

Water Demand Forecast Update

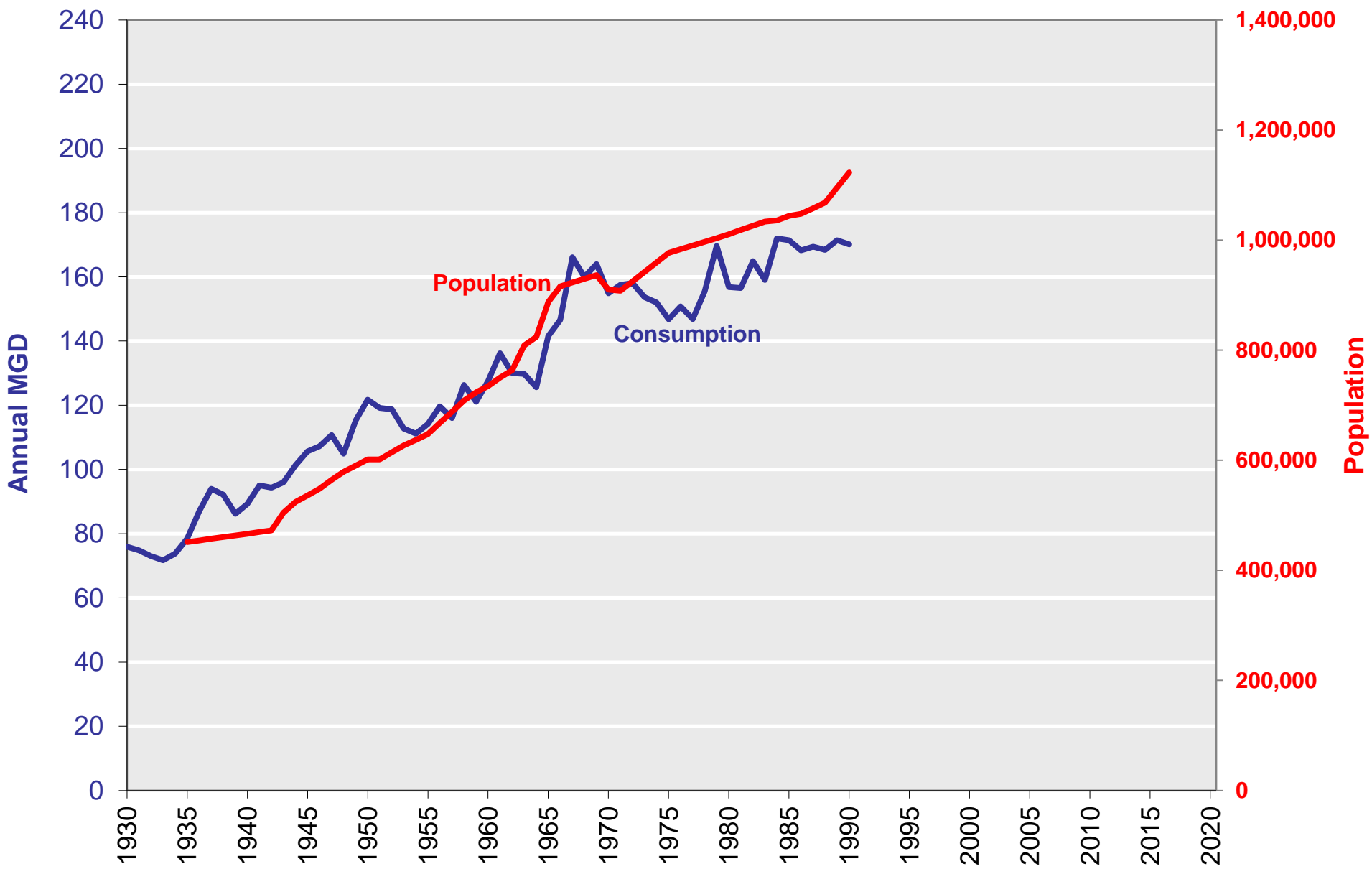
Operating Board

December 1, 2016

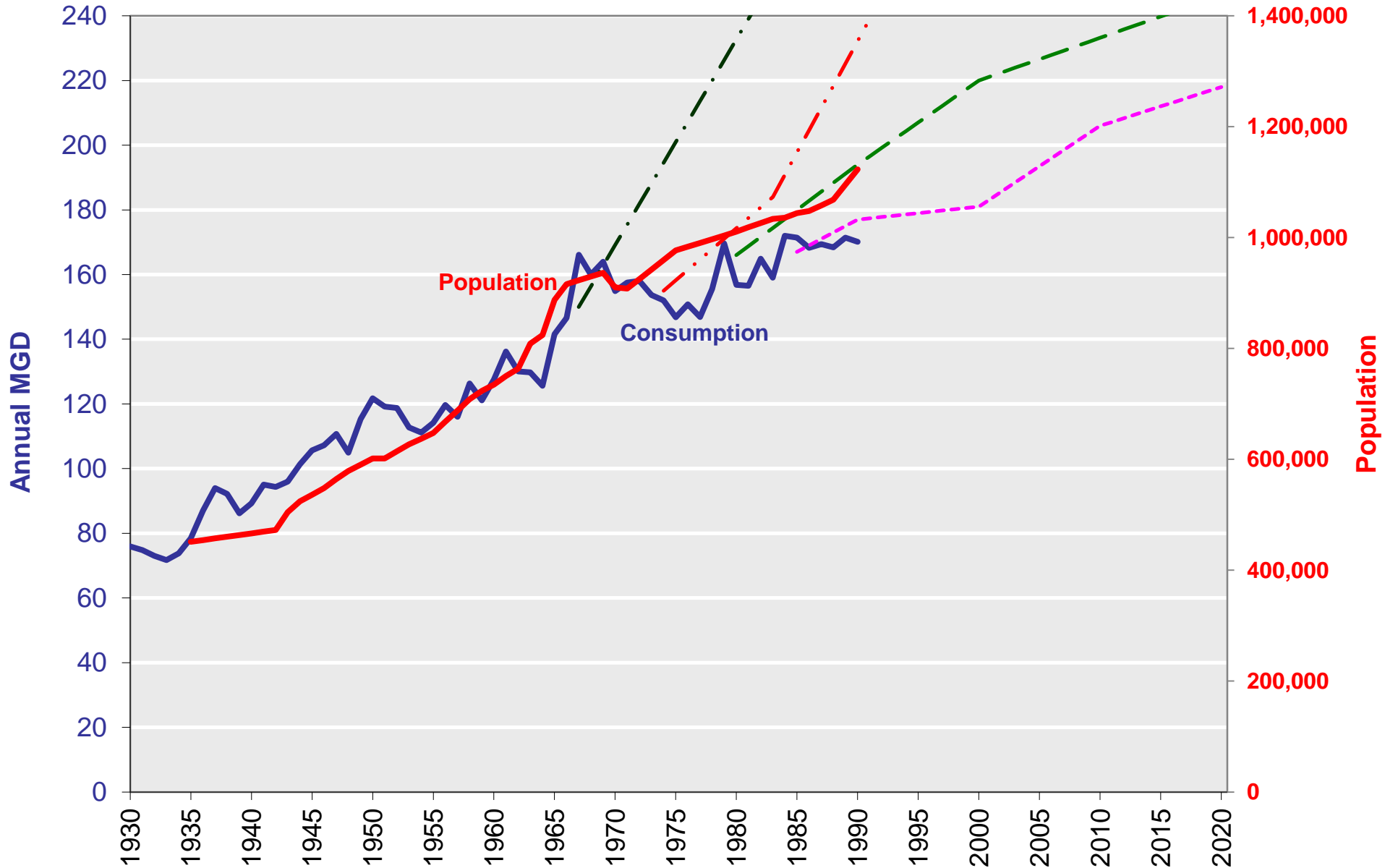
Bruce Flory, SPU Principal Economist



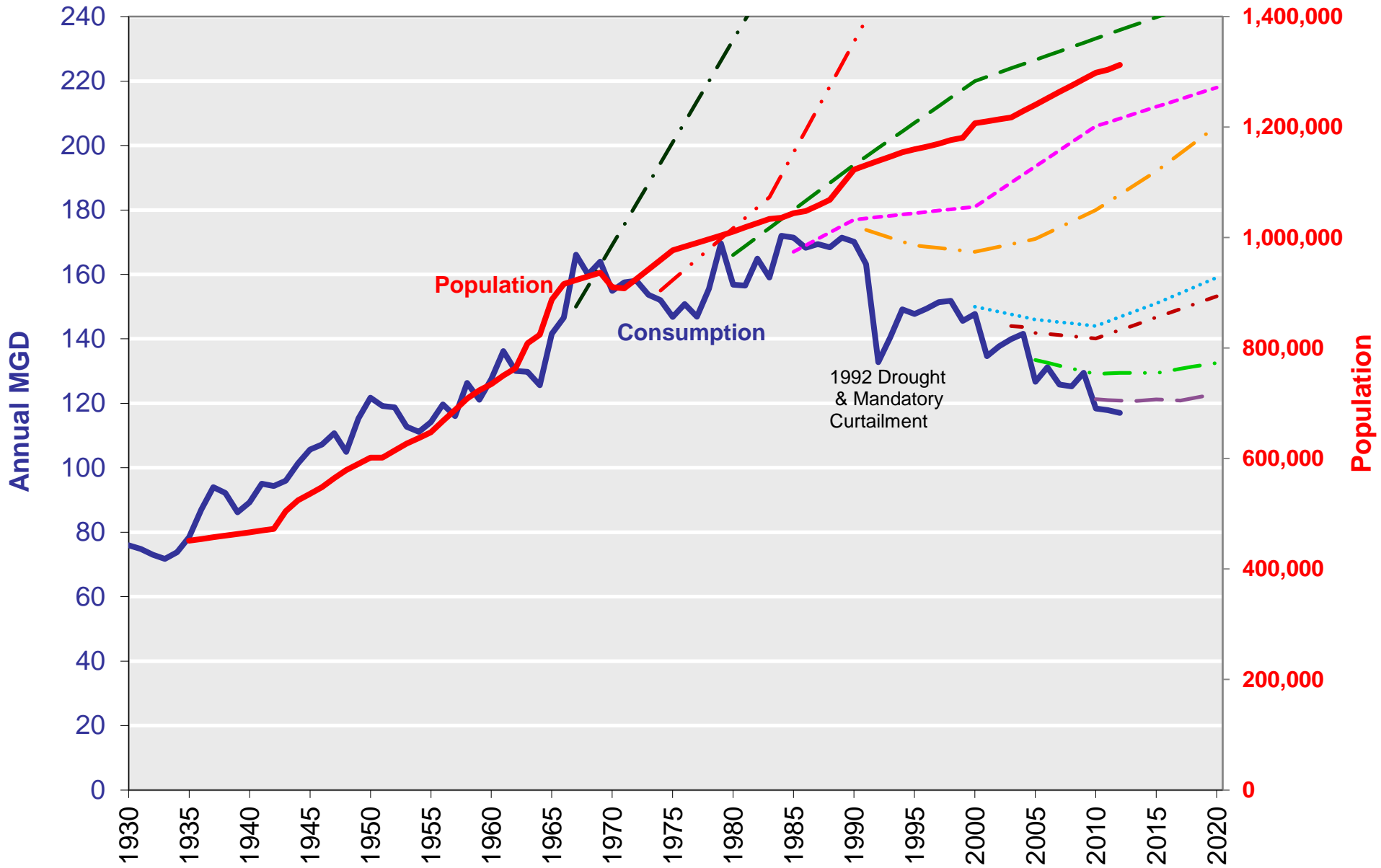
Water Demand & Population: 1930-1990



Water Demand & Population: 1930-1990



Water Demand & Population: 1930-2015

