



We work with others to protect the health of the people of Washington State by ensuring safe and reliable drinking water.

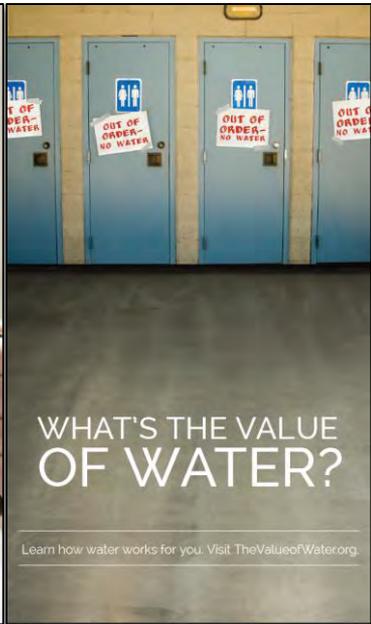
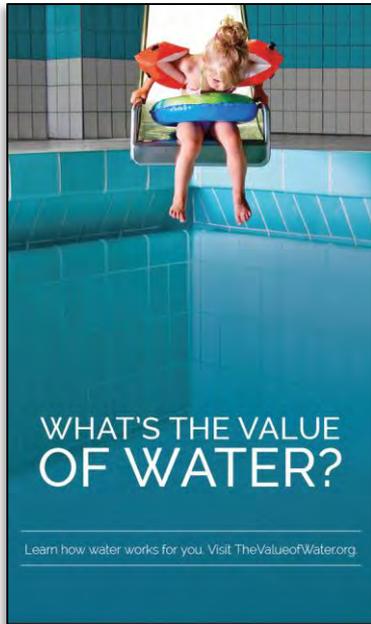
INTRO TO DRINKING WATER



Washington State Department of Health



What's the Value of Water?

