Ending an Era: The Replacement of Open Finished Water Reservoirs

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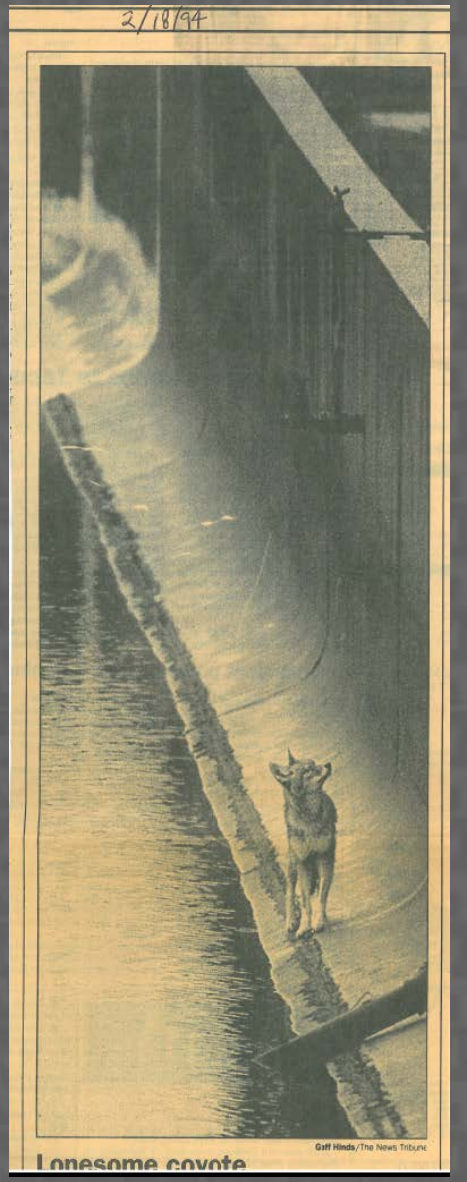

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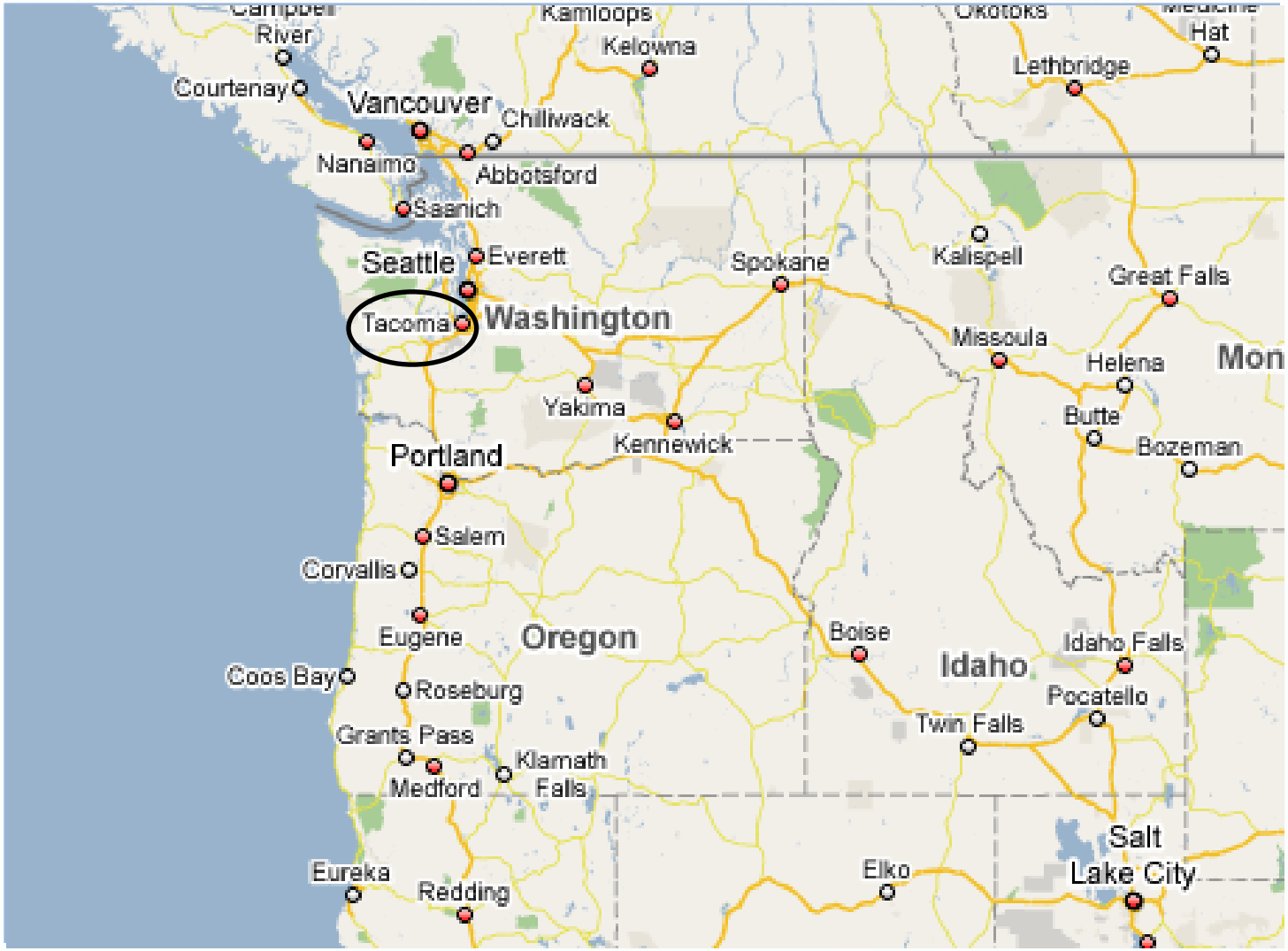

