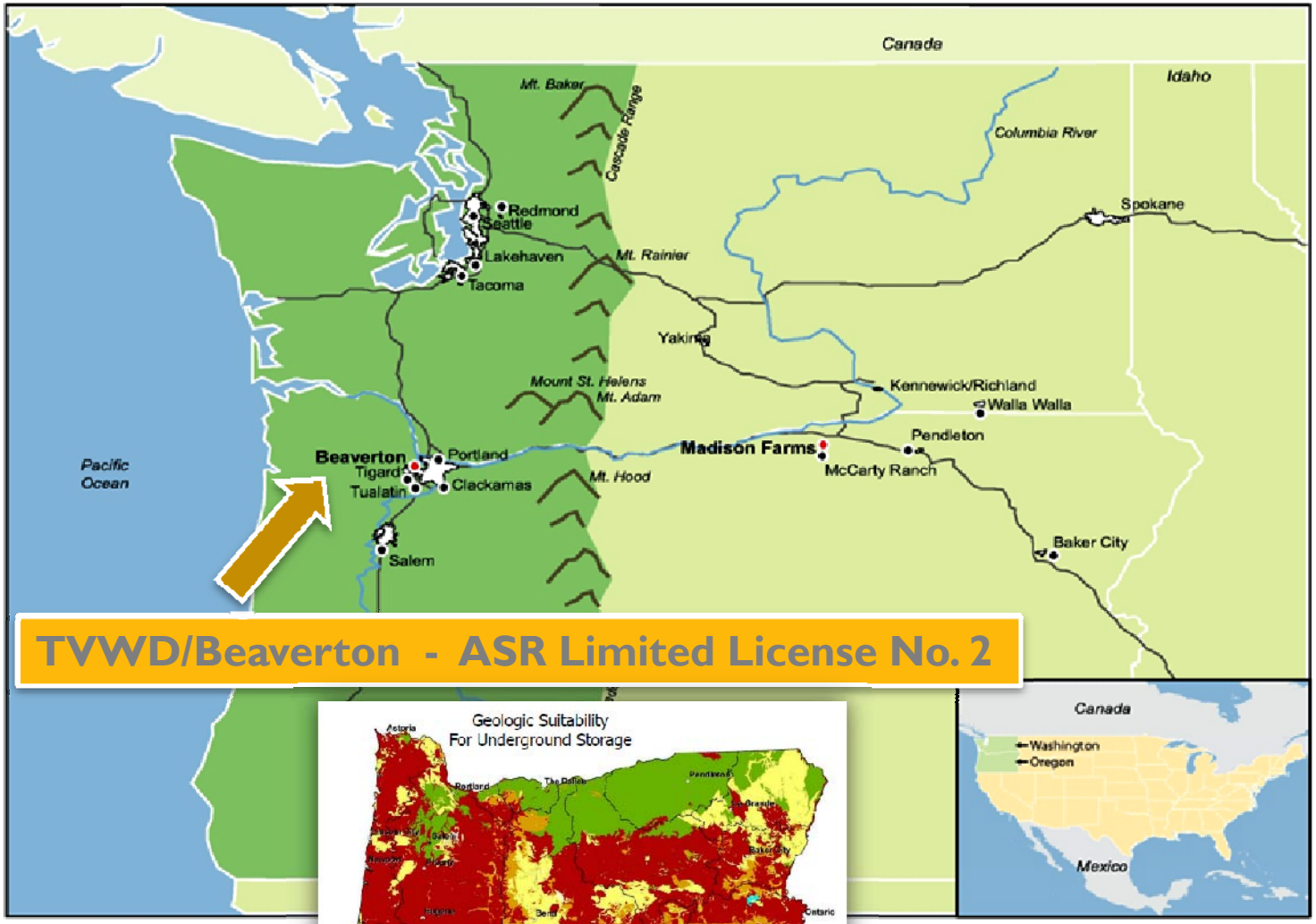
JWC ASR Program

Cooper Mountain, Washington County – Columbia River Basalt Group



Less Storage More Storage

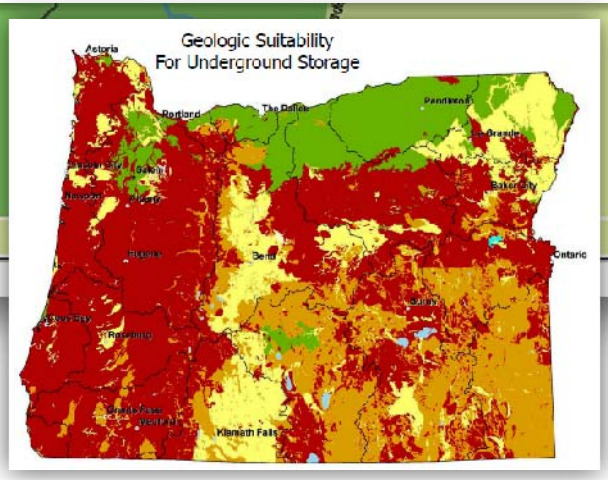
Pacific Northwest - ASR



TVWD/Beaverton - ASR Limited License No. 2

LEGEND

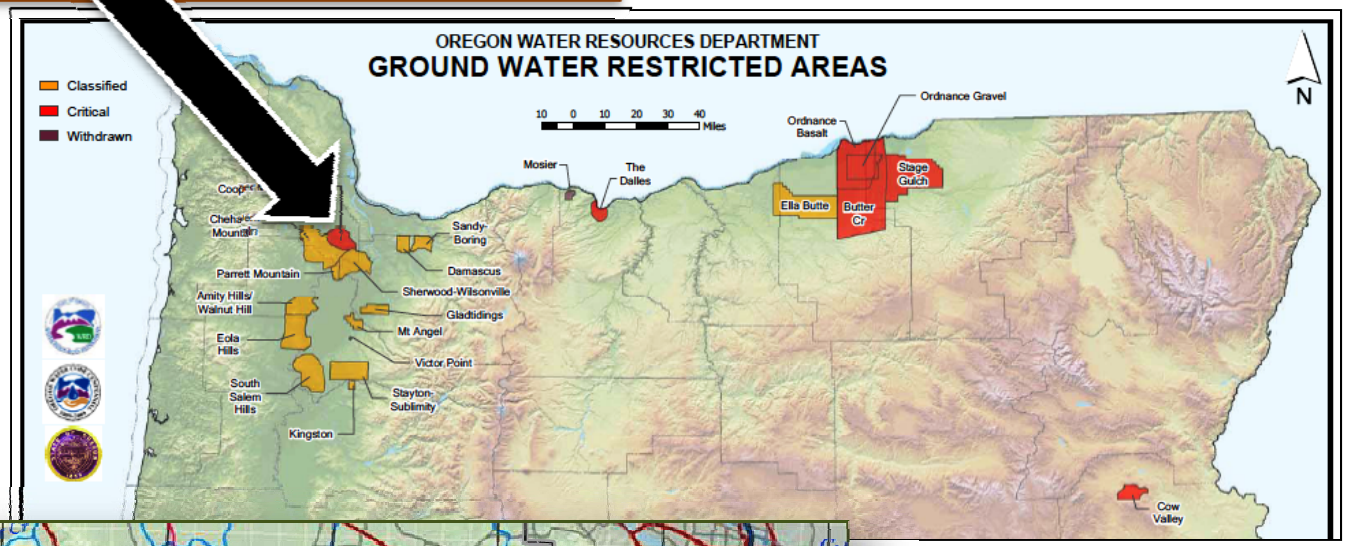
- City Boundary
- Precipitation ~ 1,000 mm
- Precipitation ~ 380 mm
- ASR Project Locations
- ASR Project Presented in this Publication