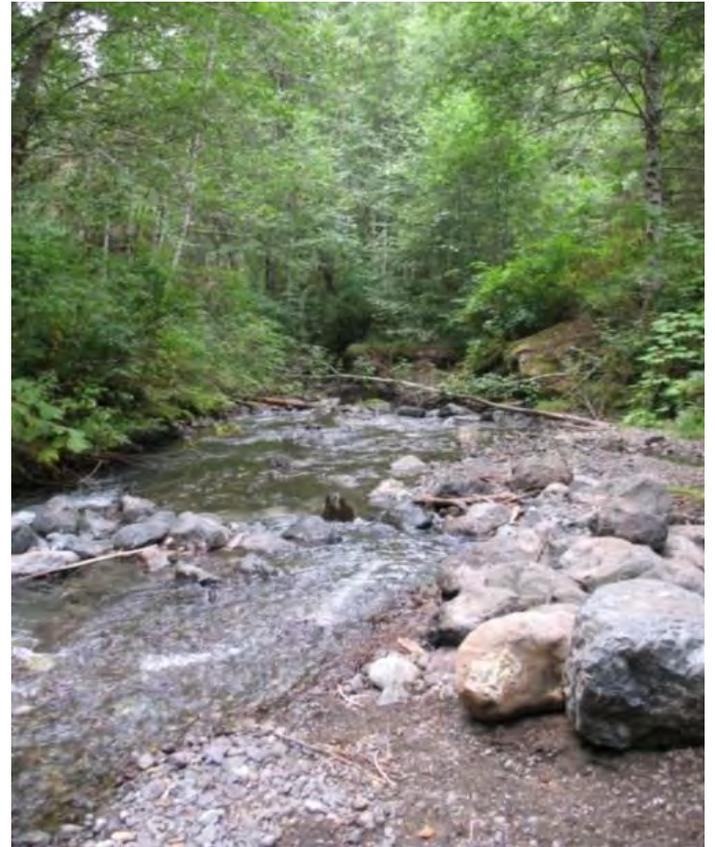


Applicability

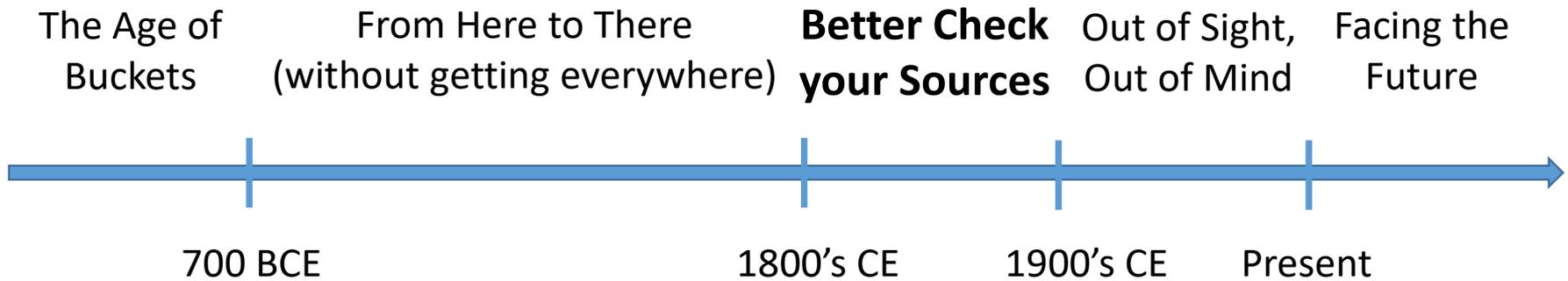
Surface water – “a body of water open to the atmosphere and subject to surface runoff”

- Excludes seawater sources, but not estuaries

Ground water under the direct influence of surface water (GWI)



Better Check Your Sources – Historical Cites



Better Check Your Sources – Historical Cites



Images courtesy of Wikipedia Commons

Federal Surface Water Rules

Milwaukee Crypto Outbreak (1993) – over 400,000 people sick



SWTR
(1989)

IESWTR
(1998)

FBRR
(2001)

LT1ESWTR
(2002)

LT2ESWTR
(2006)

SWTR - Surface Water Treatment Rule

IESWTR - Interim Enhanced Surface Water Treatment Rule

FBRR - Filter Backwash Recycling Rule

LT1ESWTR - Long Term 1 Enhanced Surface Water Treatment Rule

LT2ESWTR - Long Term 2 Enhanced Surface Water Treatment Rule



Cryptosporidiosis Outbreaks in SW Supplies

Location	Year	Type of System	Approximate Number of Cases
Carrollton, GA	1987	Treated Surface Water Supply	13,000
Jackson County, OR	1992	Medford-Chlorinated Spring Talent-Treated Surface Water Supply	15,000
Milwaukee, WI	1993	Treated Surface Water Supply	403,000
Cook County, MN	1993	Treated Surface Water Supply	27
Clark County, NV	1994	Treated Surface Water Supply	78
North Battleford, SK	2001	Treated Surface Water Supply	>1000
Baker City, OR	2013	Treated Surface Water Supply	2,780

Target Organisms

Giardia lamblia

Viruses

Legionella, and

Heterotrophic Bacteria

Cryptosporidium – IESWTR, LT1ESWTR, and LT2ESWTR

Others??



Treatment requirements

Giardia and Virus removal + inactivation =

- At least 99.9% (3 Log) *Giardia* cysts
- At least 99.99% (4 Log) Viruses

At least 99% (2 Log) *Cryptosporidium* oocysts

Treatment Technique Requirements

- Disinfect
- Filter or meet avoidance criteria

Qualified Operators



Turbidity

What is it and why do we measure it?

- A measurement of the cloudiness caused by particulate matter.
- Measured in Nephelometric Turbidity Units (NTUs) (USEPA Method 180.1)
- Monitoring is used to:
 - -Show how efficiently the filtration system is working (rapid rate)
 - -Ensure levels won't interfere with disinfection



