

Waste Not, Want Not – Recycling Food Waste at a Wastewater Treatment Plant

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Los Angeles County Sanitation Districts**

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Do you know...

**How much of the pie goes in the trash
at your favorite restaurant?**



Pie Chart



Presentation

- Who we are and what we do
- How food waste digestion fits into solid waste management
- Project details...
 - Program design
 - Integration into wastewater treatment plant
 - Results to date





Our Mission Statement

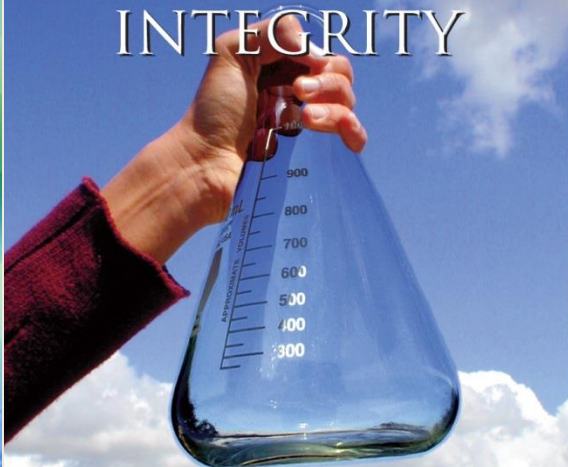
M I S S I O N

SANITATION DISTRICTS OF LOS ANGELES COUNTY

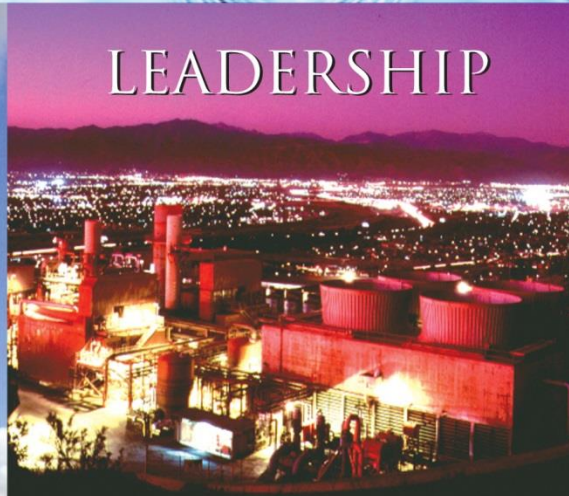
To protect public health and the environment through innovative and cost-effective wastewater and solid waste management and, in doing so, convert waste into resources such as recycled water, energy, and recycled materials.