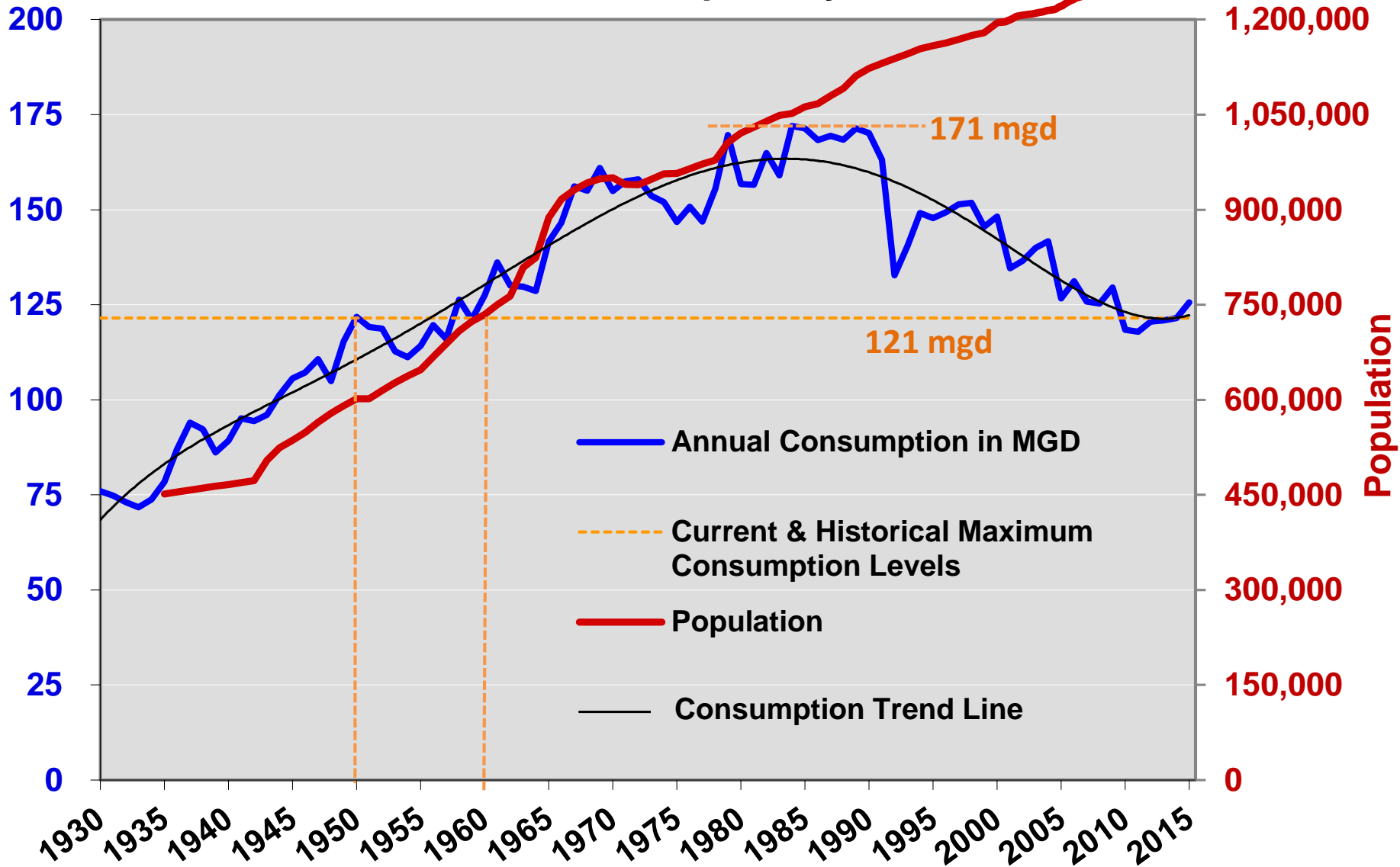


The Great Decoupling

1992 Drought and Curtailment

- Non-Revenue Water
- Pricing – Water and Sewer Rates
- Conservation Programs
- Plumbing Fixture Codes

Total Seattle Regional Water System Annual Demand in Millions of Gallons per Day: 1930-2015

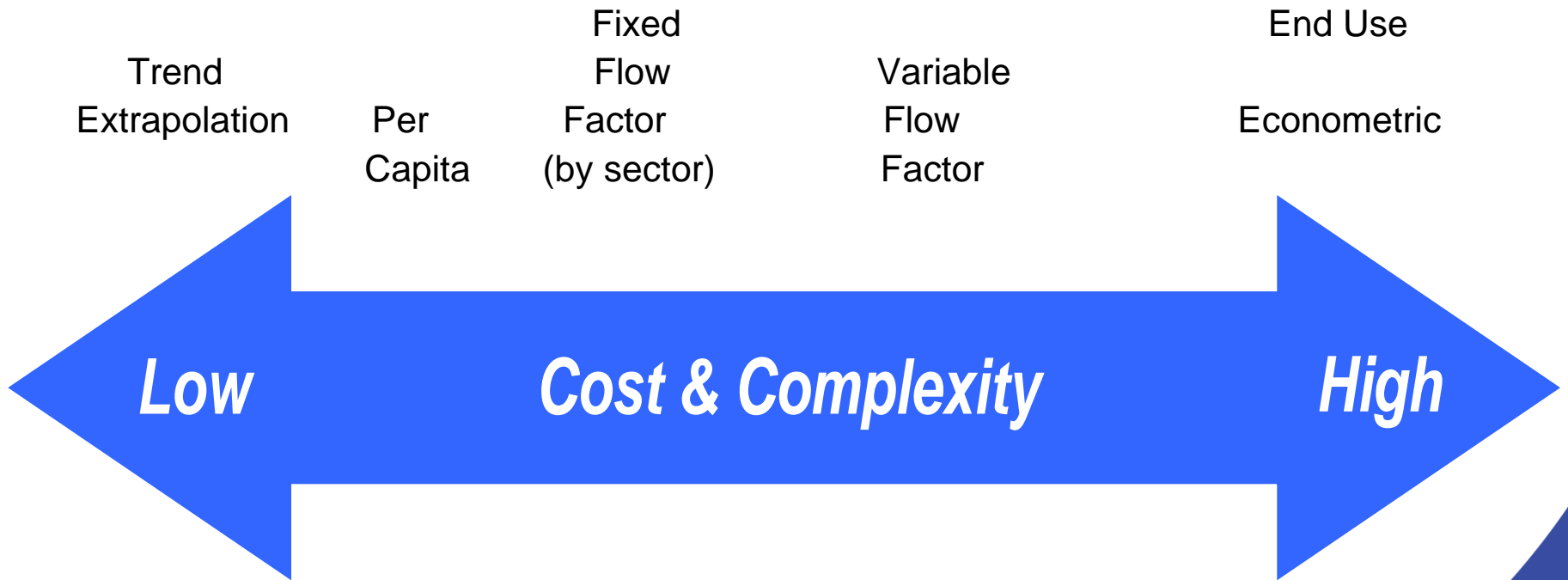


Why Do We Need a Demand Forecast?