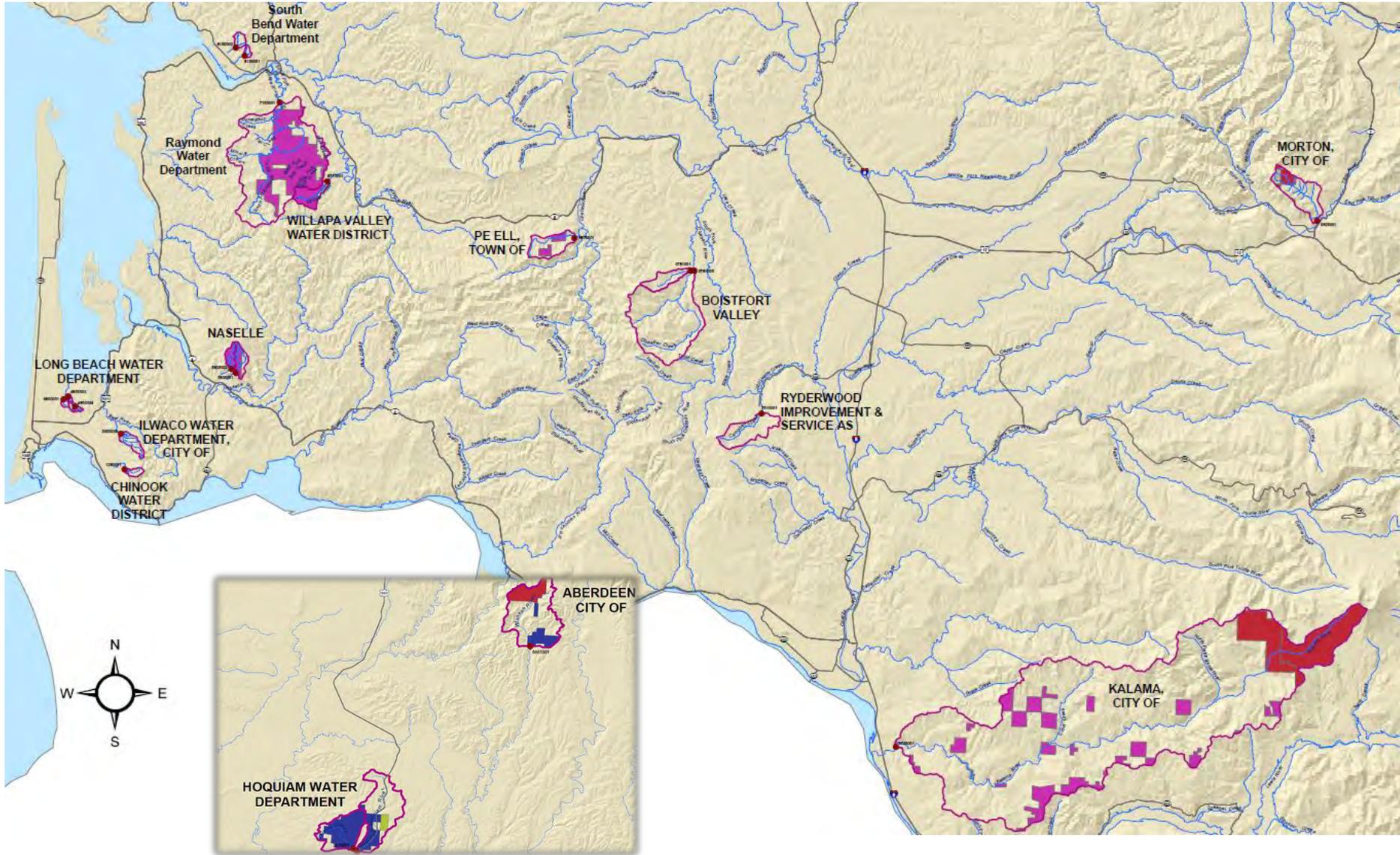
Surface Water Treatment

Every treatment plant has a limit of turbidity it can treat

- Slow sand: 10 NTU with roughing filter
- Diatomaceous Earth: 20 NTU
- Rapid rate: 30 NTU
- Membranes: 80 to 100 NTU