INTEGRITY



LEADERSHIP

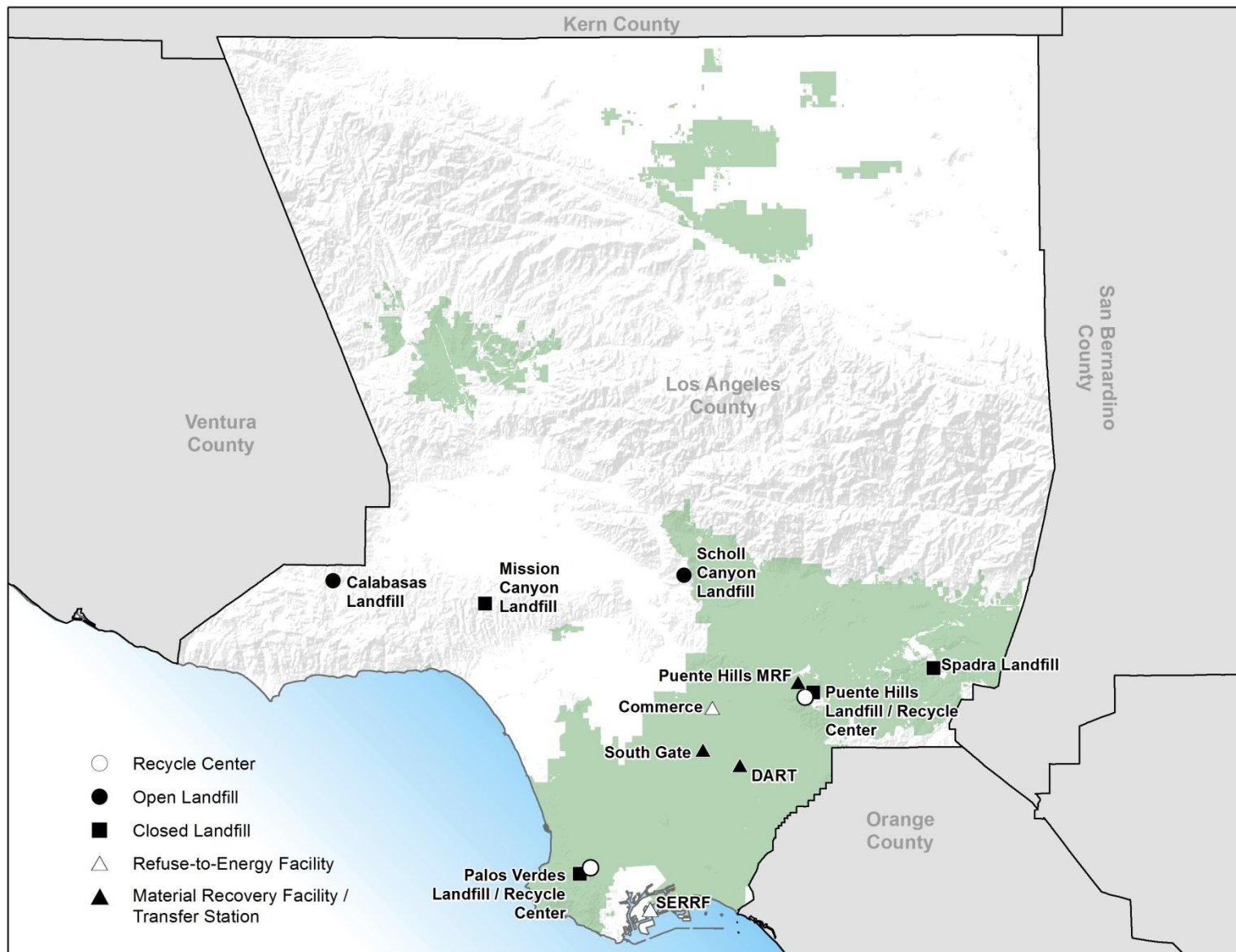


SERVICE



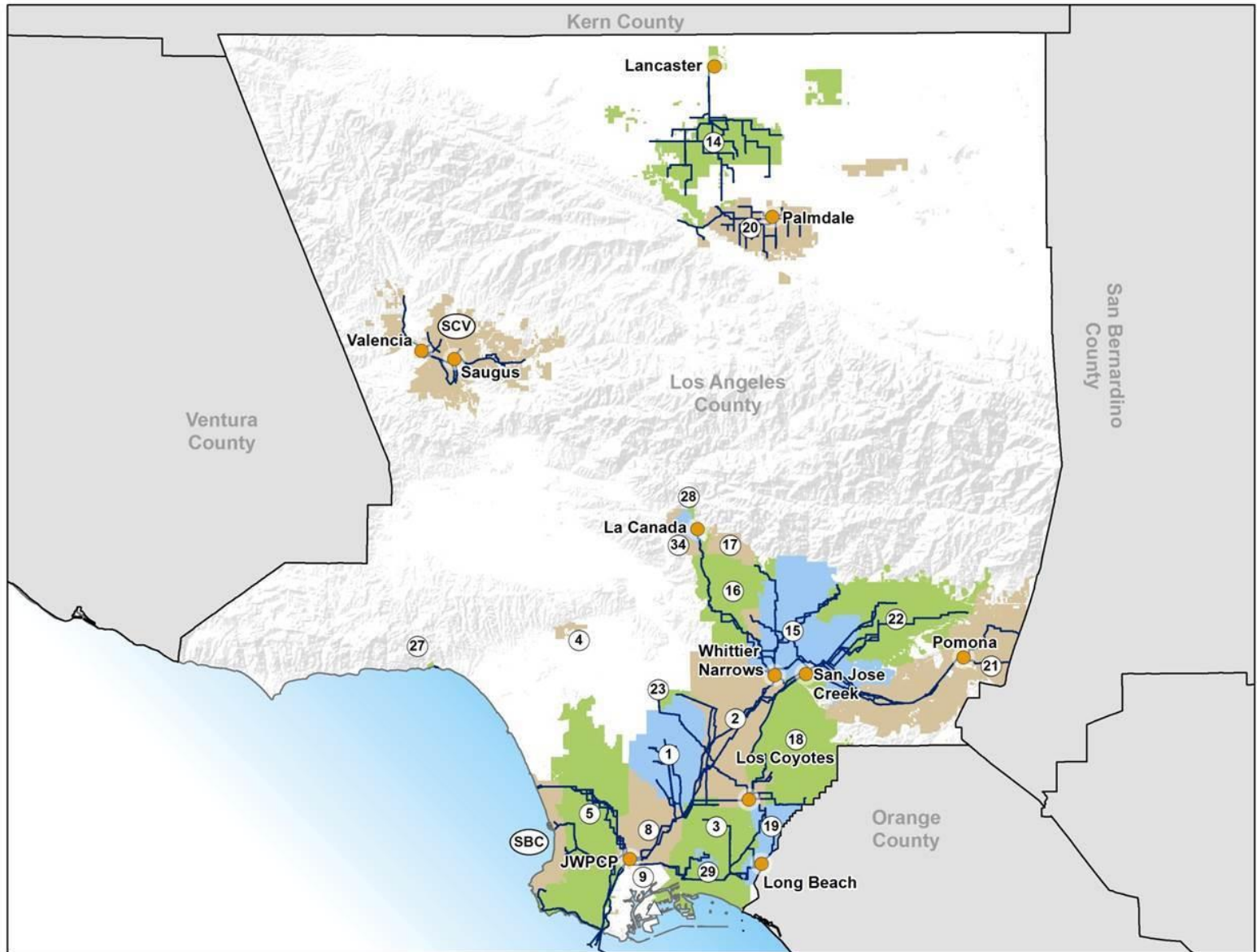


Districts' Solid Waste Facilities



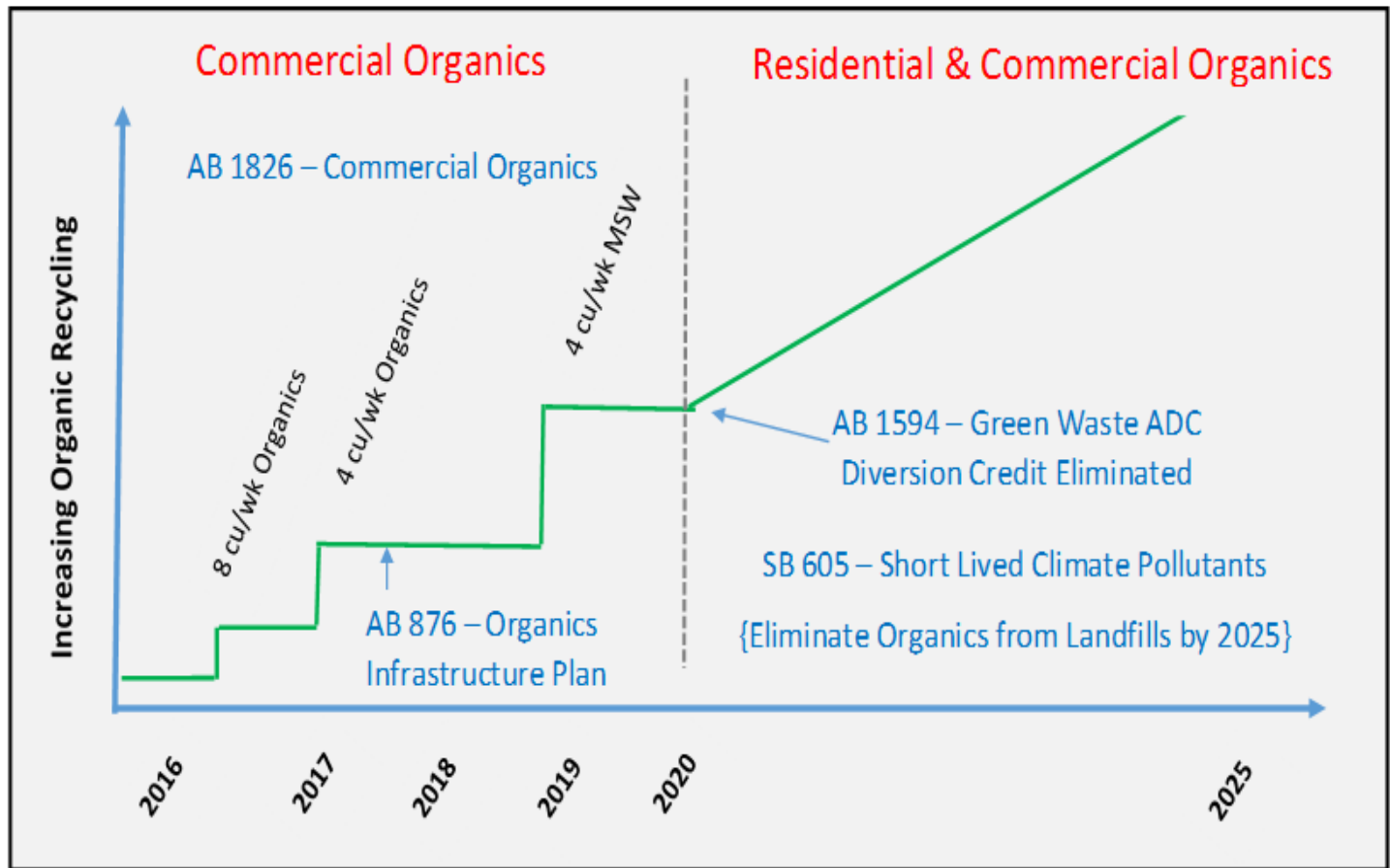


Districts' Wastewater Facilities