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- 310,000 direct service population
- Up to 200,000 more people served through regional partnerships and wholesale customers.
- 167 MGD peak treatment capacity from the Green River Supply, an unfiltered, uninhabited -235 mi^2 watershed.
- 55 MGD supplemental supply from urban groundwater supplies.

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REGULATORY LANDSCAPE IN WASHINGTON STATE

JUNE 23, 1975 - INITIAL DISTRIBUTION SYSTEM RULES BECAME EFFECTIVE.

- **No new uncovered reservoirs.**
- **Existing uncovered reservoirs must be scheduled for covering or replacement unless it met certain standards:**
  - Four-log virus disinfection requirement
  - Meet fencing height and setback requirements
  - Operations program & emergency response program.

AUGUST 1983 - SIMPLIFIED RULES

- **All requirements addressed within the scope of a plan of operation.**

APRIL 9, 1999 – BEGINNING OF THE END

- **Required a department-approved plan for a schedule to cover all uncovered reservoirs.**

JUNE 2006 – LT2

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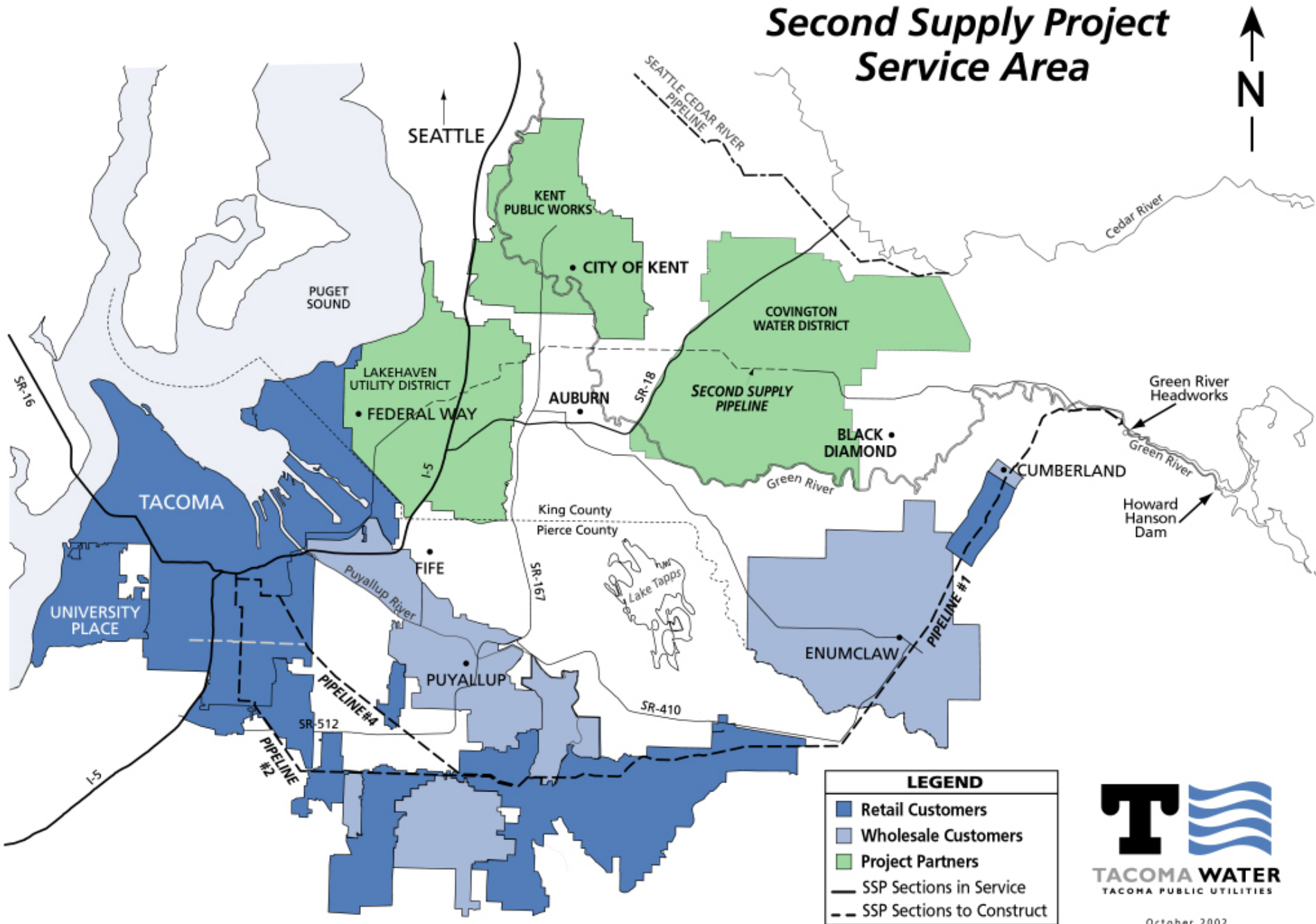
TACOMA WATER – SYSTEM OVERVIEW



WHEN VOLUME & SOLAR DISINFECTION WERE KING

Hood Street Reservoir
Replaced 1987
Old: 13MG
New: 10 MG
Cost $2.7 Million ($5.7M 2012 Dollars)

WHEN VOLUME & SOLAR DISINFECTION WERE KING

Alaska Street Reservoir
Replaced 1988
Old: 9 MG
New: 6 MG
Cost $1 Million ($2.1M 2012 Dollars)