Drinking Water—Watersheds



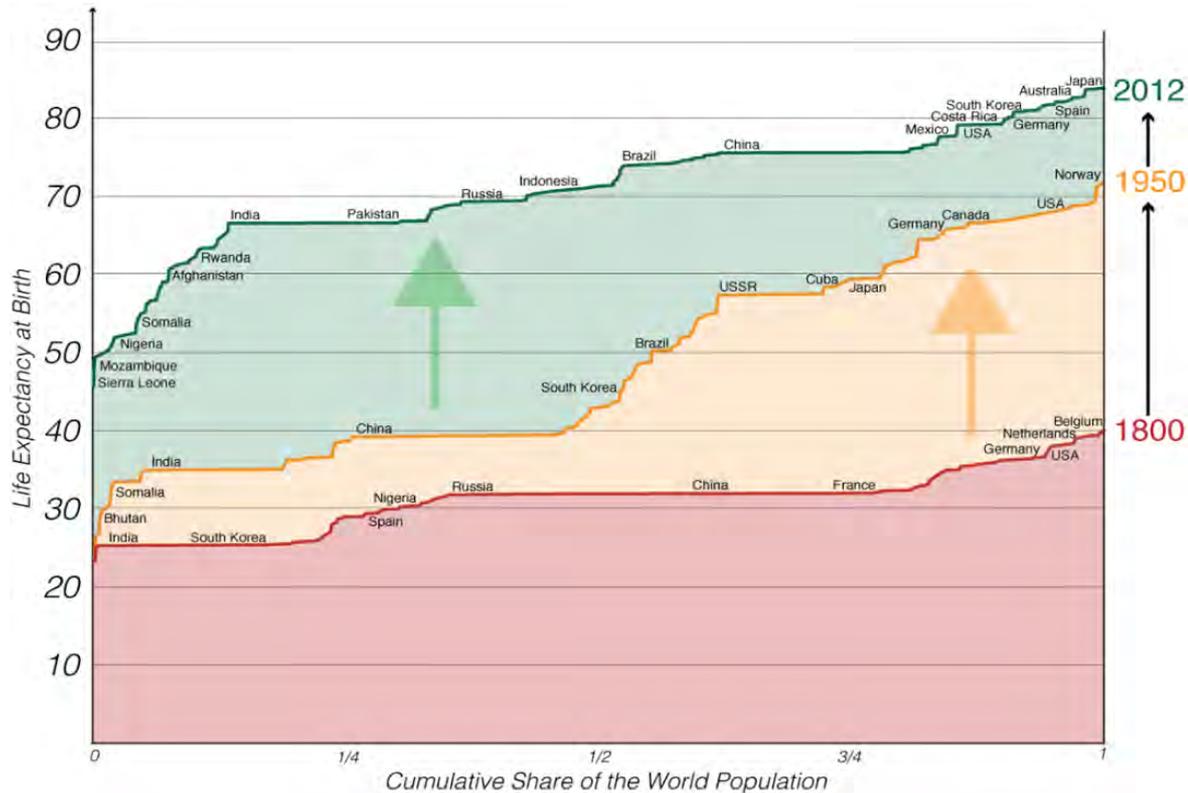
This instead or that



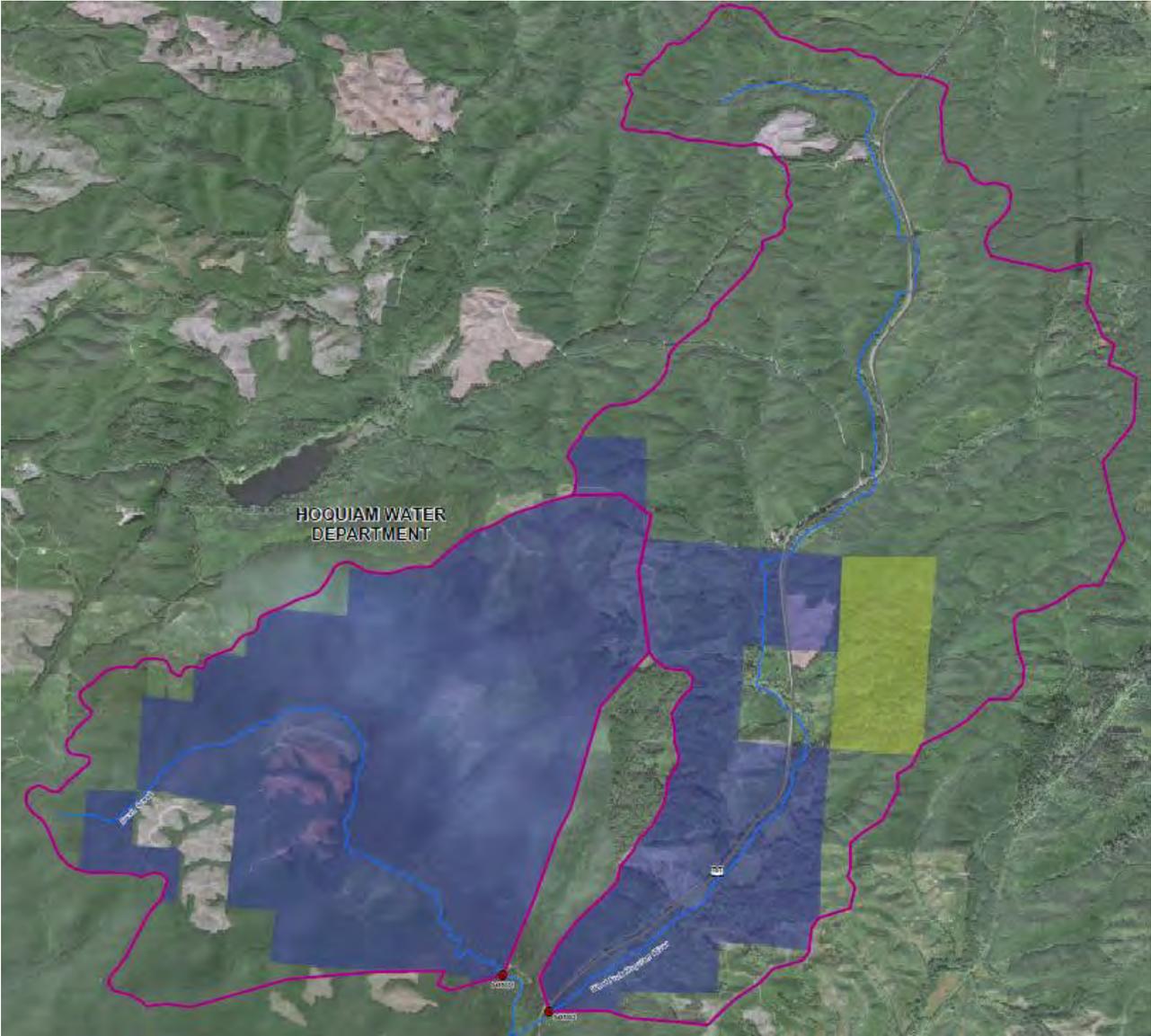
Images courtesy of Wikipedia Commons

Why

Reduction in water borne disease added more to life expectancy than all of recent modern medicine....