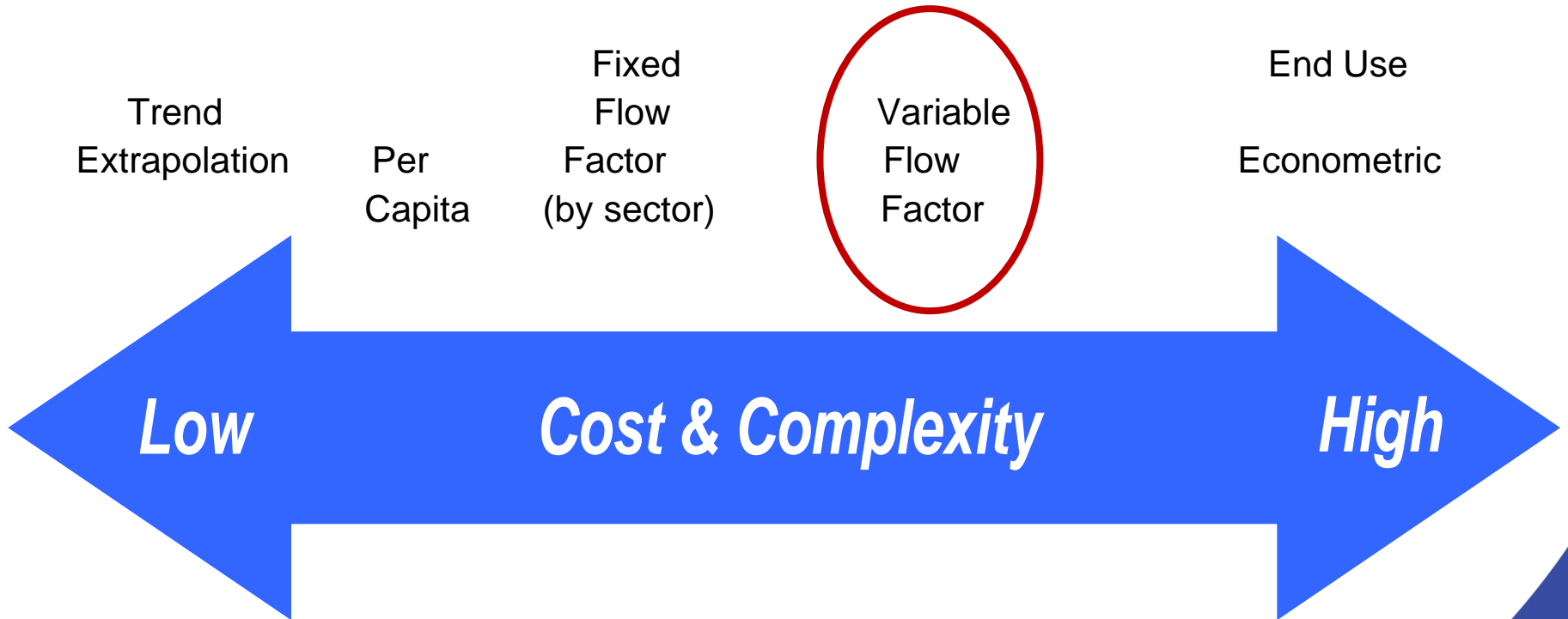
- 2019 Water System Plan
 - Supply Planning
 - Conservation Planning
 - Transmission System Planning

- Financial Planning
 - Long term
 - Short Term (Rate Design)

Forecast Methods



Forecast Methods



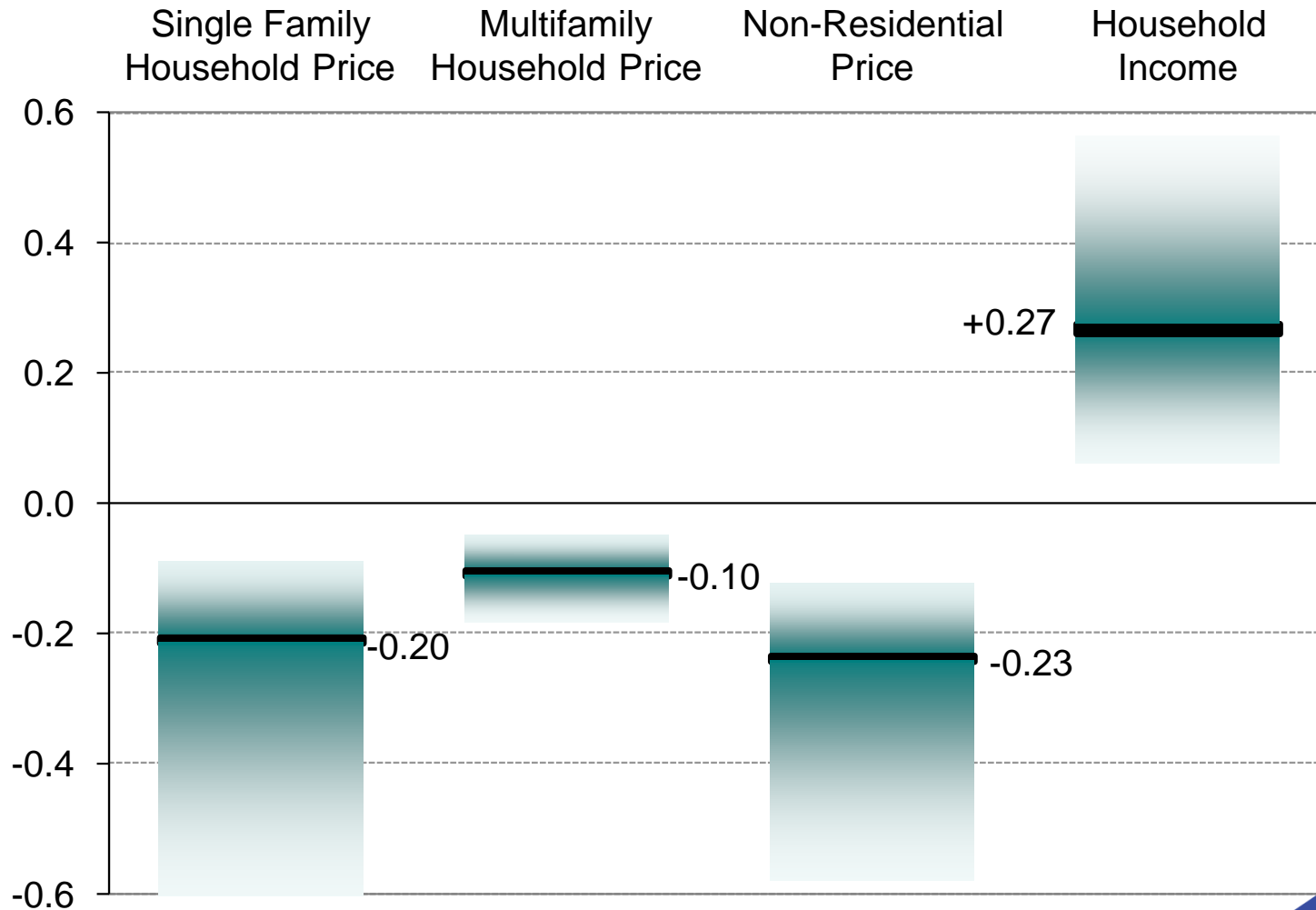
Model Overview - 1

- Base Year Flow Factors by Sector and for Seattle and Wholesale Customers:
 - Current weather-adjusted consumption
 - Current households and employment

Model Overview - 2

- Future Flow Factors are affected by:
 - Changes in average household size
 - Future income growth
 - Future growth in water/sewer rates
 - Future conservation program savings
 - Passive savings (Code Savings + Market Transformation)

Elasticities



Model Overview - 3

- Forecasts of households and employment
 - Source: PSRC (2014-2016)
 - Forecasts extrapolated beyond 2040 (generally at 2030-2040 growth rate)

Model Overview - 4

- Other Adjustments to Forecast:
 - Forecast of non-revenue water
 - Forecast of other sources of supply
 - Potential new wholesale customers
 - Block contracts

What's Changed?

1. Calibrated to 2015
2. New PSRC Demographic Forecast
3. Individual forecast for each Wholesale Customer
4. Smaller Declines in Household Size
5. Conservation Assumptions
6. No New Wholesale Customers (for now)