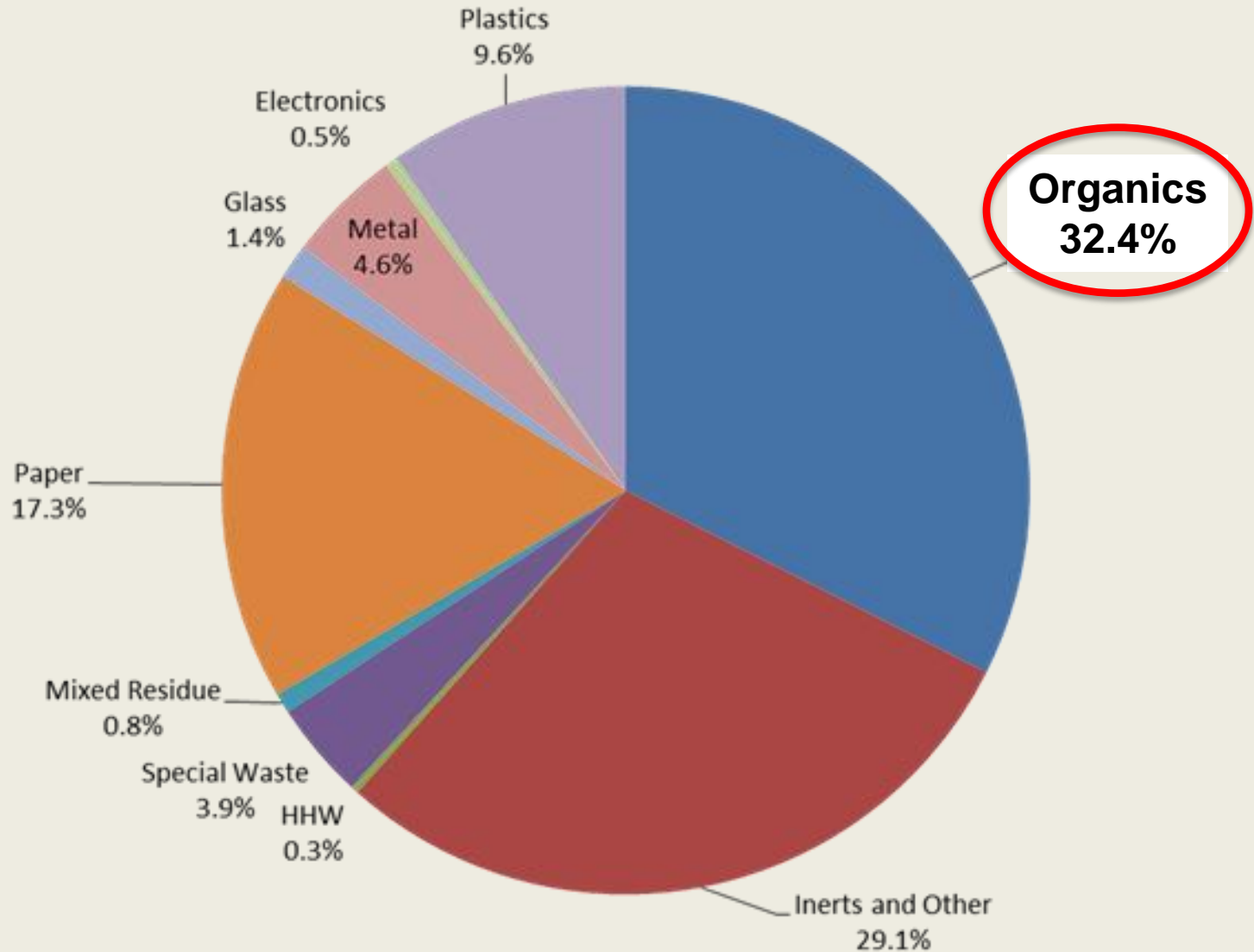


California's Path to Organics Recycling



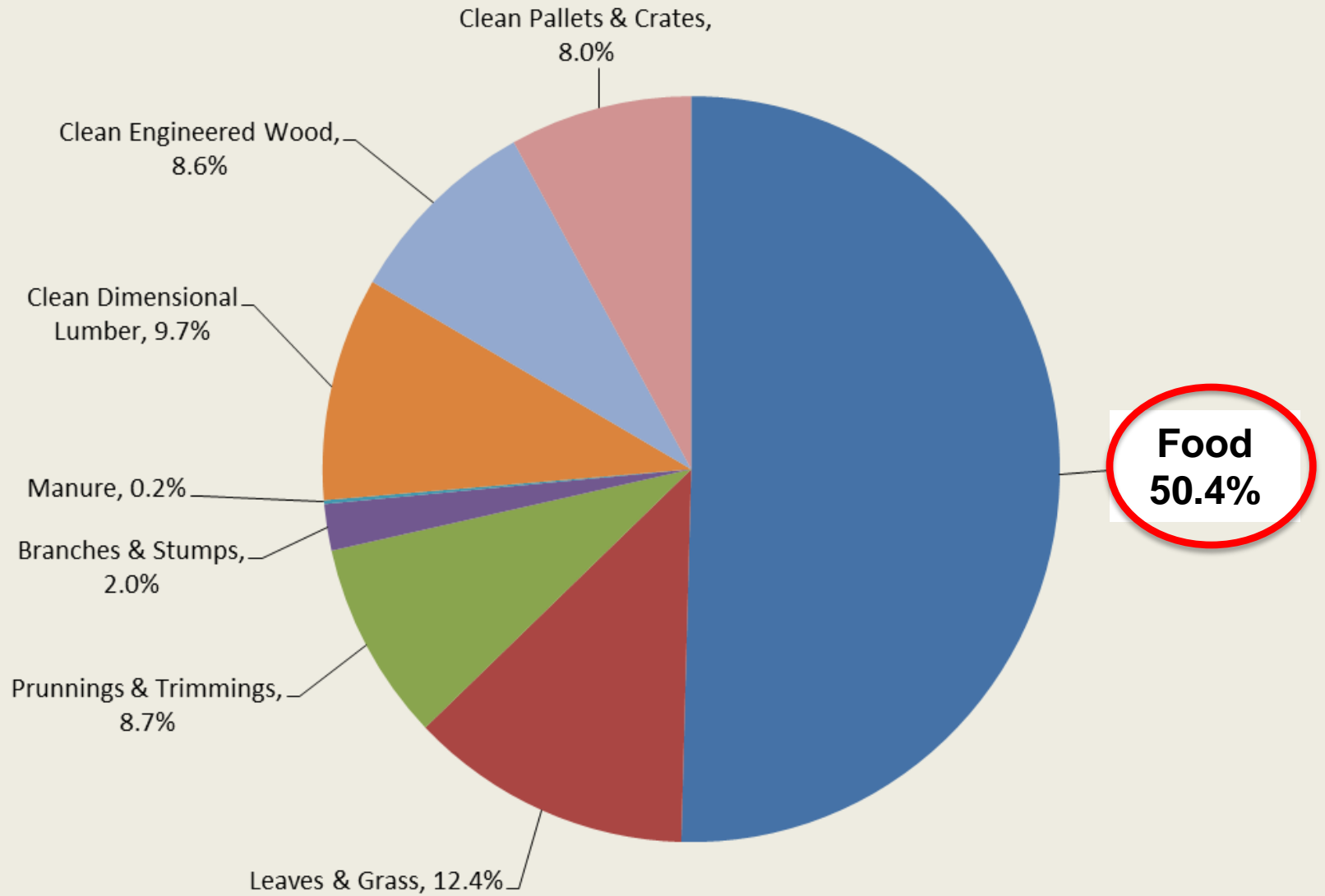


% Organics in Waste





% Food Waste in Organics

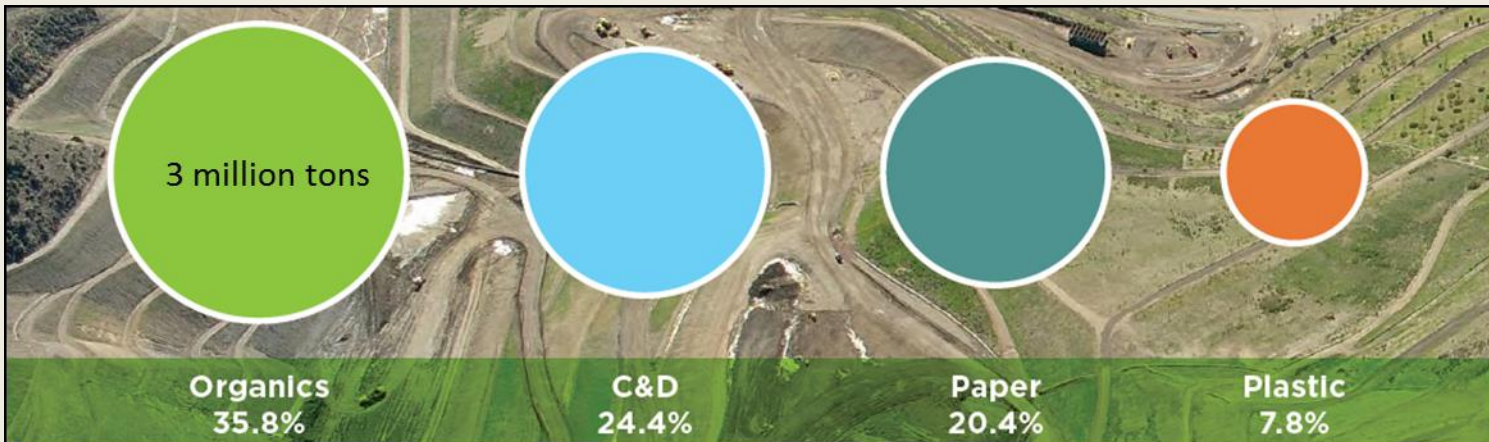




LOS ANGELES COUNTY

2012 Summary

Solid Waste	Million Tons
Generated	21.5
Disposed	8.8
Diversion Rate	60%



Source: Roadmap to a Sustainable Waste Management Future by Los Angeles County Department of Public Works, October 2014



