



Organics Recycling from Source Separated Organics and MSW with Centralized Mixed Waste Processing and Anaerobic Digestion

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Our Vision: A Zero Organic Waste Future

Wastewater
Biosolids



Source
Separated
Organics



Municipal
Solid Waste



Food
Processing
Waste



Agricultural
Waste



Integrated
Solutions



Renewable
Power



Renewable
Gas



Recyclables

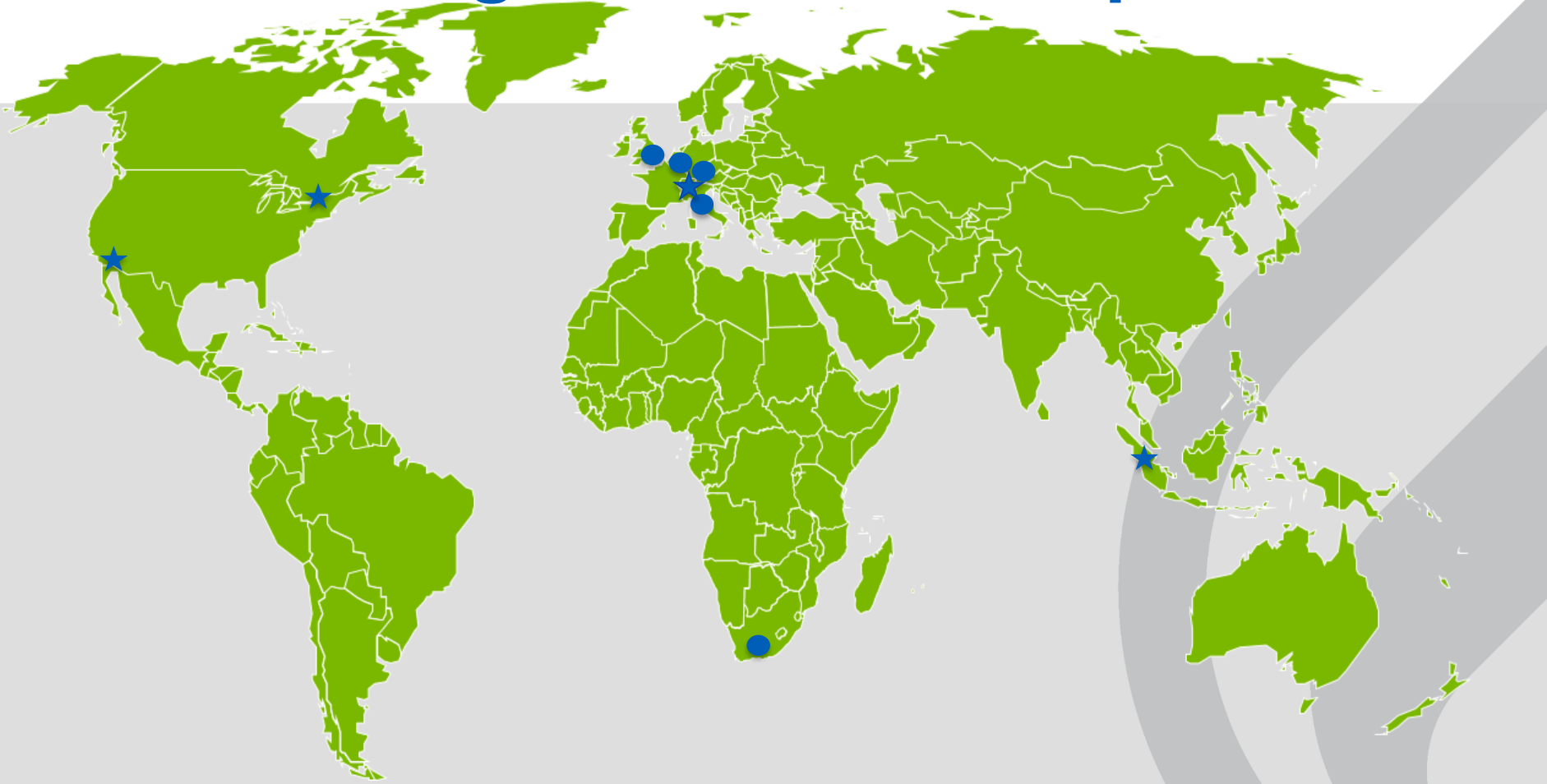


Fertilizer



Clean Water

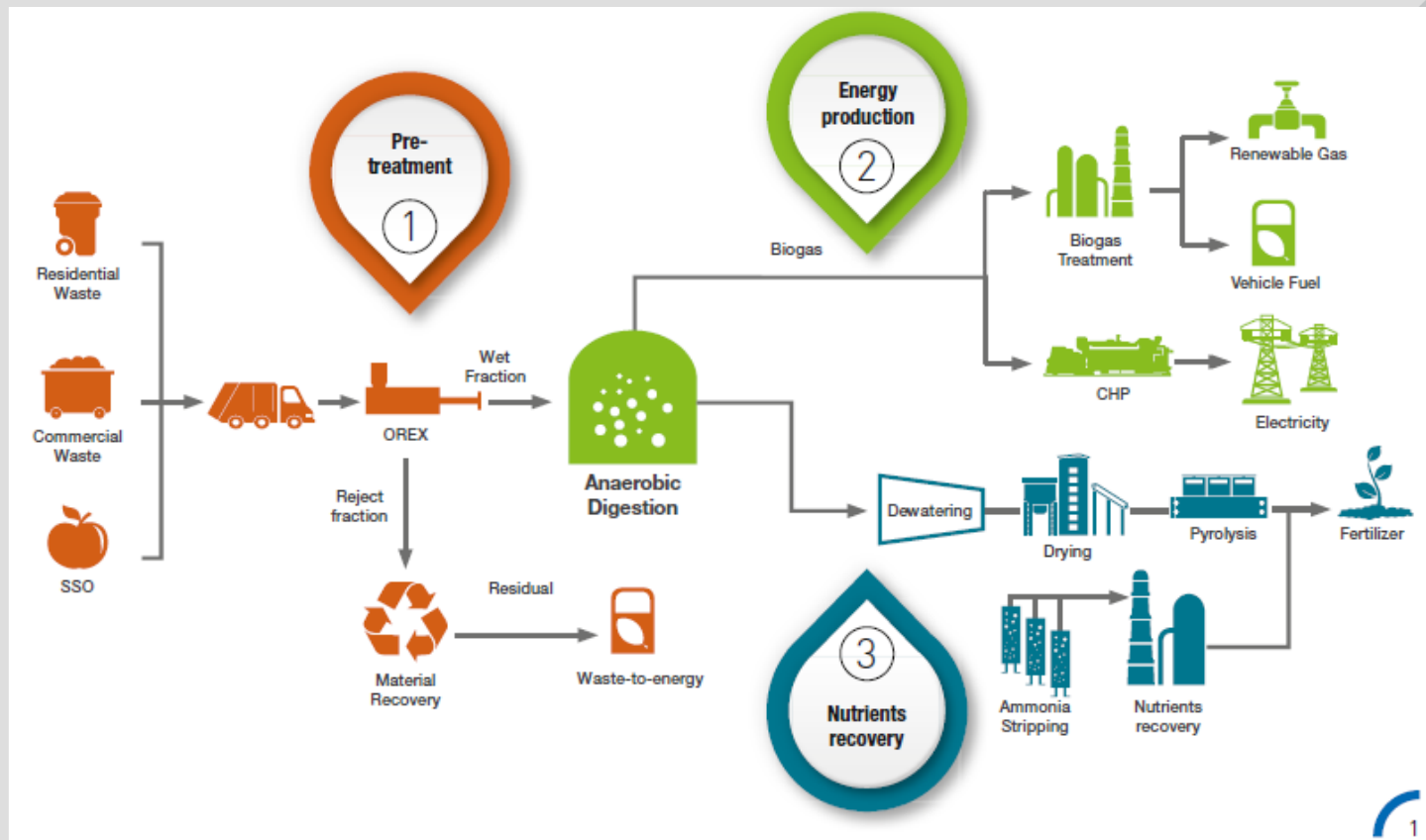
Anaergia's Global Footprint



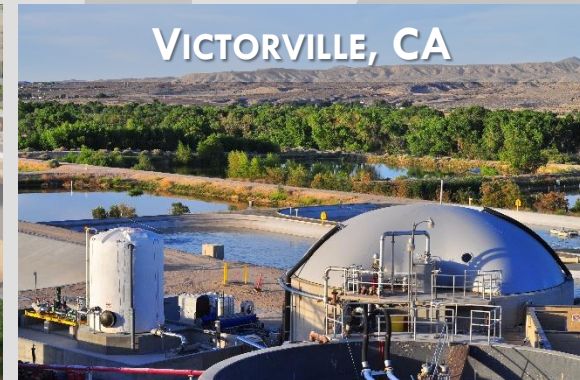
1,700+ Projects, 10 Offices, 3 Factories, 4 Continents



