EAST BAY MUNICIPAL UTILITY DISTRICT

Water Conservation Workshop

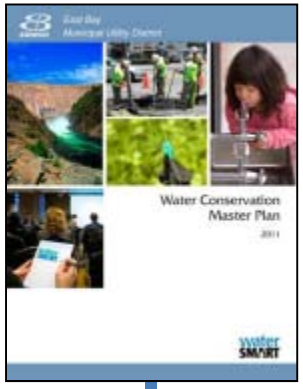
Board of Directors

May 10, 2016

Agenda

- Water Conservation Master Plan Overview
- Water Conservation Trends
- Customer Engagement
- Asset Management /Supply-Side Conservation
- Technology Research and Policy
- Questions

Water Conservation Master Plan (WCMP)



- Originated 1994 under WSMP 2020
- Revised in 2011 under WSMP 2040

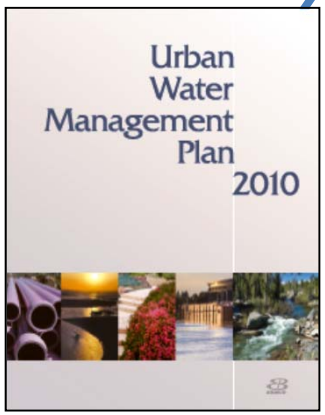
WSMP 2020 / **1994 WCMP**

WSMP 2040 / **2011 WCMP**

2020 UWMP / **2021 WCMP**

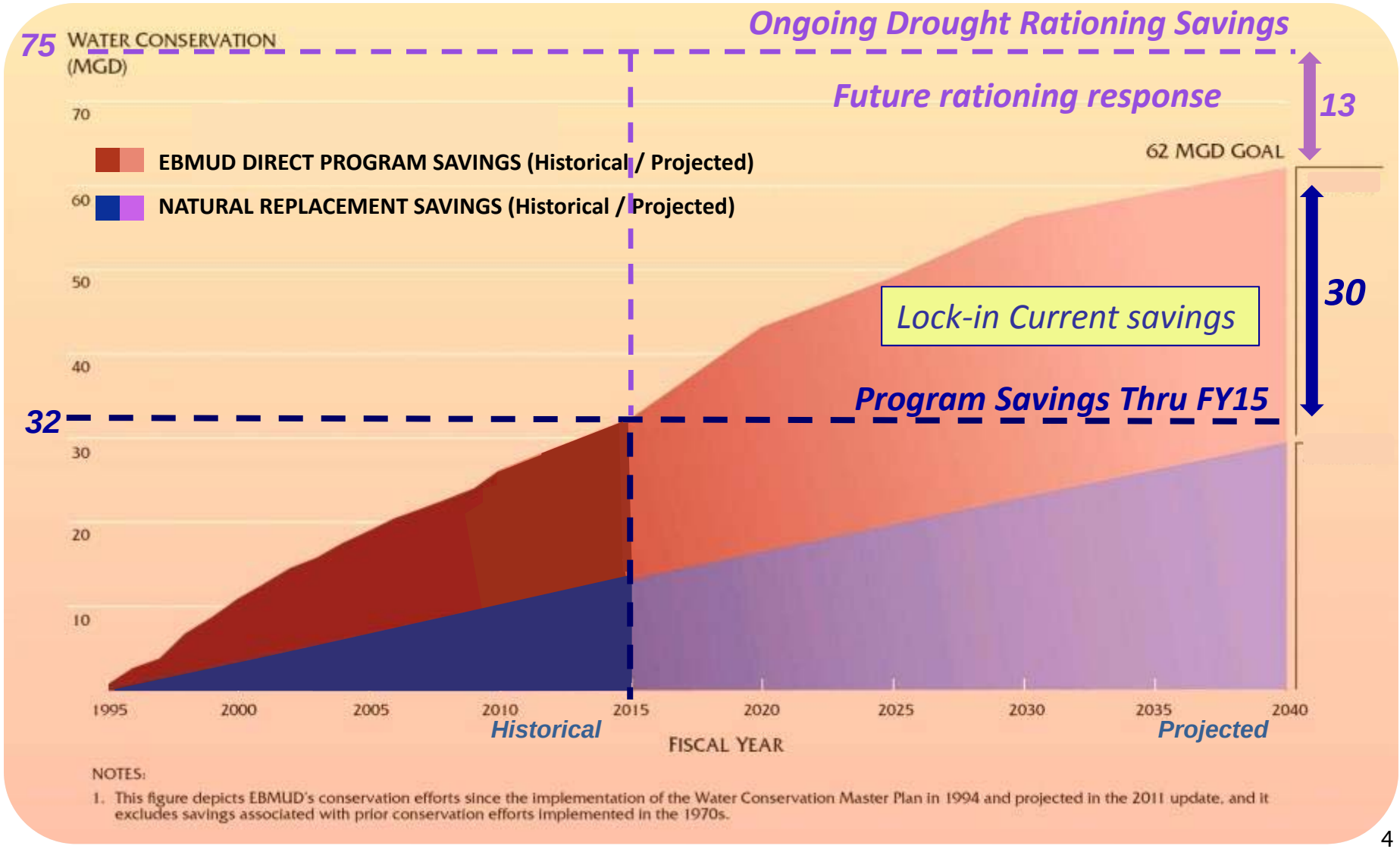
2030 UWMP / **2031 WCMP**

2040 UWMP / **2041 WCMP**



- Updated every 10 years linked to UWMP

Water Conservation Master Plan: Water Savings & Targets (1995-2040)

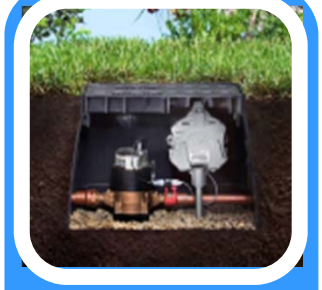


NOTES:

1. This figure depicts EBMUD's conservation efforts since the implementation of the Water Conservation Master Plan in 1994 and projected in the 2011 update, and it excludes savings associated with prior conservation efforts implemented in the 1970s.

Water Conservation Master Plan (2011-2020)

IMPLEMENTATION STRATEGIES



Water Management

- Advanced Metering Infrastructure
- Web Self Services
- Landscape Water Budgets
- Home Water Reports
- Leak Notification

Education & Outreach

- Marketing
- Landscape Advisory Committee
- Community Events
- Conservation Workshops
- Training & Certifications

Conservation Incentives

- Landscaping
- Plumbing Fixtures
- Appliances
- Commercial Process Equipment
- Customized
- On-bill Financing

Regulation & Legislation

- Water-efficiency Requirements
- Individual & Landscape Metering
- Calgreen
- Model Landscape Ordinance
- Plumbing Codes

Supply Side Conservation

- Advanced Metering Infrastructure
- Leak Detection
- Pipeline Replacement
- Pressure Management
- District Metered Areas

Research & Development

- Advanced Metering Infrastructure
- Water-use Information
- Meter Technology
- Product Testing And Labeling (i.e. Watersense, Energy Star
- Water Reuse

Conservation Trends

Past (1970s-1990s)

- Response to episodic droughts
- General education
- Behavior modification
- Few incentives
- Low water cost
- Uniform water rates

Present (1990s-2010s)

- Long-term planning
- Retrofit savings
- Indoor residential becoming saturated
- Standards/codes, advanced metering infrastructure
- Higher cost of water
- Various rate structures

Future (2010s-2030s)

- Response to climate change
- Savings from information services
- Smart Cities: water-energy- wastewater
- Outdoor, CII and supply-side focus
- Enhanced web and mobile services
- Price-signal key