Organic Waste AD Options: Dry Digestion

- Total Solids \geq 15% (needs to be pushed)
- Best if feedstock high in green waste to allow moving and stacking in digester.
- Compared to wet AD
 - Larger footprint
 - Less gas production
 - More residual material
 - Residuals typically require composting





Organic Waste AD Options: Wet Digestion

- Total Solids < 15% (can be pumped)
- Best if feedstock has no green waste, can be pumped & mixed in digester.
- Wet FW AD digestion generally provides better mixing and digestion, higher biogas yields, good odor control, and lower O&M costs.
 - Co-digestion ...The digestion of multiple organic wastes in one digester such as our demonstration program where food waste is mixed with sludge at JWPCP.





Digesting Organic Waste Streams at Wastewater Treatment Plants (WWTPs)

- Advantages:

- Digester already exists
- Energy recovery equipment already exist
- California WWTPs have capacity for up to 75% of California's food waste stream



- Concerns and challenges:

- Can accept only relatively clean feedstock
- Impact of additional residuals on biosolids
- WWTPs have an important public health mission

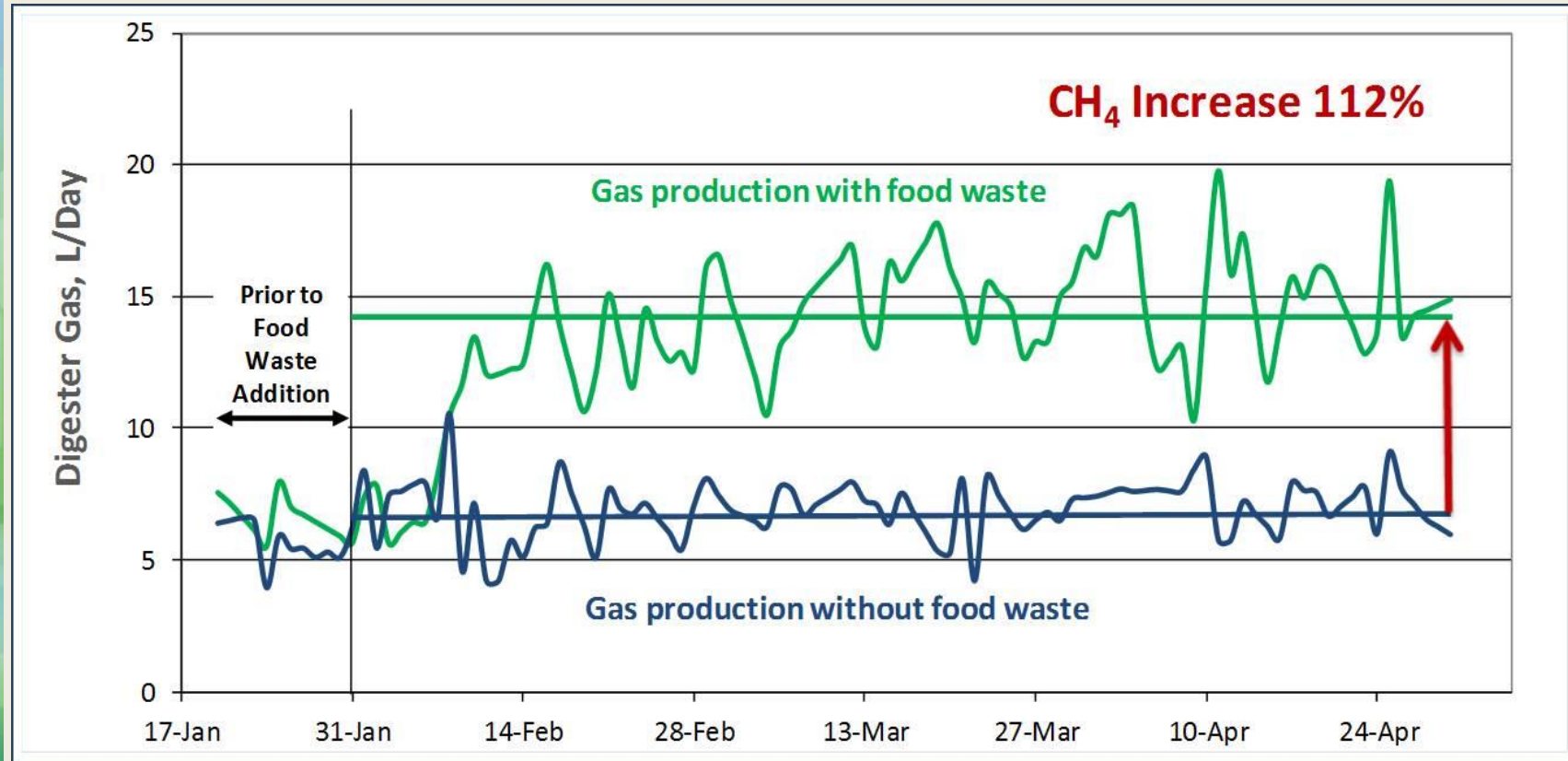


Feasibility Study and Bench Scale Testing

- In 2011, Districts completed feasibility study on co-digestion of food waste at Districts WWTPs.
- Conclusion...we had a viable project at JWPCP.
 - It is technically feasible (economics still a question)
 - It is allowed under current regulations
 - It could assist L.A. County cities/haulers with diversion efforts
- In 2012, performed bench scale testing of co-digestion of FW slurry and Districts biosolids...
 - Characterized FW slurry (developed FW specifications)
 - Identified no negative impacts on digester operation
 - Quantified biogas production potential