Areas of Competence



North American Facilities Processing Solid Waste to Anaerobic Digestion



California's 2045 Carbon Neutrality Goal Requires Carbon Negative Fuel

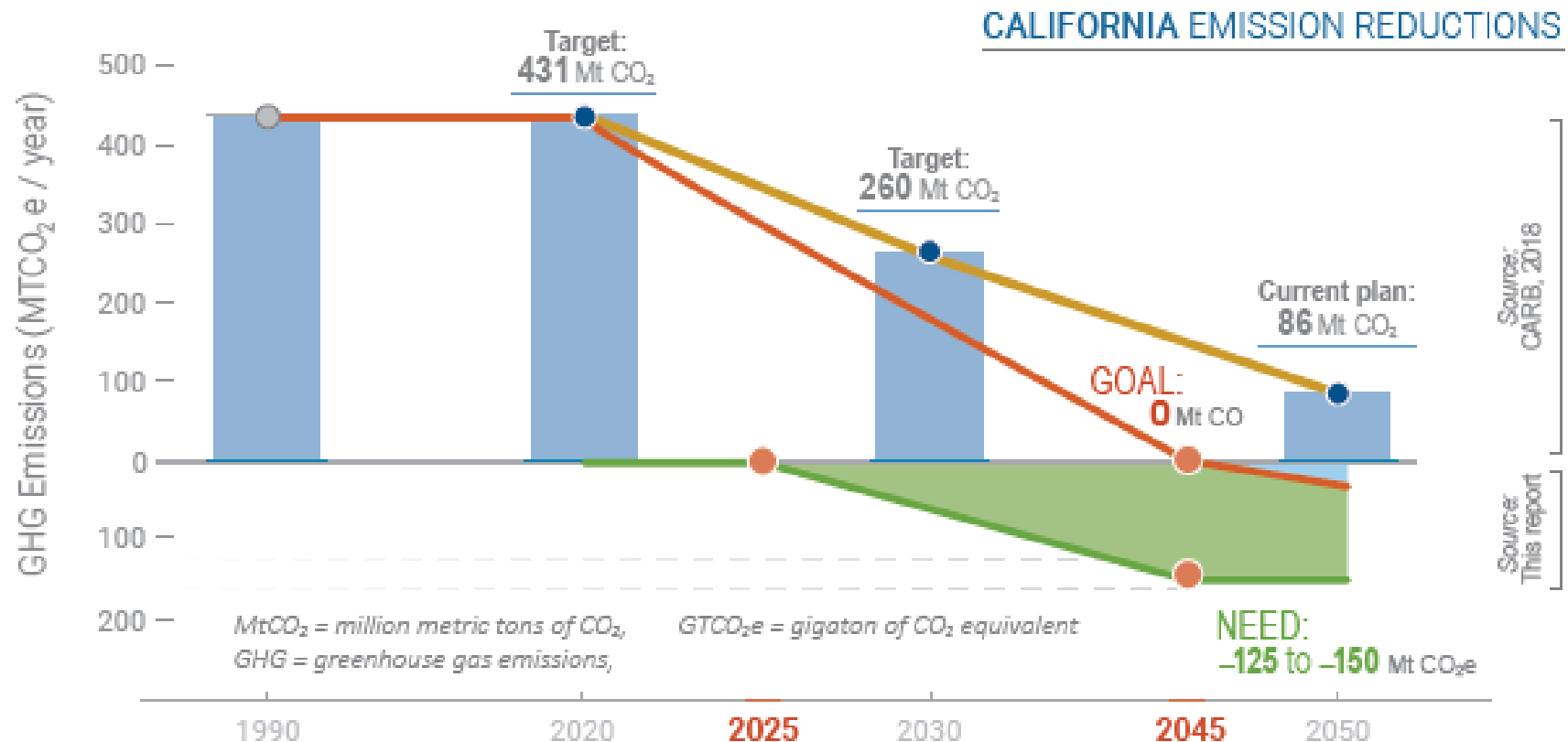
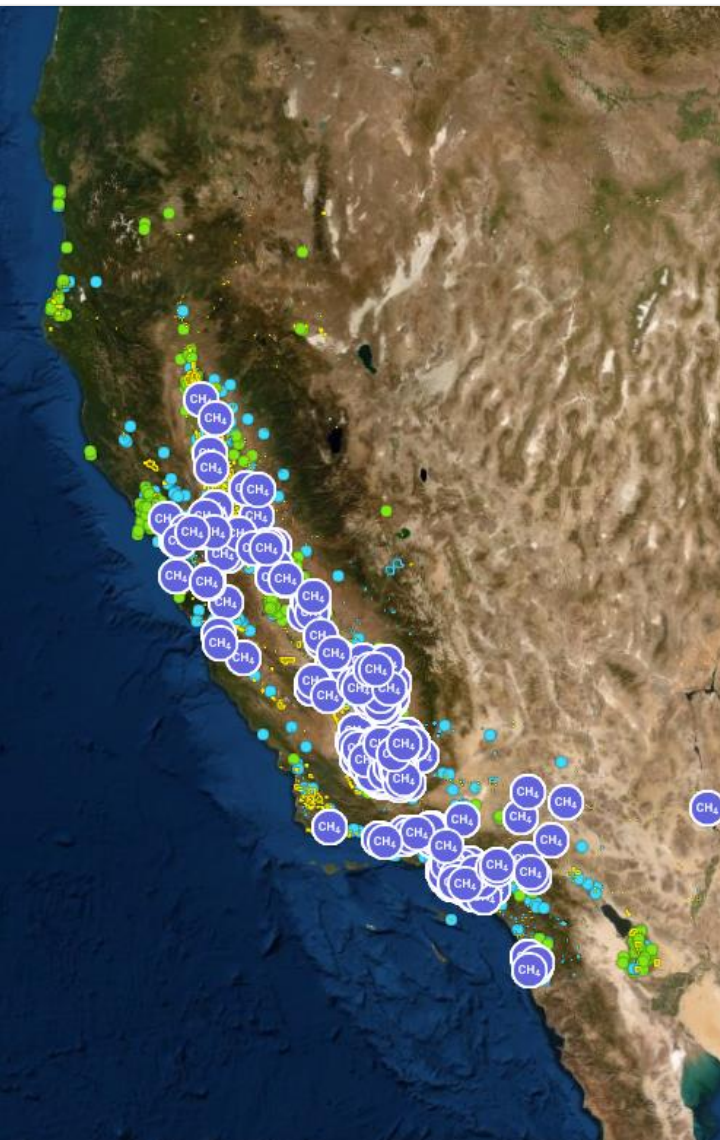