Advances in Technology

THEN …

…and NOW

Increasing Densities, Unit Metering

- Migration from master metering to individual unit metering/submetering

Areas of Future Focus

WC & Drought Response

- Water Conservation Master Plan
- Water Shortage Contingency Plan

Customer Engagement

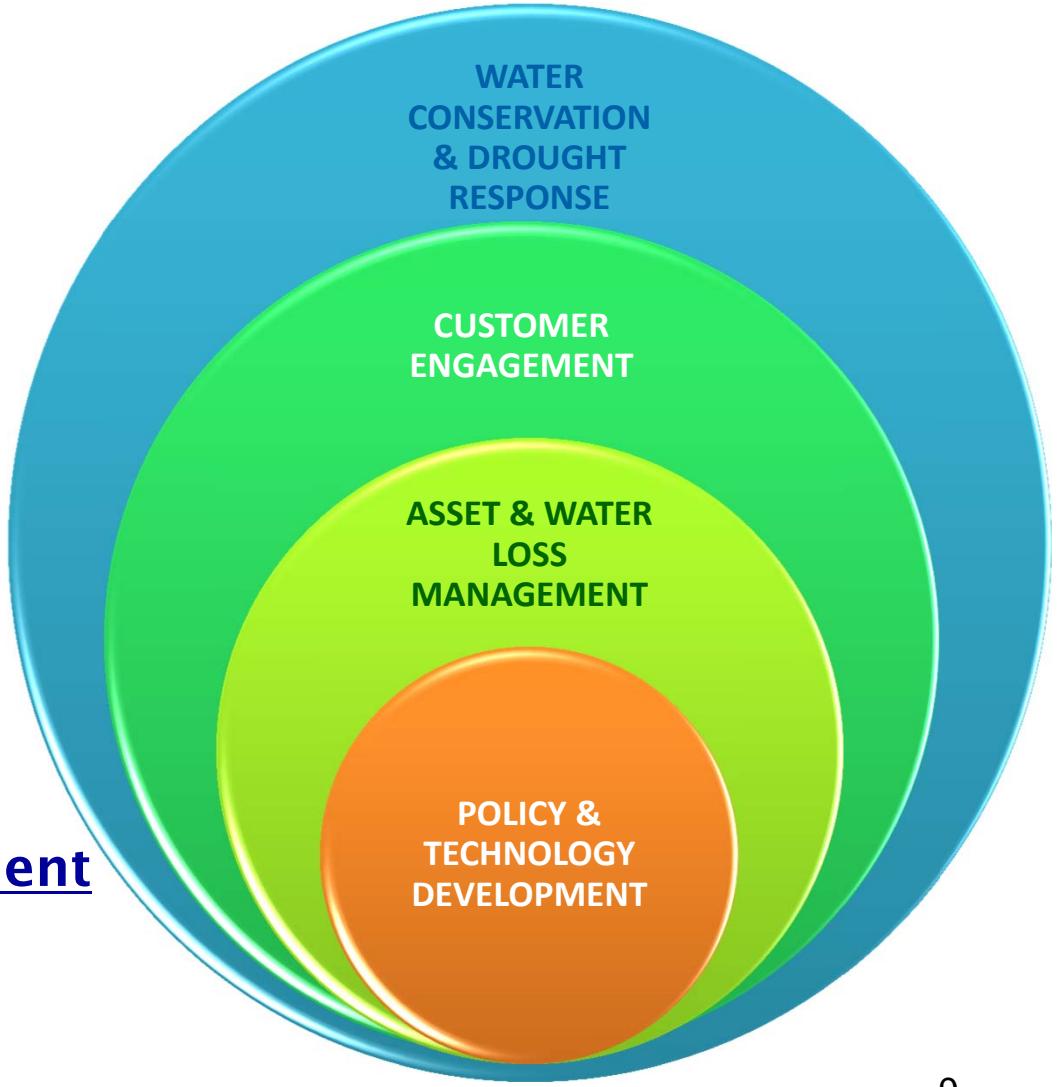
- Water management tools
- Education & outreach
- Conservation incentives

Asset & Water Loss Mgmt

- Leak detection
- Pipeline repair/replacement
- Non-revenue water recovery

Policy & Technology Development

- Efficiency standards & codes
- New efficiency technology R&D
- Regulatory, legislative initiatives



Customer Incentives

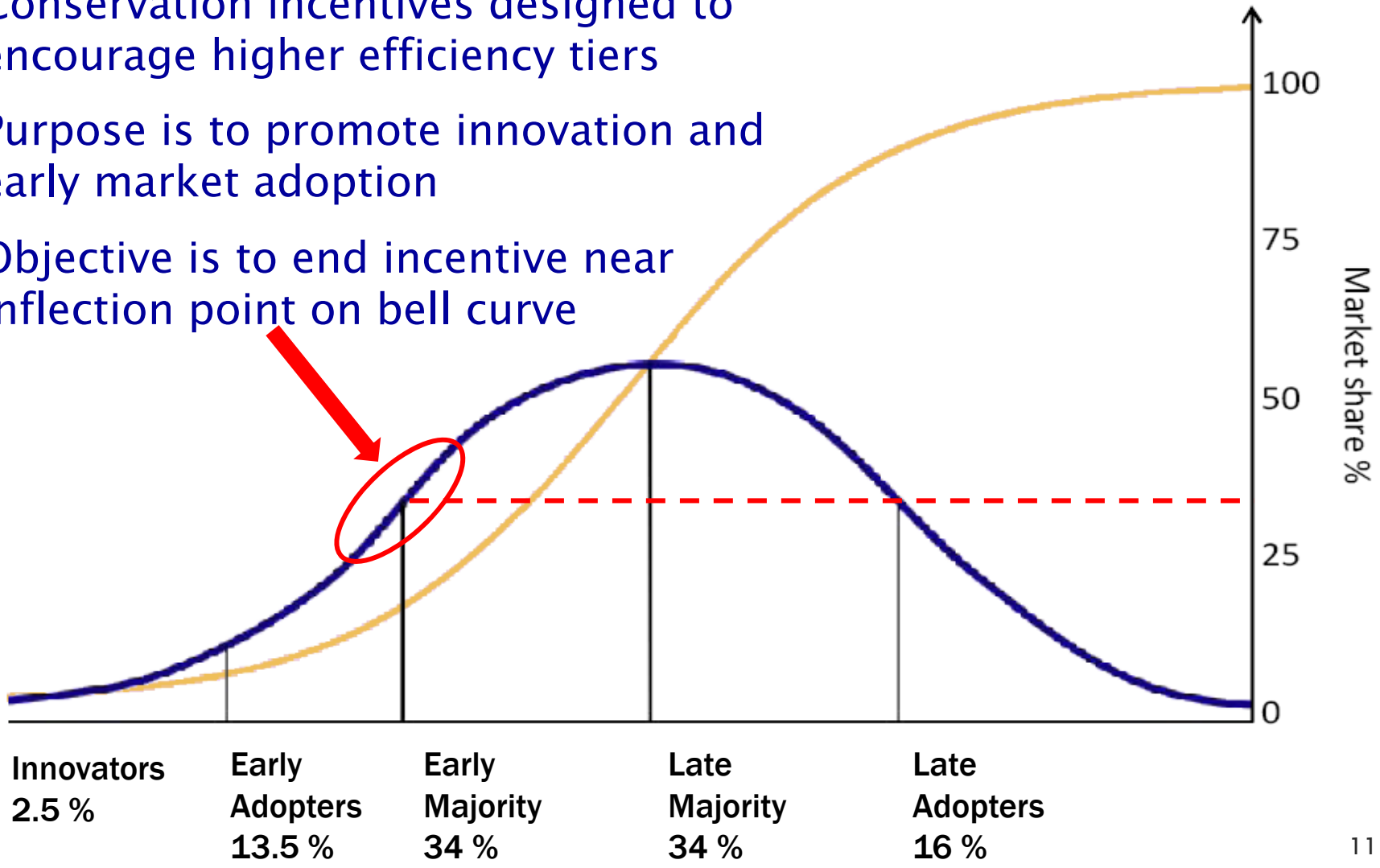
- Device giveaways
- Landscape retrofits
- Plumbing, appliance and equipment upgrades
- Customized rebates
- Graywater *Laundry to Landscape*
- On Bill Financing Pilot

1995 – 2016 Totals

- *Approx. 200,000 rebates*
- *Approx. $23M distributed*

Conservation Incentive Trends: Market Saturation Levels

- Conservation incentives designed to encourage higher efficiency tiers
- Purpose is to promote innovation and early market adoption
- Objective is to end incentive near inflection point on bell curve



Recommend Sunset of Toilet & Clotheswasher Rebates Jan. 1, 2017

High-Efficiency Toilet Standards	High-Efficiency Clotheswasher Standards
Jan. 1, 2017 Replace SFR Jan. 1, 2019 Replace MFR, CII	Jan. 8, 2013 Commercial Mar. 7, 2015 Residential
Diminishing participation and increasing free ridership	Diminishing participation and savings potential
Estimated >80% market saturation in households	PG&E to end rebate program Dec. 31, 2016
CCWD ended Jan. 2015 SCVWD ended Mar. 2015	All Bay Area regional partners planning to end Jan. 1, 2017

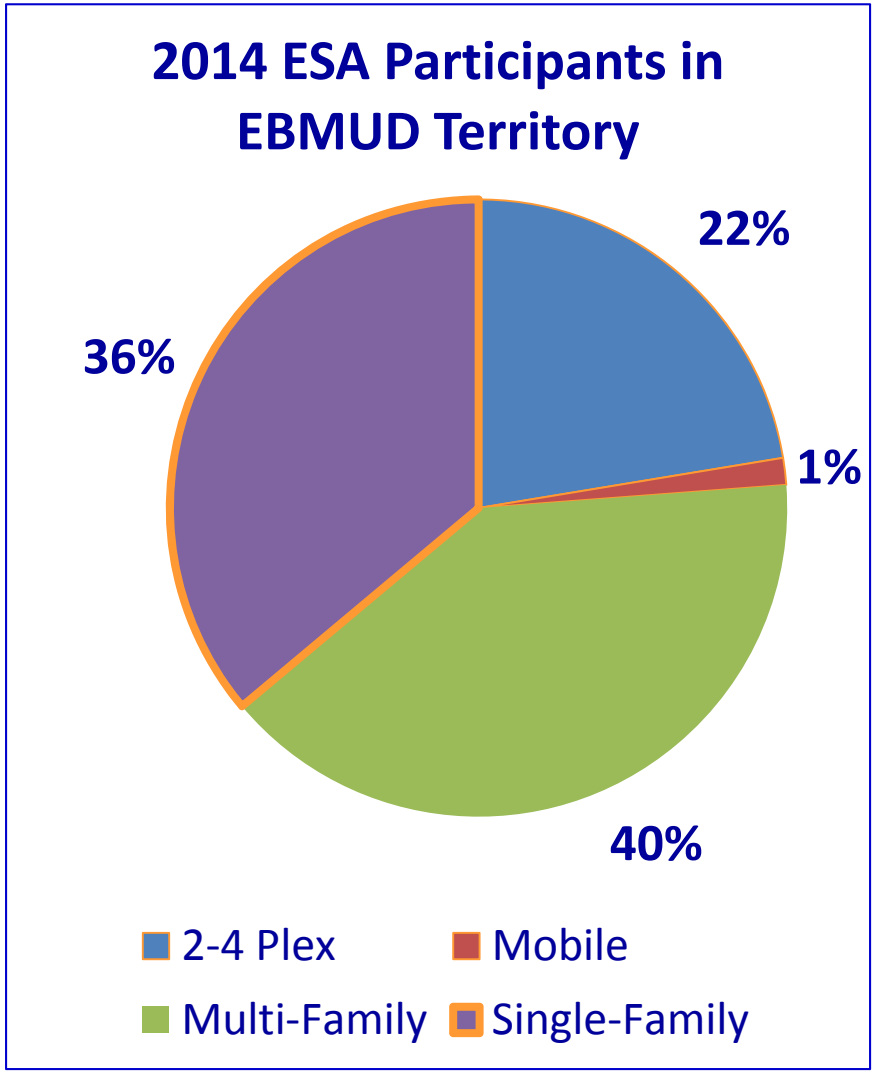
- *EBMUD incentives remain available thru custom rebates*
- *State rebates for high-efficiency toilets*