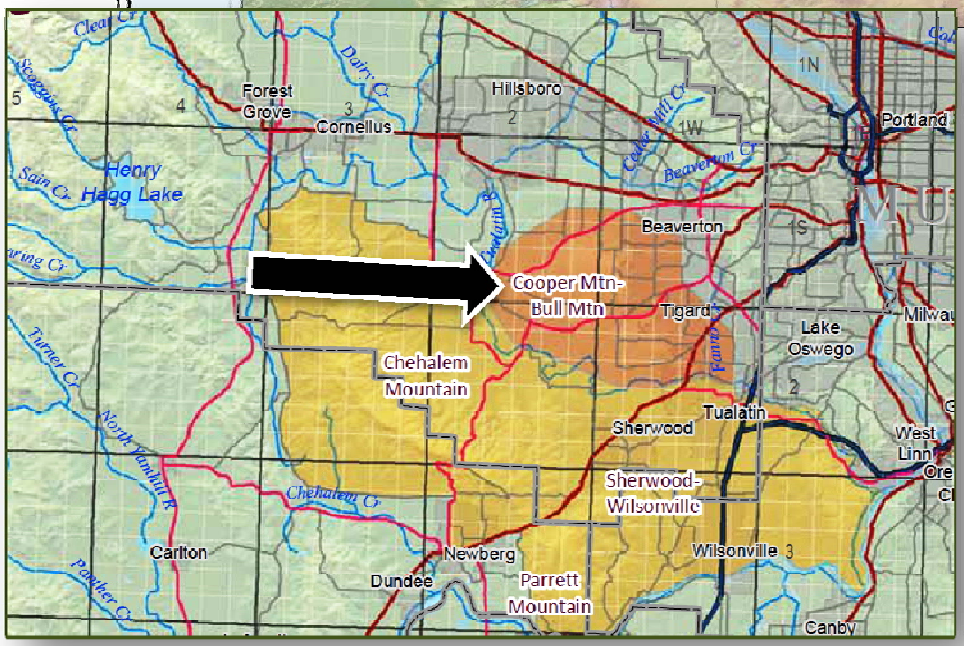


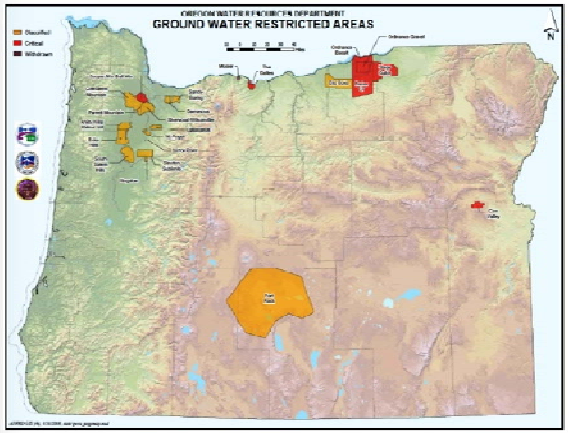
Joint Water Commission

Cooper-Bull Mountain Critical Groundwater Area, Washington County

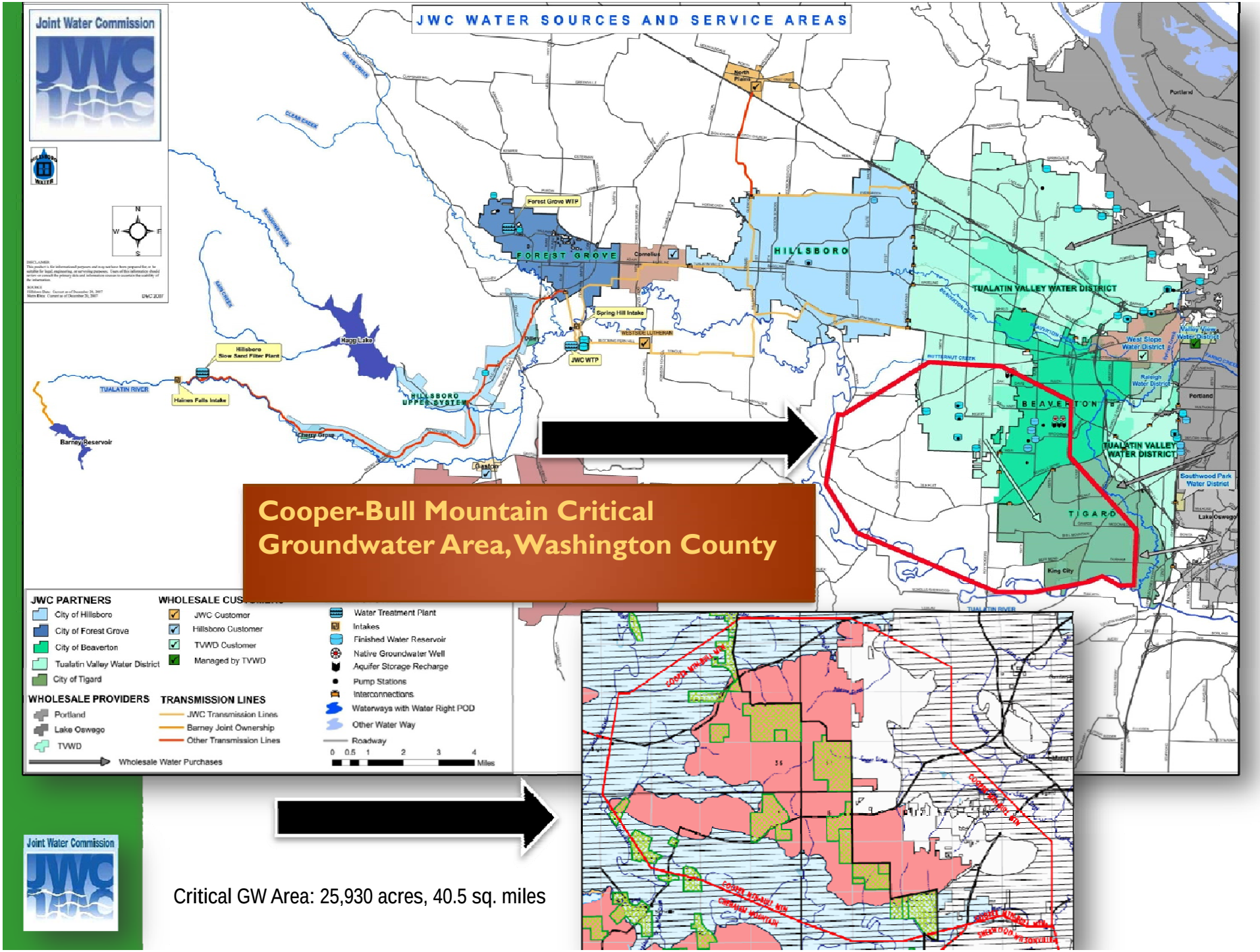
Declared by WRC May 17, 1974





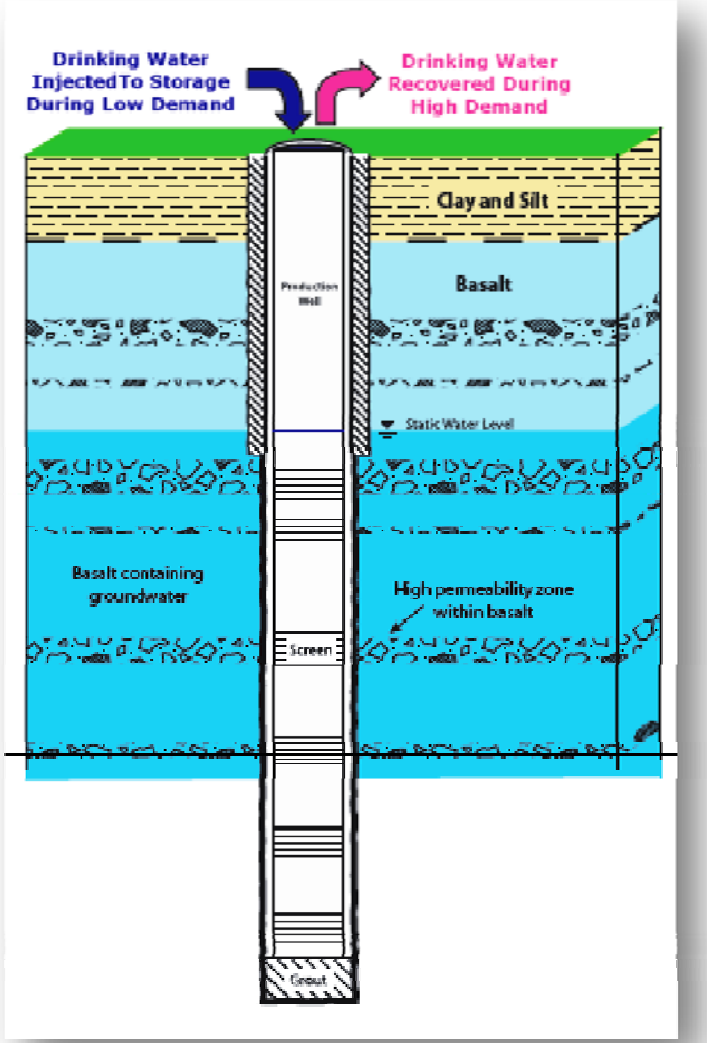


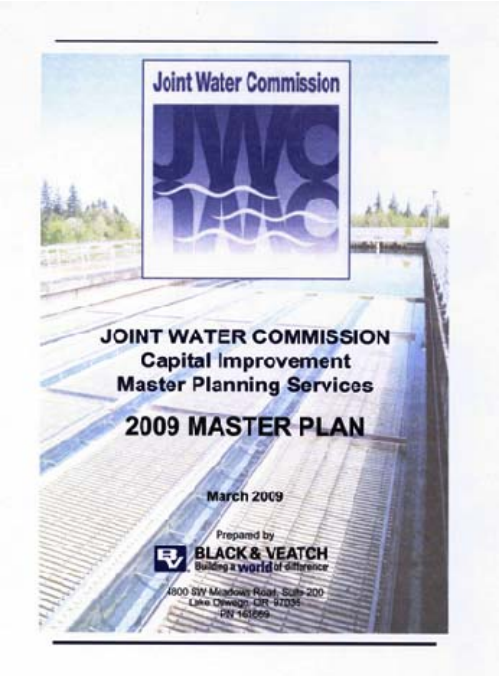
Joint Water Commission

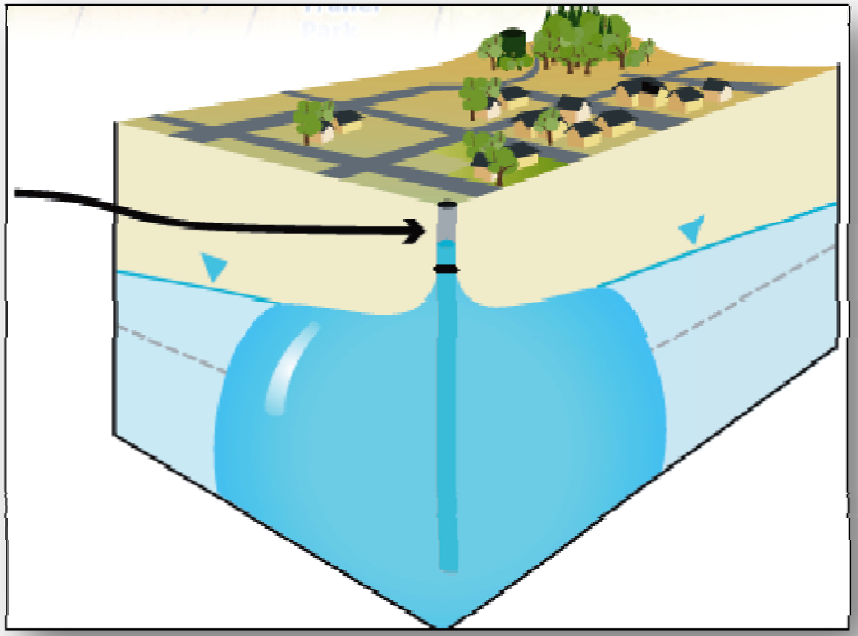


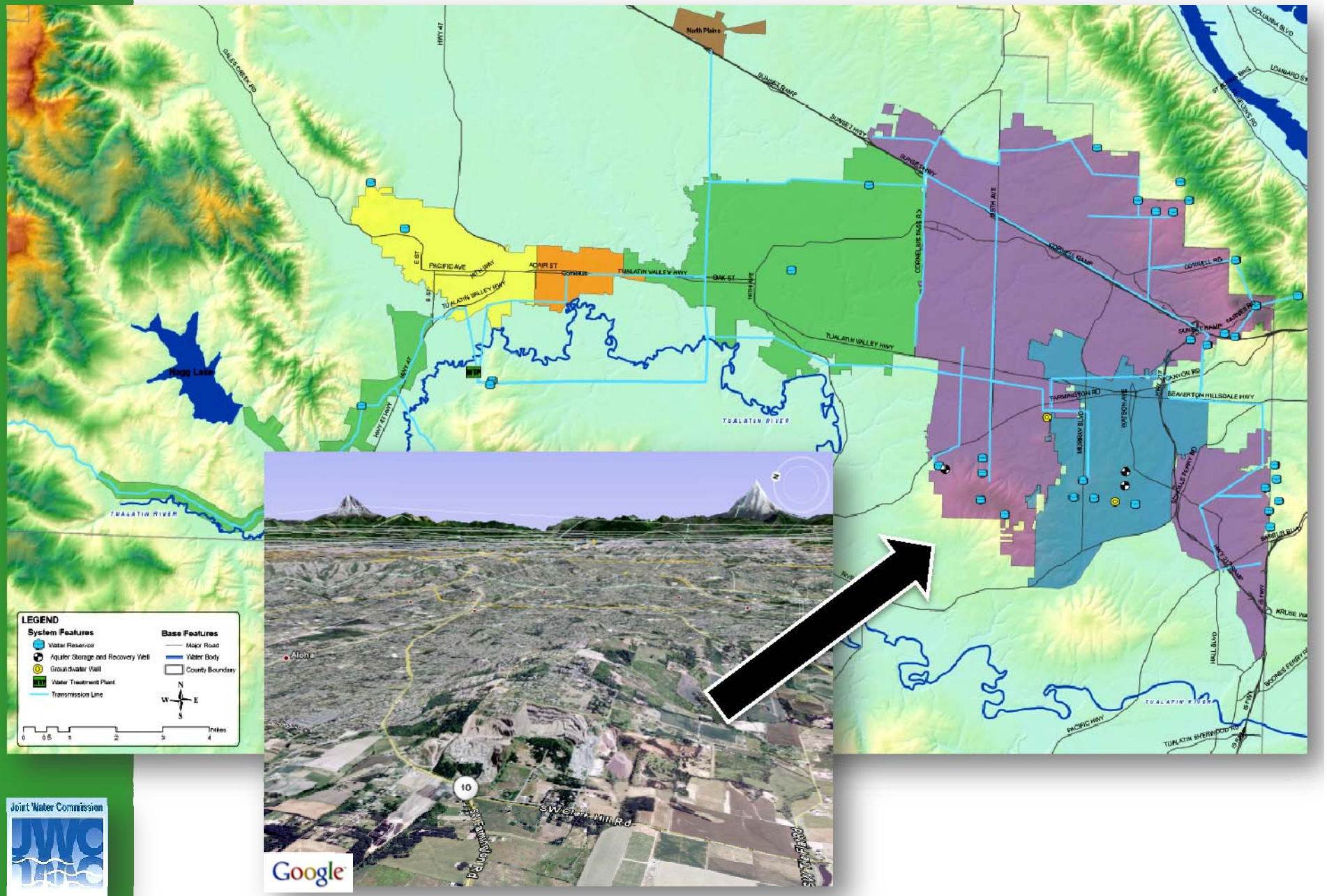
Critical GW Area: 25,930 acres, 40.5 sq. miles

JWC ASR Program









