How Satellite Treatment Facilities Can Help the City of Los Angeles Meet its Water Recycling Goals

December 2, 2014

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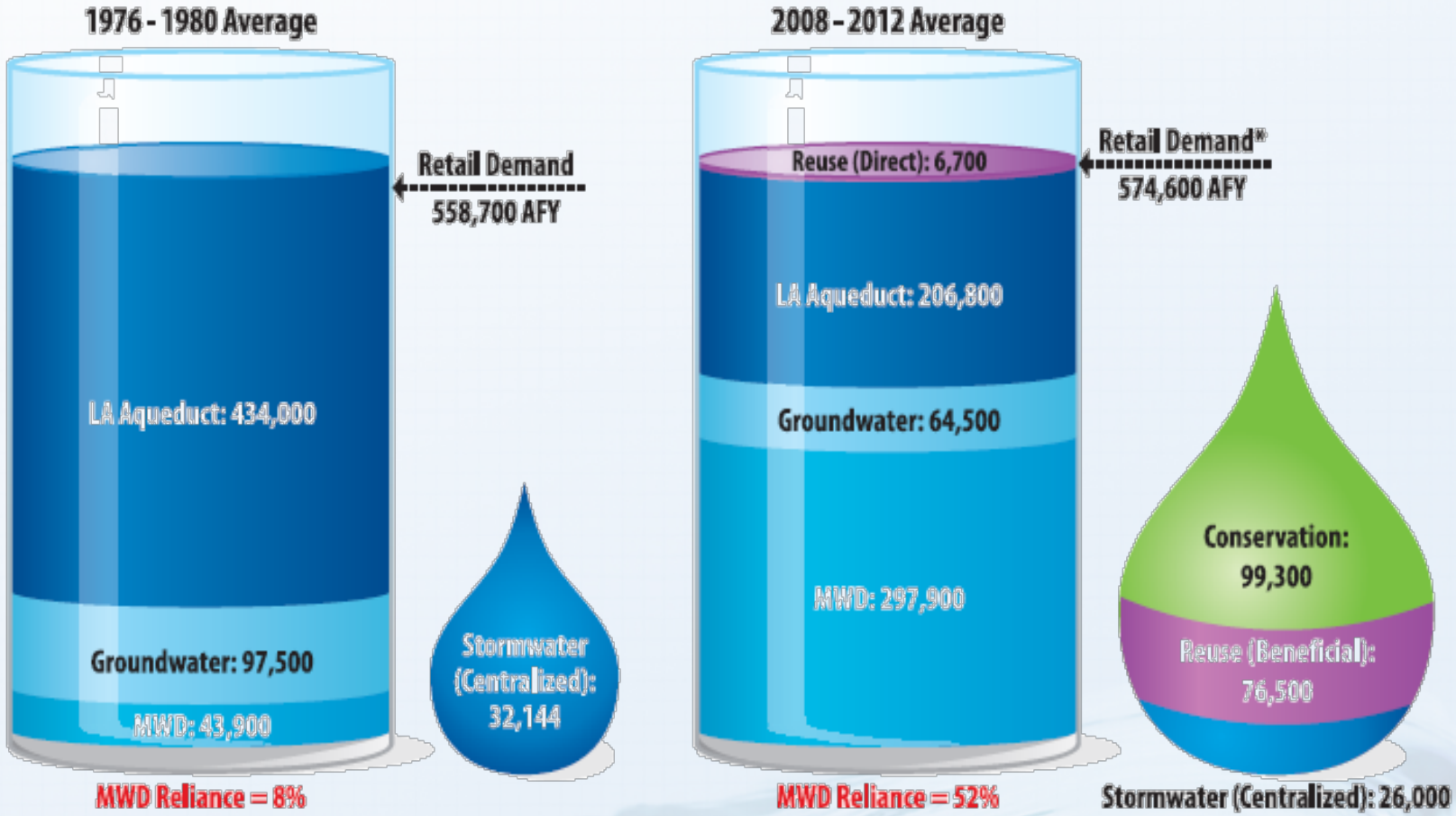
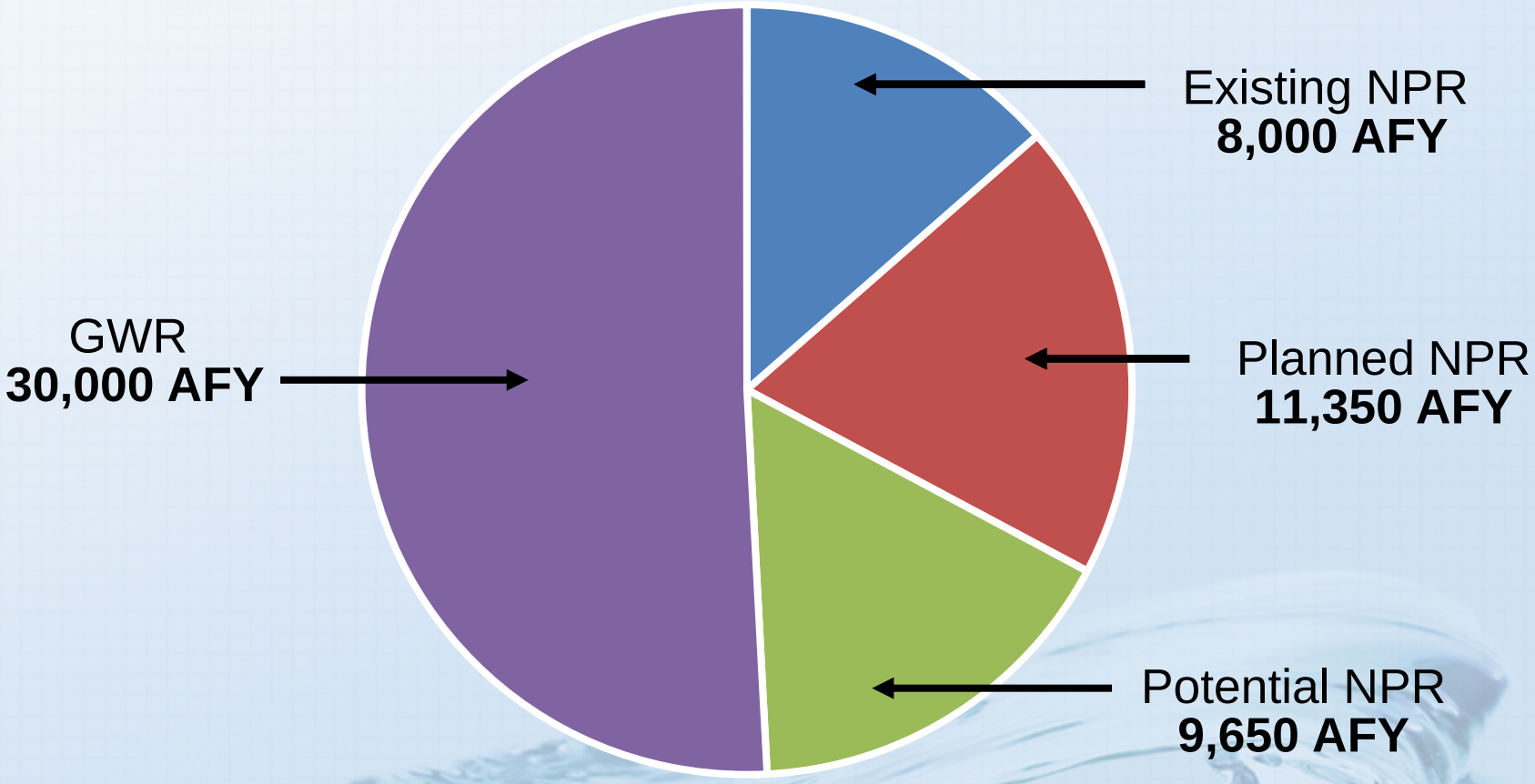
Trussell Technologies Inc	Bryan Trussell, PE	