Plan for Phasing Out Toilet & Clotheswasher Standard Rebates

- Marketing plan/customer outreach – July-Dec
- Vendor/retailer displays – July-Dec
- Program closeout – Dec-March 2017
- Support/partner on low-income high-efficiency clotheswasher incentive with PG&E /RHA - 2017

PG&E Energy Savings Assistance (ESA) Program:

- 120,000 low-income households per year
- Home energy audits + energy-saving measures
- Free water-saving measures (faucet aerators, shower heads, thermostatic valves)
- In 2014, the ESA program served approx. 11,000 EBMUD customers
- Installed over 36,000 water savings measures



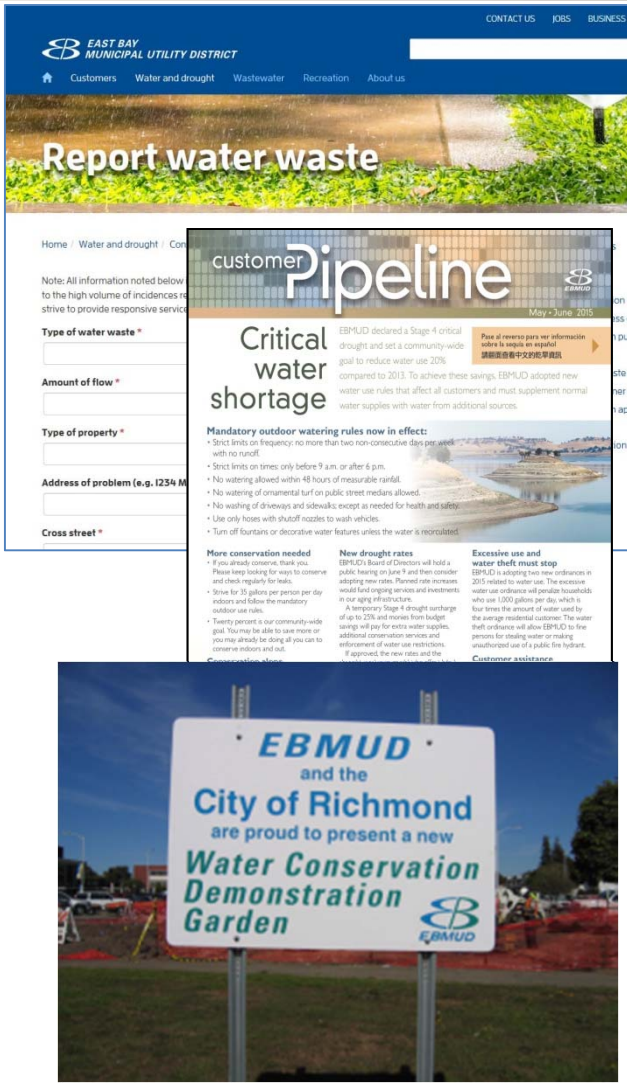
EBMUD PAYS Ph. 1 Pilot Study Candidate Participants

Customer Description	Proposed Measures	Total Cost (@ 4% Int.)	Avg. Bi-monthly Savings	Bi-monthly Surcharge
MFR Low-Income 43 Units (Berkeley)	43 Toilets 43 Showerheads 43 Kitchen & Bath Aerators	$11,900	$560	$440
MFR 15 Units (Berkeley)	14 Toilets 15 Kitchen Aerators	$3,600	$170	$130
MFR 32 Units (Danville)	6 Toilets 32 Showerheads 32 Kitchen & Bath Aerators	$2,200	$205	$165
College Dorm (Oakland)	23 Toilets 23 Bath Aerators	$5,850	$465	$365

Total Est. Cost: $23,550	Estimated Water Savings: 622,000 Gal/Yr.	Estimated Payback 2-5 yrs.

Education and Outreach

- Web and print communications
- WaterSmart Gardener Program
- Landscape Advisory Committee
- School Education Program
- Green Business Program
- Community events & workshops



Education and Outreach: Master-Metered Customers

- Partnering with community-based organizations
- Services for low-income, senior housing (e.g. Rising Sun, PG&E Express Efficiency)
- Services for property managers and homeowner associations
- Key contacts with cities & counties (e.g. housing authorities, public works, parks, etc.)

CYES
CALIFORNIA YOUTH ENERGY SERVICES

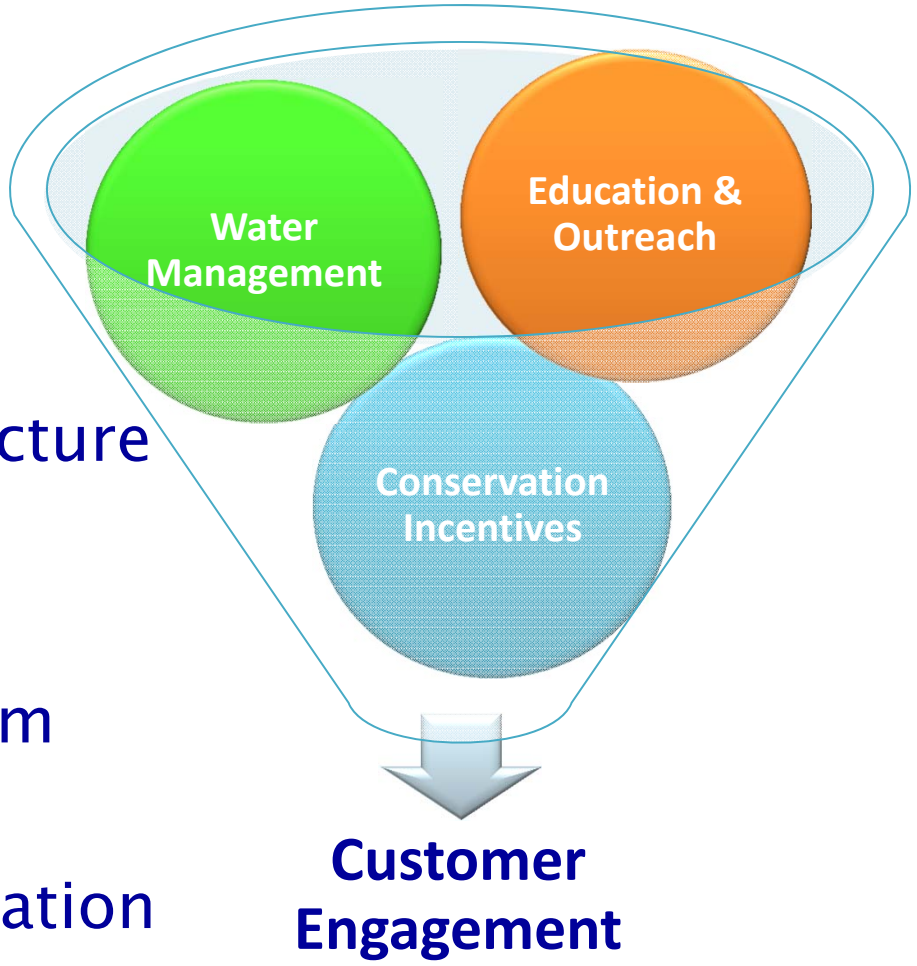
Customer Engagement Programs

Water Management Tools

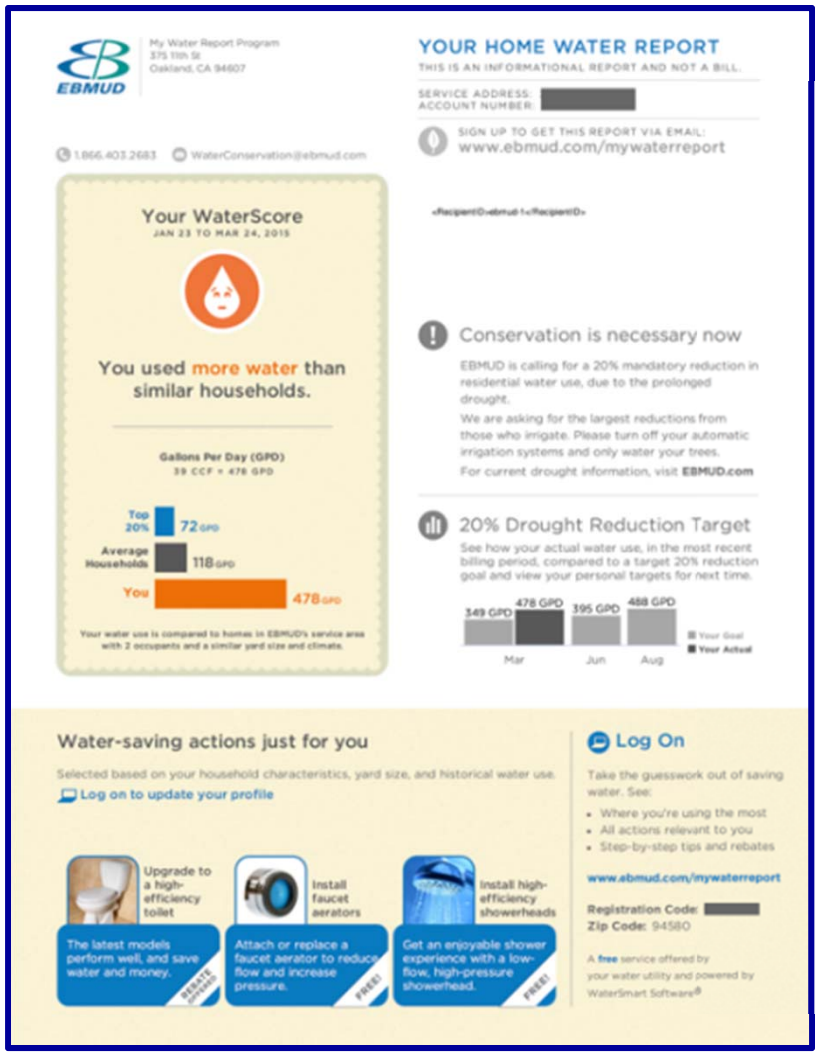
- Web services
- Home Water Reports
- Landscape water budgets
- Advanced Metering Infrastructure