Joint Water Commission

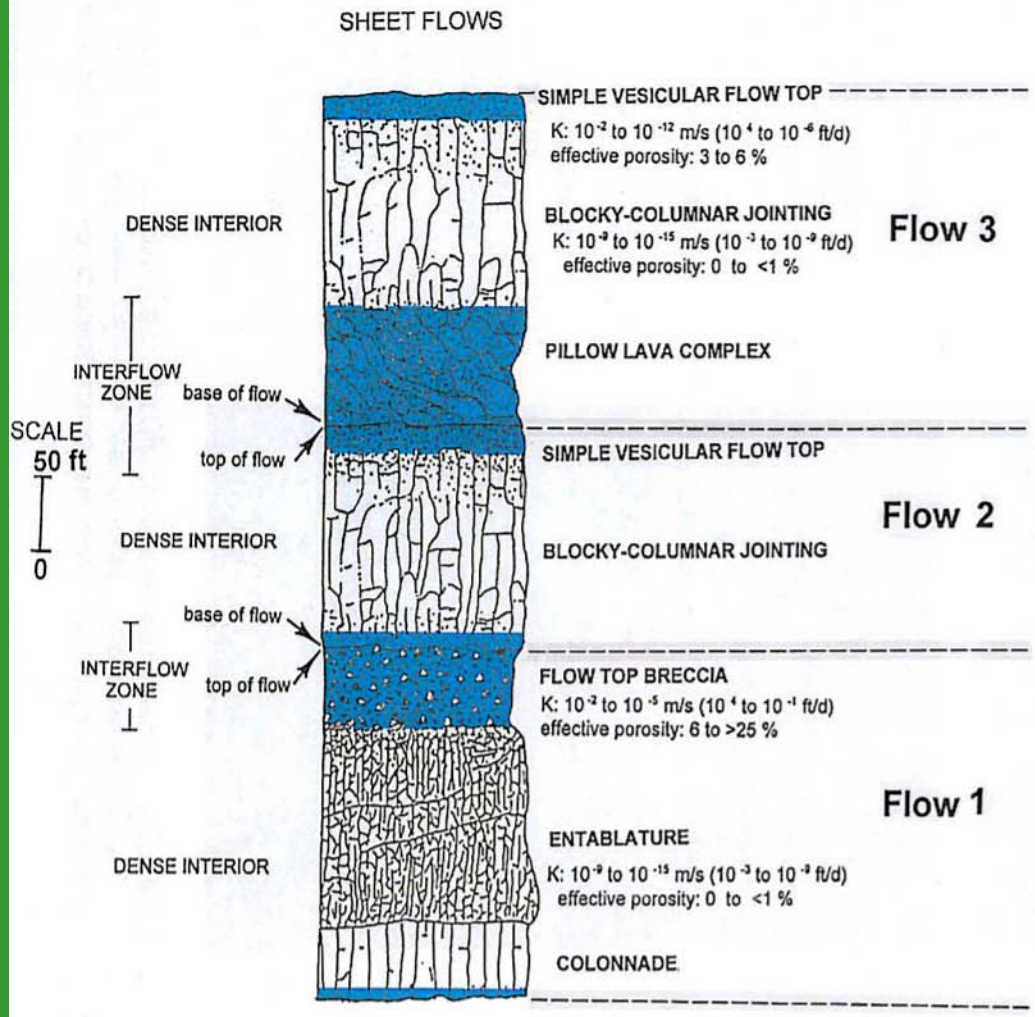
JWC ASR - Scope of Work

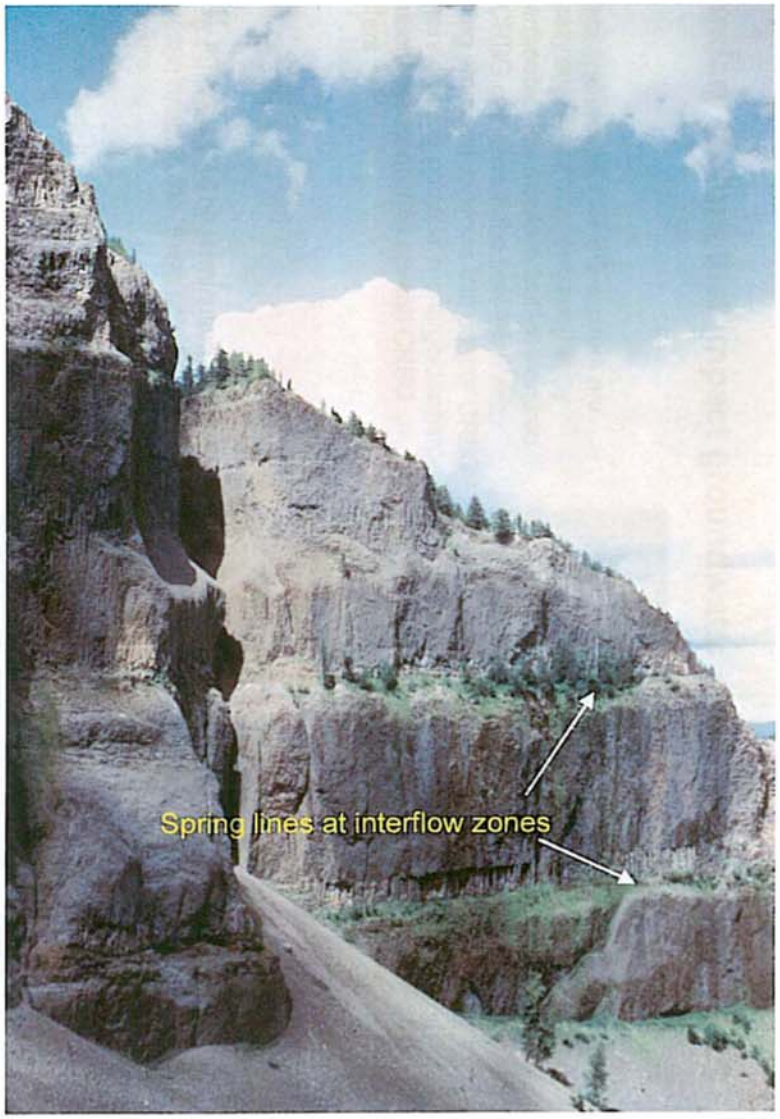
- Review Existing Technical Resources
- Complete a hydrogeologic assessment of the Cooper Mt. target area.
- Develop and Evaluate ASR Program Alternative Strategies – Land availability; Hydraulics/infrastructure; Water quality/compatibility; and Preliminary cost
- Prepare ASR Well Site/Facilities Plan
- Cost Analysis
- Final site selection & Implementation plan
- Exploratory Well Drilling