Adding Food Waste to Digesters Increases Biogas Production

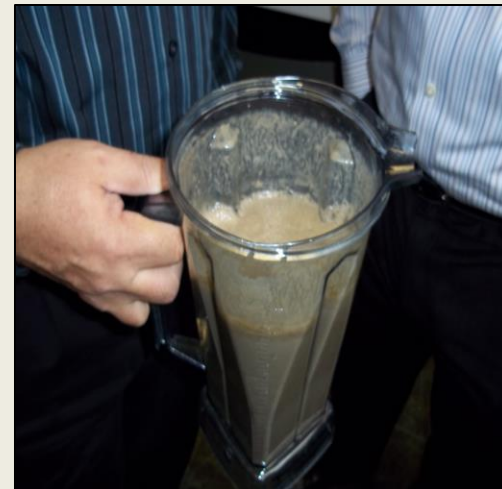
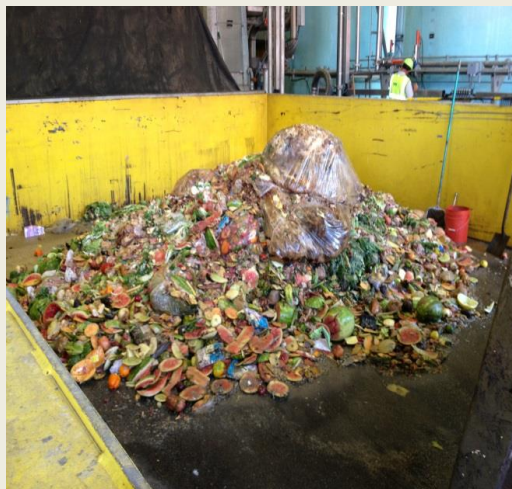


Adding 10-12% (v/v) food waste slurry to sludge could double biogas production



WM's CORE[®] Solution in Orange

- WM collects food waste from sources such as restaurants, food processing plants, cafeterias and grocery stores. Tipped material is inspected prior to processing.
- Food waste is processed to remove physical contamination (e.g., utensils, cans, packaging, and heavies) using WM's patented CORE[®] process.
- The processed food waste is blended and tested to manufacture a high quality, consistent EBS[™] product.
- Manufactured EBS[™] is loaded into tanker trucks for delivery to JWPCP.





Program Summary

- The Districts and Waste Management entered into a program agreement, with food waste specifications being a key issue
- WM will process food waste slurry at off-site location and deliver to JWPCP, with target feed rate of 84 tons (20,000 gallons) per day
- AT JWPCP, the slurry is injected into one digester for co-digestion at 9% food waste slurry on a liquids basis and 30% food waste on a solids basis
- WM and JWPCP's Research team are monitoring the program to evaluate the impacts and performance of food waste when co-digested at a WWTP