Figure ES-1. Goals of California's emissions plan extrapolated to 2045 (CARB, 2017) with negative emissions estimates from this report.

Carbon Negative Renewable Natural Gas From Solid Waste Will Play A Central Role In Carbon Neutrality

Landfills - Largest Source of CH₄ Release



Article

California's methane super-emitters

<https://doi.org/10.1038/s41586-019-1720-3>

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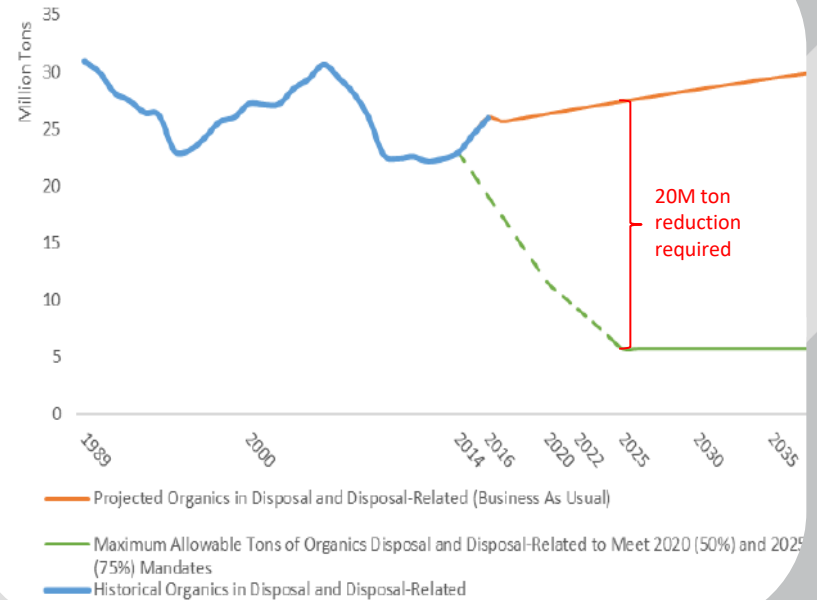
Riley M. Duren^{1,2*}, Andrew K. Thorpe¹, Kelsey T. Foster¹, Talha Rafiq³, Francesca M. Hopkins³, Vineet Yadav¹, Brian D. Bue¹, David R. Thompson¹, Stephen Conley⁴, Nadia K. Colombi⁵, Christian Frankenberg^{1,6}, Ian B. McCubbin¹, Michael L. Eastwood¹, Matthias Falk⁷, Jorn D. Herner⁷, Bart E. Croes⁷, Robert O. Green¹ & Charles E. Miller¹

Methane is a powerful greenhouse gas and is targeted for emissions mitigation by the US state of California and other jurisdictions worldwide^{1,2}. Unique opportunities for mitigation are presented by point-source emitters—surface features or infrastructure components that are typically less than 10 metres in diameter and emit plumes of highly concentrated methane³. However, data on point-source emissions are sparse and typically lack sufficient spatial and temporal resolution to guide their mitigation and to accurately assess their magnitude⁴. Here we survey more than 272,000 infrastructure elements in California using an airborne imaging spectrometer that can rapidly map methane plumes^{5–7}. We conduct five campaigns over several months from 2016 to 2018, spanning the oil and gas, manure-management and waste-management sectors, resulting in the detection, geolocation and quantification of emissions from 564 strong methane point sources. Our remote sensing approach enables the rapid and repeated assessment of large areas at high spatial resolution for a poorly characterized population of methane emitters that often appear intermittently and stochastically. We estimate net methane point-source emissions in California to be 0.618 teragrams per year (95 per cent confidence interval 0.523–0.725), equivalent to 34–46 per cent of the state's methane inventory⁸ for 2016. Methane 'super-emitter' activity occurs in every sector surveyed, with 10 per cent of point sources contributing roughly 60 per cent of point-source emissions—consistent with a study of the US Four Corners region that had a different sectoral mix⁹. The largest methane emitters in California are a subset of landfills, which exhibit persistent anomalous activity. Methane point-source emissions in California are dominated by landfills (41 per cent), followed by dairies (26 per cent) and the oil and gas sector (26 per cent). Our data have enabled the identification of the 0.2 per cent of California's infrastructure that is responsible for these emissions. Sharing these data with collaborating infrastructure operators has led to the mitigation of anomalous methane-emission activity¹⁰.