Education & Outreach

- WaterSmart Gardener Program
- School education
- WaterSmart Business Certification
- Community workshops & training



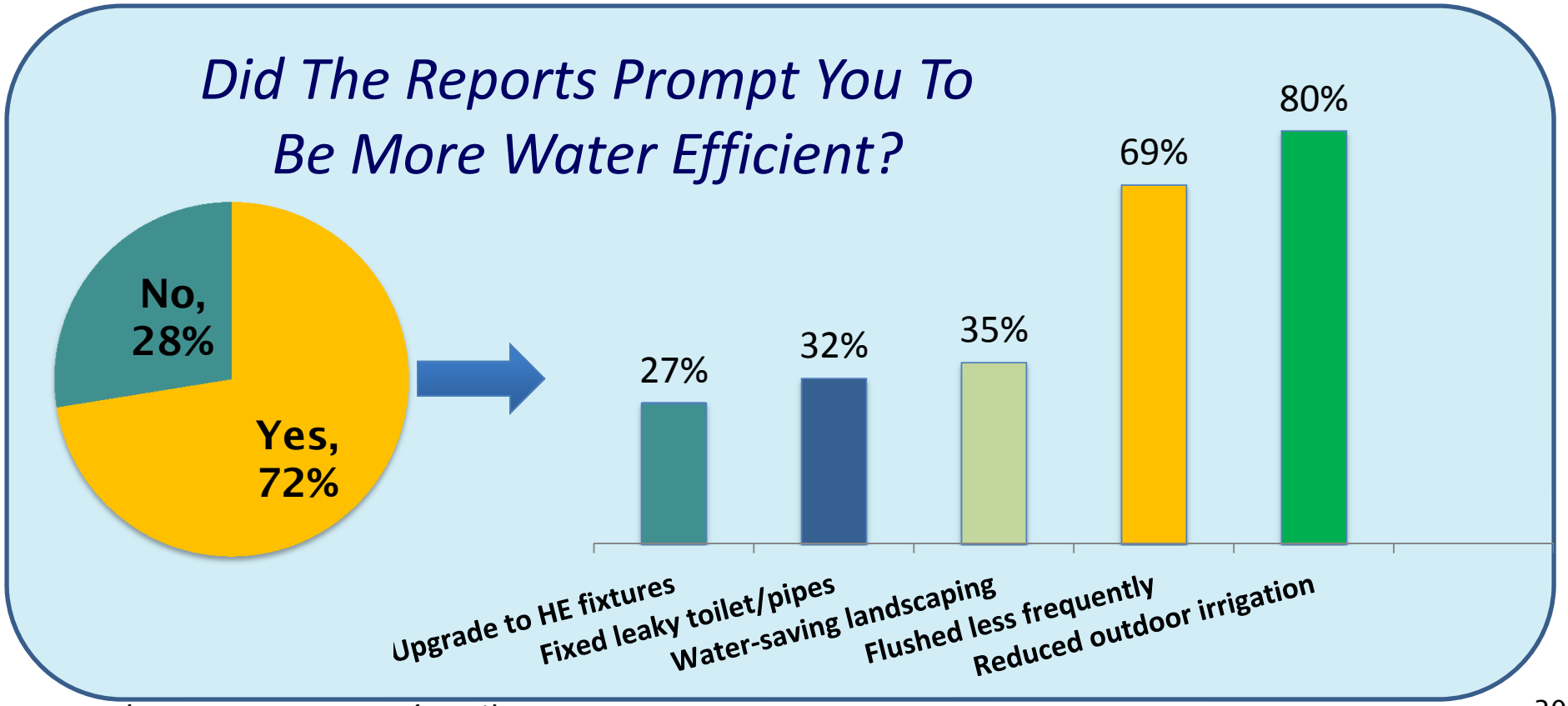
Water Management: Home Water Reports



- Email & paper reports
- Online portal
- Mobile applications

Home Water Report: Recipient Survey

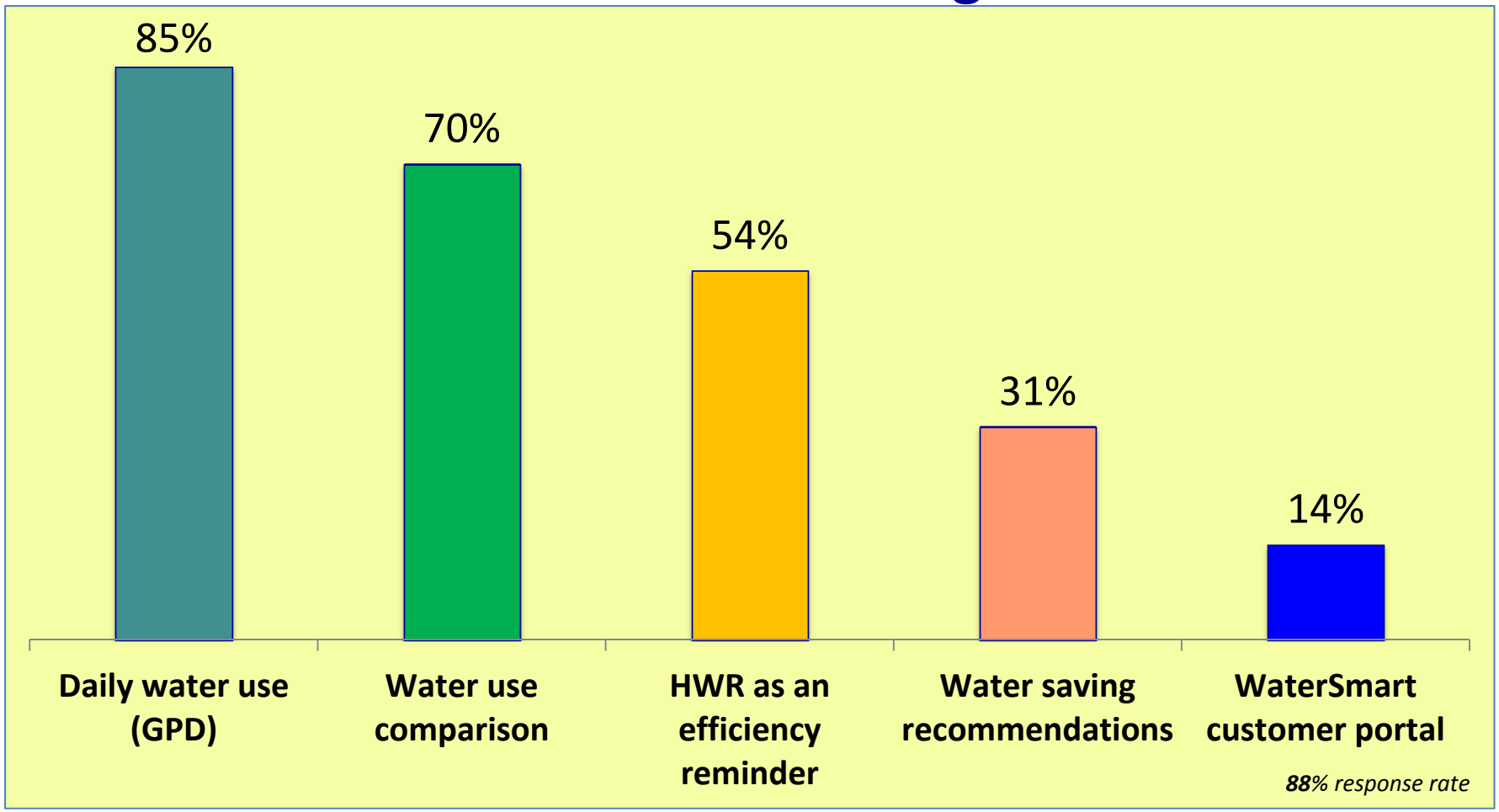
- 84% recall receiving the HWR (10% are not sure)
- 77% look at most of their reports, 13% look at some



*4,908 responses (98%)

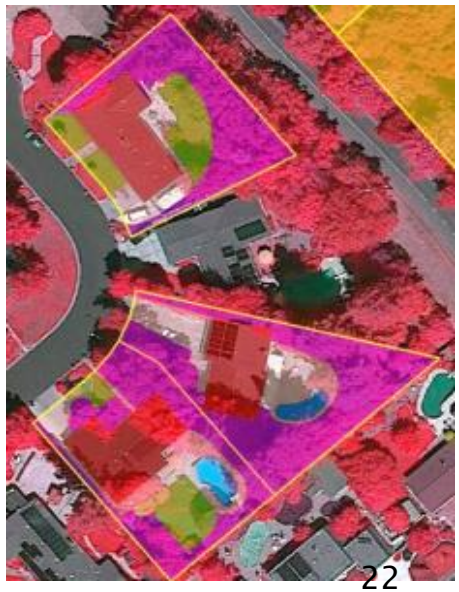
Home Water Report: Water Use & Social Comparison Tools

What aspects of the Home Water Report did you find most interesting?