1. Calibrated to 2015

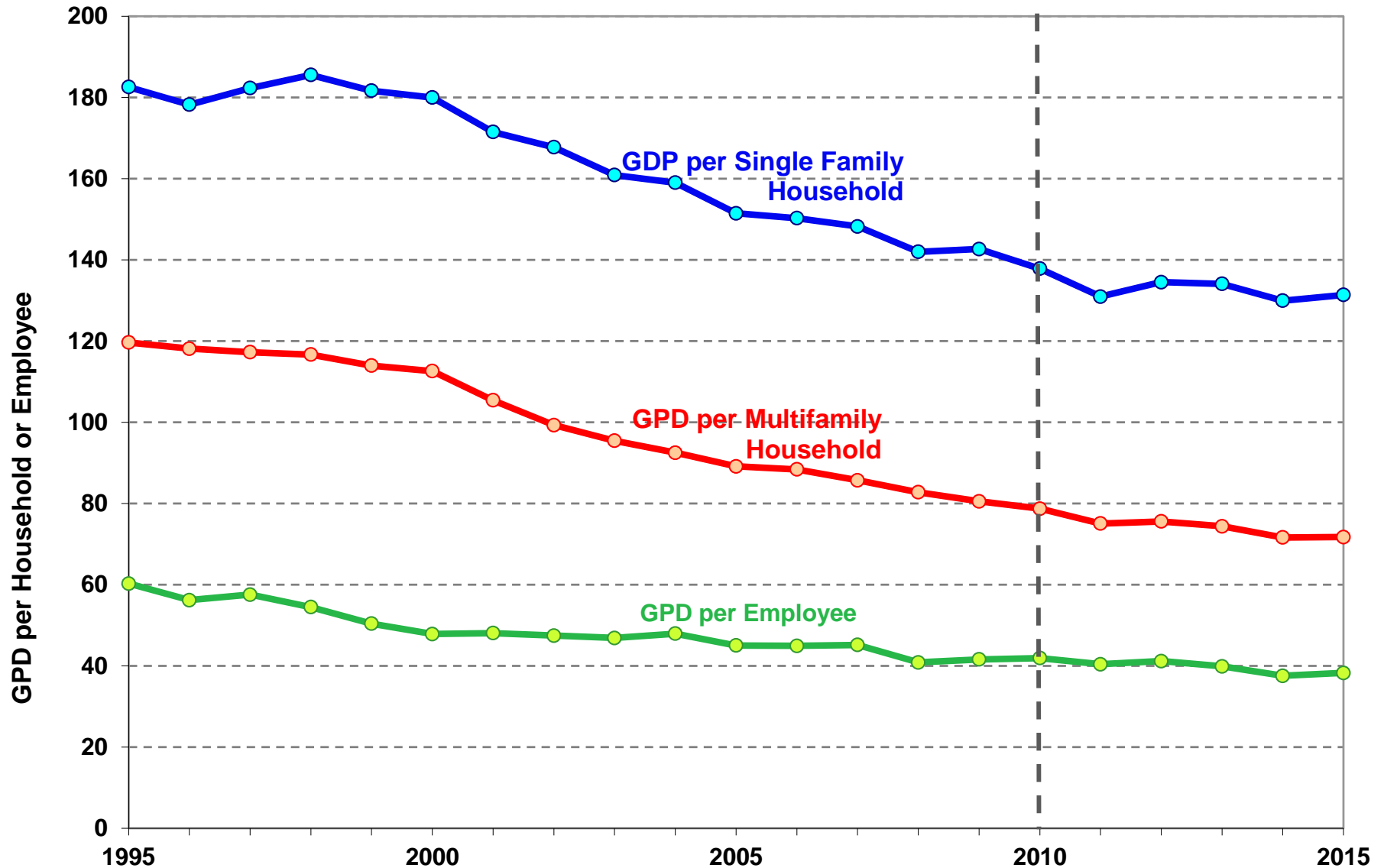
Actual weather-adjusted 2015 consumption

Flow Factors

	Units	2010	2015	% Change
Retail				
Single Family	gpd per household	138	131	-5%
Multifamily	gpd per household	79	72	-9%
Non-Residential	gpd per employee	42	38	-9%
SWP Wholesale				
Single Family	gpd per household	177	158	-10%
Multifamily	gpd per household	130	121	-8%
Non-Residential	gpd per employee	41	37	-10%

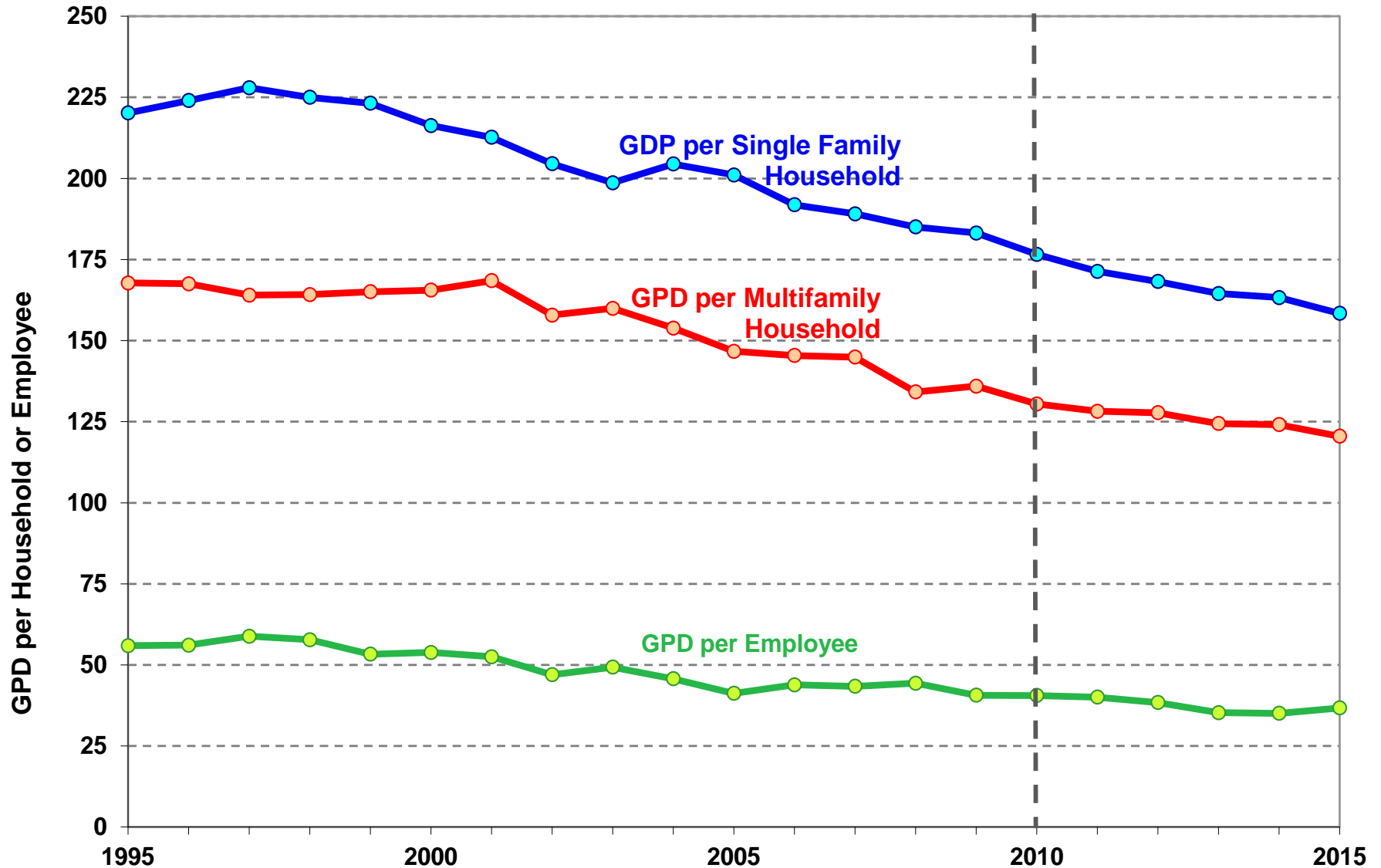
1. Calibrated to 2015

Consumption per Household or per Employee in GPD Seattle Retail



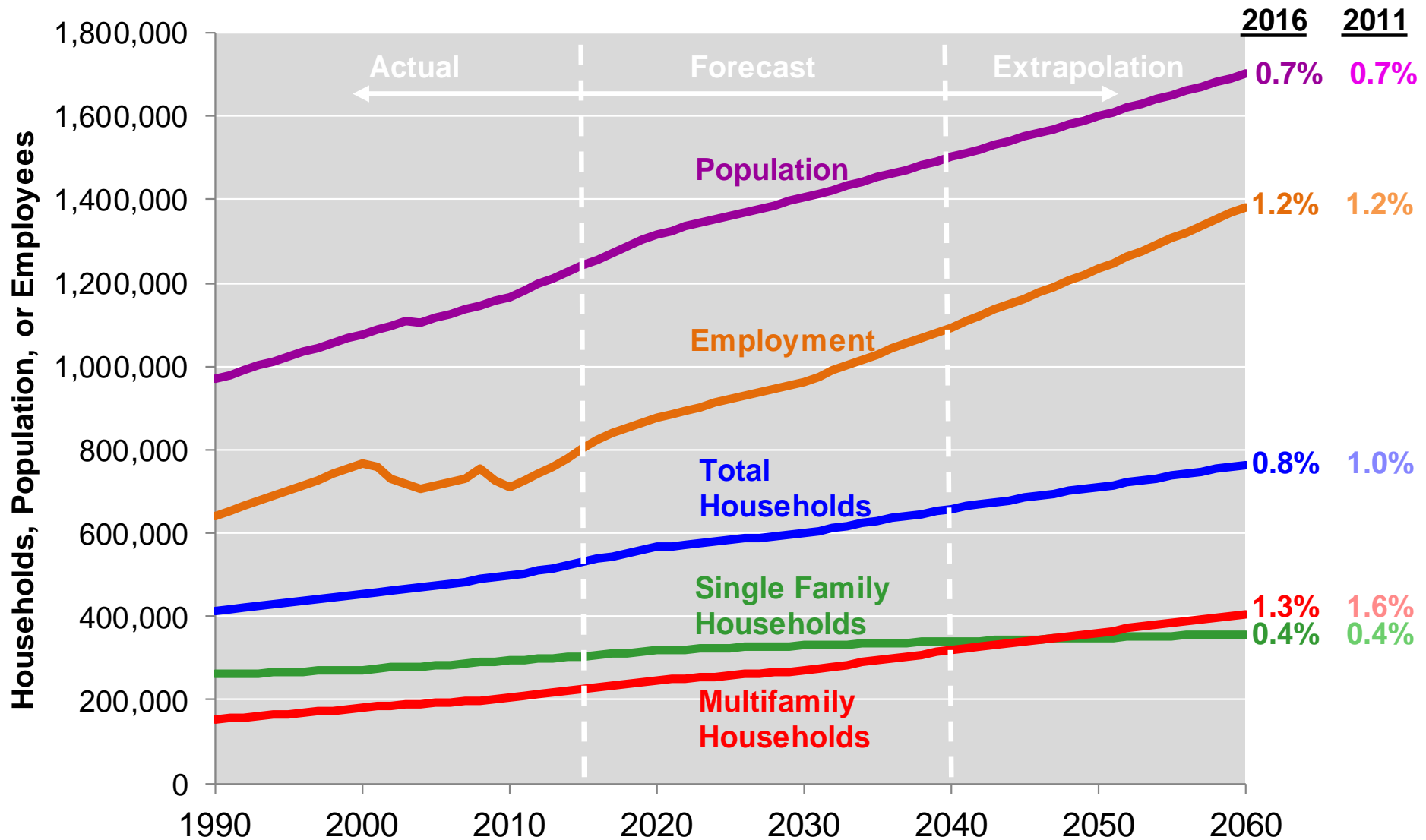
1. Calibrated to 2015

Consumption per Household or per Employee in GPD
Wholesale SWP



2. New PSRC Demographic Forecasts

PSRC Forecasts of Demographic Variables: 2015-2060



3. Individual Purveyor Forecasts

- 25 Wholesale forecasts plus Seattle
- Should be more accurate
- Basis for comparison with customers' own forecasts
- Forecasts for subsets of customers possible
- Renton question

4. Adjust for Declining Household Size

- Calculate projected annual household size
- Reduce per household flow factors by (% decrease in household size times size elasticity)
- Elasticity of demand with respect to household size = 0.38
- Source: End-Use study conducted by SWD in mid-1990s.