California's Mandate (SB 1383) to Organics Diversion from Landfill

- Requires 75% organic diversion by 2025
- Anaerobic Digestion or Composting Acceptable Processing Solution
- Will result in up to 200 organics recycling facilities
- Land applied organics need to meet stringent compost standards

Required Organics Diversion from Landfill



Compost Standard for Land Applied Organics

Material	% dry basis, > 4 mm
Rigid Plastic, Film Plastic, Metal, Glass	<0.5%
Film Plastic	<0.1%

Source: Calrecycle

State Water Board: WWTP Co-Digestion is Key

panies to develop third-party merchant facilities. Anaergia is developing a biorenergy facility in Rioja, CA, and is known to be targeting further BOO arrangements in the state (see GWT April 2020, p28).

While co-digestion at wastewater treatment plants could go some way towards meeting the state's landfill diversion tar-

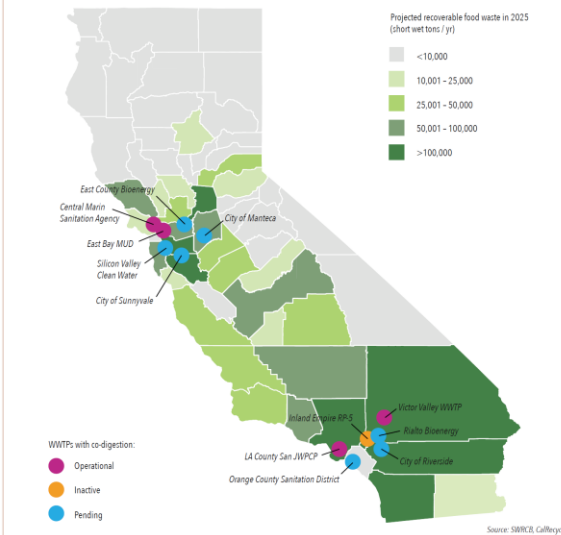
Synagro, for instance, currently has a series of merchant composting facilities in California that it is looking to permit for post-consumer food waste, the company's director of legislative and regulatory affairs, Layne Barndt, told CWI this month.

Likewise, the processing of organic waste at wastewater treatment plants would

developed under SB1383 – which are due to be adopted later this year – will help ensure that land application of biosolids in California is unhindered by local ordinances. From January 2022, counties such as Stanislaus and San Joaquin will no longer be able to prohibit the land application of lower-quality 'Class B' biosolids. ■

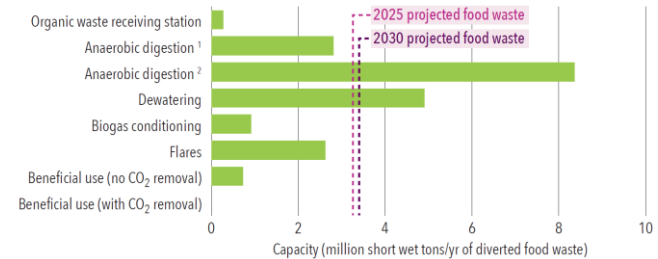
MAPPING OUT CO-DIGESTION IN CALIFORNIA

A dozen wastewater and organic waste co-digestion schemes are either underway or in the planning stages in California. WWTPs have the advantage of already being located where food waste is generated.



DIGESTING CALIFORNIA'S CO-DIGESTION CAPACITY

A new report assessed statewide co-digestion capacity at WWTPs, including AD capacity under two operating scenarios. Ancillary infrastructure such as waste pre-processing will require the most investment.



¹ Design solid residence time; largest unit out of service

² 15-day solid residence time; all units in service

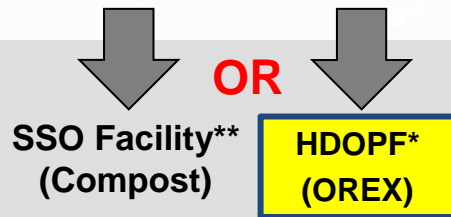
Source: SWRCB

Key Points from Aug 20' State Water Board Report:

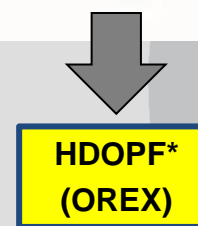
- Wastewater plants have half the capacity needed for 1383.
- Wastewater community can play key role in landfill diversion of organics.
- Retrofitting infrastructure can increase capacity and resiliency.
- Largest hurdle is pre-processing for feedstock security (Anaergia OREX solves this).