Water Management: Landscape Water Budgets

- >360,000 SFR, MFR and IRR parcels
- 4-band imagery/land classifications
- 6-inch resolution
- 6 microclimate zones



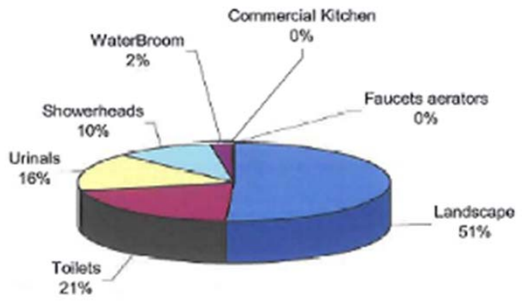
Water Management Tools: Business Site Survey Reports

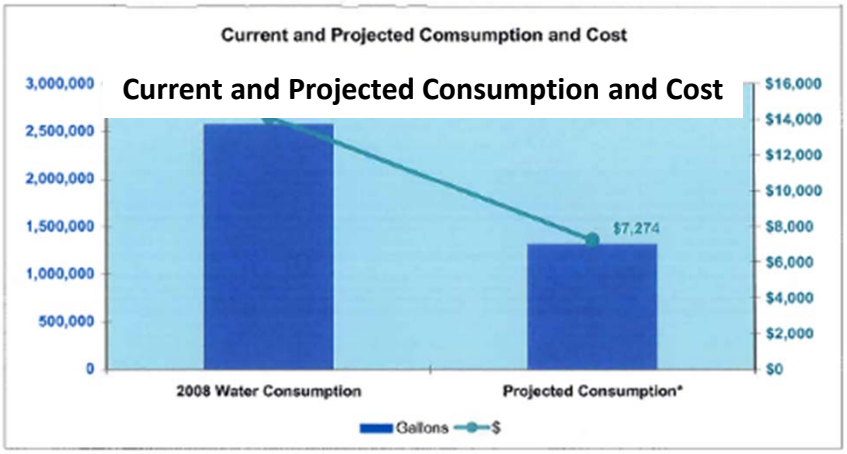
Water Savings Summary

Estimated Annual Savings	
Water Savings (gallons)	1,254,777
Energy Savings (therms)	423
Total Dollar Savings	$6,906

Return on Investment	
Estimated cost for water efficiencies:	$14,445
EBMUD Rebates:	$1,574
Payback (years):	1.9

Identified Water Savings by Device/Area





Savings and Payback Summary for Water Efficient Measure(s) Identified

Identified Measures	Initial Cost[1]	Incentives & Rebates[1]	Annual Water Savings (gallons)	Energy Savings (Therms)	Annual Water & WW Savings ($)	Annual Energy Savings ($)	Total Annual Savings ($)	Simple Payback (years)
Landscape	$0	$0	638,335	0	$3,507	$0	$3,507	Immediate
Toilets	$7,845	$576	261,469	0	$1,437	$0	$1,437	5.1
Urinals	$6,300	$848	196,184	0	$1,078	$0	$1,078	5.1
Showerheads	$ FREE	$ FREE	128,571	412	$706	$0	$706	Immediate
WaterBroom	$300	$150	26,863	0	$148	$0	$148	1.0
Commercial Kitchen	$ FREE	$ FREE	3,355	11	$18	$11	$30	Immediate
Faucets aerators	$ FREE	$ FREE	0	0	$0	$0	$0	Immediate
Totals	**$14,445**	**$1,574**	**1,254,777**	**423**	**$6,895**	**$11**	**$6,906**	**1.9**

[1] $ FREE indicates that EBMUD provided your facility of free water efficient device.

WCMP & Advanced Metering Infrastructure

Advanced Metering Infrastructure

39 MGD Savings by 2040:

- AMI Fixed Network Infrastructure included
- Up to 135,000 customer end points

AMI Applications:

- Demand management
- Supply-side evaluations

District AMI Approach

- Cautious, measured approach
- Test of evolving AMI technology
- Learn from District pilots & other utility experiences
- Evaluate operational and integration challenges
- Phase AMI installations
  (e.g. conservation, leak detection, meter replacement, Pipeline Rebuild)

AMI Potential Benefits

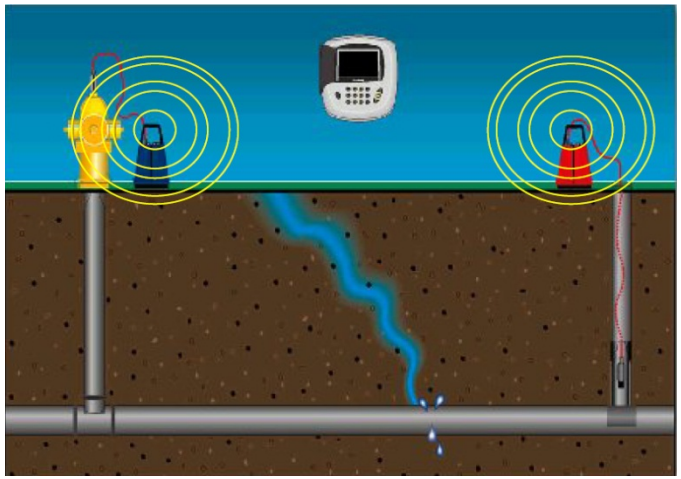
- Customer service
- Water conservation
- Water loss control/revenue loss recovery
- Asset management & predictive maintenance
- Demand forecasting
- Energy management
- Facility sizing

Recommended Phased AMI Implementation

- Initiate AMI Strategic Workgroup for District-wide implementation and integration
- Establish AMI and smart meter requirements
- Phase/leverage installations with other projects to maximize benefits/minimize cost/increase revenue
- Seek grants and other funding partners

Water Loss Overview

- Defining water loss
- Strategy to address real and apparent loss
- Avoided costs
- Water energy nexus



Water Loss

$$\textit{Water Loss} = \text{Non Revenue Water} = \text{Apparent} + \text{Real Losses}$$

Apparent Loss

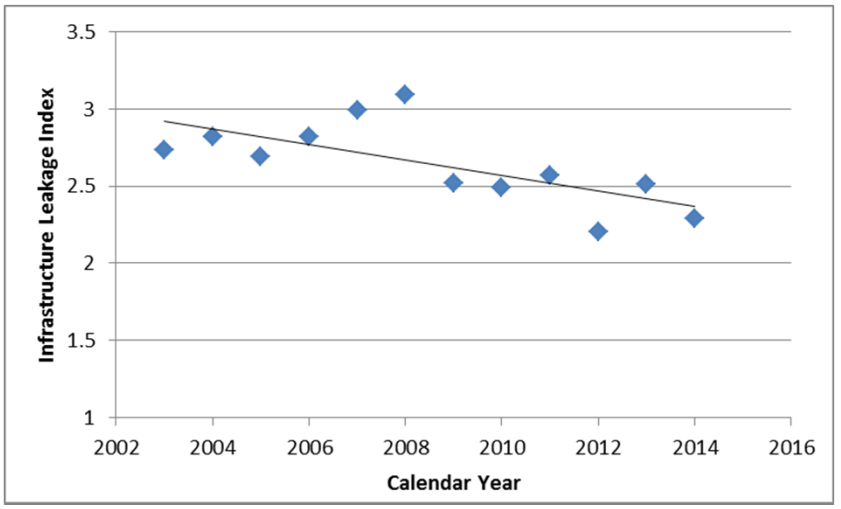
- Meter inaccuracy
- Unauthorized consumption
- Data handling errors
- Reducing apparent losses increases revenue