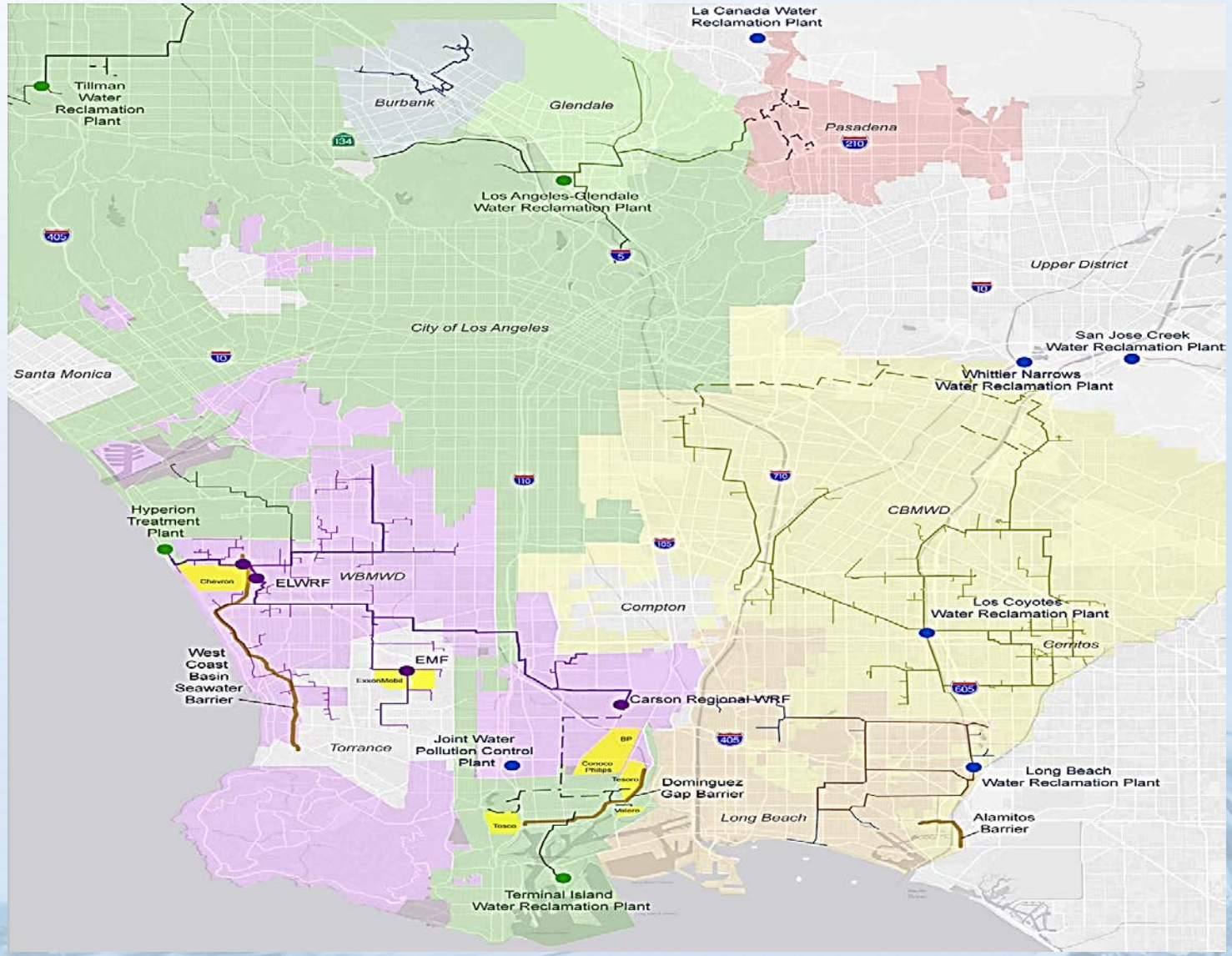
LA's Reliance on MWD Water Has Increased 7-Fold in the Past 30 Years



The City's Goal is to Deliver 59,000 ac-ft day of Recycled Water by Year 2035



Existing Recycled Water Distribution System



Opportunities to Increase NPR Throughout the City

- Expand existing reclamation plants
- Purchase recycled water from adjacent agencies
- Construct new satellite treatment facilities
  - Large Plants >10 MGD
  - Small Plants < 2 MGD

Satellite Treatment Facility Benefits

- Increased recycled water usage in areas without purple pipe network
- Reduced strain on sewers and regional treatment plants
- Reduce mass loadings to water bodies (ocean discharge)
- Opportunities for public education and involvement
- Research opportunities for emerging technologies
- Social, Environmental, and Economic (triple bottom line)

What is the City Doing?