SB 1383 Requires Three Options for Organics Collection and Recycling

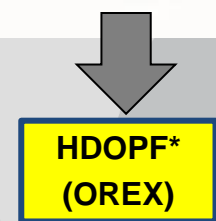
3 Bin



2 Bin



1 Bin



*High Diversion Organics Processing Facility, 75% organics diversion

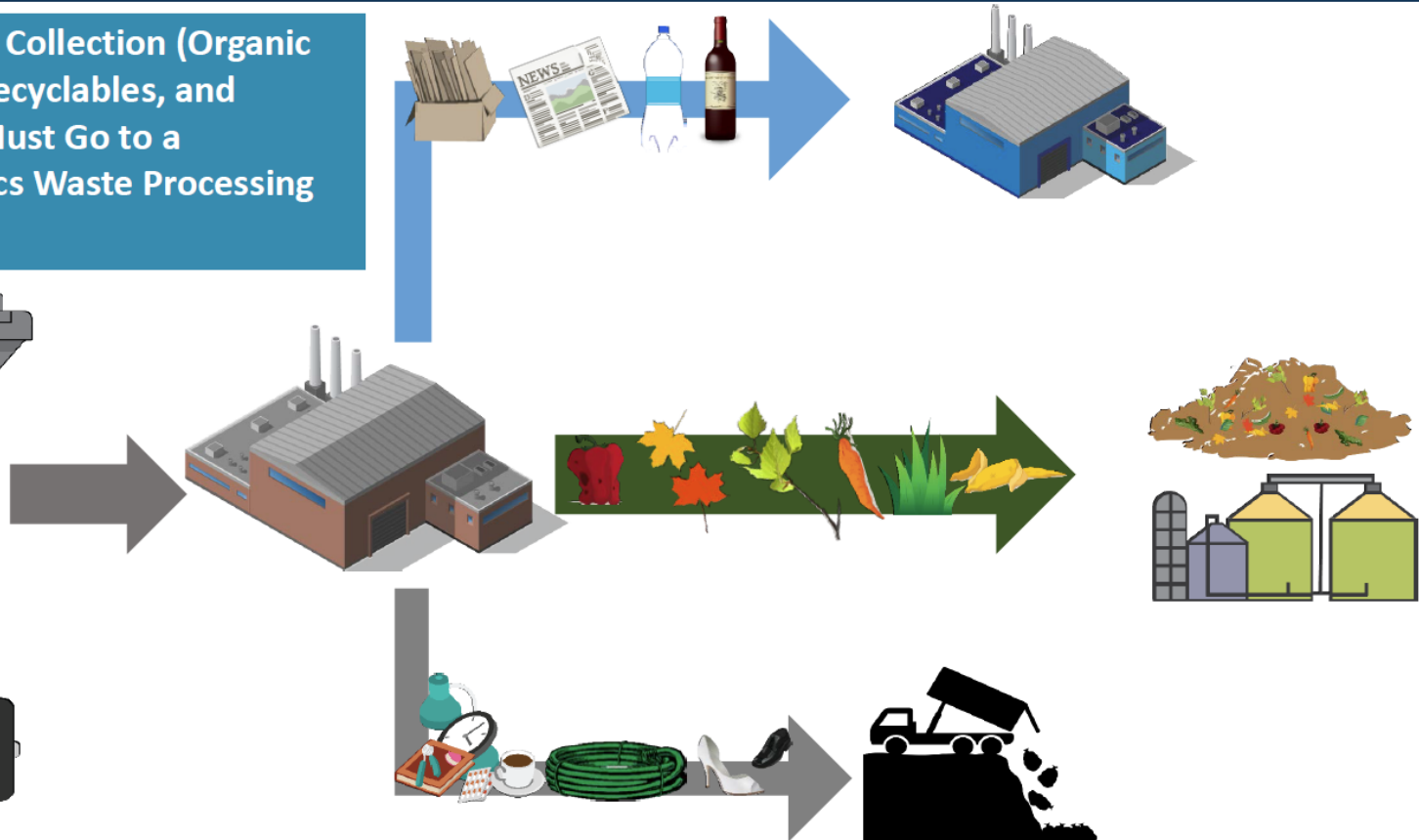
**SSO Facility must have <10% organics in rejects and <10% rejects in organics