CRBG Hydrogeology

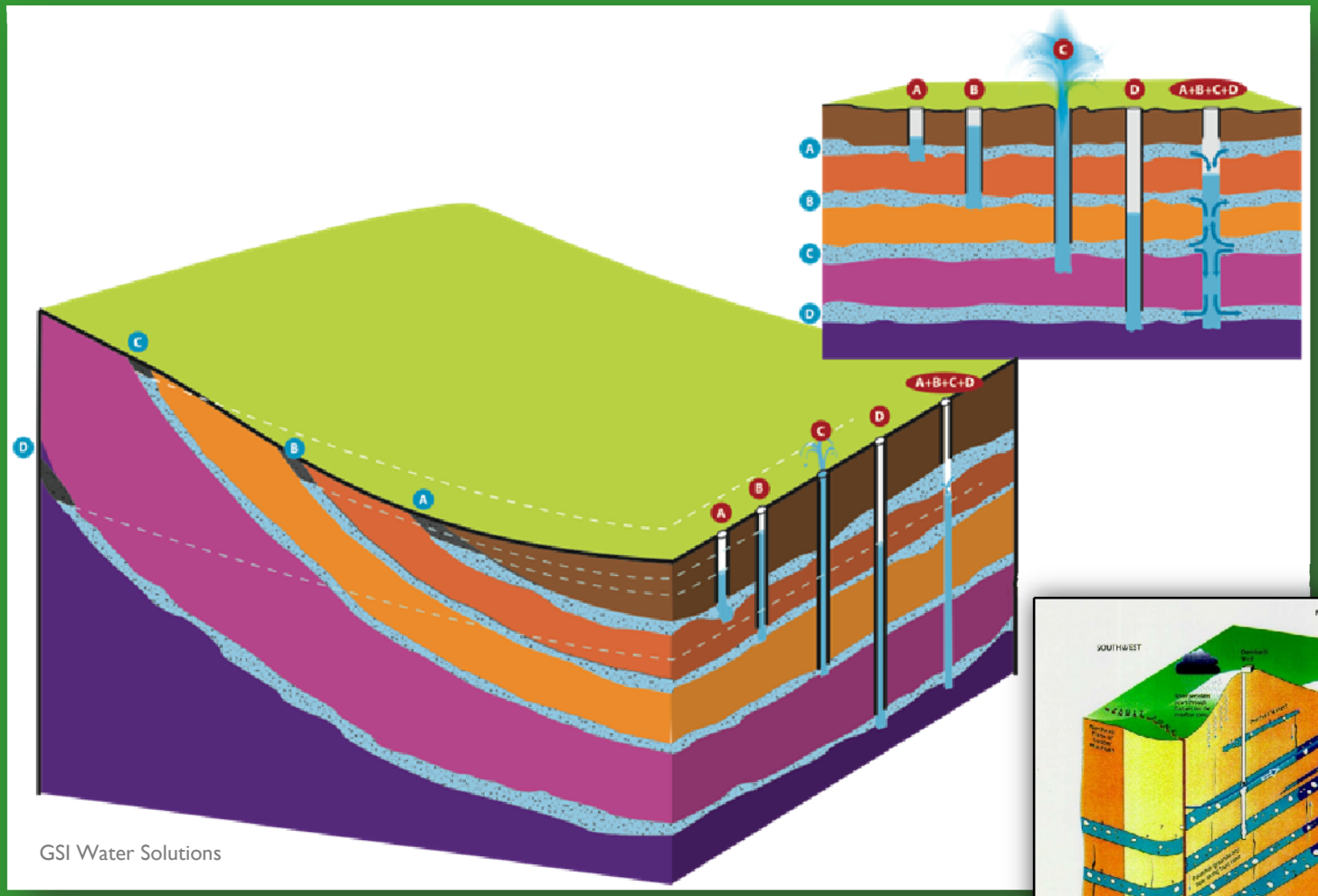
CRBG intraflow structures & their relevance to groundwater occurrence

CRBG intraflow zones typically host groundwater (aquifers) while the dense interiors of the flows are usually confining layers (aquitards). In their undisturbed state, the layered CRBG can consist of a series of confined aquifers.