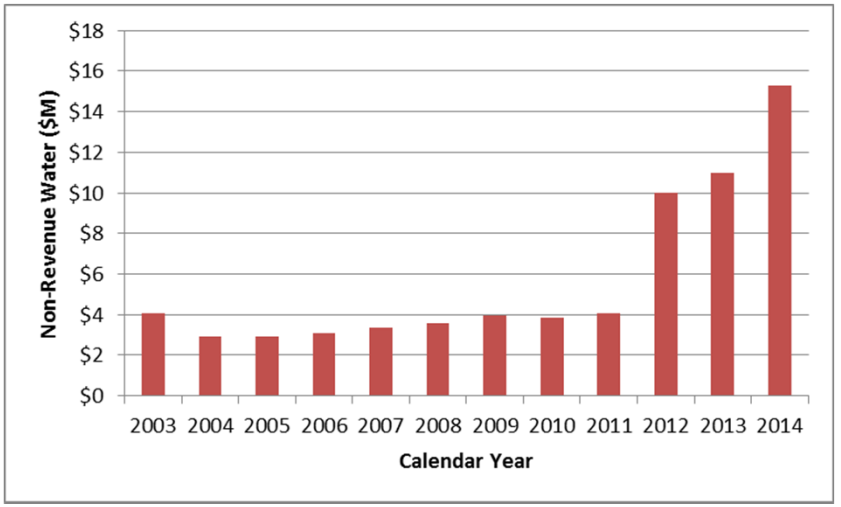
Real Loss

- Leaks
- Reducing real losses recovers water, operating costs

District Water Loss
Calendar Year 2014 performance

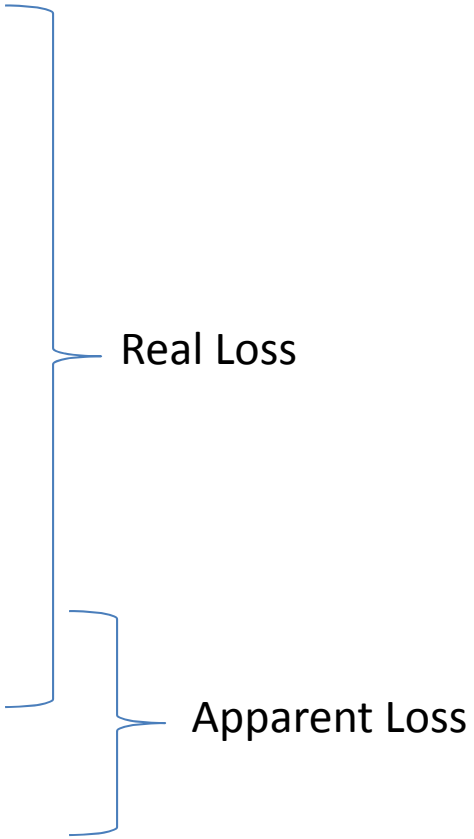
- Non-revenue water: 7,843 MG (12.7% of system input)
- Non-revenue water value: $15.3M
- Real loss: 5,663 MG
- Apparent loss: 2,052 MG
- Unbilled authorized consumption: 128 MG





Water Loss Strategy

- Leak detection
- Improved repair time and quality
- Pipeline replacement
- Pressure management
- Pressure monitoring
- District Metered Area's
- Meter replacement

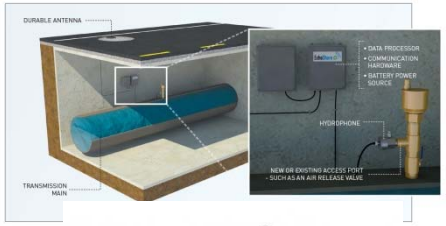


Acoustic Loggers

- Find non-surfacing leaks
- 1000 acoustic loggers
- Plan to expand number of acoustic loggers
- Pilot for non-metallic pipes will begin June 2016

Year	Miles Surveyed	Leaks Repaired
FY11	355	118
FY12	315	128
FY13	535	143
FY14	227	183
FY15	629	348

Fcs Fluid Conservation Systems



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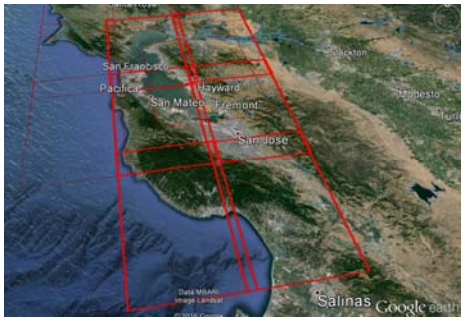
Satellite Leak Detection

- Uses satellite imagery to identify leaks
- Prioritizes leaks
- Benefits
  - o Quickly survey entire service area
  - o Faster response to leaks
  - o Not affected by pipe material, diameter
- Pilot began March 2016
- Complete pilot May 2016

UTILIS
Leaks can be detected from space



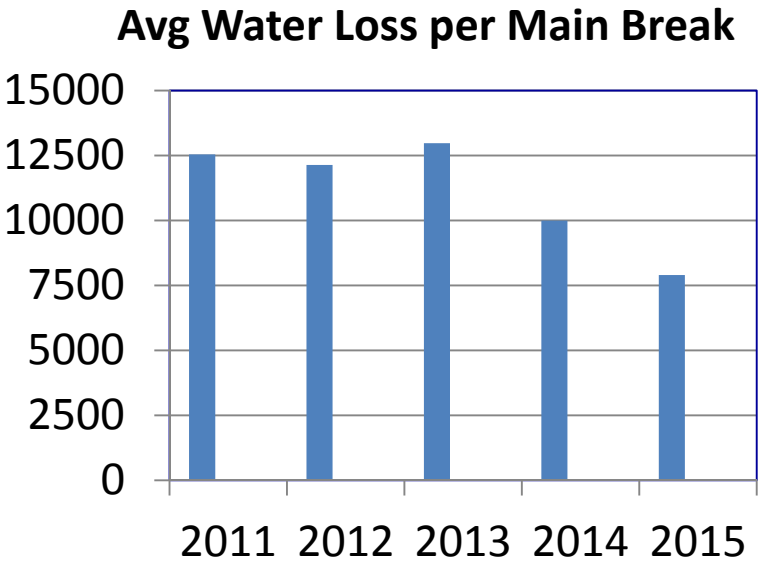
Satellite Leak Detection
Preliminary Results

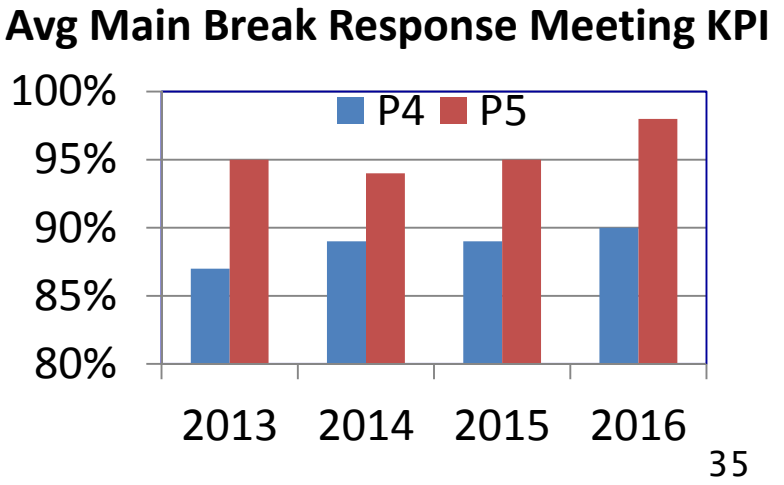
- 88 locations evaluated for the pilot (prime and non-prime)
- Identified leaks at prime locations 10 percent higher
- Leaks identified on the main, services and customer lines

Main	11
Service	17
Residential	6
Total	**34**

Leak Response

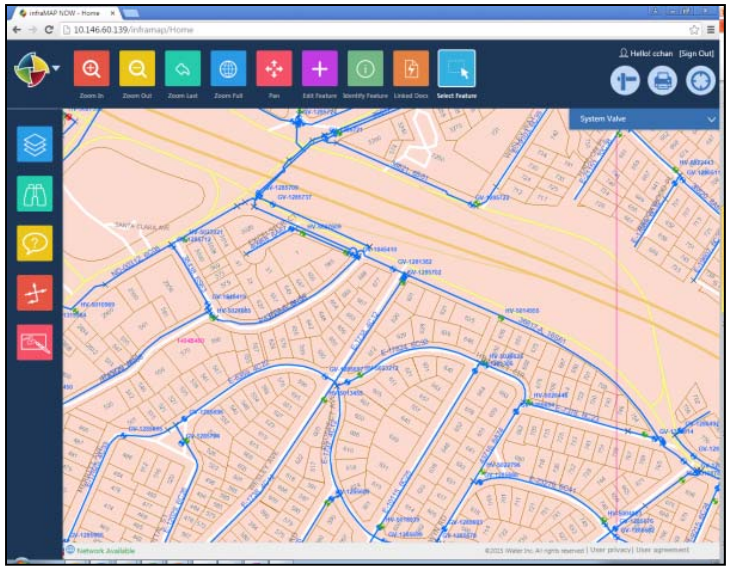
- Faster response to main breaks reduces water loss
- Water loss per main break 4,600 gallons less than 4 years ago
- Main break response KPI
  - P4: Repair 90% within 7 days
  - P5: Repair 90% within 1 day
  - ~60% main breaks are P5
  - 3% improvement in P4 and P5 response