High Diversion Facility Provides Compliance Solution for Any Collection Option

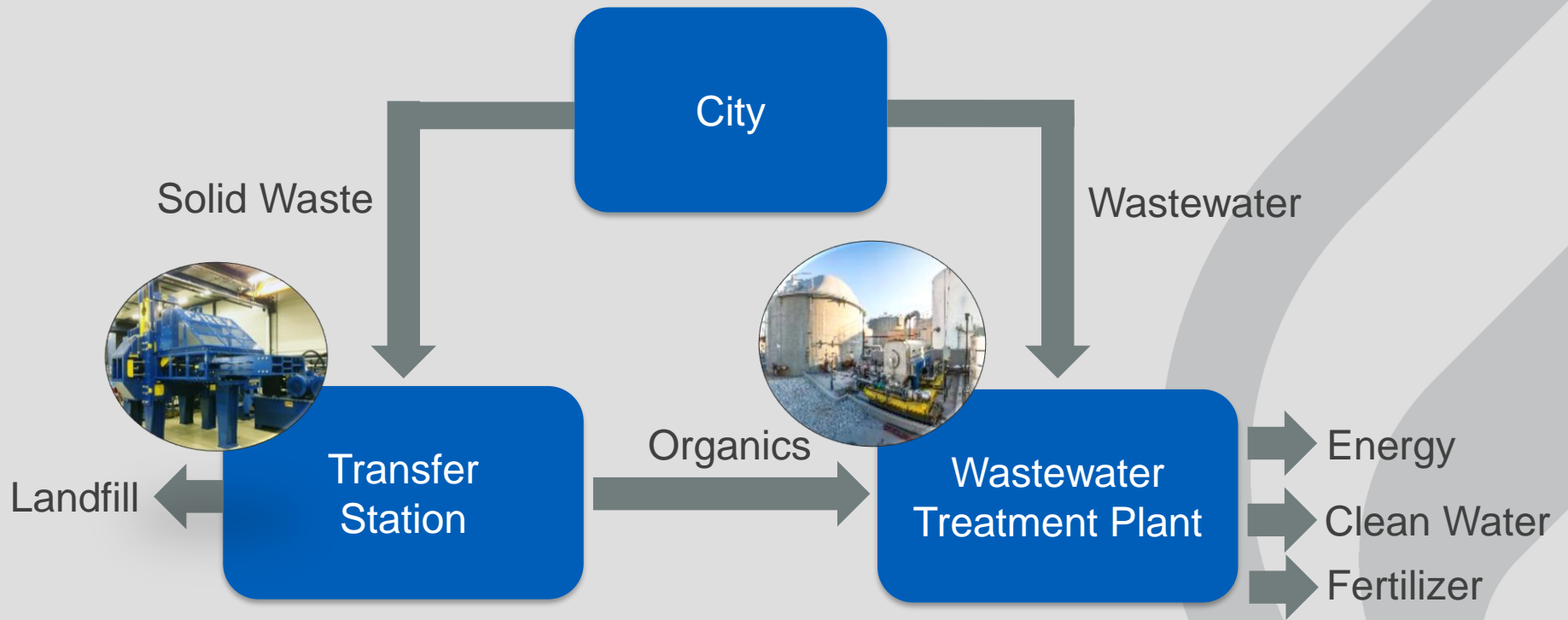
Mixed Organics Allowed and Must be Processed at High Diversion Organics Waste Processing Facility