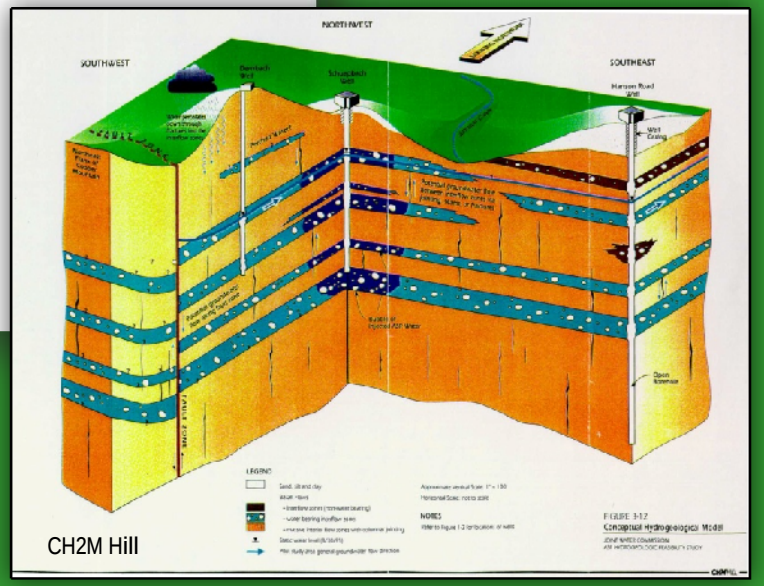




CRBG Hydrogeology

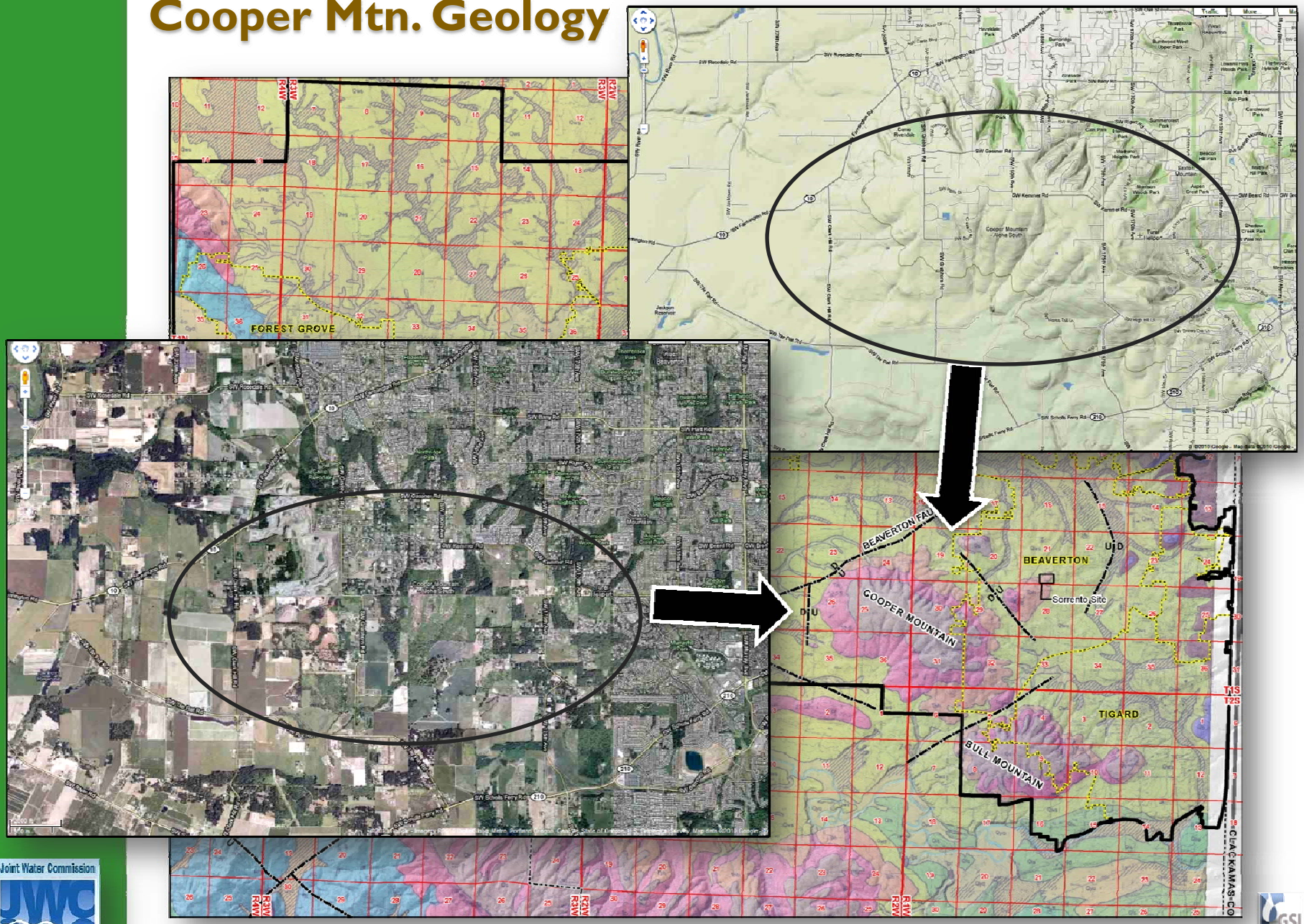


GSI Water Solutions



CH2M Hill

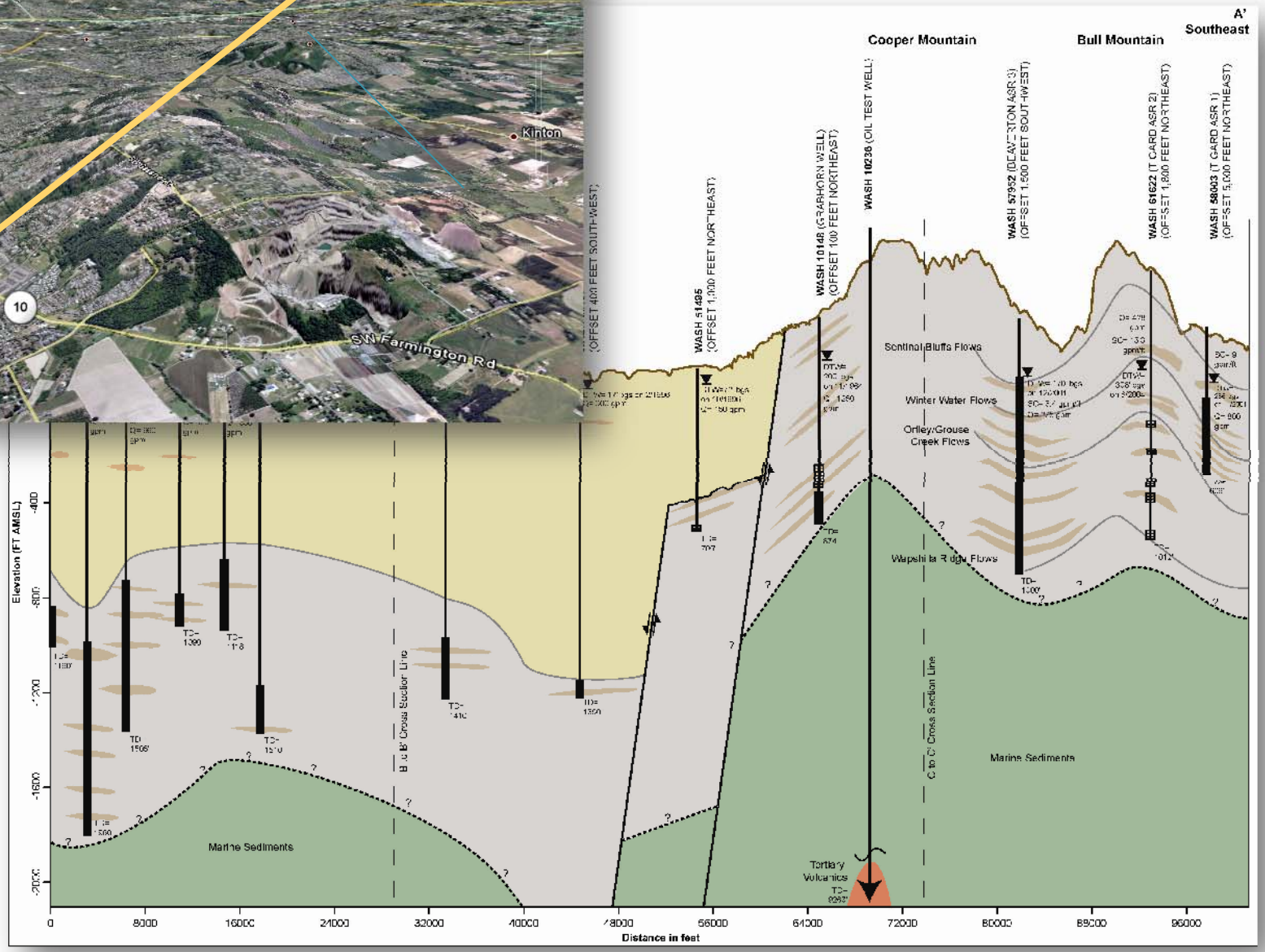
Cooper Mtn. Geology



Joint Water Commission

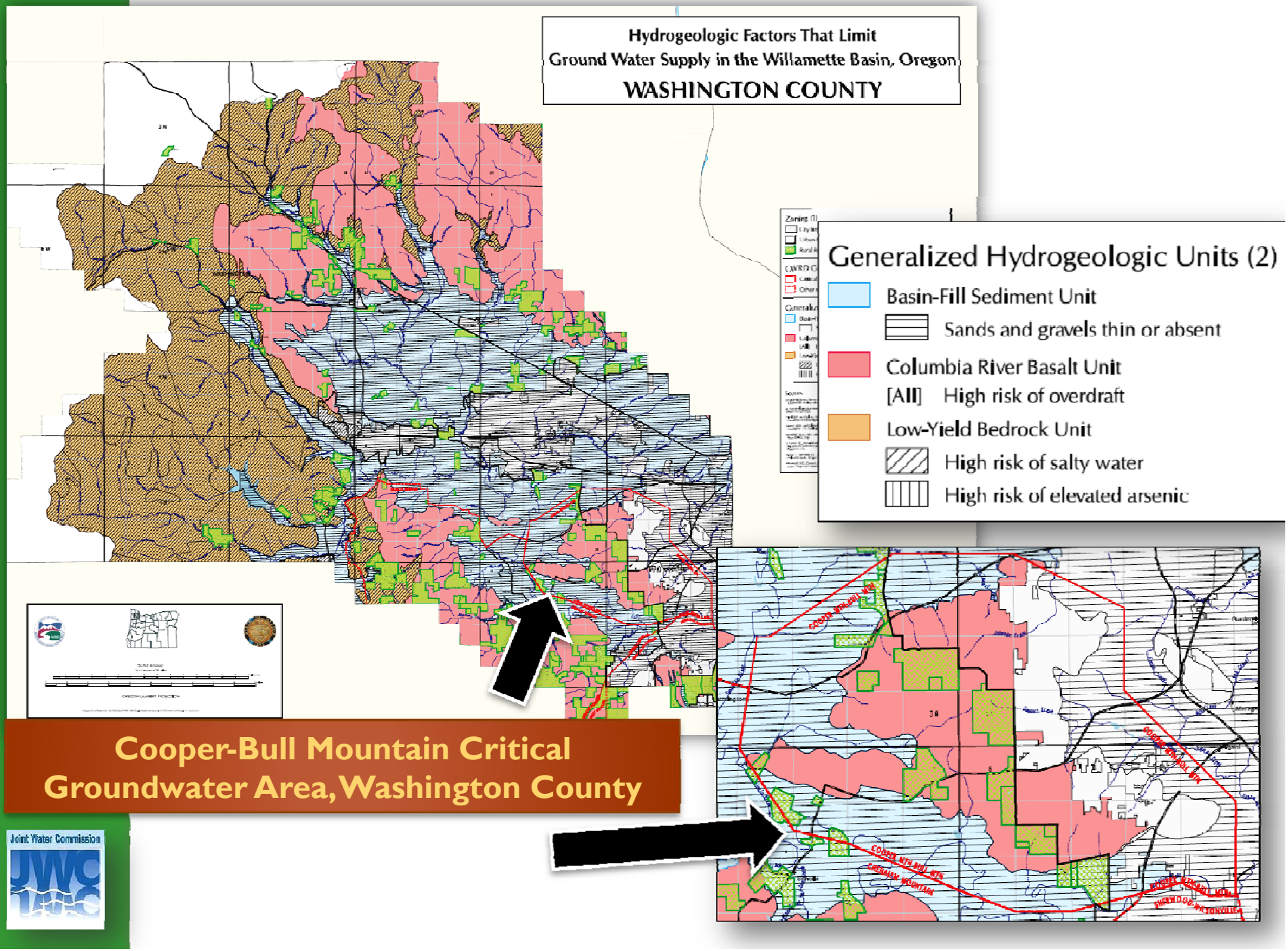
GSI Water Solutions, Inc.