5. Conservation Assumptions

Programmatic Conservation

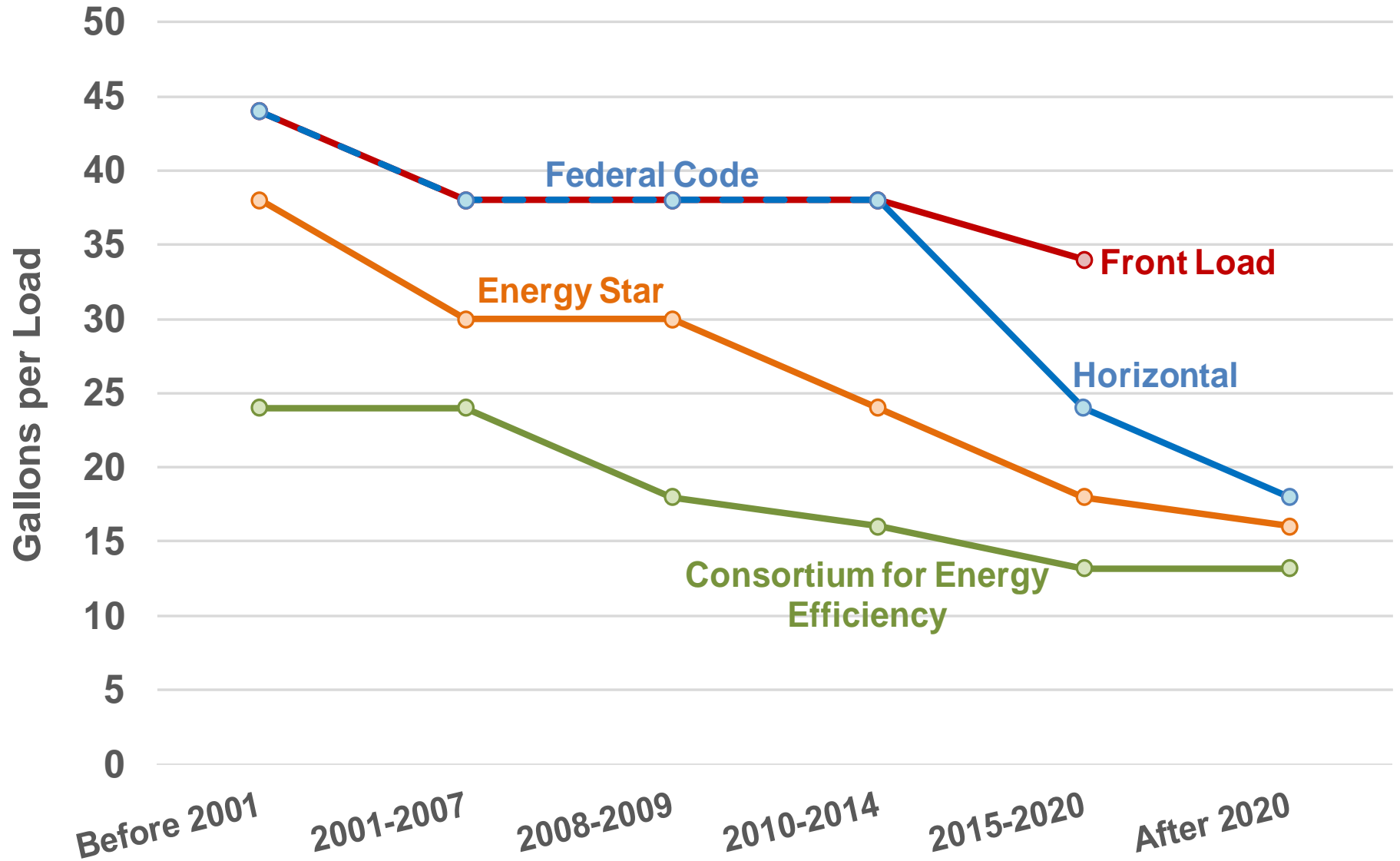
- 0.3 mgd per year 2016-2018
- Zero after 2018

5. Conservation Assumptions

“Passive” Conservation Savings

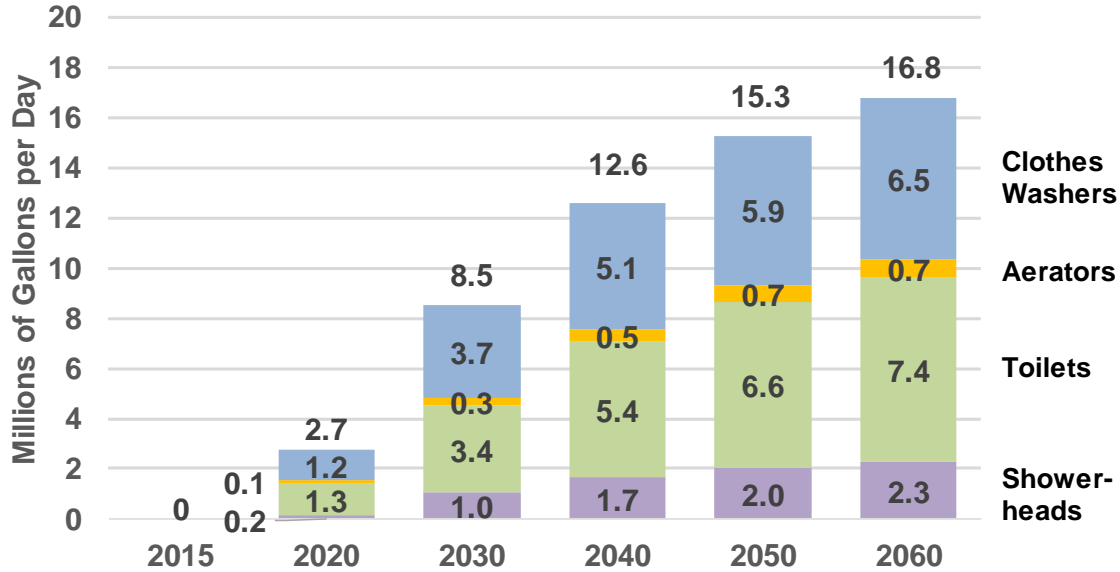
- Code savings
 - 1992 code for showerheads, toilets and aerators
 - 2002 code for aerators
 - 2015, & 2018 codes for clothes washers
- Beyond Code – Market Transformation
 - Energy Star/CEE standards for washing machines
24-34 gpw \Rightarrow 18/13 gpw
 - Toilets 1.6 gpf \Rightarrow 1.28 gpf
 - Showerheads 2.5 gpm \Rightarrow 2.0 gpm
 - Aerators 2.2 gpm \Rightarrow 2.0 gpm
- Replacement, New Construction, PSE