- Evaluated potential locations for satellite projects:
  - UCLA – Currently working with UCLA Sustainability Committee
  - Wilshire Country Club
  - Other parties have approached the City

Case Study: UCLA Campus for Potential Satellite Treatment Location

UCLA's Non-Potable Water Usage

Cogeneration
420 AFY

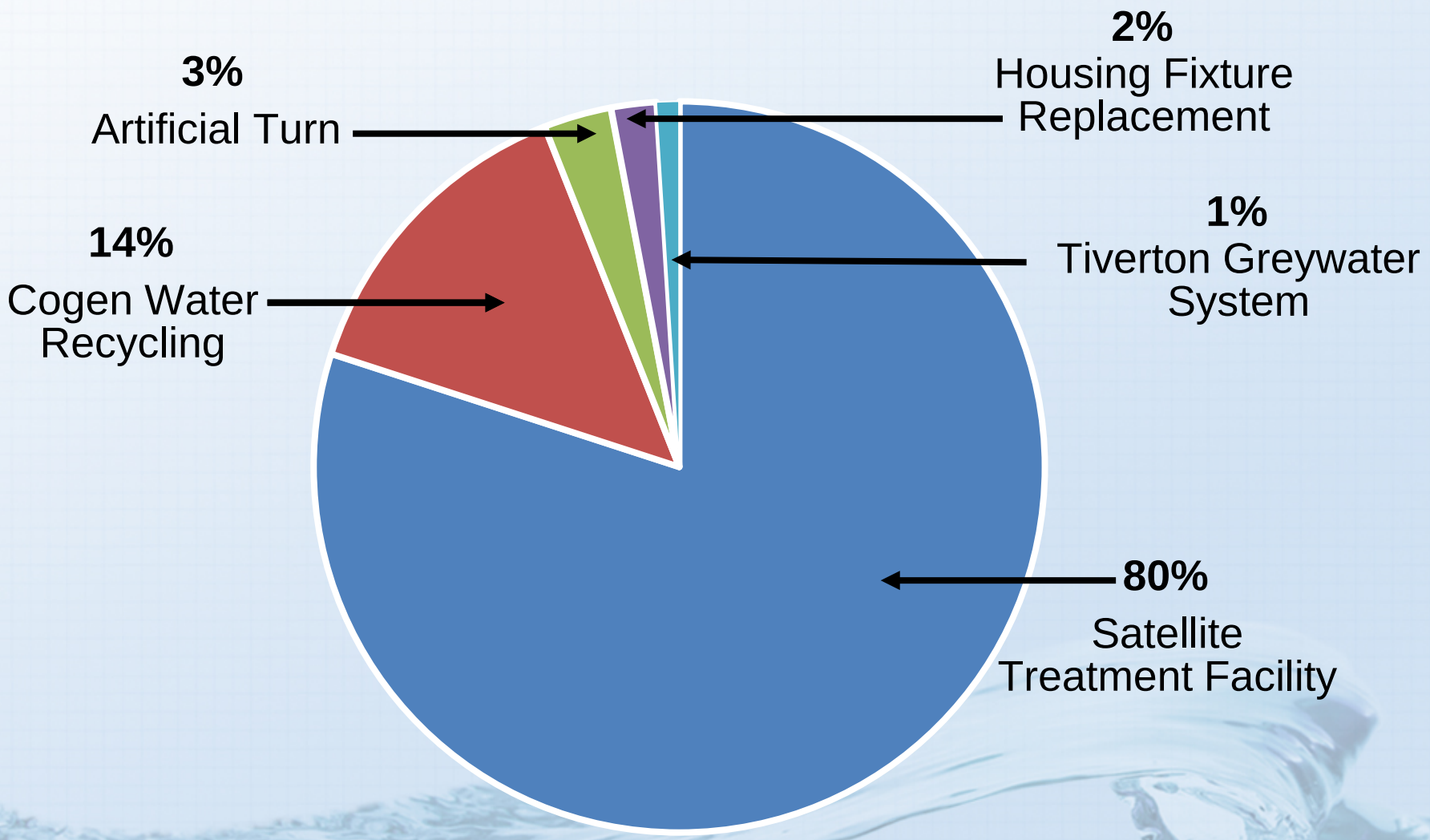
Cooling Towers
90 AFY

Irrigation
30+ AFY

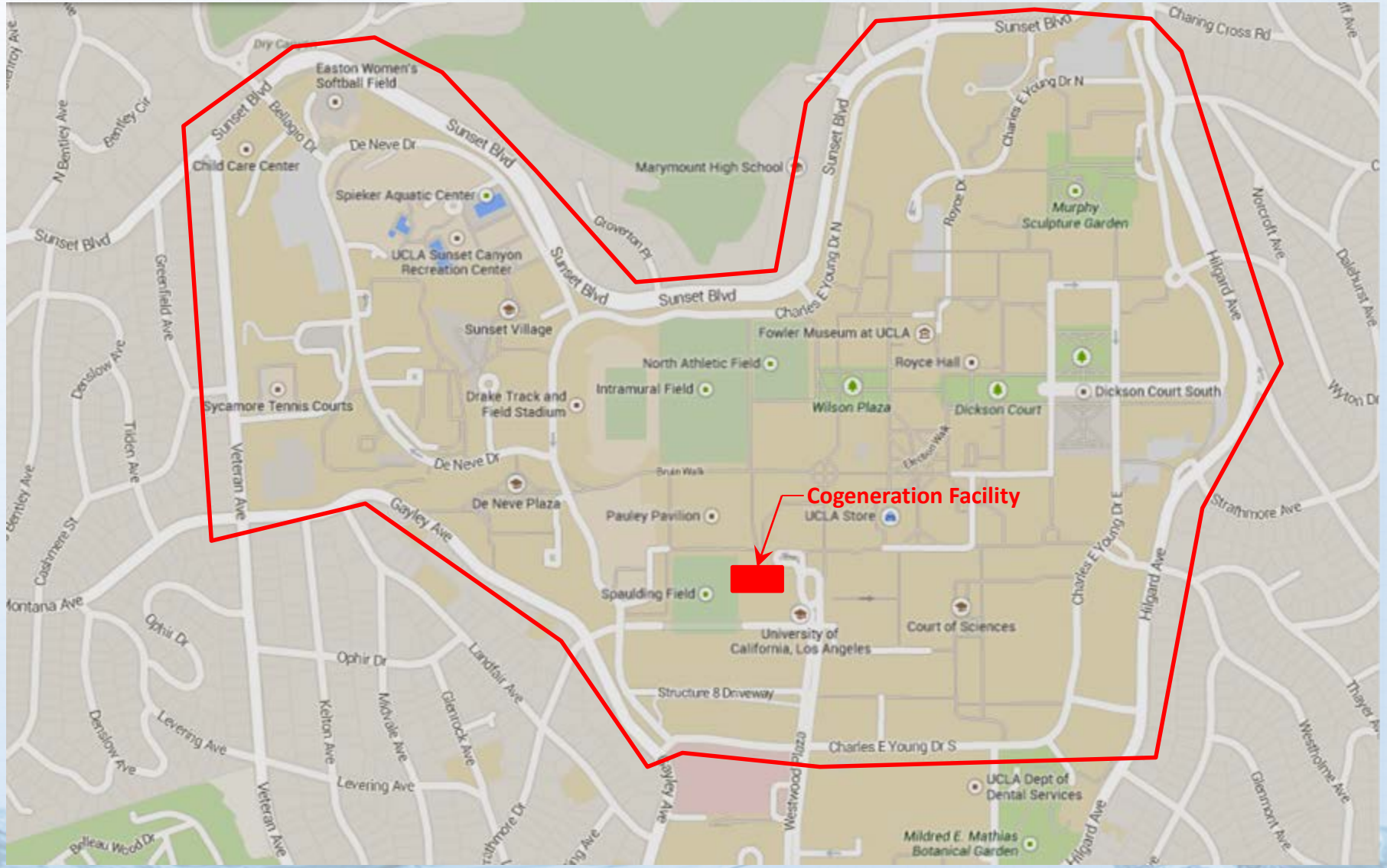
UCLA and Water Conservation

- UC goal to cut water usage by 20 percent per person by 2020
- UCLA developed a Water Action Plan in 2013
  - Reduce water usage by over 180 MG/year
  - Satellite Plant would account for most of the water savings