www.gsiws.com



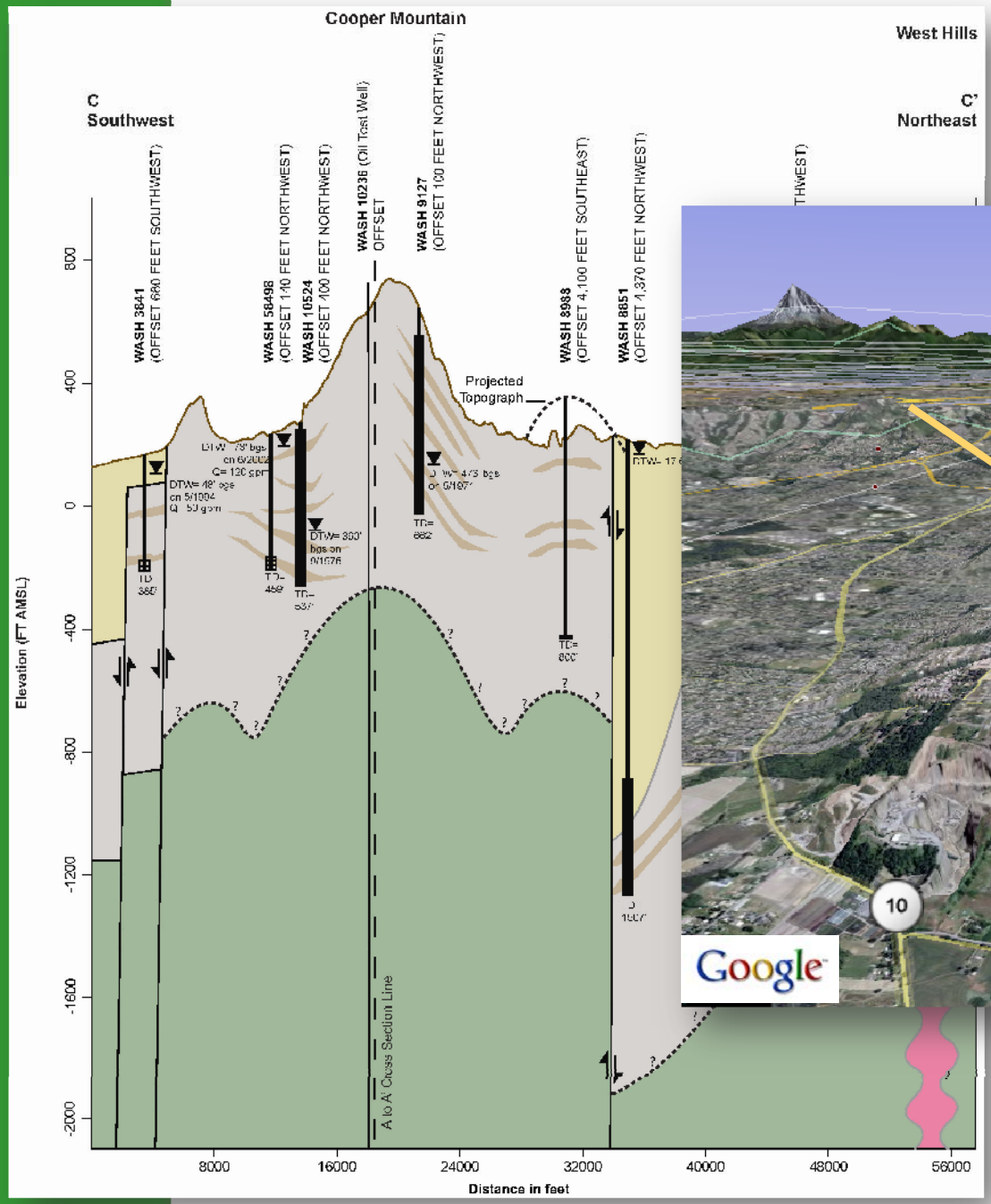
Joint Water Commission

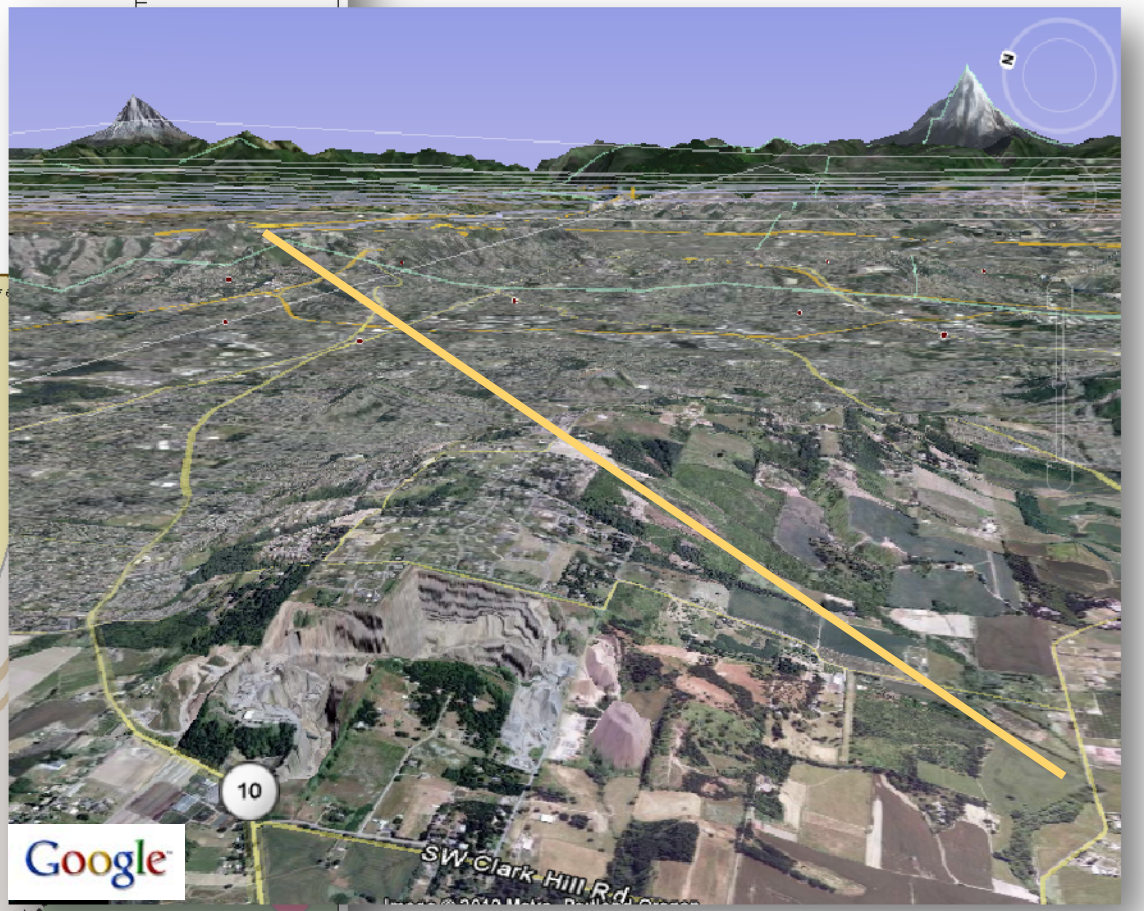
GSI Water Solutions



Cooper-Bull Mountain Critical Groundwater Area, Washington County

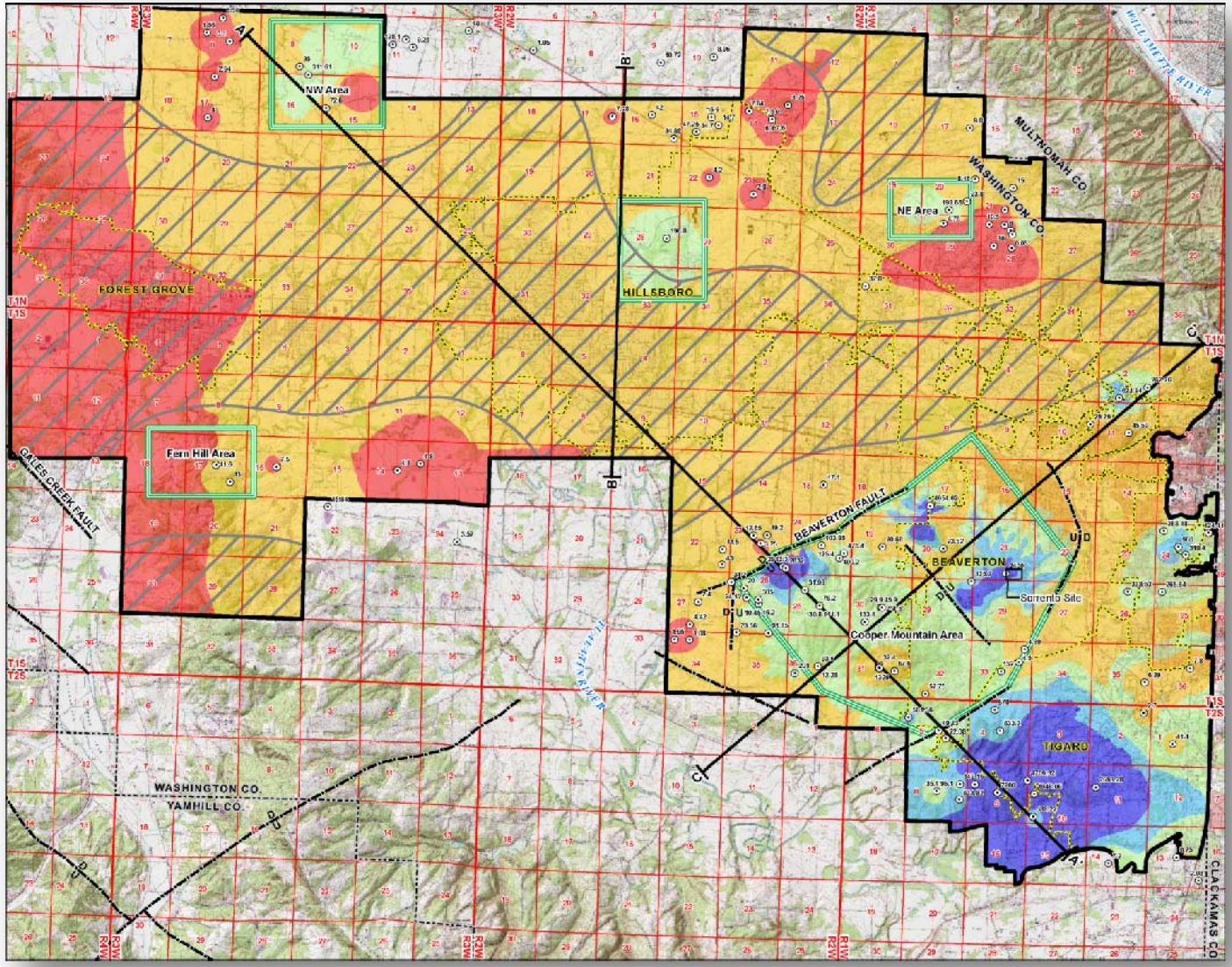
Joint Water Commission


Cooper Mountain
West Hills
C
Southwest
C'
Northeast
WASH 3841
(OFFSET 680 FEET SOUTHWEST)
WASH 58498
(OFFSET 140 FEET NORTHWEST)
WASH 10524
(OFFSET 100 FEET NORTHWEST)
WASH 10236 (Oil Test Well)
OFFSET
WASH 9127
(OFFSET 100 FEET NORTHWEST)
WASH 8988
(OFFSET 4,100 FEET SOUTHEAST)
WASH 8851
(OFFSET 1,370 FEET NORTHWEST)
Projected
Topograph
DTW= 48' bgs
on 5/1994
Q= 50 gpm
DTW= 380'
based on
9/1976
TD=
862
TD=
800'
A to A' Cross Section Line
Elevation (FT AMSL)
800
400
0
-400
-800
-1200
-1600
-2000
8000
16000
24000
32000
40000
48000
56000
Distance in feet