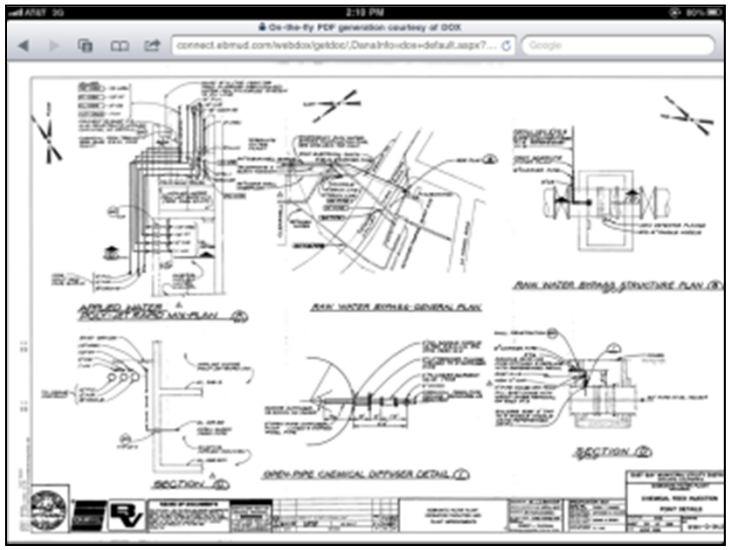




Leak Response

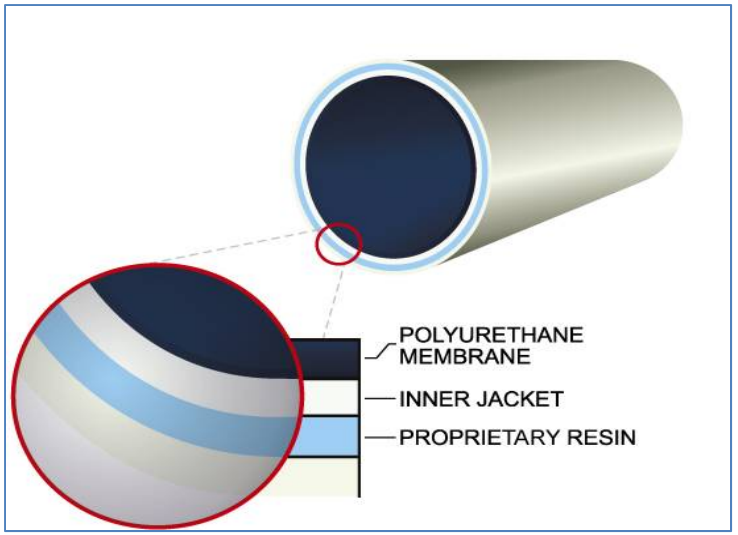
- Field mobile computing to support maintenance
  - Valve testing
  - Shutdown planning and tracking
- Improve repair time and quality





Pipeline Replacement

- Pipeline rebuild test alternative pipe renewal methods
- Increase replacement rate from 10 to 40 miles per year
- Pilots
  - Kubota Pipe
  - Aquapipe
  - Certa-Lok PVC

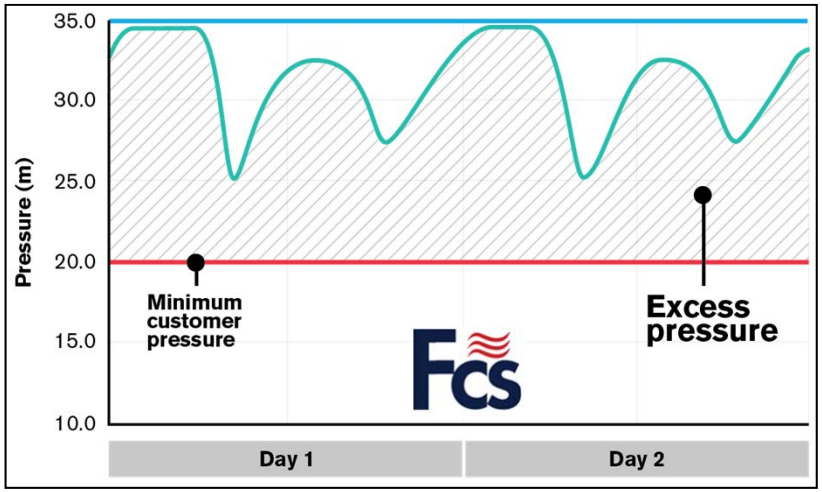


Corroded Copper Services

- 32,000 non-coated copper services on non-metallic mains
- 4,000 surveyed: 3.5% leak rate
- Plan
  - Survey remaining services
  - Install anodes
  - Replace leaking services

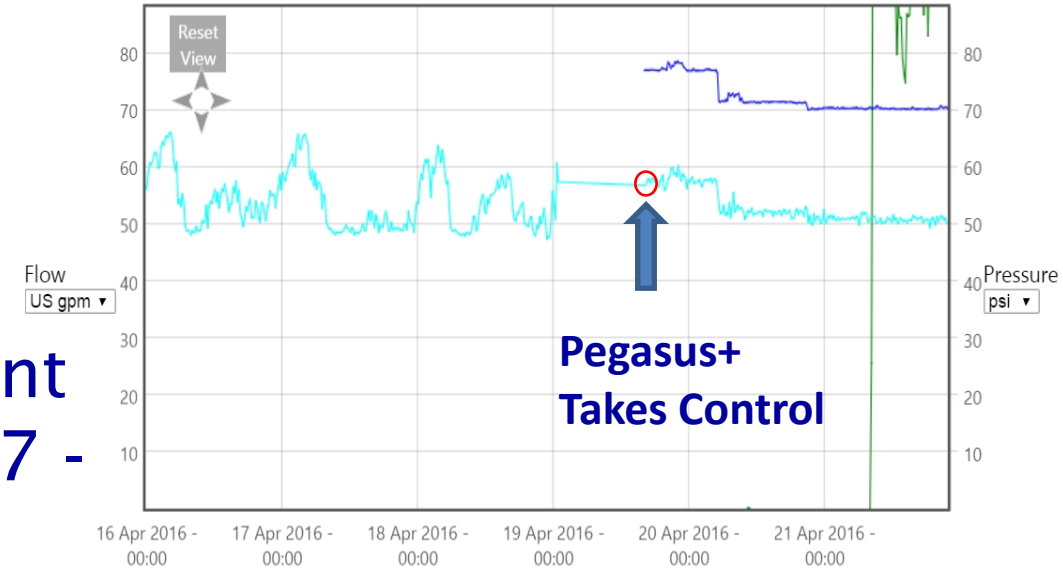
Pressure Management

- Basic concept
  - Excessive pressure in periods of low consumption
  - Manage downstream pressure
- Benefits
  - Reduced leakage
  - Reduced main breaks
  - Improved customer service
- Pilot in Berkeley
  - FCS Pegasus
  - Pilot began January 2016
  - Installed April 2016



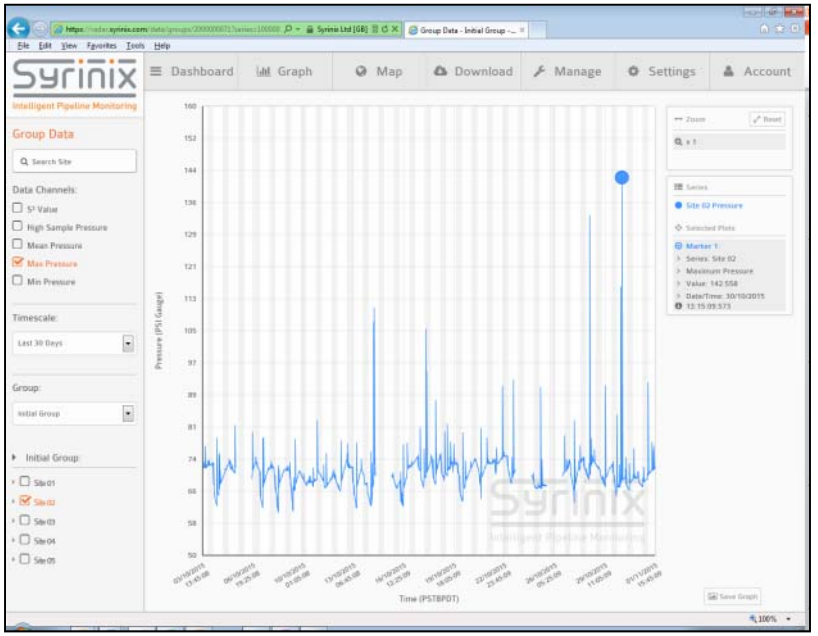
Pressure Management Results

- Downstream pressure variation 67 - 86 psi
- Pressure at critical point in the system varied 47 - 66 psi
- Minimum nighttime flow reduced from 56 gpm to 34 gpm (11 MG per year)



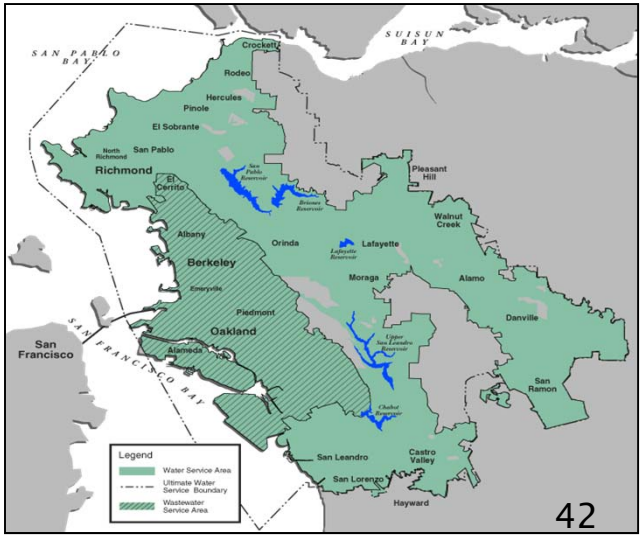
Pressure Monitoring

- Real-time monitoring of pressure transients
- Automatic notifications
- Reduce main breaks
- Pilot started 2015



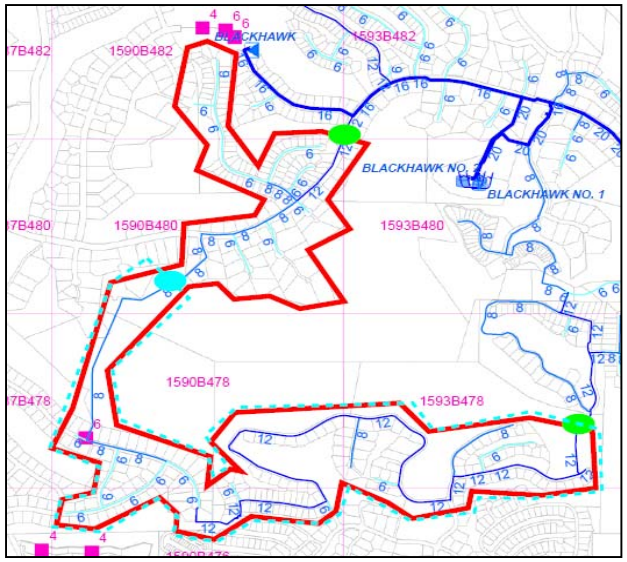
District Metered Area (DMA)