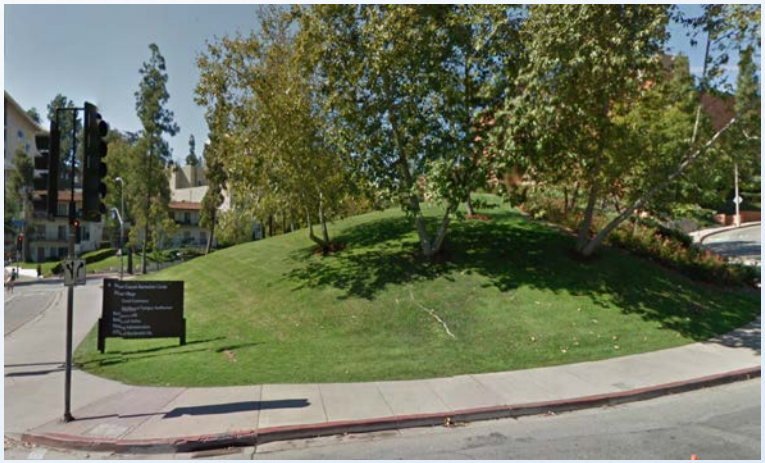
UCLA Water Action Plan



UCLA Campus - North

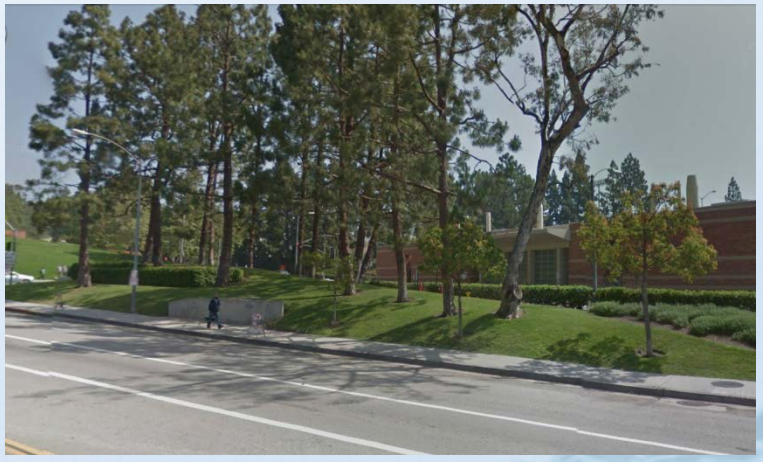


Potential Satellite Locations

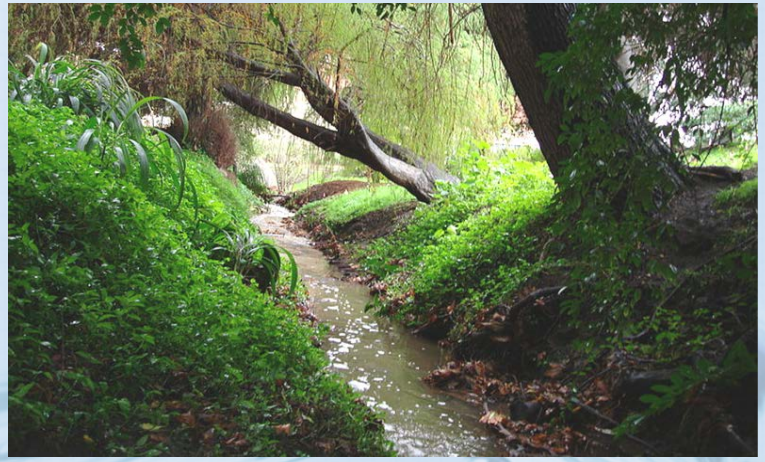


Strathmore Hill

Spaulding Field

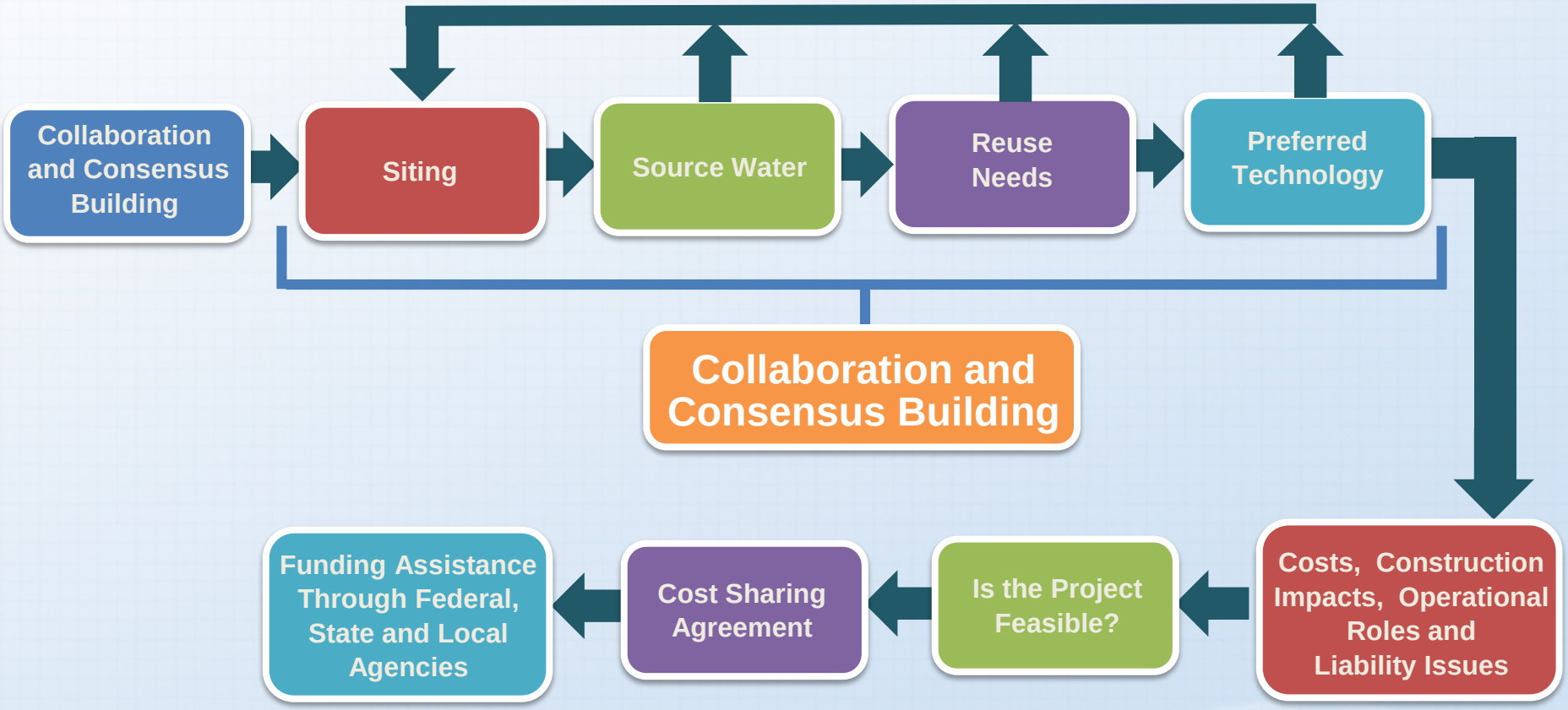


Large Landscaped Areas



Stone Canyon Creek

From Concept to Reality



Cost Sharing Analysis

- Cost/Benefit Analysis
  - Capital Cost
  - O&M Costs
    - Facility O&M
    - Standby Rates
    - Quality Surcharge Rates
  - Benefits = Current Cost to UCLA for water and wastewater services
- Return on Investment (ROI) Analysis for all parties

Capital Cost Estimate

Project Element	Construction Cost
Influent Pump Station[1]	$900,000
Site Preparation	$1,400,000
Treatment Facility[2]	$5,600,000
Equalization Tank[3]	$1,500,000
Recycled Water Pump Station	$600,000
Distribution Pipe[4]	$200,000
TOTAL CONSTRUCTION COST	**$10,200,000**
Soft Costs (30%)	$3,100,000
TOTAL PROJECT COSTS	**13,300,000**

[1] Influent Pump Station assumed to be buried wet well design with no land acquisition necessary
[2] Treatment facility assumed as 150 gpm MBR with UV and chlorine, no RO
[3] Equalization tank assumed as 500,000 gallons
[4] Assumed 1000 LF of distribution pipe at $200/LF

O&M Cost Estimate

O&M Element	O&M Cost/Yr
Power	$90,000
Membrane Replacement[1]	$50,000
Equipment Repairs	$40,000
Chemicals[2]	$75,000
Diffuser Replacement	$5,000
Labor (1 FTE)	$140,000
Quality Surcharge (TSS & BOD)[3]	$260,000
Potable Water Backup Standby[4]	$130,000
Sanitation Backup Standby[4]	$110,000
Administrative Costs	$30,000
Total O&M	**$930,000**

[1] Membrane Replacement at 5-Yr cycles
[2] Chemicals used for cleaning, odor control, and product disinfection
[3] Quality Surcharge based on projected 2015-2016 rates at $0.44/lb of TSS & BOD
[4] The City currently does not have standby charges in their rate structure.