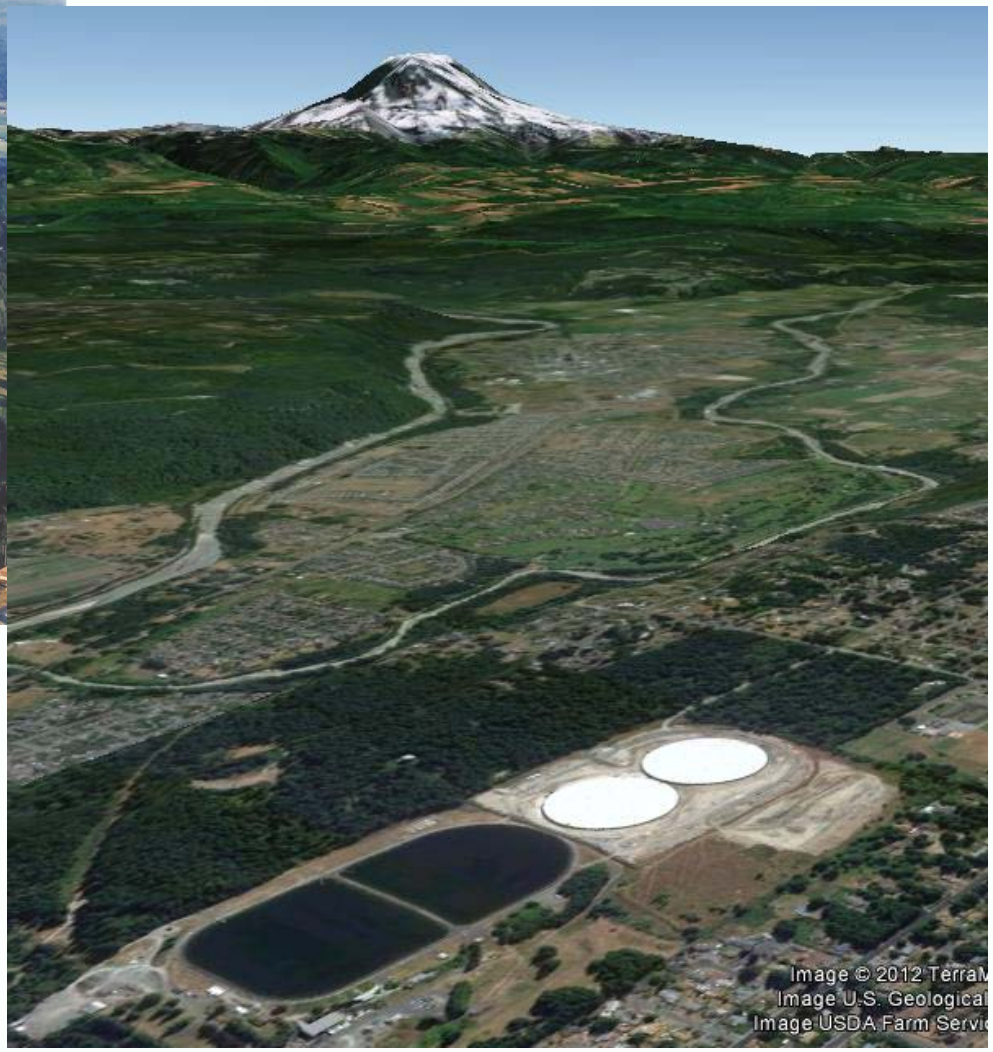
WHEN VOLUME & SOLAR DISINFECTION WERE KING

North End Reservoir
Replaced 1990
Old: 25 MG
New: 10 MG
Cost $2.3 M ($4.5M 2012 dollars)

WHEN VOLUME & SOLAR DISINFECTION WERE KING

Portland Avenue Reservoir
Replaced 2003
Old: 50 MG
New: 20 MG
Cost $7.1 Million ($8.2 2012 Dollars)

WHEN VOLUME & SOLAR DISINFECTION WERE KING



McMillin Reservoir
Replaced 2012
Old: 210 MG
New: 66 MG
Cost $32 Million

COVERING/REPLACING – WHAT IS THE R.O.I.?

Facility	Old Volume	New Volume	Construction Cost (2012$)
Hood St	13	10	$5.7 M
Alaska	9	6	$2.1 M
North End	25	10	$4.5 M
Portland Ave	50	20	$8.2 M
McMillin	210	66	$32.1 M
		TOTAL:	$52.6M

$52.6M for –195 MG (195 MG) of storage. Interesting Return on Investment

BUT:

- Four rechlorination stations eliminated; one pending
- Reduced labor for operating & surveillance
- Eliminated Copper sulfate and activated carbon treatments, or reservoir dumps
- Dramatically improved water quality & site security
- Very low microbial risk remains very low
- Compliance achieved

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“THERE ARE WORMS IN MY WATER!”

“Not to worry…they mostly get chopped up in the water meters….”

--Former employee, as quoted in the local press

Bay, E.C. 1993 Chironomid (Diptera: Chironomidae) Larval Occurrence and Transport in a Municipal Water System. J. Am. Mosquito Control Assoc. 9:3:275-284

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TASTE & ODOR - ACCEPTABLE PERFORMANCE

Flavor Rating Assessment (FRA)

- **Seattle Public Utilities T&O panel 1-9 SCALE**

1. I would be very happy to accept this water as my everyday drinking water.
2. I would be happy to accept this water as my everyday drinking water.
3. I am sure that I could accept this water as my everyday drinking water.
4. I could accept this water as my everyday drinking water.
5. Maybe I could accept this water as my everyday drinking water.
6. I don't think I could accept this water as my everyday drinking water.
7. I could not accept this water as my everyday drinking water.
8. I could never drink this water.
9. I can't stand this water in my mouth, & I could never drink it.