City of Hoquiam - Watersheds



Davis Creek Intake

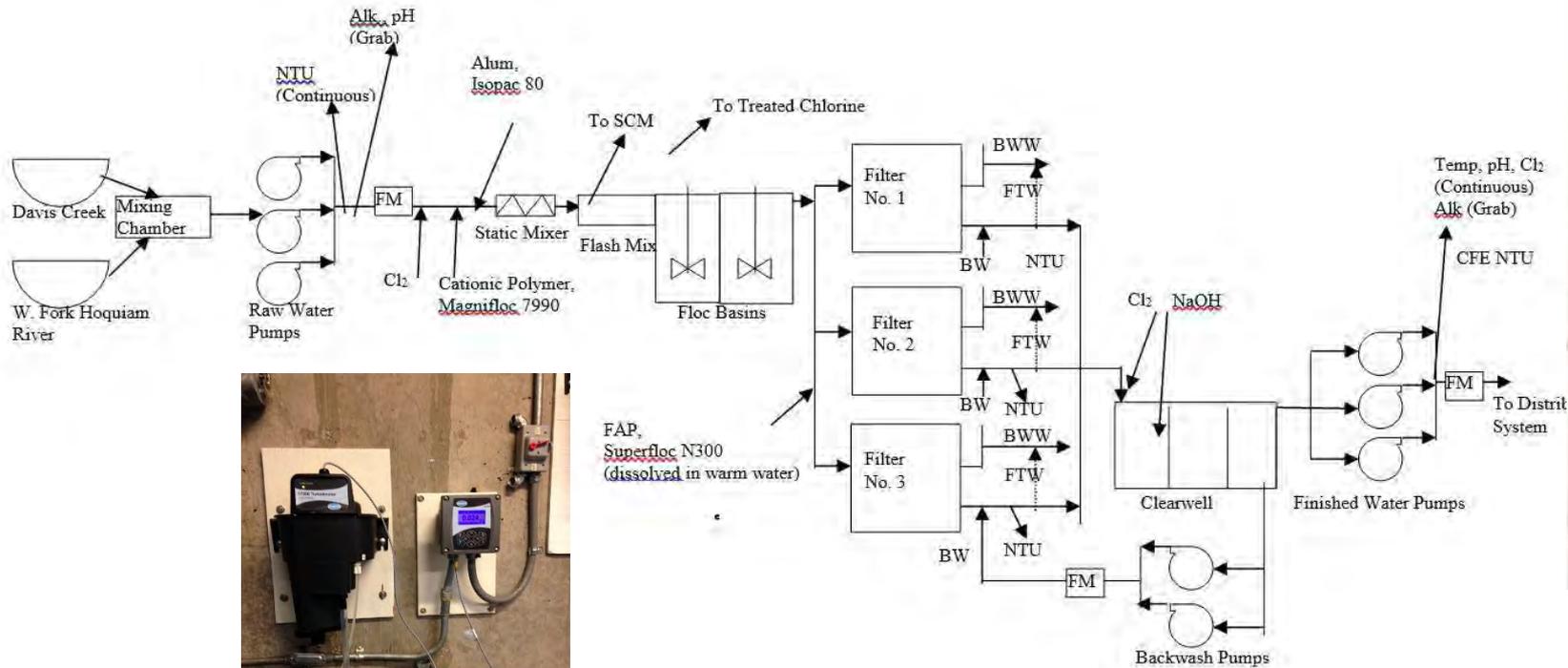


West Forks Hoquiam

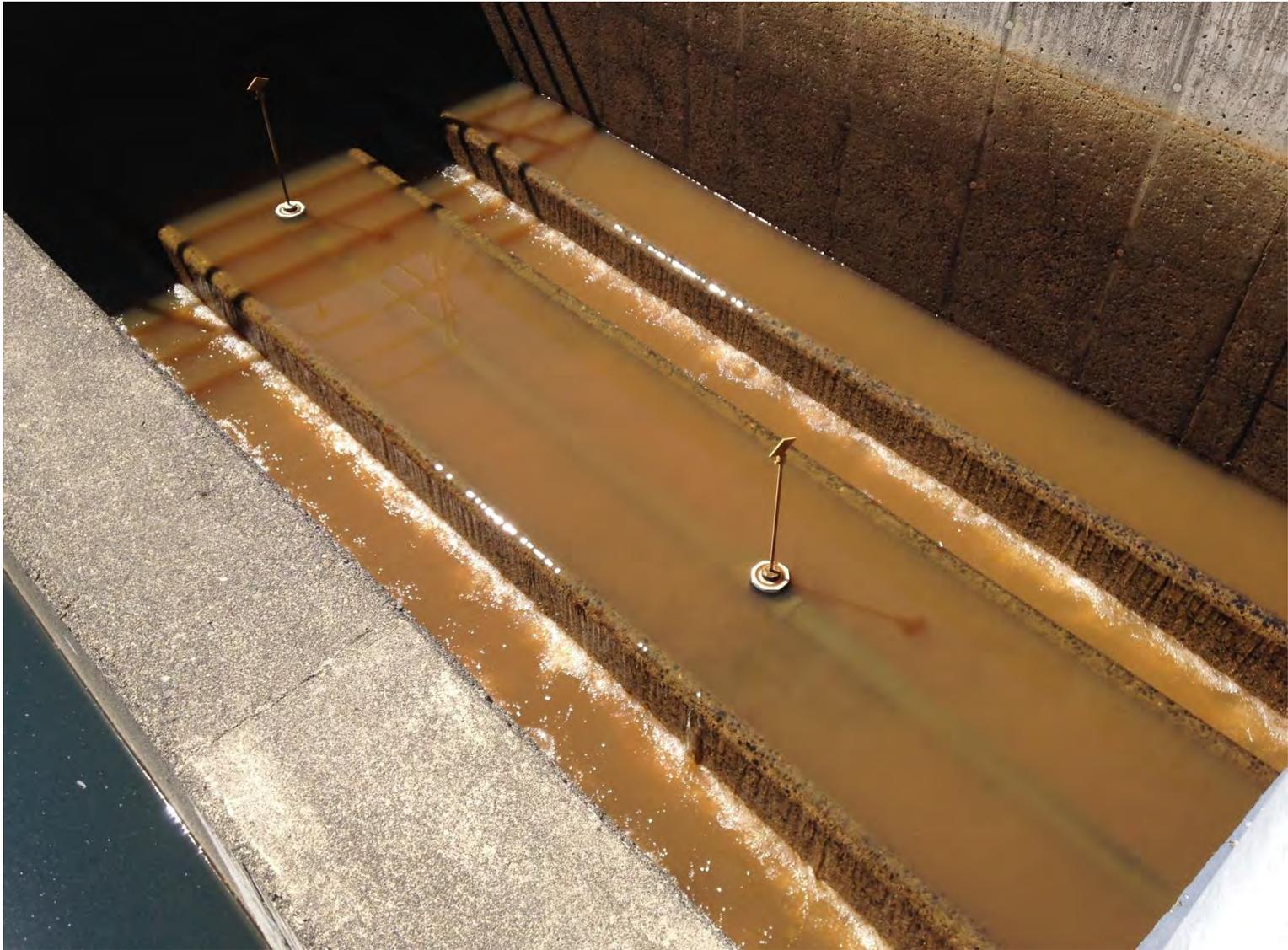


City of Hoquiam – Rapid Rate Treatment