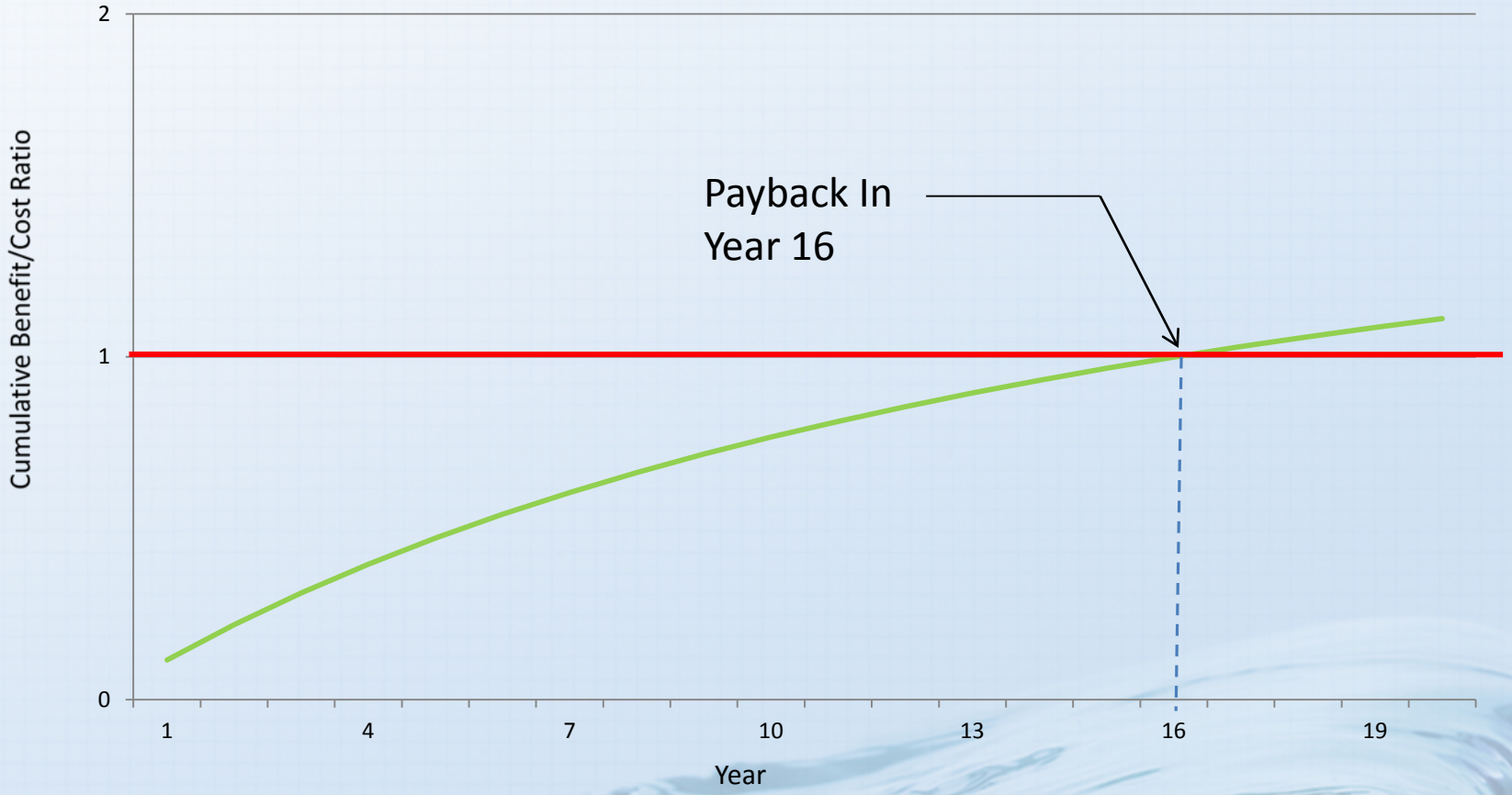
Aggregate Benefits/Savings

- Aggregate Benefits/Savings is calculated without regard to beneficiary
- It is assumed that the cost to produce, treat, and deliver the water and wastewater are equivalent to fees paid by UCLA
- 450,000 gal/day reduced water consumption and wastewater flow

	Rate[1]	Savings/yr
Water Supply	$4.15/HCF	$910,000
Sanitation	$3.35/HCF	$ 730,000
Total		**$1,640,000**

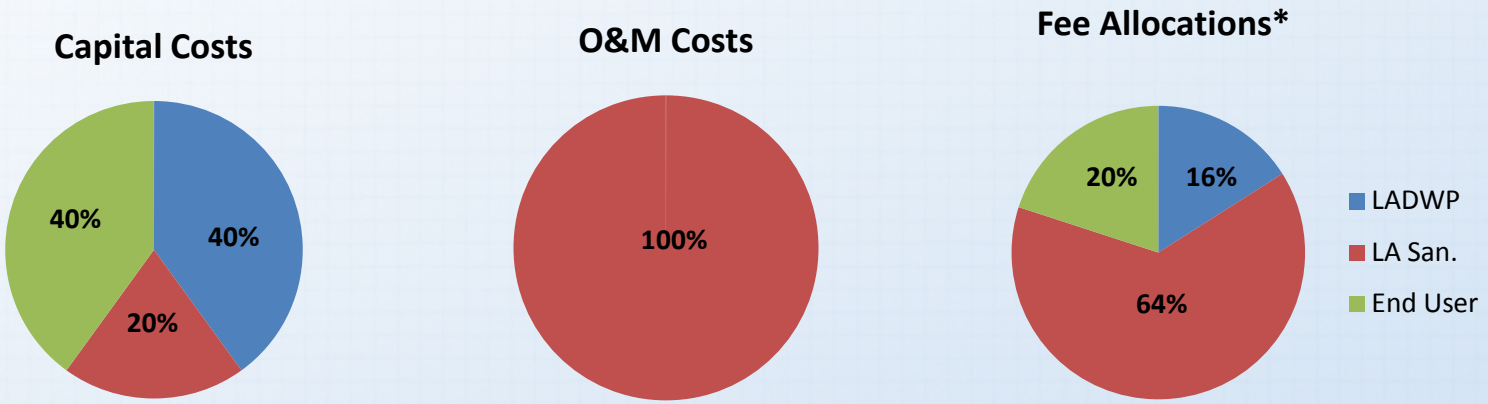
[1] June 2013 LADWP Billing Rates

UCLA 0.5 MGD MBR
Return On Investment



Based on 5% Interest

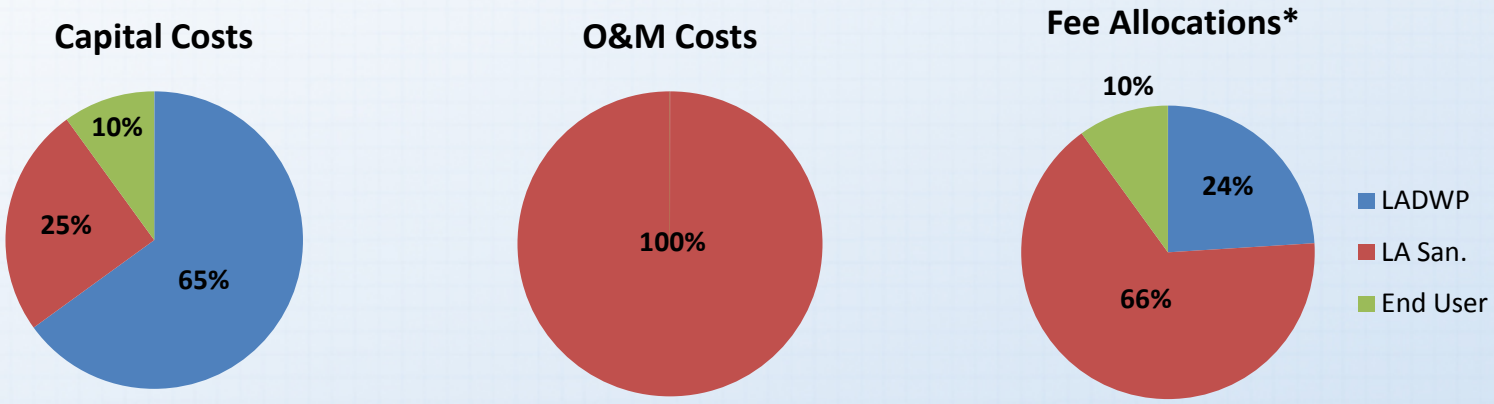
Potential Cost Sharing Options
End User Pays Upfront and Through Fees



