Why Demand Matters

Eight Reasons Why Studying Water Demand Is Critical for the City of Phoenix Water Services Department
8. Peaking Characteristics
Determine Facility Needs

- Daily peaking characteristics of customers determines sizing and operation of facilities like boosters and reservoirs
- Monthly & annual peaking characteristics of customers determines sizing and operation of treatment plants
- Changes in indoor fixture/appliance use is affecting daily peaking
- Declines in outdoor irrigation use is dramatically reducing summer peaking and weather-related volatility
Seasonal Peaking Has Been Declining: Difference Between Peak and Off Peak Demands is Shrinking (Lower Volatility)
7. Design Guidelines Based on Development Demand

- Developers routinely build smaller mains and sewers (12” and less pipes) and often build medium-sized facilities (transmission mains, big sewers, etc.)
- Facilities are sized based on water demand and wastewater generation factors
- Factors have been revised downwards to take account of falling fixture/appliance flows
- More changes inevitable – ADEQ scrutinizes
- Major $ savings provided to developers and WSD
# Improved Planning – Specific Development Level: Revised Wastewater Design Standards

<table>
<thead>
<tr>
<th>Land Use</th>
<th>2004 Design Standards</th>
<th>Proposed Design Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit Daily Flow / Unit (gal)</td>
<td>Unit Daily Flow / Unit (gal)</td>
</tr>
<tr>
<td>Single Family</td>
<td>Dwelling 320</td>
<td>Dwelling 240</td>
</tr>
<tr>
<td>Multifamily</td>
<td>Dwelling 250</td>
<td>Dwelling 180</td>
</tr>
<tr>
<td>Commercial (retail / mall)</td>
<td>Sq-ft .5</td>
<td>1000 sq-ft 75</td>
</tr>
<tr>
<td>Commercial (office)</td>
<td>1000 sq-ft 100</td>
<td>1000 sq-ft 90</td>
</tr>
<tr>
<td>Warehousing / Big Box Retail</td>
<td>N/A N/A</td>
<td>1000 sq-ft 25</td>
</tr>
<tr>
<td>Industrial</td>
<td>Person 50</td>
<td>1000 sq-ft 50</td>
</tr>
<tr>
<td>Schools</td>
<td>Student 75</td>
<td>Student 20</td>
</tr>
<tr>
<td>Hotel / Motel (w/o restaurant)</td>
<td>Room 130</td>
<td>Room 100</td>
</tr>
<tr>
<td>Hotel (w/ restaurant)</td>
<td>Room</td>
<td>Room 150</td>
</tr>
<tr>
<td>Resort</td>
<td>Room</td>
<td>Room 210</td>
</tr>
<tr>
<td>Hospital</td>
<td>N/A N/A</td>
<td>Bed 300</td>
</tr>
</tbody>
</table>

City of Phoenix
Lower flows allow smaller lift stations to replace more expensive large lift station in plan, saving tens of $ millions.
• Reclaimed water facilities entirely dependent on wastewater flows for supply
• Falling per capita and per unit wastewater flows cause aggregate flows to treatment plants to remain the same or flat line even with growth
• Wastewater flows and thus reclaimed water supplies have not increased as anticipated -> existing flows allocated
• Plans for additional future reclaimed water facilities will be scaled back because of lower flows

6. Wastewater Flows = Reclaimed Water Capacity
Wastewater & Reclaimed Water Flows Have Remained Level Even With Growing Population
Plans from the 1980s and 1990s anticipated two reclamation plants north of the CAP – probably only one will be needed now because of reduced flows.
5. Impact Fee Calculation
Requires Detailed Numbers

- Common law and State Statutes require detailed analysis of demand by different customer classes for infrastructure and water resources
- Development community scrutinizes calculations
- Impact fees have provided over a half billion dollars worth of infrastructure and water resources (‘96-’13)
- When development occurs on large scale again, impact fees will be key to funding new infrastructure and paying down debt
Estimate of Value of Water-Related Impact Fees and Facilities
Dedicated In-Lieu of Fees, FY 1996-97 to FY 2012-13
Development levels are unusually low now but could come back to historic levels, triggering need for infrastructure and thus impact fees.
• Reduced flows can lead to smaller capital improvement plans because of delays and cost reductions for projects
• Smaller lines, boosters, lift stations, reservoirs required
• Less capacity required at water treatment plants
• Less volume (but more solids) to wastewater plants
• Not without challenges:
  • Slower turnover in mains can lead to expensive chlorine residual issue costs
  • Low flows in sewers can lead to higher O&M/rehab costs

4. Flows Affect CIP and O&M Planning and Management
Lake Pleasant Water Treatment Plant under construction – cost of project: $220 million +

If per unit water demands had remained steady during the past twenty years an additional plant (Western Canal) and/or an expansion of Lake Pleasant would have also been required soon.
FY 1998-2003 CIP Growth Versus Non-Growth Comparison

- Growth
- Non-Growth

64% Growth
36% Non-Growth
FY 2016-2020 CIP Growth Versus Non-Growth Comparison

- Growth
- Non-Growth

92%

8%
3. ‘Smart’ Demand Management Requires Targeted Efforts

- Old conservation programs often followed ‘shotgun’ approach
  - Sometimes ineffectual or counter-productive
  - When successful sometimes blunt and caused irritation
- Need for future programs that can target specific customers and water uses
  - Provide most benefits to customers and WSD
  - Ensure economic development & social goals met
  - Differentiate between long and short-term objectives
Past water efficiency initiatives have tended to focus on single family customers.