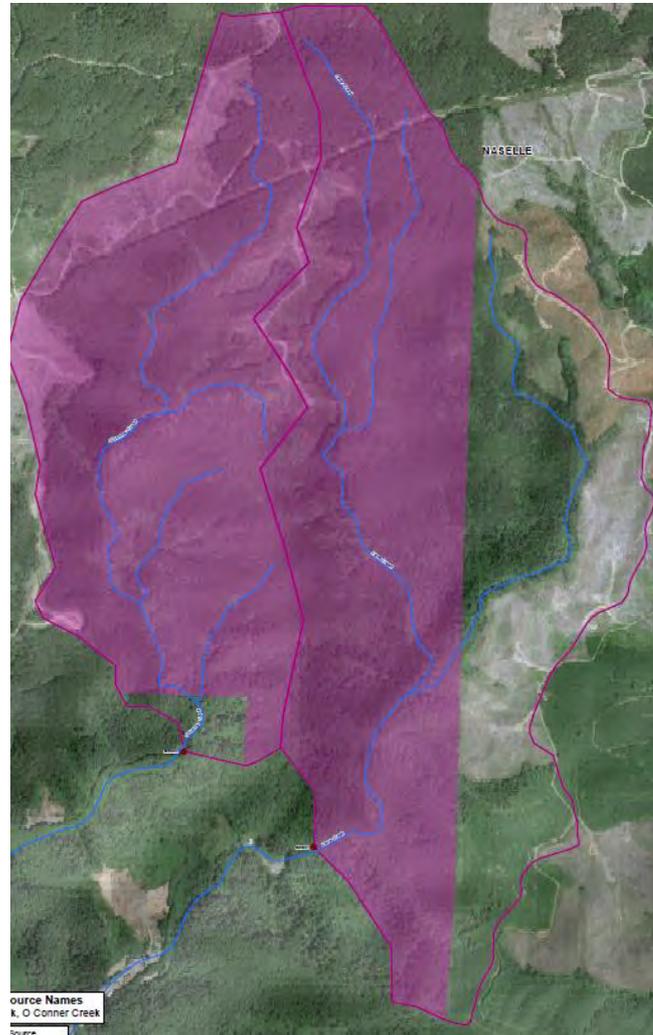
Hoquiam WTP Schematic



Filters during backwash



Naselle Water Company - Watershed



Intake



Intake



Roughing Filter



Questions?