- End User(s) would pay 40% of capital costs upfront
- End User(s) would save 20% of fees
- ROI Payback would be approximately 18 years LADWP & LA Sanitation and 15 Years for End User(s)*

* Based on UCLA's Capital, O&M, and fees

Potential Cost Sharing Options
End User Pays Through Fees



- End User(s) would pay only 10% of capital costs upfront
- End User(s) would save 10% of fees
- ROI Payback would be approximately 19 years LADWP & LA Sanitation

* Based on UCLA's Capital, O&M, and fees

Conclusions

- Satellite treatment facility appears to be economically feasible
- Can be structured to benefit all parties, including the City and end-users
- Available grant funding can provide additional economic incentive
- Can provide social and environmental benefits to City and end user
- Will provide diversification to City's NPR portfolio
- Will assist UCLA meet it's water reduction goals

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QUESTIONS?

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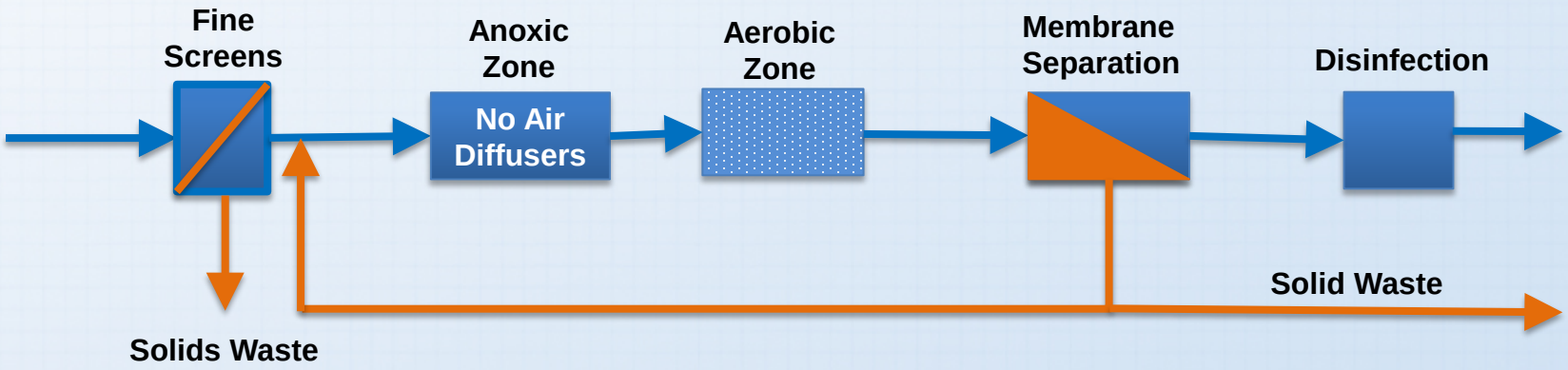
Satellite Treatment Technology Evaluation

Only evaluated technologies with small footprints and low odor potential:

- Conventional (Aerobic) MBR
- Integrated Membrane Anaerobic Stabilization (IMANS)
- Anaerobic MBR
- Spiral Aerobic Membrane Biofilm Reactor (SABRE)
- Living Machine/Hydroponic Reactor

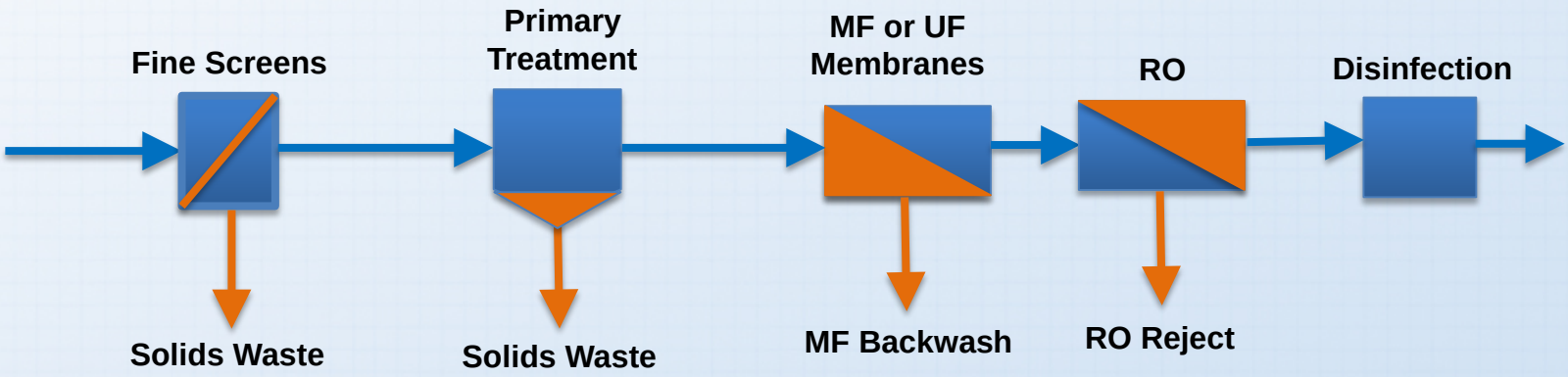
Technology Selection is driven by the water supply quality and end use

Conventional MBR



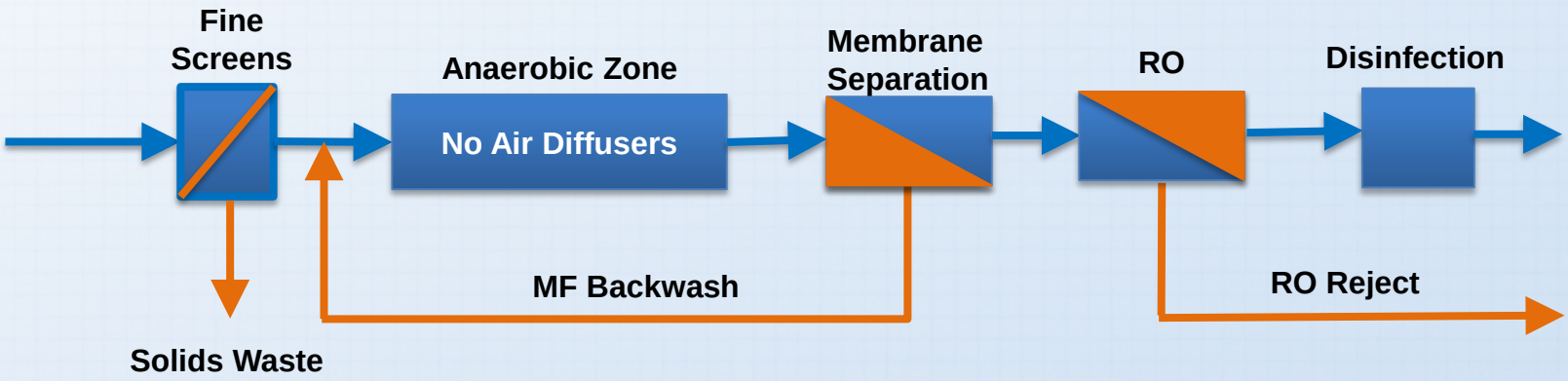
- Most conventional small scale treatment technology
- Operating costs can be high
- Installation costs continue to become more competitive