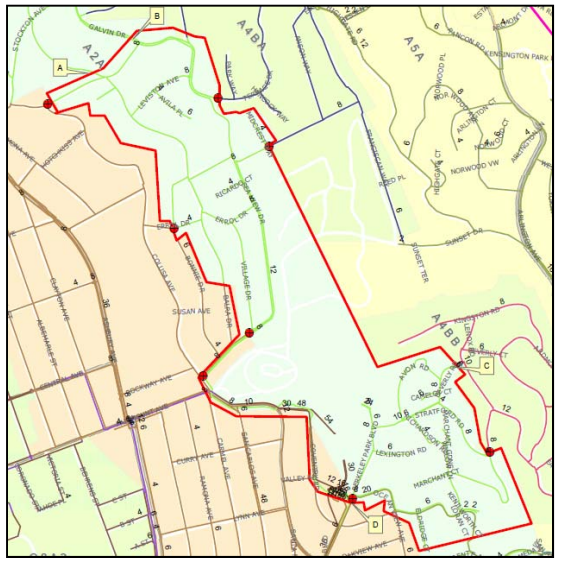
- What is a DMA?
  - Smaller well-defined area within the distribution system
  - Devices measure flow into and out of the area
- Benefit of a DMA
  - Find leaks
  - Reduce leaks through pressure management
  - Identify real and apparent losses
- DMA pilot starting early 2016



District Metered Area Pilot

Area	Blackhawk	Kensington
Miles of pipe	6 miles	5.6 miles
# Customers	320	683
Pipe	Newer pipe	Older pipe (history of leaks)





Apparent Losses

- Meter Replacement
  - Install 683 automated meters for Kensington DMA
  - Install 3000 automated meters for hazardous meter project
  - Potential AMI sites (Alamo Creek, Bishop Ranch)
  - Leverage other projects for meter replacement
- Meter replacement criteria
  - Develop criteria to identify malfunctioning meters
  - 83% success rate
  - Meter replacement criteria based on meter age, previous consumption, and meter reader notes

Avoided Costs and Water Loss

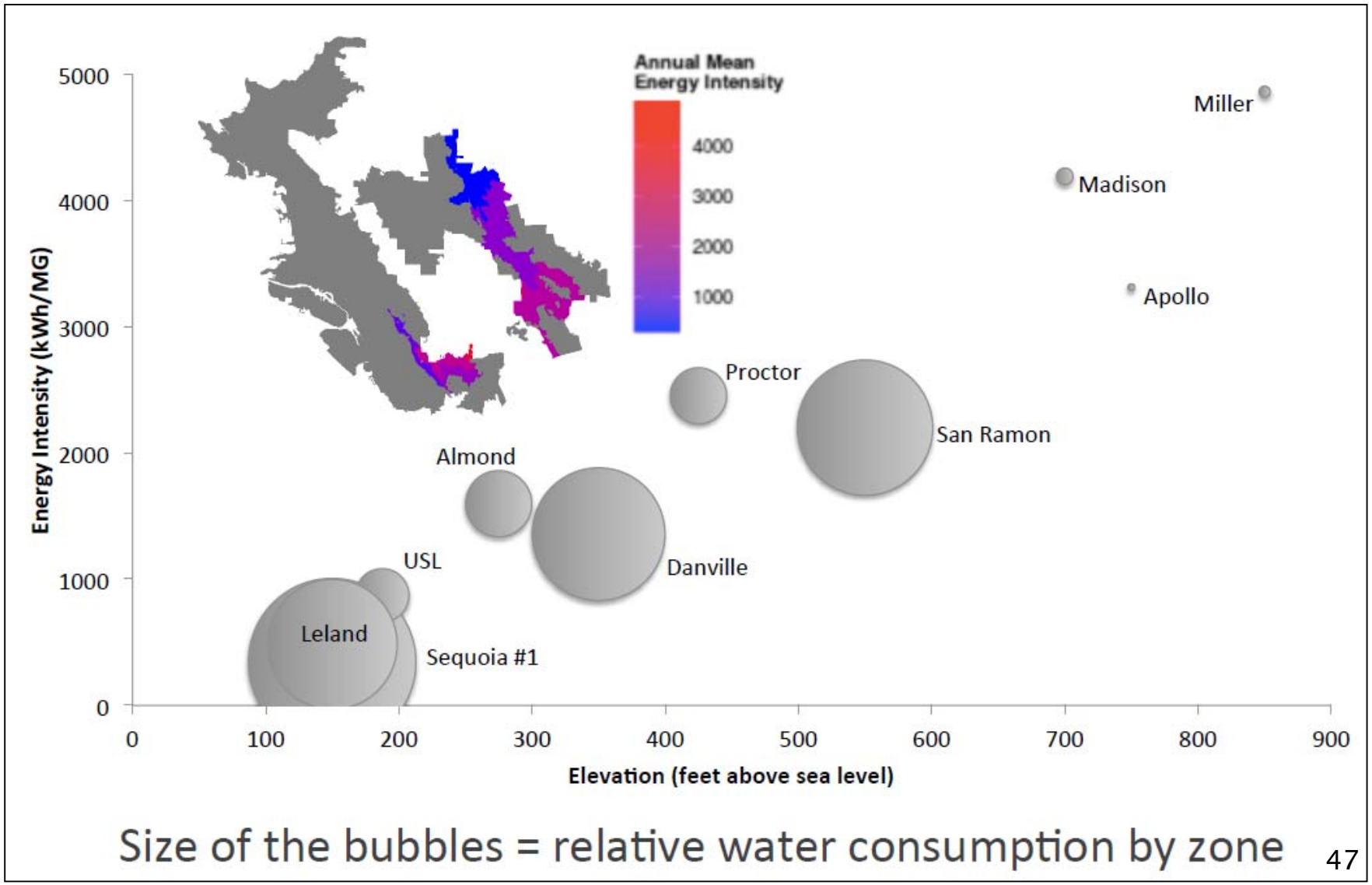
- 24% more efficient with planned repairs
- $3000 average avoided cost (labor and claims)
- FY15 leak detection program identified 348 non-surfacing leaks
  - $1M in avoided costs
  - 6,350 gallons of additional water lost for an emergency main break

UC Davis Study Project Goals

- Estimate energy intensity (EI) of water
- No one-size-fits all EI number that can be given a gallon of water
- Need to consider seasonal and spatial effects on energy

UCDAVIS
CENTER FOR WATER-ENERGY EFFICIENCY

Energy Intensity Map



Size of the bubbles = relative water consumption by zone

Conservation Research Initiatives

- AWE Restaurant Guidebook with Food Service Technology Center, MWDSC
- AWE Graywater Cost & Savings Study
- Landscape Water Savings/Market Transformation Study
- CA Sprinkler Adjustment Notification System
- California (Water-Energy) Data Collaborative with U.C. Davis
- AMI Water-Energy Savings Study with PG&E, U.C. Davis

AMI Water-Energy Nexus Study

- Targets residential customers (random selection)
- Compares approx. 5,000 AMI treatment group with 5,000 control group
- PG&E to provide $250K for AMI equipment
- EBMUD to complete meter and AMI installations
- UC Davis conducts water-energy savings analysis
- Anticipated CPUC decision: June 9, 2016
- Project duration: 27-34 months

WCMP: Standards, Regulation & Legislation

Water Service Regulations

Local & State Ordinances

Plumbing Code

Water Code

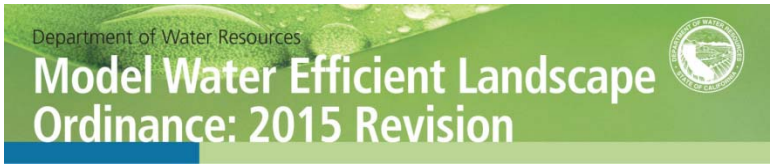
National Standards

EBMUD Water Service Regulations

- Individual, landscape metering (Sections 2 & 3)
- Water-efficiency (Sections 28, 29, & 31)

State Legislation

- CalGreen, CEC codes
- Model landscape ordinance
- SB 407 Plumbing retrofits
- SBx7-7 20x2020 Targets
- SB 555 Water Loss Reporting
- SWRCB Water Efficiency Regulations



Next Steps: WCMP Program Priorities (FY17-18)

- Lock in achieved demand reductions to cost-effectively meet near-term, 2020 and 2040 savings goals
- Continue focus on outdoor water efficiency and savings
- Expand customer water management services (landscape water budgets, Home Water Reports, web self services)
- Adopt District AMI standards and accelerate phased installations for conservation and water loss reduction
- Replace Water Conservation Database
- Sunset toilet and clotheswasher standard rebates due to codes (effective January 1, 2017)

Workshop Summary

- Water use efficiency and conservation is District-wide
- New conservation initiatives are on the rise as market transformation and codes become mainstream
- Conservation trends are moving toward more behavior-based (personal) water management tools for customers
- Opportunities exist to leverage customer engagement, metering, and instrumentation technology
- Customer expectations for tools, information and self-services increasing

Public Comments

Director Comments