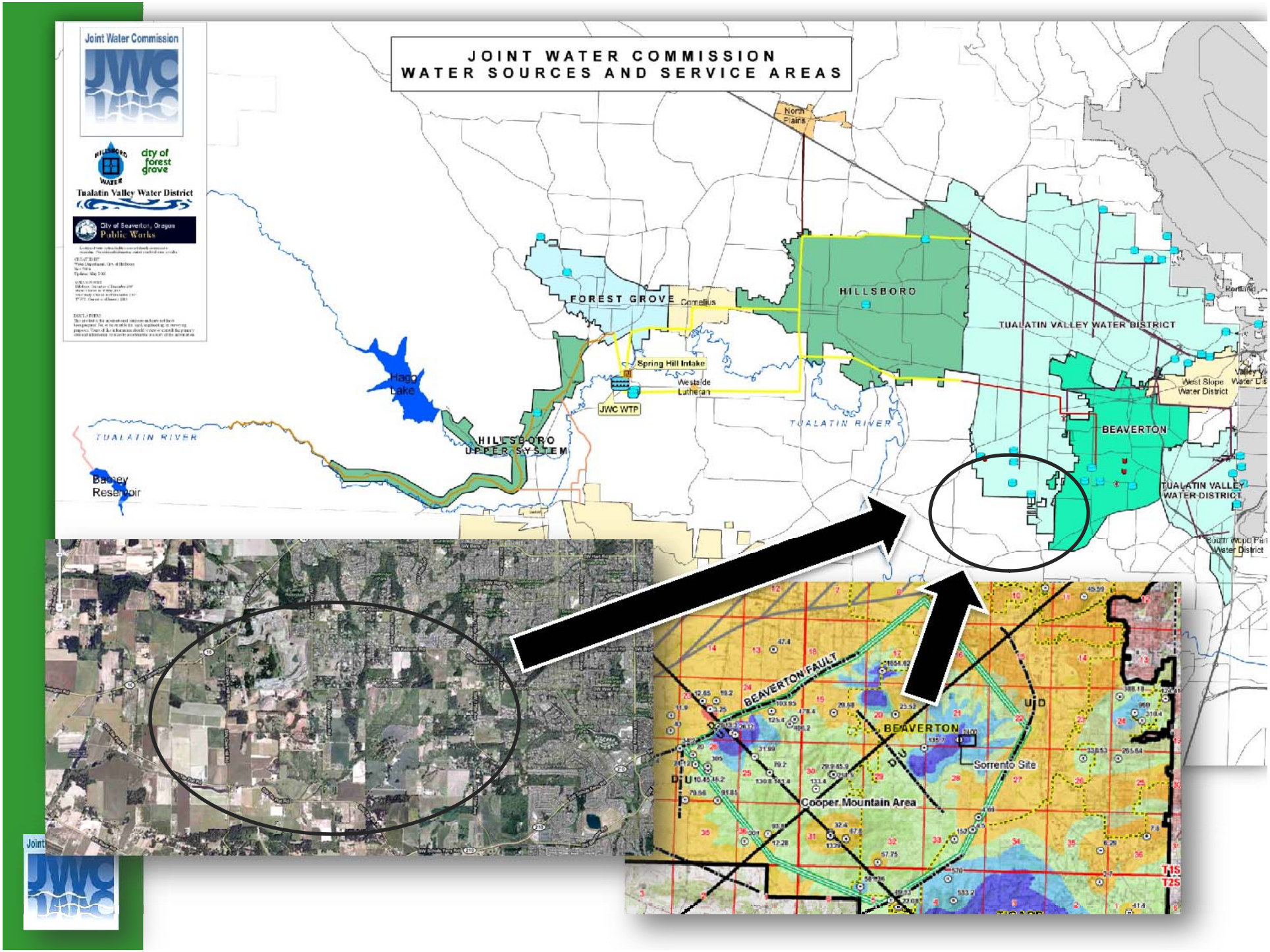

10
SW Clark Hill Rd
Google

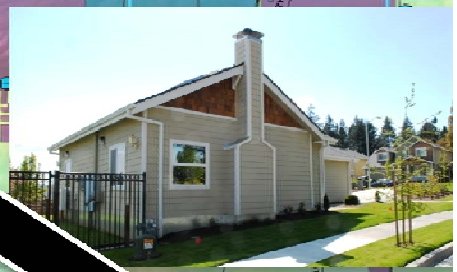
ASR Potential Map from JWC MP

(SC x Depth to Static Water Level)



GSI Water Solutions


JOINT WATER COMMISSION
WATER SOURCES AND SERVICE AREAS
Joint Water Commission
JWC
city of forest grove
Tualatin Valley Water District
City of Beaverton, Oregon
Public Works
North Plains
FOREST GROVE
Cornelius
HILLSBORO
TUALATIN VALLEY WATER DISTRICT
Portland
Spring Hill Intake
Westside Lutheran
JWC WTP
Hagg Lake
TUALATIN RIVER
HILLSBORO UPPER SYSTEM
West Slope Water District
BEAVERTON
TUALATIN VALLEY WATER DISTRICT
Barney Reservoir
BEAVERTON FAULT
BEAVERTON
Sorrento Site
Cooper Mountain Area
T1S
T2S



JWC ASR
Up to 16 wells
Total 15.8 mgd

Joint Water Commission

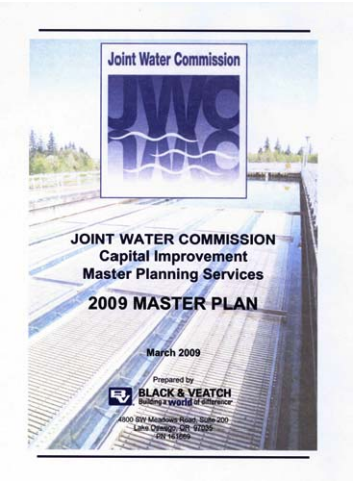
JWC Water Supply System with ASR

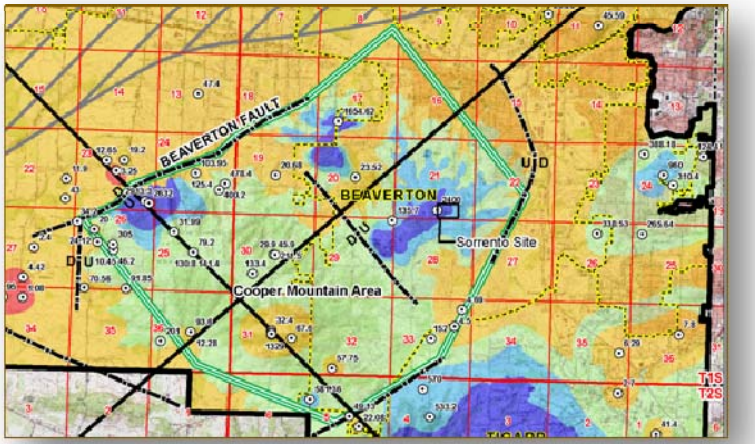
JWC ASR Program, Phase 1

Capital Cost Estimate

Cooper Mt. ASR	Estimated No. of Wells, Phase I	Total Estimated Well Yield (mgd)	ASR Well & Facilities - Average Unit Capacity (mgd/well)	ASR Well & Facilities - Average Unit Cost (millions/well)	ASR Well & Facilities - Average Unit Cost/Capacity (millons/mgd)	Total Phase I JWC ASR Cost (millions)
Well Nos. 1- 16	16	15.8	1.0	$2.54	$2.85	$40.71

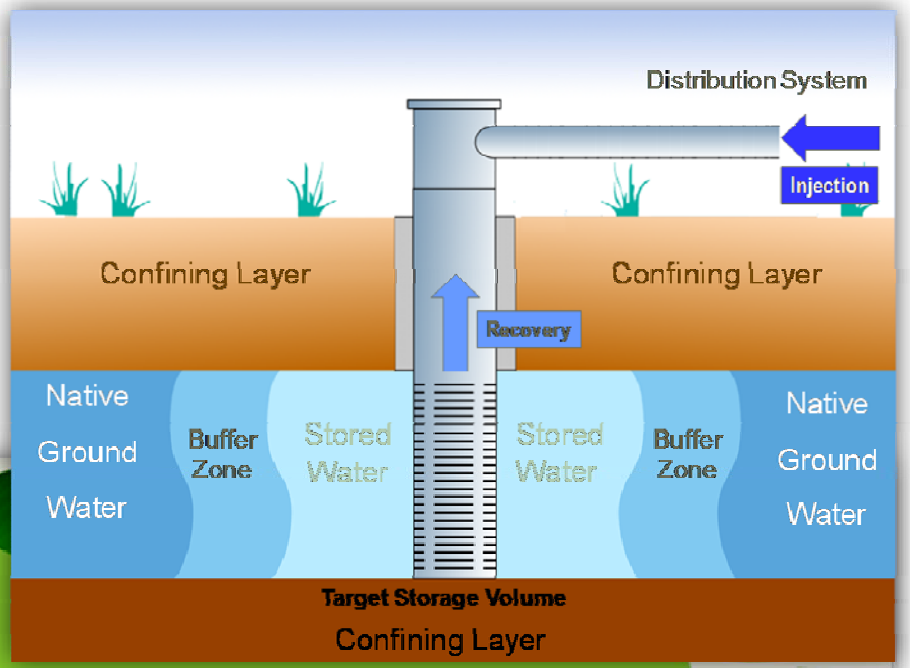
All costs 2009 dollars - 2009 JWC Master Plan (Black & Veatch, GSI)