Washing Machine Code & Standards in Gallons per Load

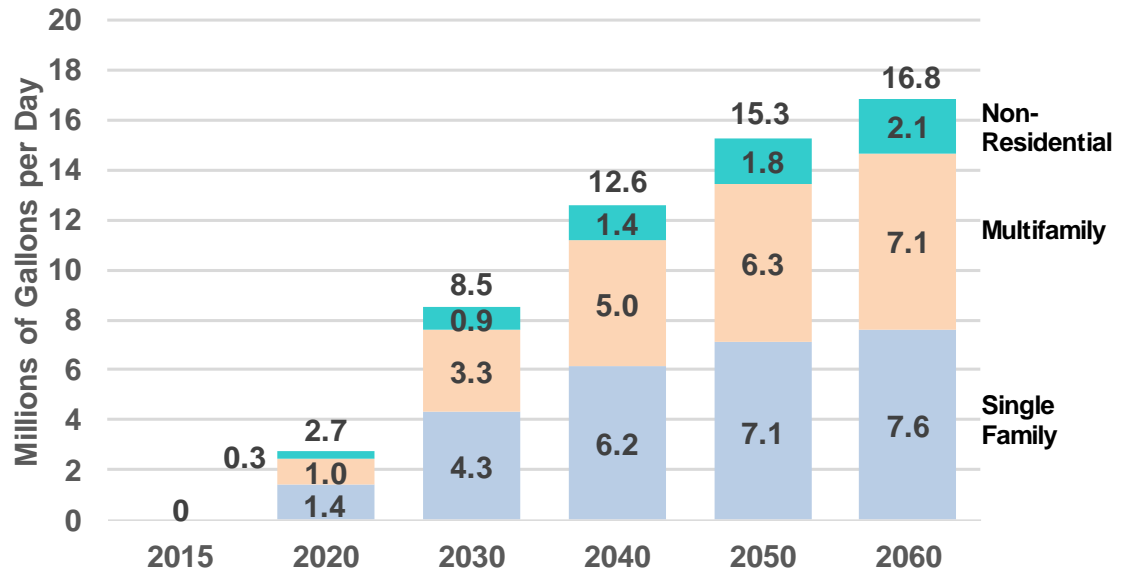


5. Conservation Assumptions

Cumulative Passive Savings by Fixture



Cumulative Passive Savings by Customer Class



5. Conservation Assumptions

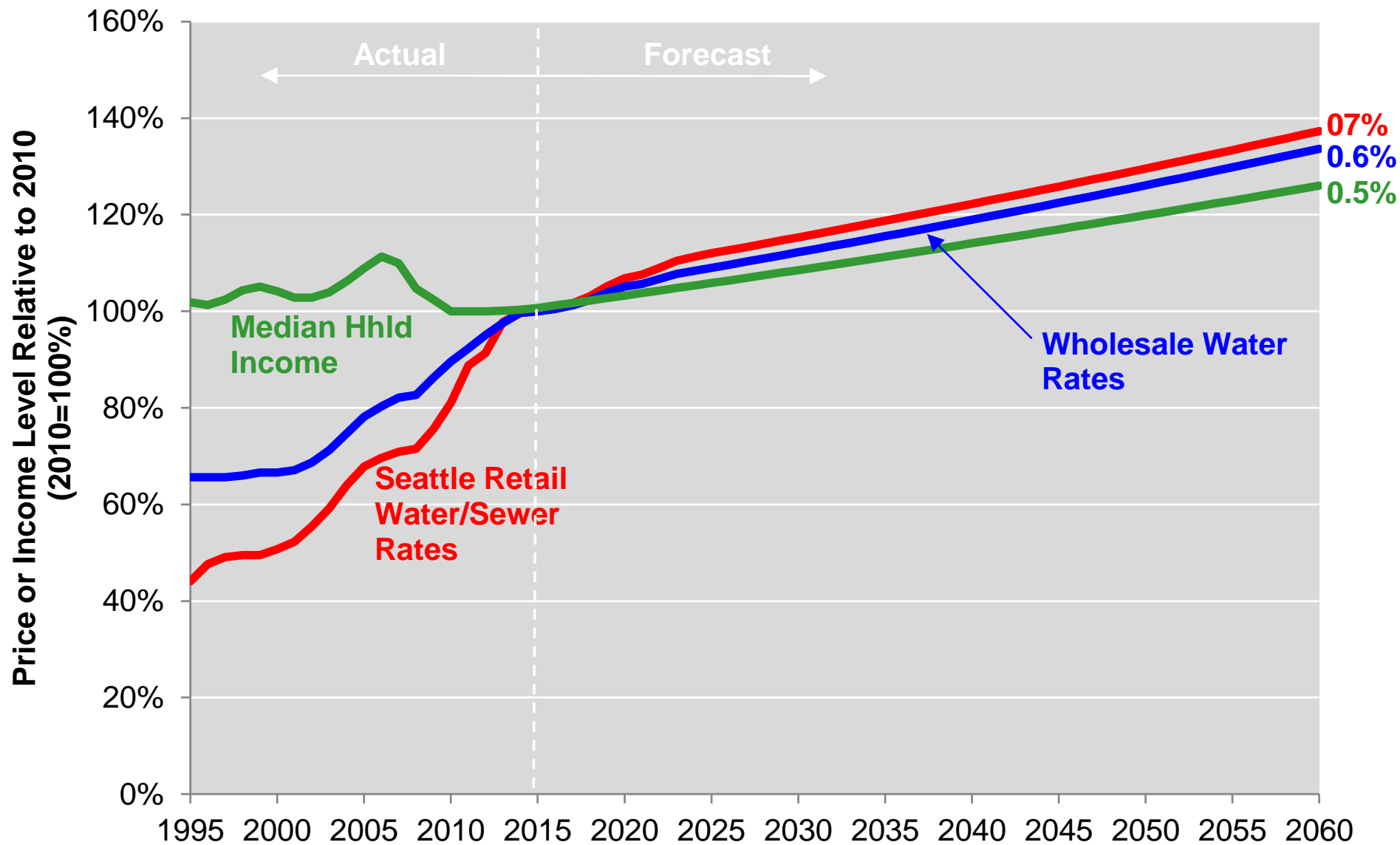
Water and Sewer Rates

- Since 1974, 3.5% average annual growth in inflation-adjusted rates.
- Annual Growth Rates

	Seattle Retail*	Wholesale Customers
2015-2020	1.3%	0.9%
2020-2025	0.9%	0.9%
2020-2060	0.6%	0.6%

* Reflects anticipated increases in water and sewer rates

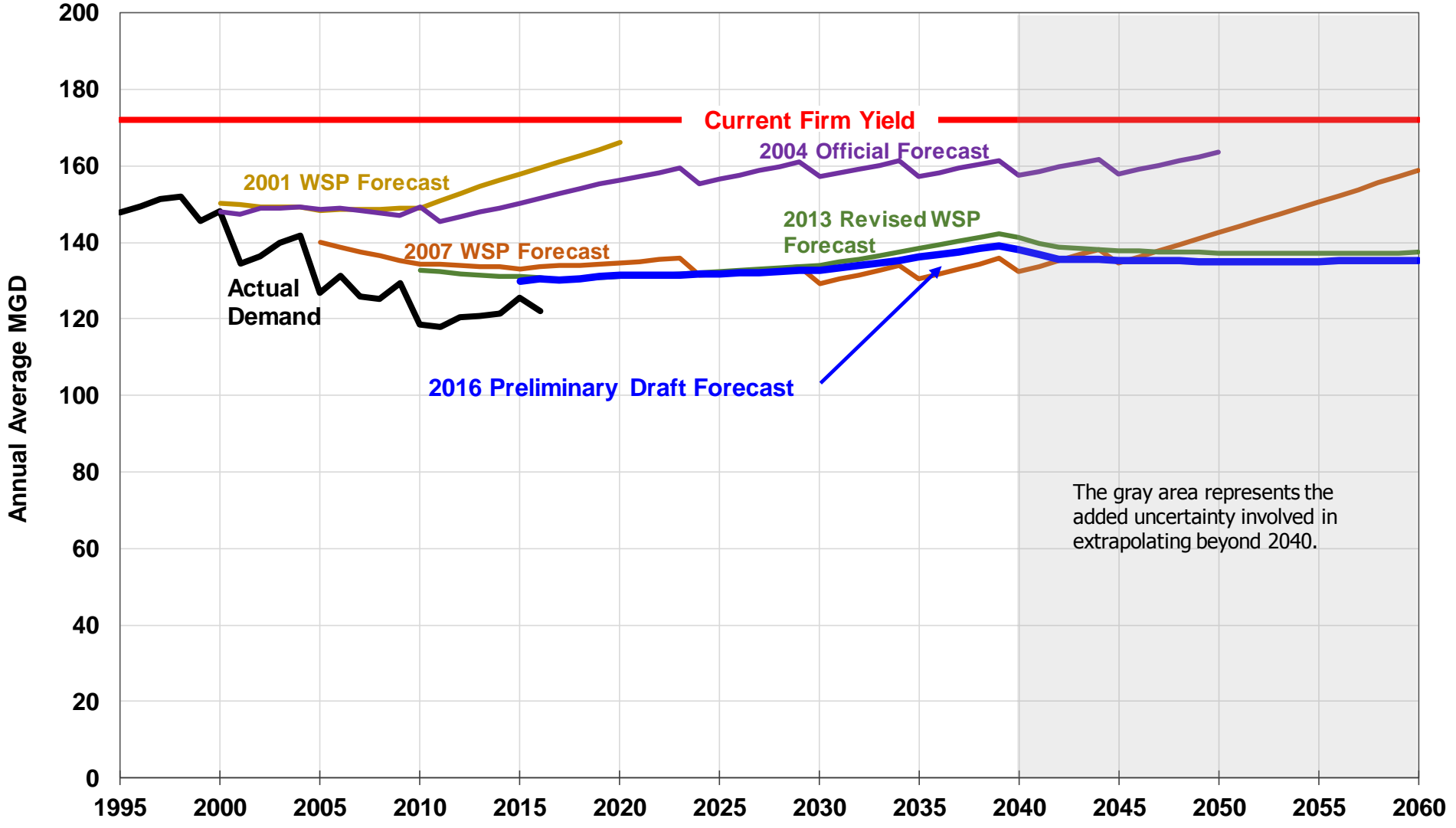
Water/Sewer Rates & Income



Non-Revenue Water

- Seattle Retail Non-Revenue Water:
6.3 mgd \Rightarrow 8.4 mgd
- Wholesale Distribution System Non-Revenue Water: 6%
- Transmission System Non-Revenue Water: 1%