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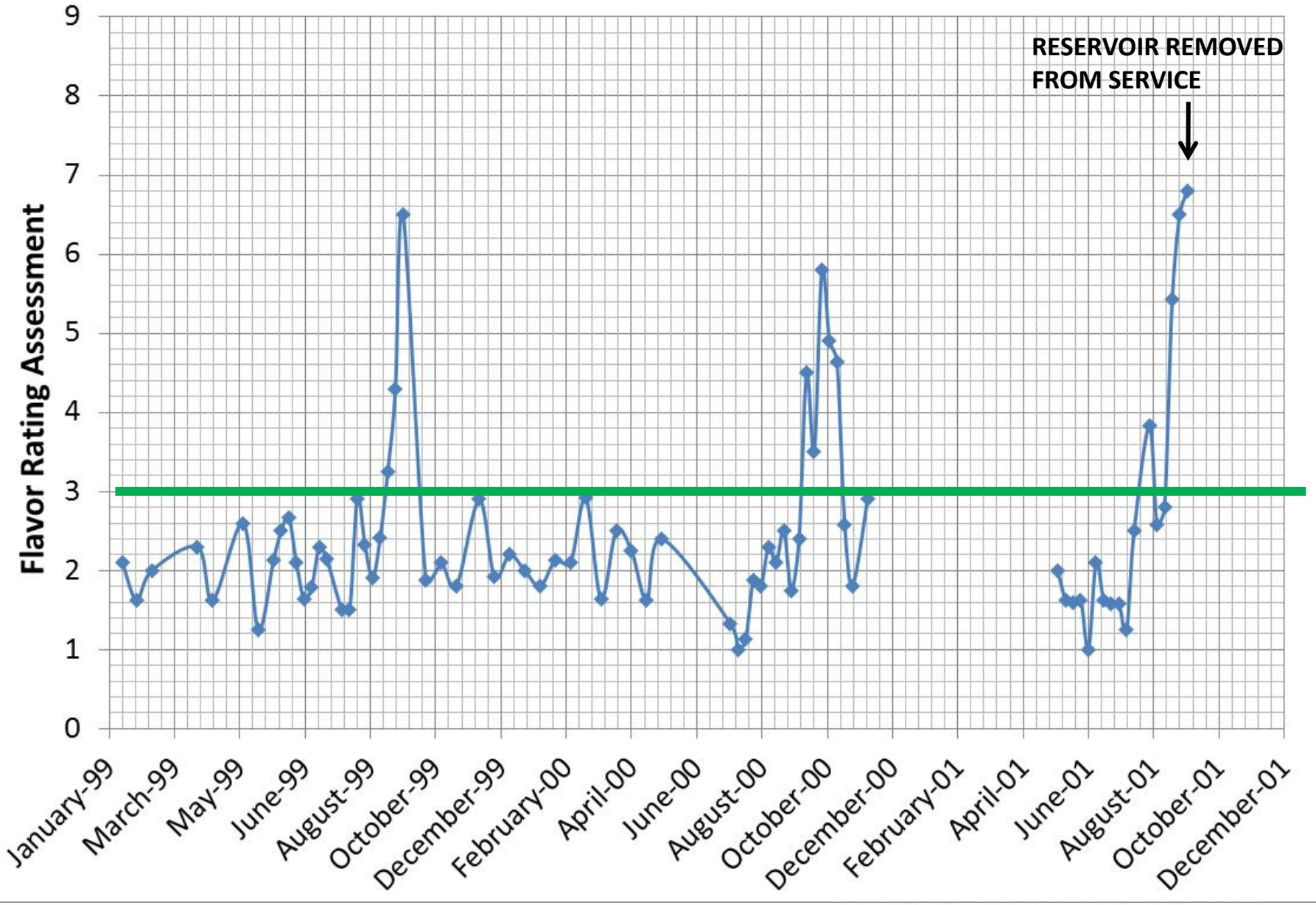