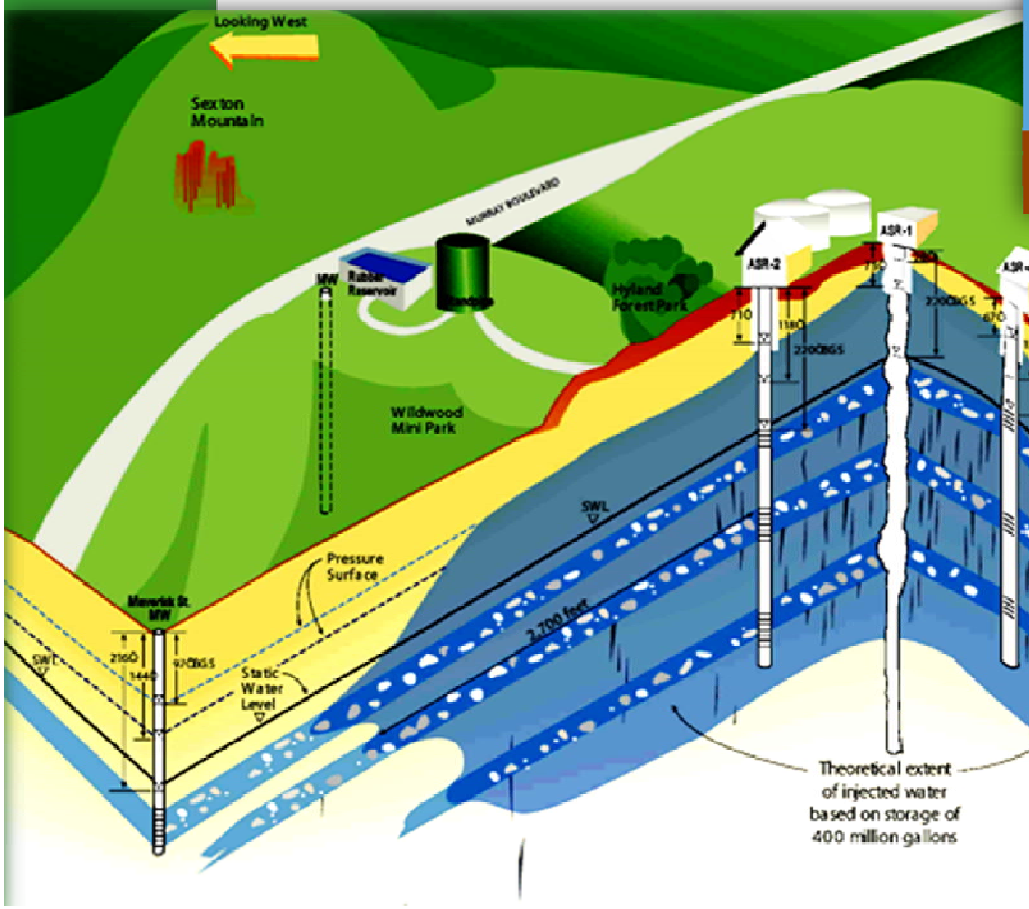


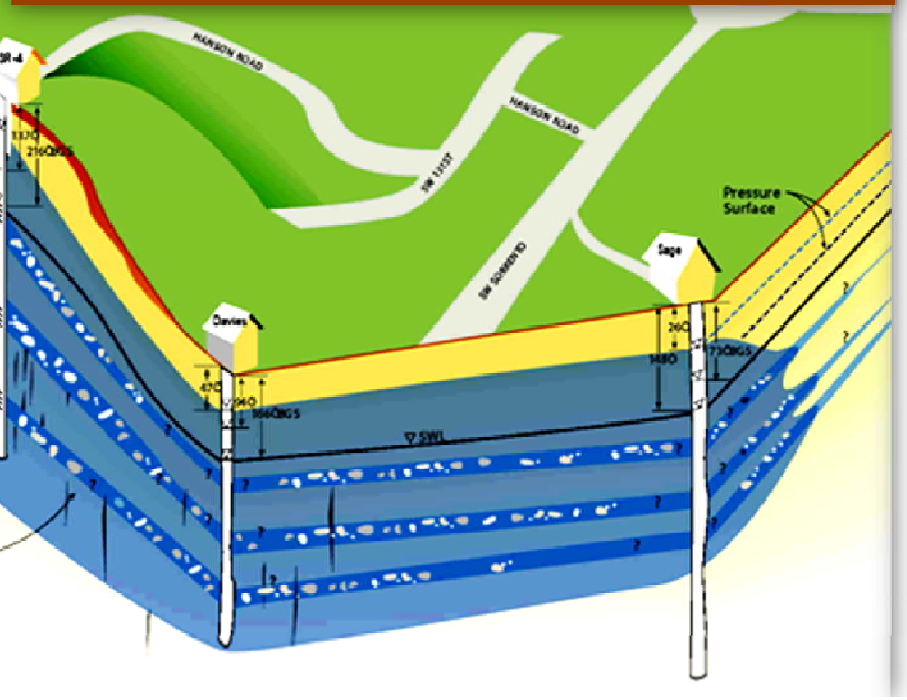


City of Beaverton's ASR Well Nos. 1, 2, and 4

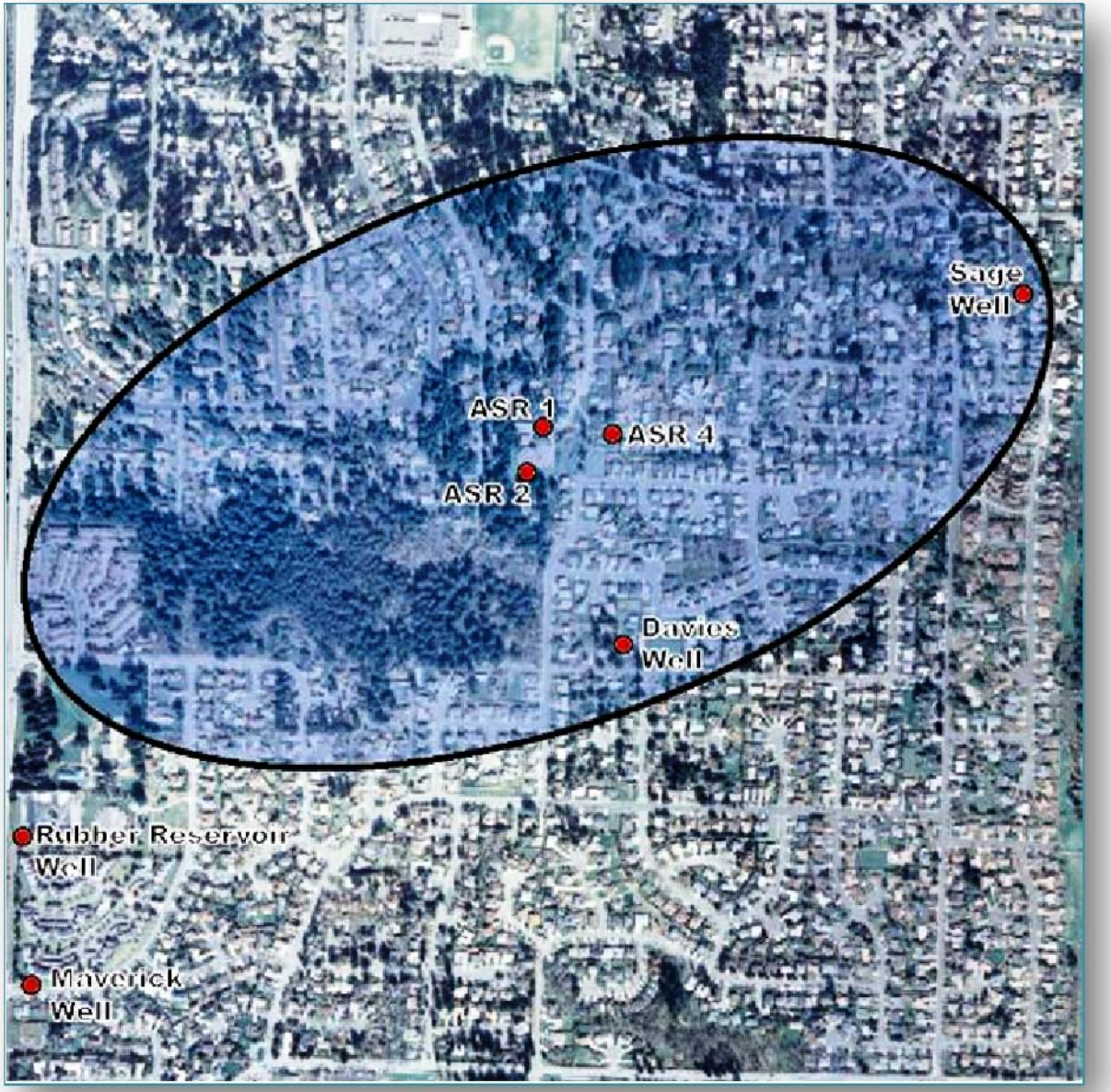
Hydrogeology







ASR Footprint



Aerial extent of injected water based on storage of 400 million gallons. Storage area radius is approximately 2,700 feet. Approx. 500 acres.

TVWD's Grabhorn ASR No. 1

Beaverton's ASR No. 1

Beaverton's ASR No. 2

Joint Water Commission

ASR No. 4

3 mgd

Operational February 2007

ASR Capital Cost Comparison

Utilizing Existing Reserve Capacity vs. New Surface Supply Capacity

Based on 5 mgd Flow Capacity

Facility	ASR Capacity Cost/mgd		Conventional JWC Supply Cost/mgd
	Utilize Existing Reserve Supply Capacity	New Supply Capacity	Surface Water Supply
ASR Well & Pump Station	$973,997	$973,997	
Raw Water Storage (untreated surface water)	$0	$0	$5,242,214
Water Treatment Plant Capacity	$0	$1,333,855	$2,704,762
Finished Water Storage	$0	$338,092	$685,575
Finished Water Transmission	$0	$642,464	$1,302,775
Total	**$973,997**	**$3,288,408**	**$9,935,326**

All costs 2010 dollars

OVERALL COST COMPARISON

Beaverton ASR v. JWC Conventional Surface Supply

5 mgd Flow/500 mg Volume (Recovery) Capacity

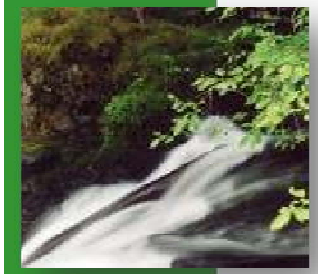
New ASR Supply[1]	Total ASR Unit Cost ($/CCF)	Total ASR Unit Cost ($/kgal)	Benefit/Cost Ratio
Total ASR Annualized Capital Cost	$0.569	$0.761	
Total ASR O&M	$0.789	$1.055	
Total	**$1.36**	**$1.82**	**1.299**

New JWC Conventional Supply[1]	Total JWC Unit Cost ($/CCF)	Total JWC Unit Cost ($/kgal)	Benefit/Cost Ratio
Total JWC Annualized Capital Cost	$1.355	$1.811	
Total JWC O&M	$0.409	$0.547	
Total	**$1.76**	**$2.358**	**0.770**

1) Assumes 5 mgd supply flow capacity; all costs 2010 dollars

Regional ASR – JWC Intergovernmental Issues

- Water rights for injection
- WTP & transmission lines - capacity allocation to ASR
- Limited license permittee(s) - JWC, TVWD/COB?
- Partners distribution system sharing for ASR
- Water quality compatibility within partner distribution systems
- O&M responsibilities - labor delegation & cost allocation
- Capital cost allocation to partners
- Monitoring and reporting responsibilities
- Ownership of facilities
- Which partners will consume recovered water & how much?
- Fluoridation
- CCR reporting responsibility
- Future ASR ownership & partner transactions



City of Beaverton

David Winship, PE, PLS, WRE
dwinship@ci.beaverton.or.us

Engineering Division

CITY OF HILLSBORO
Water

Niki J. Iverson
Water Resources Manager
City of Hillsboro
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