Future initiatives may focus more on promotion of efficiency efforts in the ICI sector; for example measures to accelerate adoption of new equipment or artificial turf.
COP WSD RESEARCH WILL LEAD TO STUDIES TO IDENTIFY MOST COST-EFFECTIVE ‘WIN-WIN’ POTENTIAL INTERVENTIONS

Priority Savings From Literature Review

Metropolitan Water District of Southern California Water Conservation Market Study

<table>
<thead>
<tr>
<th>Business Type</th>
<th>End Use</th>
<th>Annual Water Use AFY</th>
<th>Savings Potential AFY</th>
<th>Percent Reduction</th>
<th>Estimated Cost</th>
<th>$/AFY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beauty Salons</td>
<td>Hair Washing</td>
<td>5,440</td>
<td>2,720</td>
<td>50%</td>
<td>$587,570</td>
<td>$216</td>
</tr>
<tr>
<td>Fitness Centers</td>
<td>Shower</td>
<td>6,268</td>
<td>2,095</td>
<td>33%</td>
<td>$552,060</td>
<td>$264</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>Cooling &amp; Heating</td>
<td>7,895</td>
<td>1,579</td>
<td>20%</td>
<td>$462,992</td>
<td>$293</td>
</tr>
<tr>
<td>Full-Service Restaurants</td>
<td>Toilet</td>
<td>7,061</td>
<td>1,387</td>
<td>20%</td>
<td>$391,532</td>
<td>$282</td>
</tr>
<tr>
<td>Full-Service Restaurants</td>
<td>Dishwashing</td>
<td>3,519</td>
<td>1,130</td>
<td>32%</td>
<td>$1,395,125</td>
<td>$1,235</td>
</tr>
<tr>
<td>Fitness Centers</td>
<td>Pools &amp; Spas</td>
<td>4,459</td>
<td>1,106</td>
<td>25%</td>
<td>$4,119,670</td>
<td>$3,725</td>
</tr>
<tr>
<td>Fitness Centers</td>
<td>Laundry</td>
<td>4,180</td>
<td>1,084</td>
<td>26%</td>
<td>$755,314</td>
<td>$697</td>
</tr>
<tr>
<td>Limited-Service Restaurants</td>
<td>Toilet</td>
<td>5,481</td>
<td>1,076</td>
<td>20%</td>
<td>$303,942</td>
<td>$282</td>
</tr>
<tr>
<td>Offices of Physicians</td>
<td>Cooling &amp; Heating</td>
<td>4,969</td>
<td>994</td>
<td>20%</td>
<td>$291,377</td>
<td>$293</td>
</tr>
<tr>
<td>Offices of Physicians</td>
<td>Toilet</td>
<td>4,689</td>
<td>921</td>
<td>20%</td>
<td>$260,010</td>
<td>$282</td>
</tr>
</tbody>
</table>
2. Rate Revenues & Structure
Dependent on Demand

• Network and fixed costs remain almost same even if per unit and per capita volume declines steadily
• Falling demand usually leads to need to increase volume-based rates if full cost recovery required
• Difficult to sell public and decision-makers on rate increases for inflation; additional increases very difficult
• Critically important to understand demand and cost profiles of different types of customers
• Need to understand how different customers will be affected by rate & rate structure changes
Volume-based revenue is increasingly important – and volume-based revenue is dependent on trends in demand.
Hypothetical Utility - Falling Demand, Aging Facilities, No Rate Increases, Mild Inflation and No Growth In Accounts or Network

3.7% per year rate increase needed to maintain positive cash flow

$52.5 Million Shortfall By 2030

Assumptions:
0% per year increase in fixed charges and rates
1.5% per year decrease in water volume
2% per year increase in big 3 & rehabilitation costs
2% per year growth in rehabilitation projects
1% per year increase in labor/administrative costs
0% per year increase in debt service costs
No growth in accounts or expansion of network/plant
• Impossible to understand long-term supply needs without understanding long-term supply trends
• Numerous additional supply projects eliminated or deferred because of demand reductions to date
• Understanding ‘how low can you go’ key to determining long-term supply needs
• Falling demands in some cases can cause ‘hardening’ of demand and decrease margin of safety
• Shift from emphasis on new supplies to supply back-up

1. Demand Determines Long-Term Supply Needs

Note that total water demands have fallen for first time in over 50 years
Demand goes up and down in the short term with variations associated with weather, rate changes, and the economy but the long term trend is obvious – a roughly 20% decline in GPCD from 2000 to 2010.
SPU Water Demand & Forecasts: 1930-2011

Annual MGD

1967 SWD Forecast
1973 RIBCO Forecast
1980 Complan Forecast Medium
1980 Complan Forecast Medium-Low
1985 Complan Forecast-Medium
1985 Complan Forecast-Low
1993 WSP Forecast

1992 Drought & Mandatory Curtailment
Boeing Recession

Firm Yield

Actual Annual
5-Year Moving Average
City of Phoenix Actual Demand Versus Water Demand Projected in Past Water Resource Plans (Acre-Feet/Year)

- Actual Total Water Production
- 1985 Projected Demands
- 1995 Projected Demands
- 2000 Projected Demands
- 2005 Projected Demands (GP Option)
- 2005 Projected Demands (HD Option)
Why Demand Matters

Doug Frost
City of Phoenix Water Services Department
douglas.frost@phoenix.gov