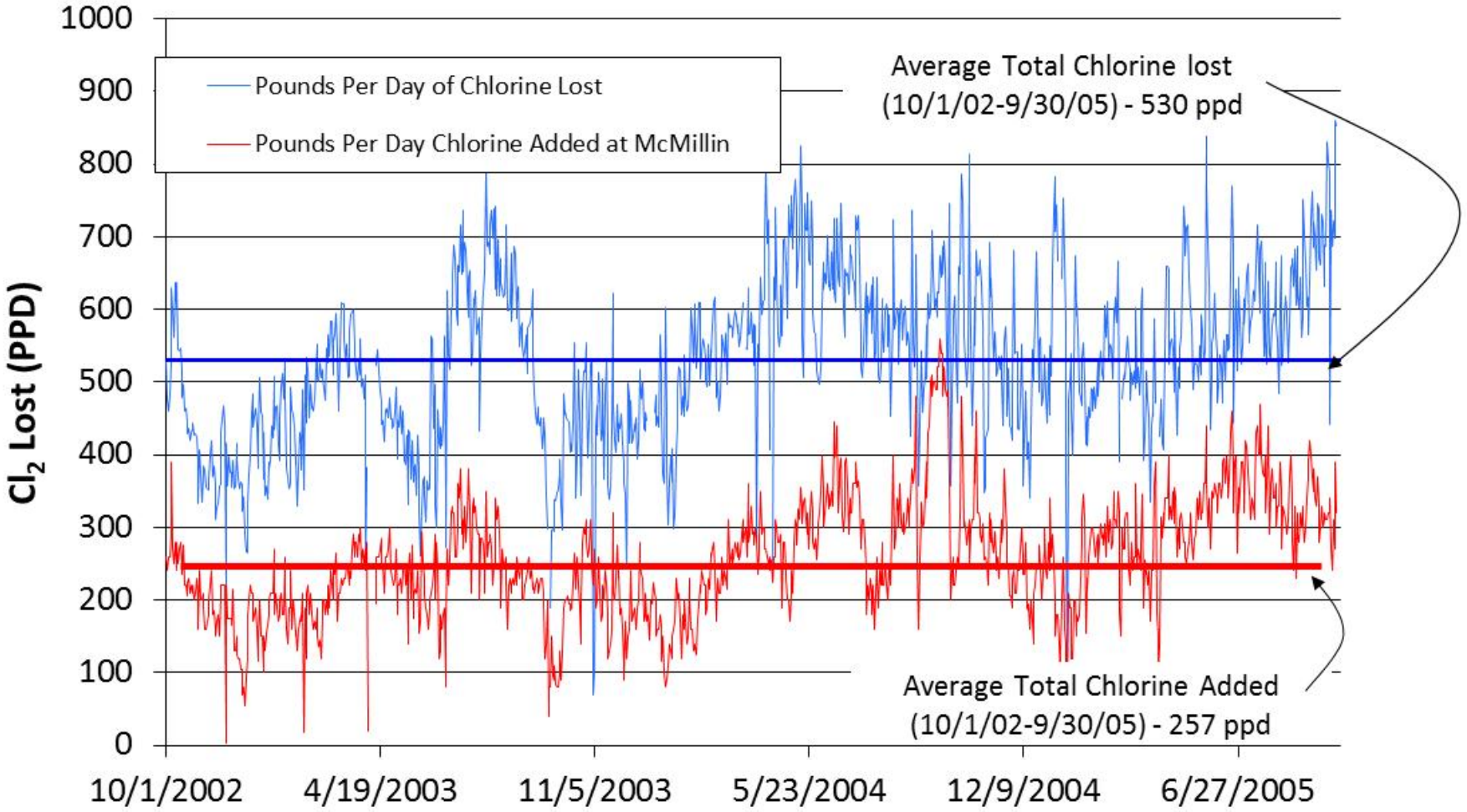
PORTLAND AVE. RESERVOIR