2016 Draft Forecast Compared to Earlier Forecasts



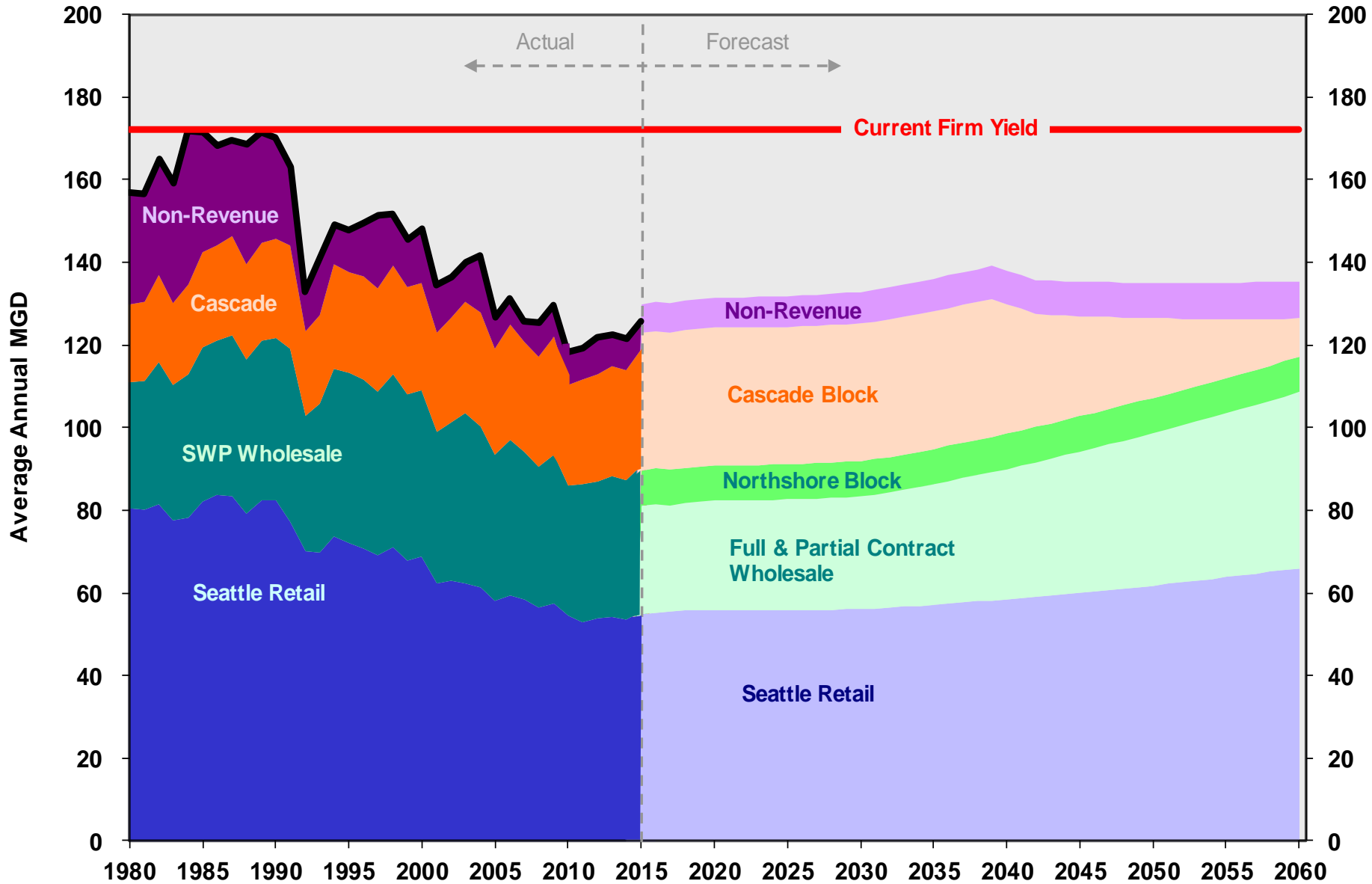
The gray area represents the added uncertainty involved in extrapolating beyond 2040.

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Components of Actual and Forecast Demand: 1980-2060

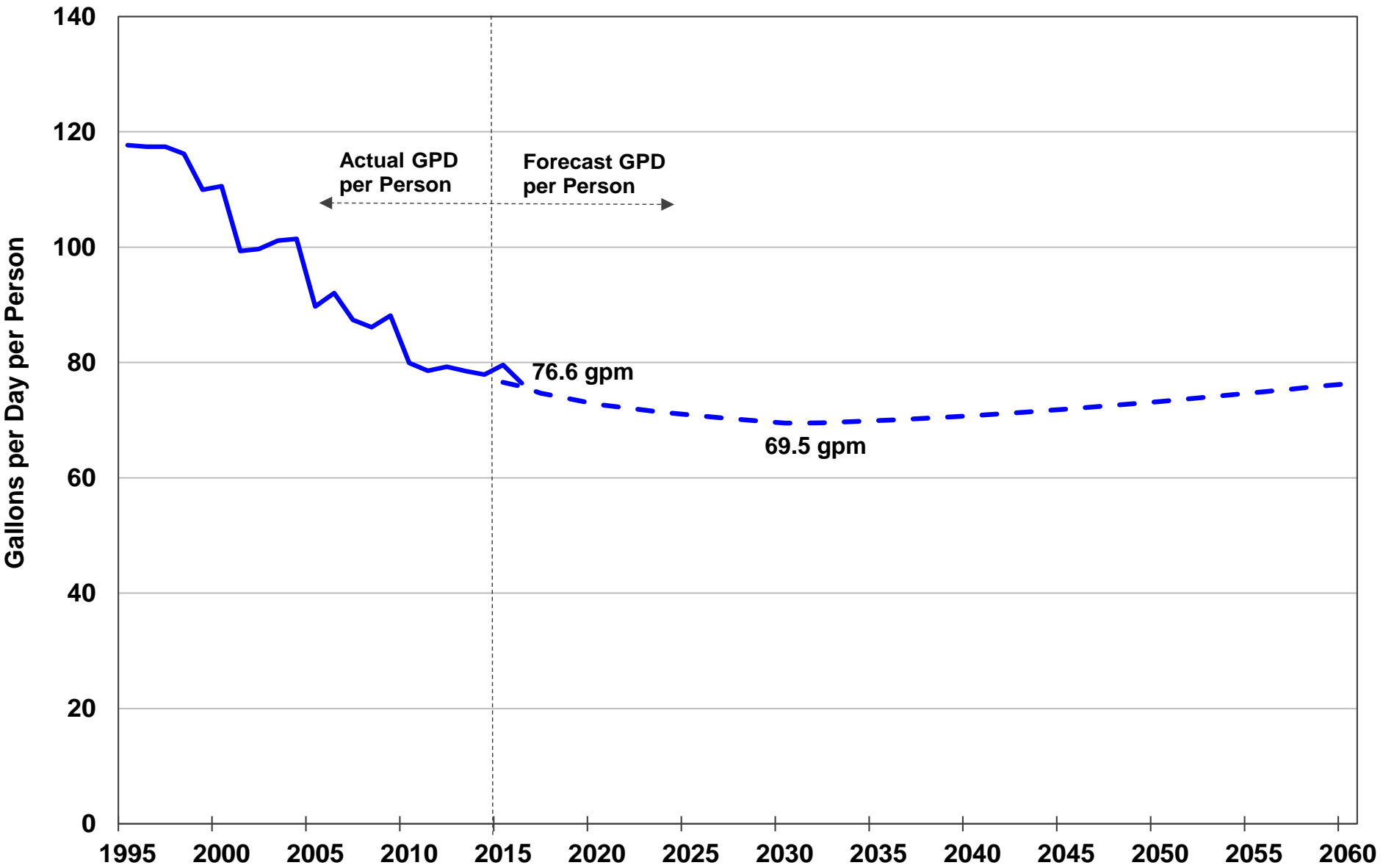


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Actual & Forecast Water Consumption Per Capita: SPU Water System



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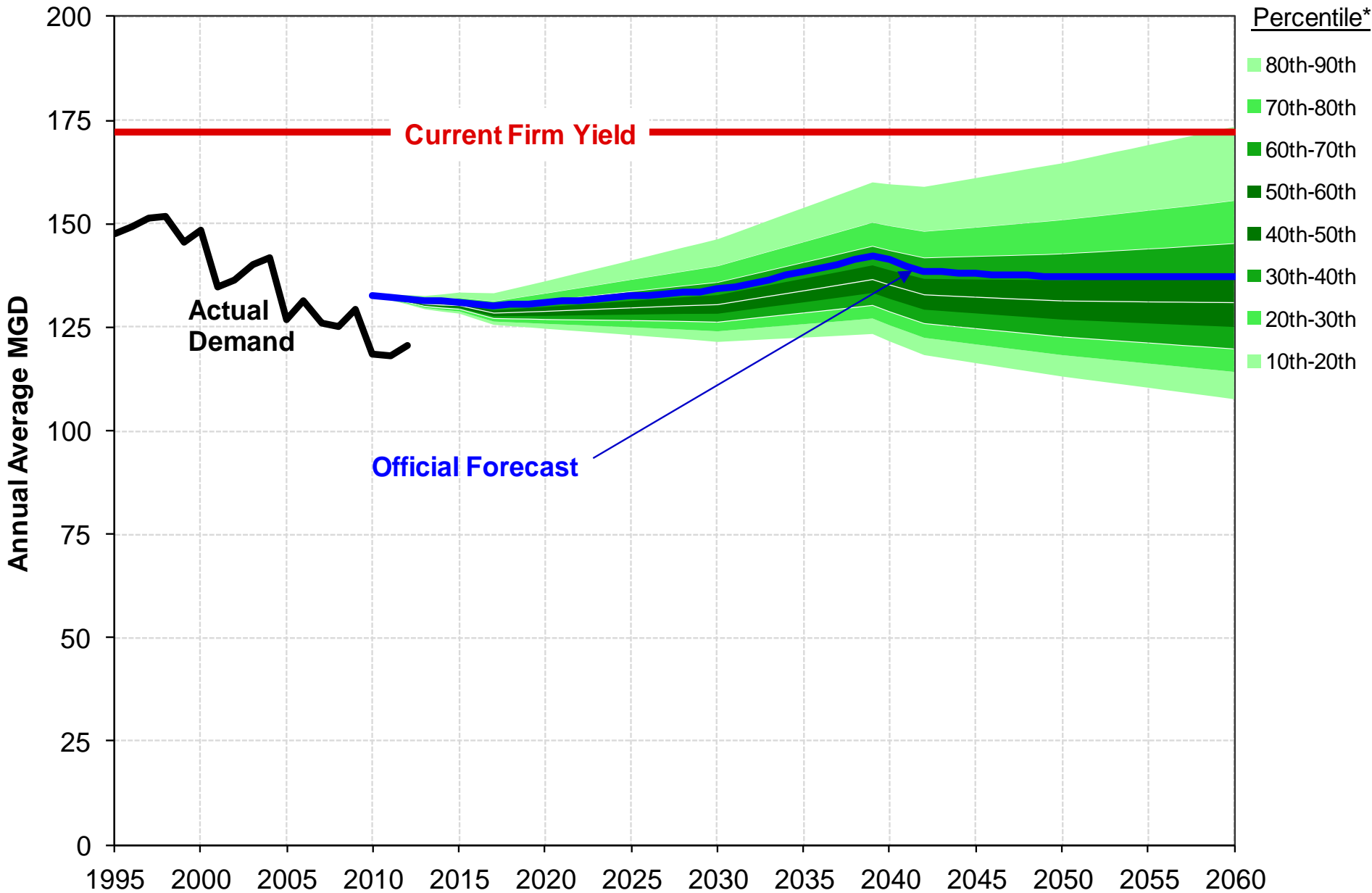
Further Refinements