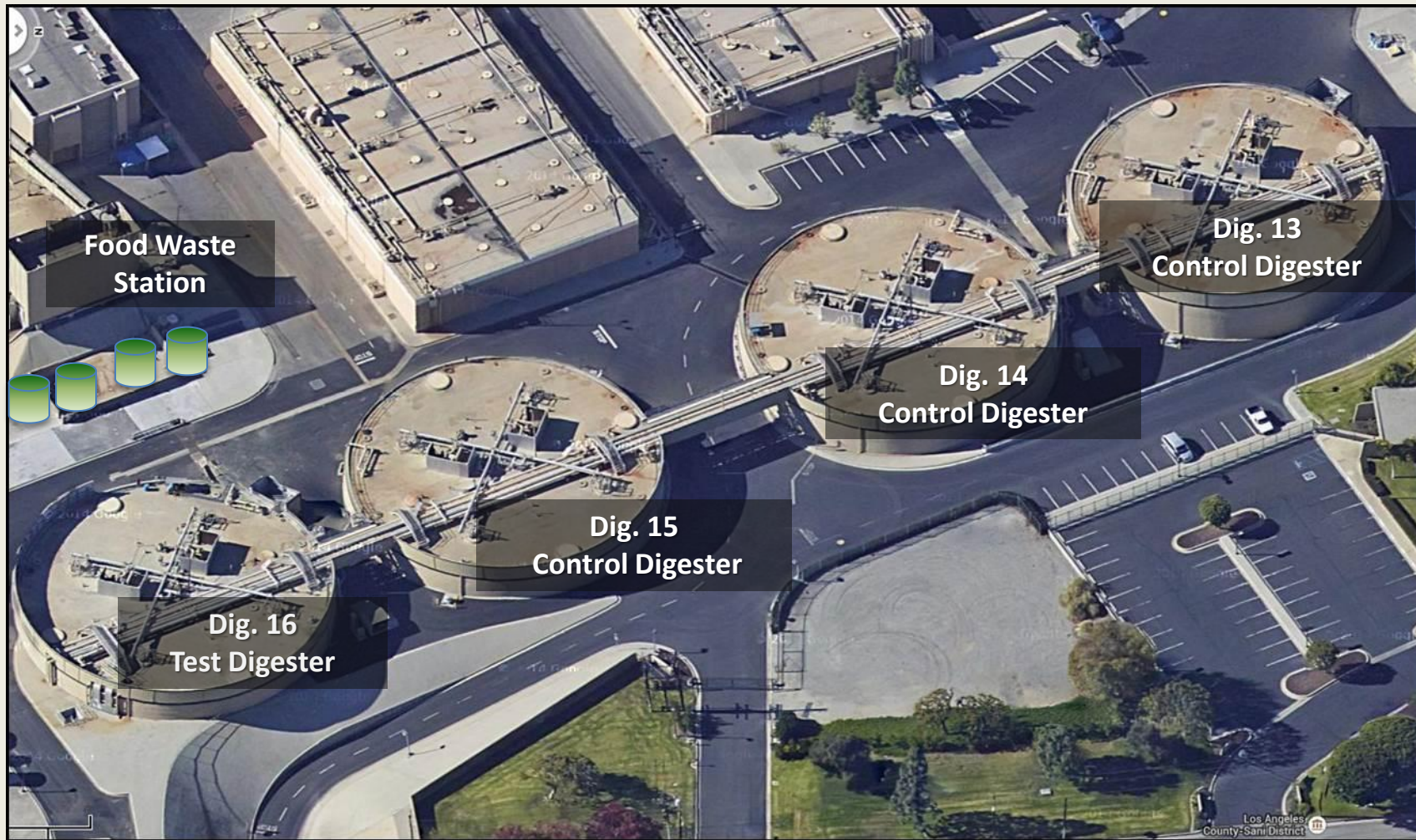
JWPCP Digesters

- 24 active digesters each with capacity of 3.7 million gallons
- 4.4 million gallons of biosolids added to digesters each day
- Biosolids breakdown (digest) for 18-19 days before exiting digester
- 5,000 scfm (or ~ 20 MW) of biogas is created
- Non-digestible solids are dewatered and trucked off for use in composting and for land application





JWPCP Test and Control Digesters



Food Waste Station



Dig. 13
Control Digester

Dig. 14
Control Digester

Dig. 15
Control Digester

Dig. 16
Test Digester



Food Waste Receiving

Food waste is pumped from WM tanker trucks into closed, sealed storage tanks, controlling odors.





Odor Control

- JWPCP has a goal of no odors detected off site
- Food waste is odorous even by the standards of a wastewater treatment plant
- Air from tank displacement and truck venting is passed through a carbon canister
- There are no odors during normal operation
- Odors during truck unloading are minimal





Food Waste Co-Digestion Plan

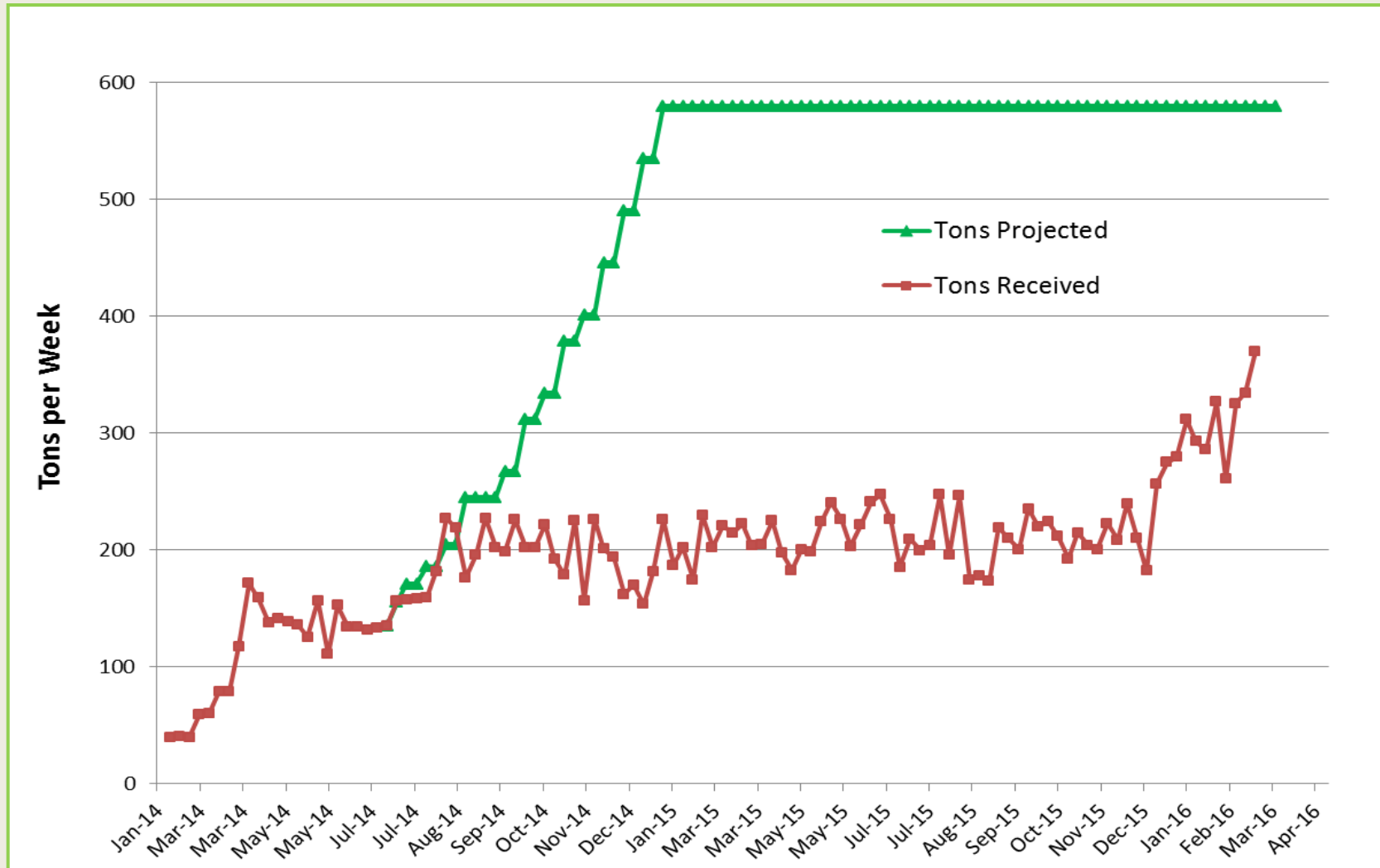
		Test Digester	Control Digesters
WW/Sludge/TWAS Feed	gal/day	205,000	205,000
	% solids	3.20%	3.20%
	tons per day solids	27.3	27.3
Food waste slurry feed	gal/day	20,000	---
	% Solids	14%	---
	tons per day solids	11.7	---
% Food Waste	liquid basis	9%	---
	solids basis	30%	---
Digester total	gal/day	225,000	205,000
	% Solids	4.2%	3.20%
	HRT, days	16.4	18.0