POUND PER DAY OF CHLORINE LOST



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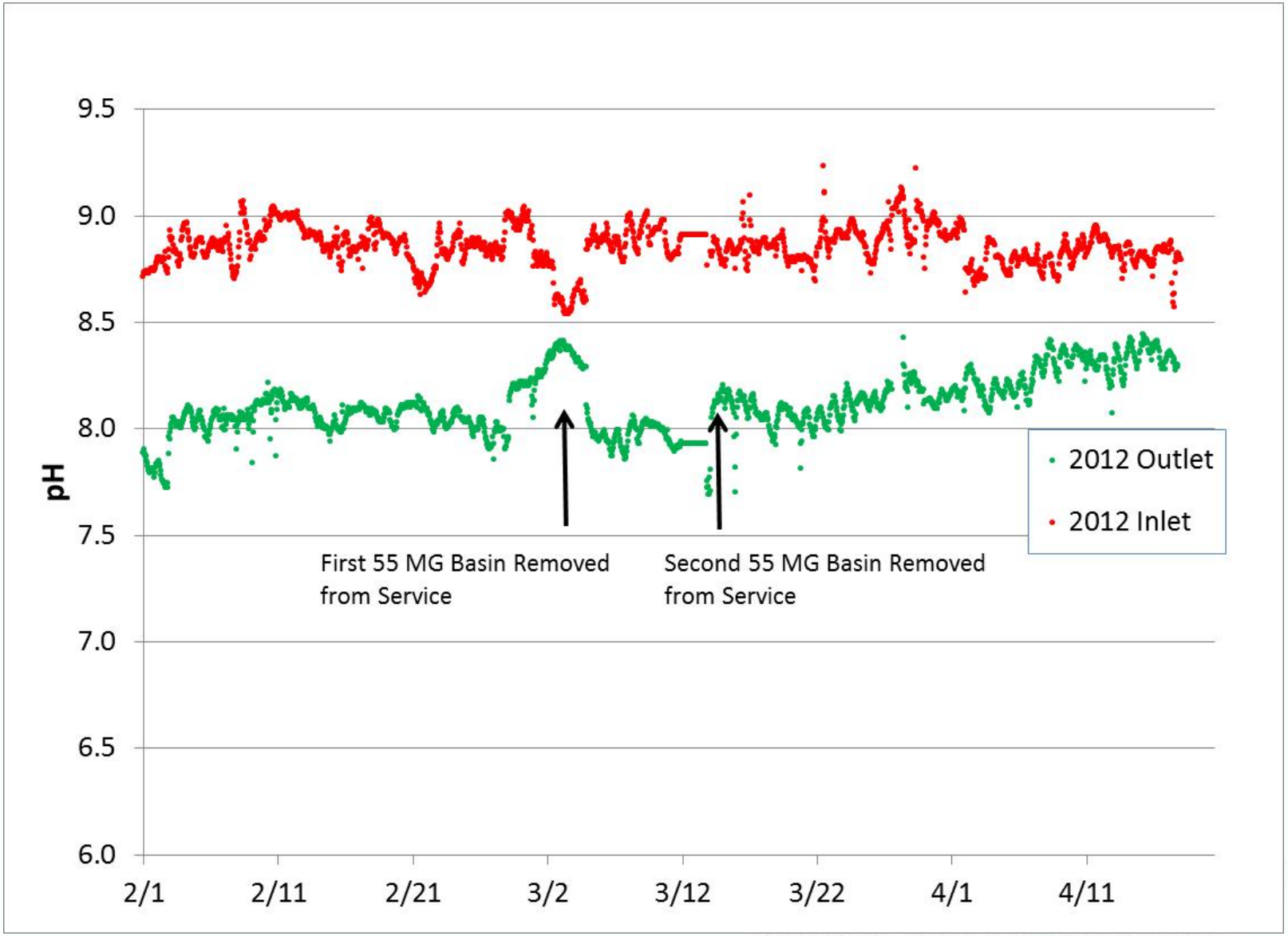
IMPACT OF REPLACEMENT ON pH