- Renton Clarification
- Potential New Wholesale Customers
- New Conservation: 2019-2028 WUE Goal
- Rate Forecasts
- Uncertainty Analysis

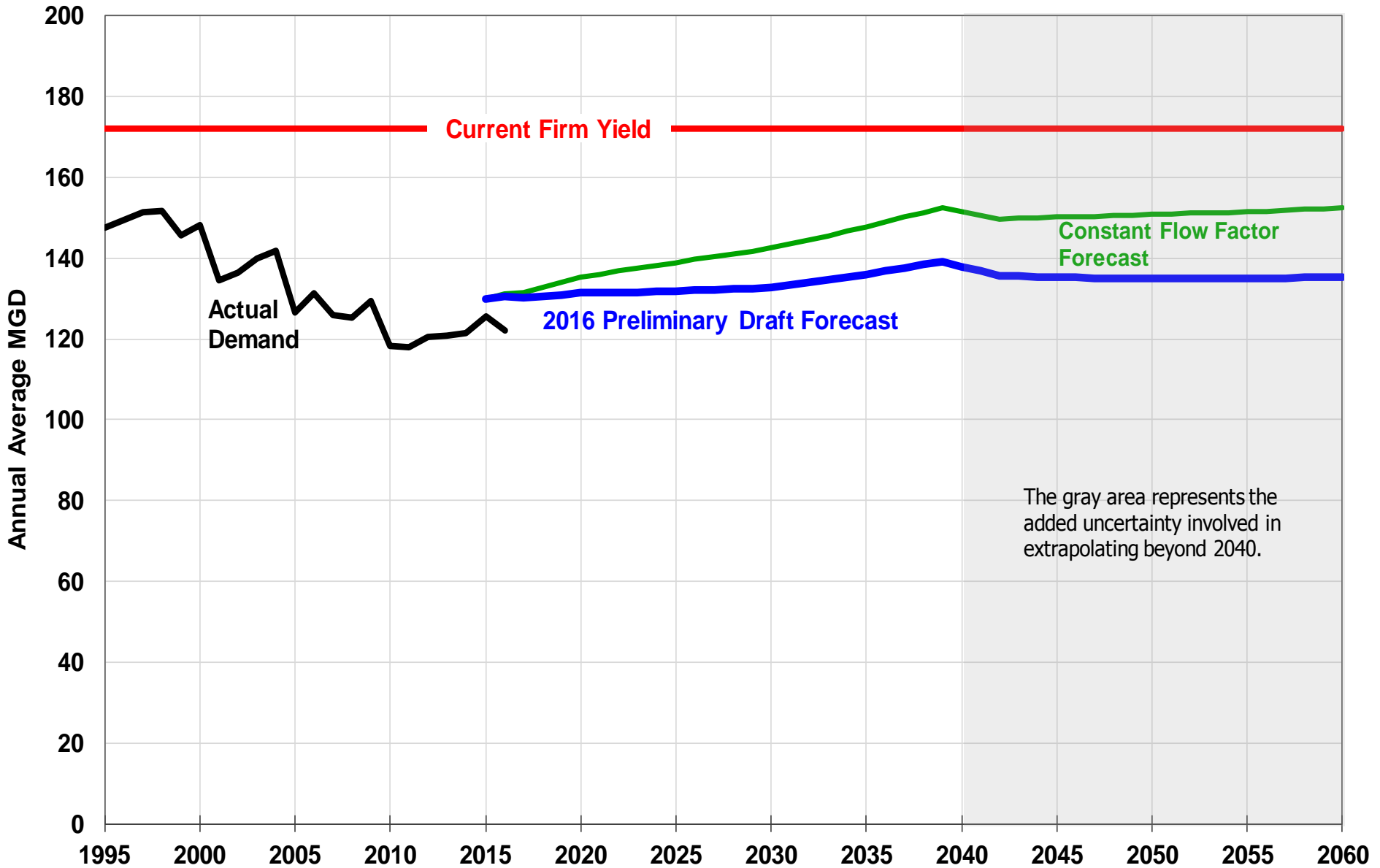
Questions

Seattle
 Public
Utilities

2013 Water Demand Forecast with New Cascade Contract



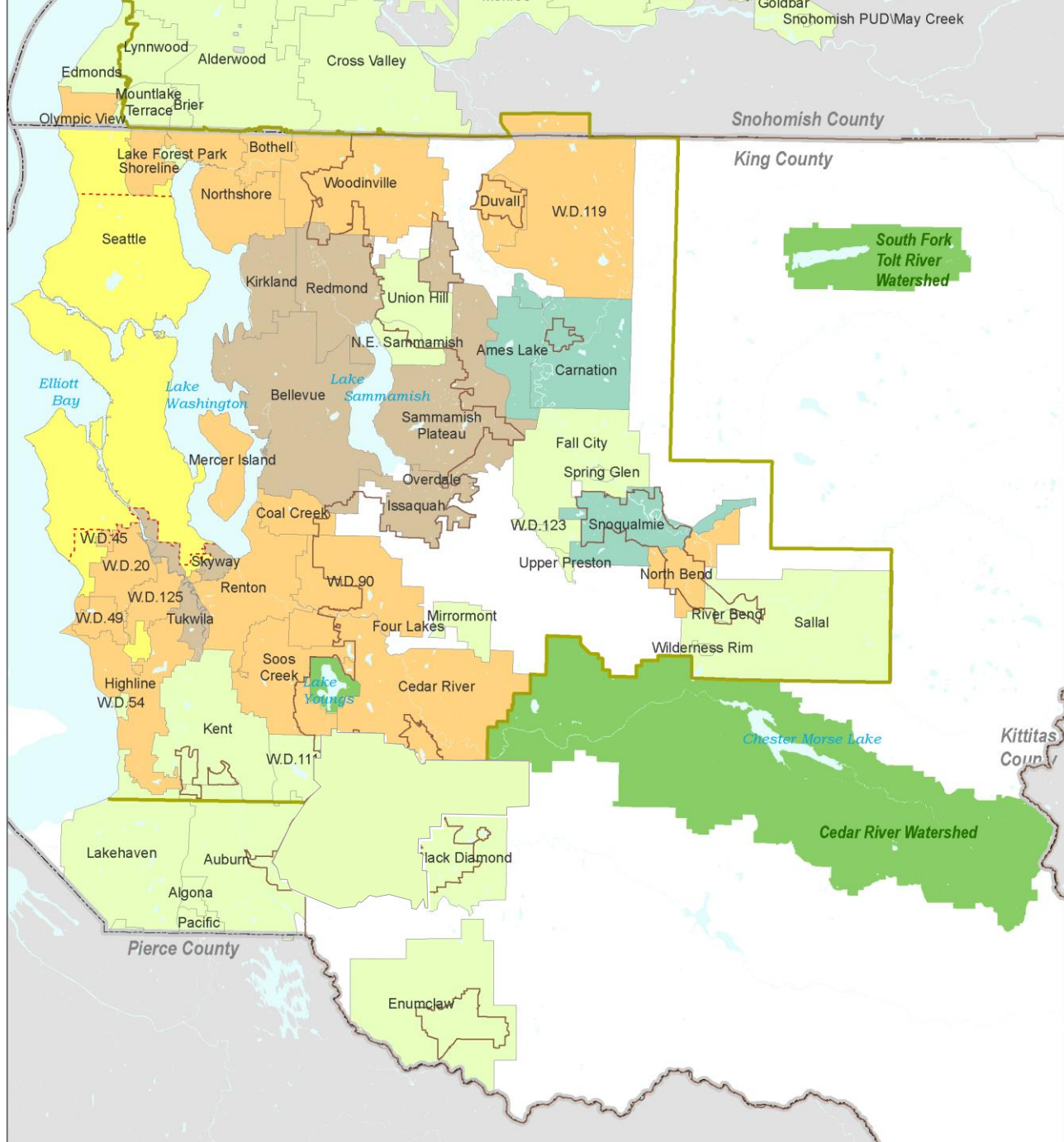
2016 Draft Forecast Compared to Forecasts with Constant Flow Factors



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Seattle Public Utilities Water Service Area