JWPCP Demonstration Update

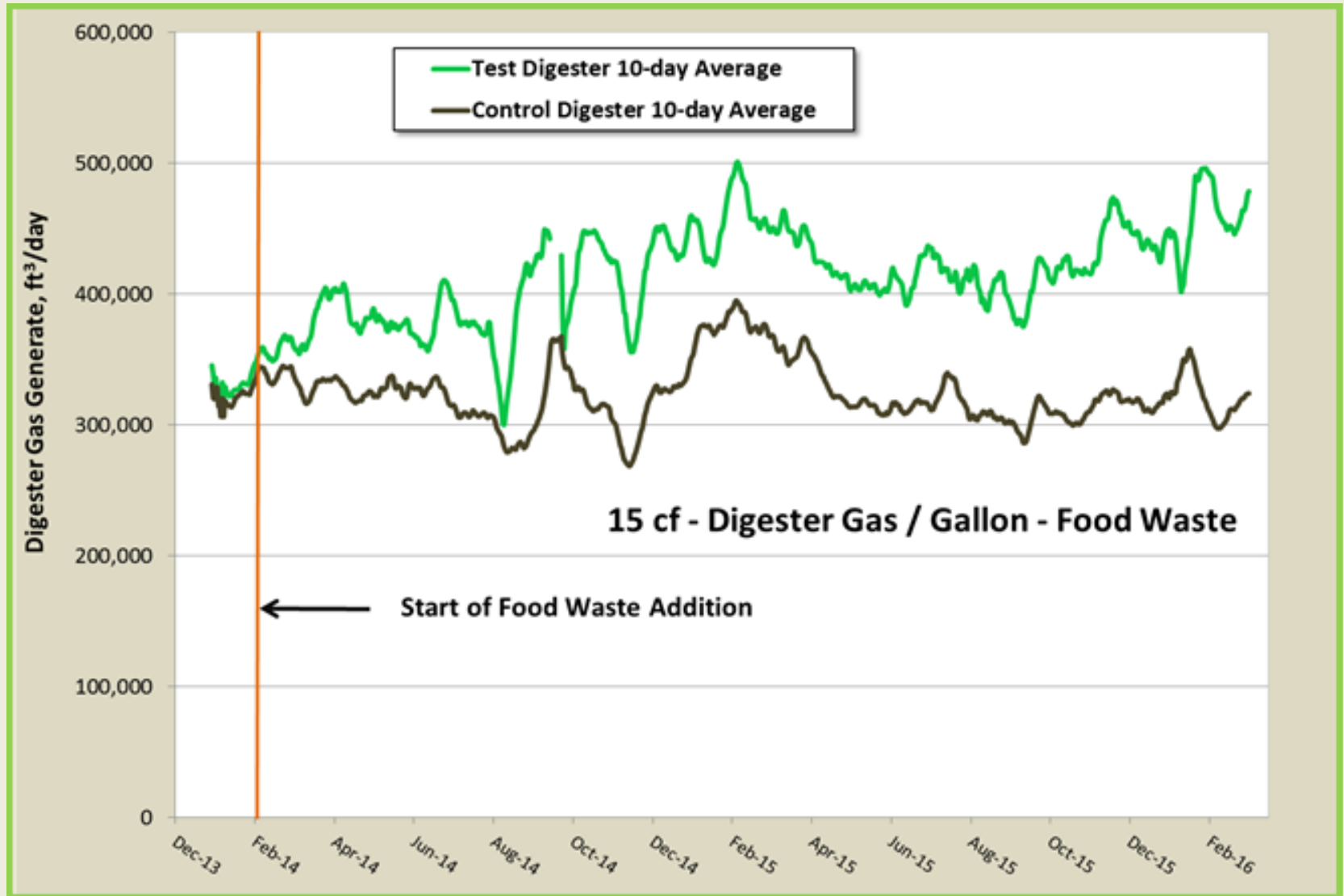
WM Food Waste Tonnage





JWPCP Demonstration Update

Digester Gas from Food Waste





Key Results to Date

- Food waste handling and storage systems have worked as designed
- No major impacts on treatment plant operation seen to date
- Biogas production has increased as expected



What to Expect Moving Forward: JWPCP Food Waste Program

- Continue ramp up to 84 tpd to validate expected peak digester gas production.
- Conduct dewatering testing on biosolids from test digester.
- Remove test digester from service in 2016 for cleaning and determine impacts from food waste.



Use of DG from Food Waste

- Current usage of digester gas
 - TEF is minimizing flaring and uses additional digester gas to generate extra electricity for sale
 - Current production of 100,000 cfd digester gas from food waste could produce an additional 270 kW.
- Future options
 - Electricity
 - Vehicle fuel
 - Pipeline biomethane
 - Hydrogen



JWPCP Total Energy Facility

Combined Cycle Cogeneration Power Plant

- (3) 9 MW Solar Turbine Mars 90's gas turbine generators
- (1) 8.7 MW Shin Nippon Machinery steam turbine-generator
- 20 MW used to meet on-site load

***2012 Grand Prize Winners – Operations Management
AAEE Excellence in Environmental Engineering and Science***





Thank you. Questions?

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"So, this Humpty Dumpty guy falls off the wall and I think, Dang, ain't lettin' this go to the food waste bin."



Food Waste Specifications

Parameter	Units	Specification Limits
pH	---	3.0 - 7.0
Volatile Acids	mg/L Ac Equiv.	< 8,000
Total Solids	%	12.0 - 15.0
Volatile Solids	% Total Solids	85 - 95
Total COD	mg/L	> 180,000
NH ₃ -N	mg/L-N	< 600