IMANS



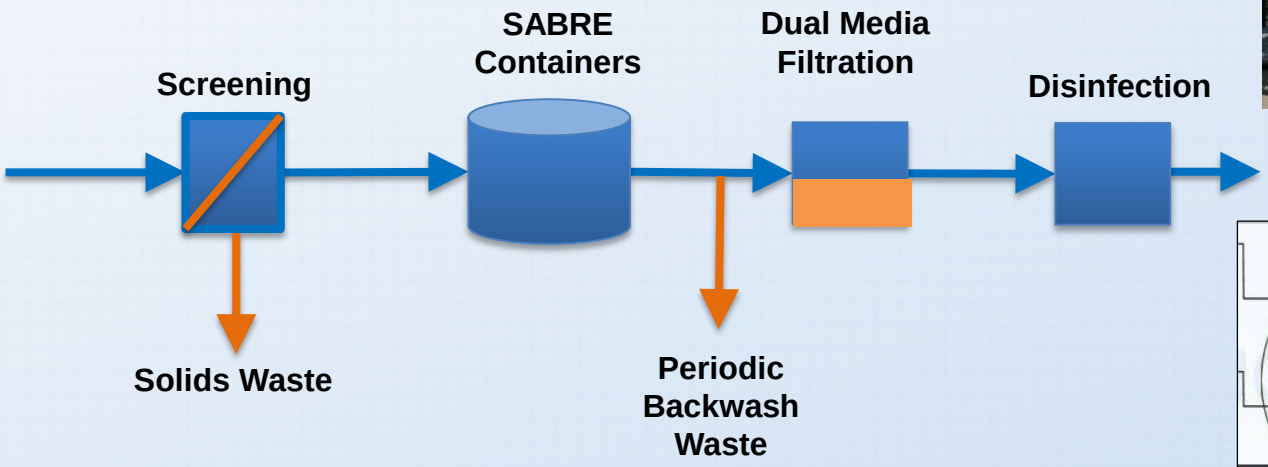
- Lower power requirements
- Complimentary with energy recovery systems
- Less effective at removing nutrients

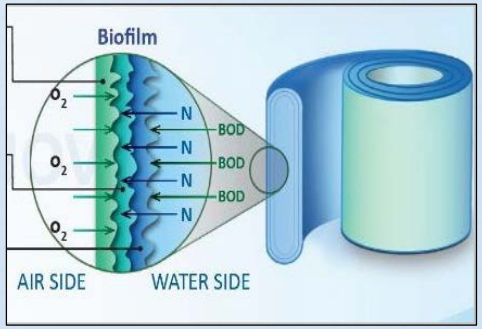
Anaerobic MBR



- Can be net energy positive process
- Less solids handling need
- Membrane fouling solutions are in development
- Less effective at removing nutrients

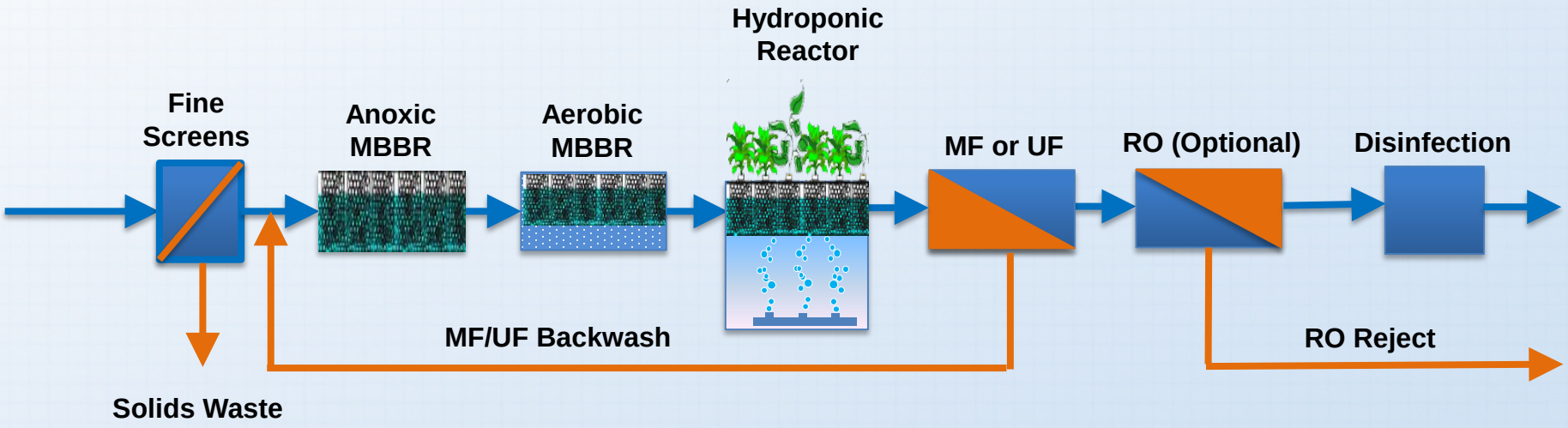
Spiral Aerobic Membrane Biofilm Reactor (SABRE)





- Potential for nutrient removal and high quality water effluent
- Lower operating costs
- Suitable for smaller plants < 0.5 MGD

Hydroponic Reactor / Living Machine



- Improved aesthetics
- Community involvement
- Can be self financed and operated

Benefits to UCLA

- Help meet their sustainability goal
- Secure water supply
- Defined and controlled rates for water supply and sanitation costs
- Public relations