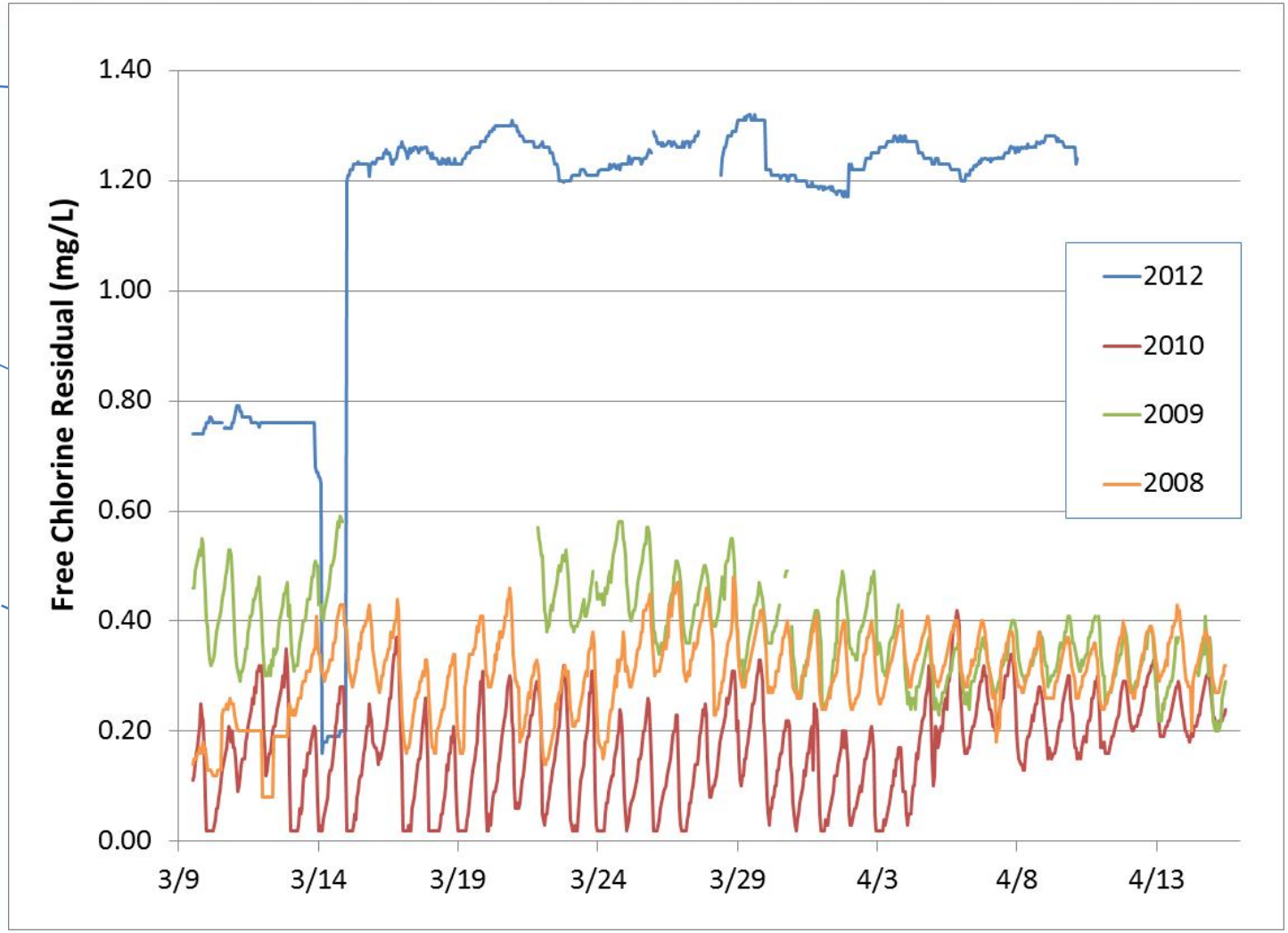


WHAT CHANGE LOOKS LIKE

Covered Basins only

Blended Open & Covered Basins

Open Basins only



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IN SUMMARY

- The regulatory construct in Washington State has been moving utilities toward covering/replacing for almost 40 years.
- Tacoma's initial drive to cover/replace driven by persistent water quality challenges, and a sense of improving security.
- Elimination of midge fly larvae consumer complaints has been accomplished.
- Seasonal algae growth (and its associated impacts) have been eliminated.
- Real, immediate, unambiguous beneficial impacts to chemical disinfection processes have been realized at every reservoir site.
- Replacement strategies, coupled with improvements in intrusion detection have substantially mitigated security risk.

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