UNSEGREGATED SINGLE-CONTAINER COLLECTION SERVICES

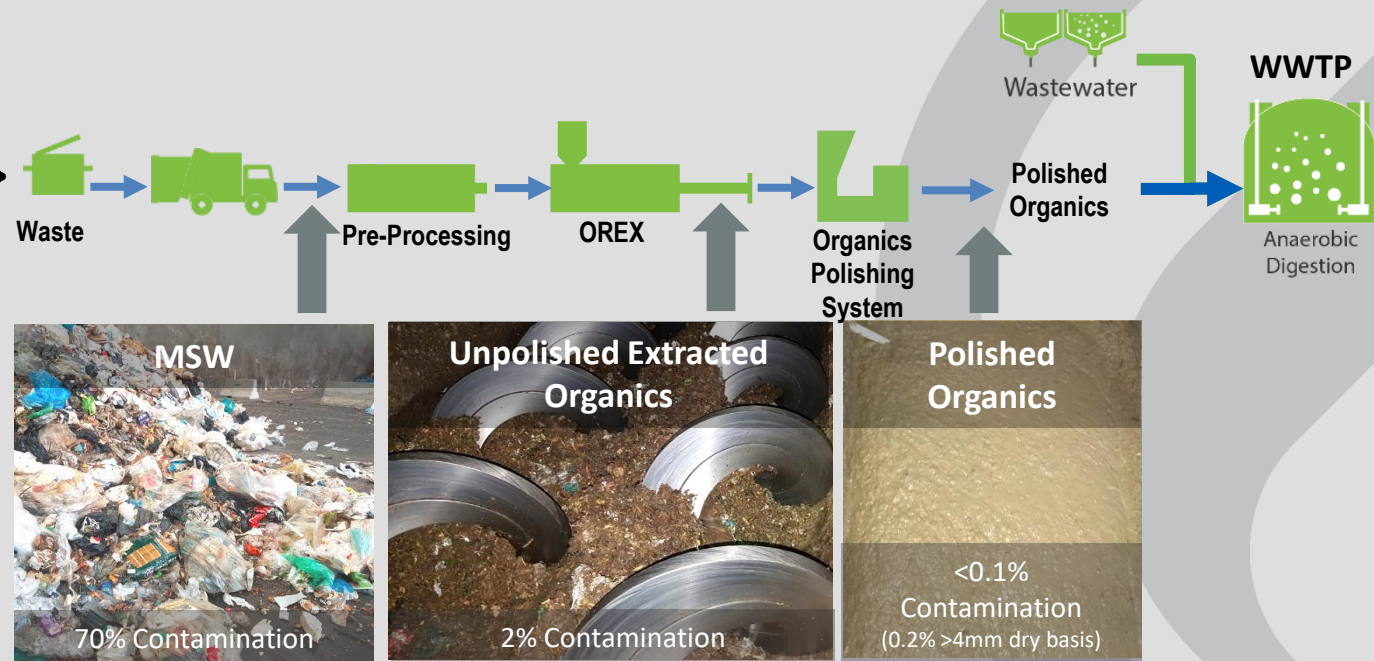
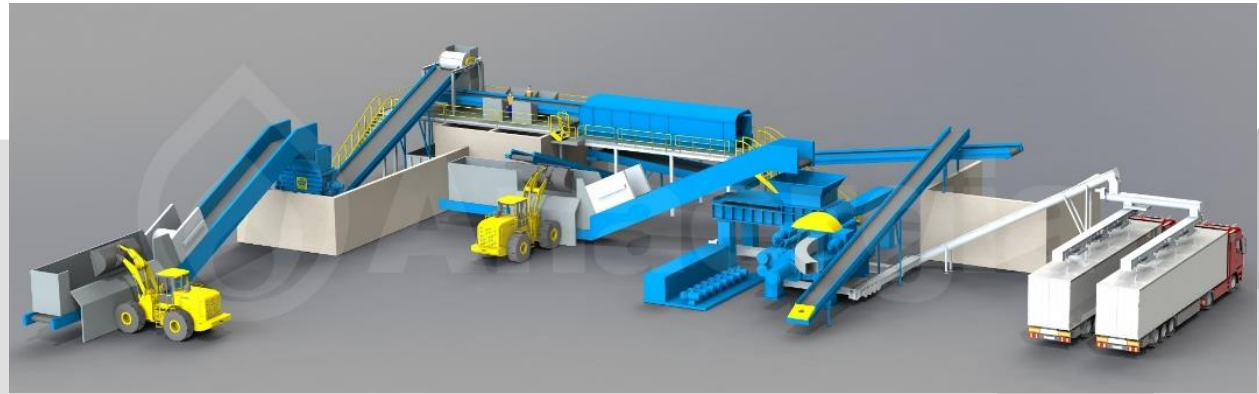
Unsegregated (Mixed) Collection (Organic Waste, Non-Organic Recyclables, and Non-Organic Waste) Must Go to a High-Diversion Organics Waste Processing Facility



Using Existing Infrastructure



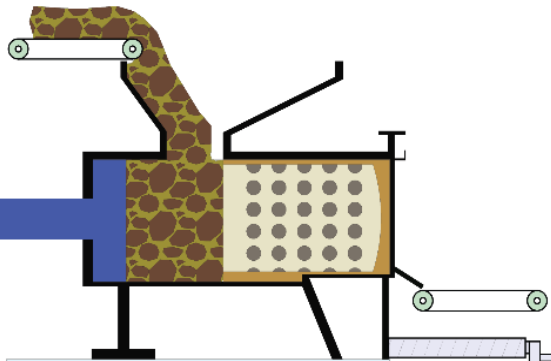
OREX Line Processes Contaminated Waste



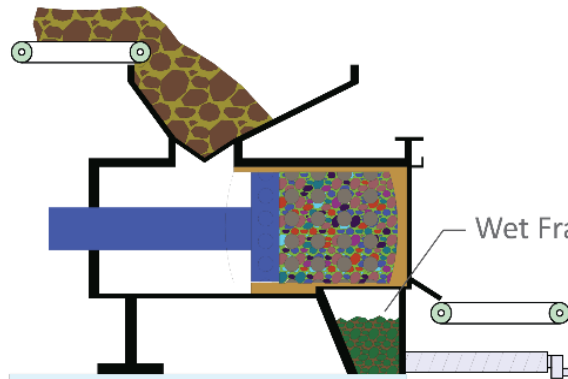
Organics Extrusion Press (OREX) Separates Organics from Mixed Solid Waste to Produce Renewable Energy and Fertilizer at Wastewater Treatment Plants



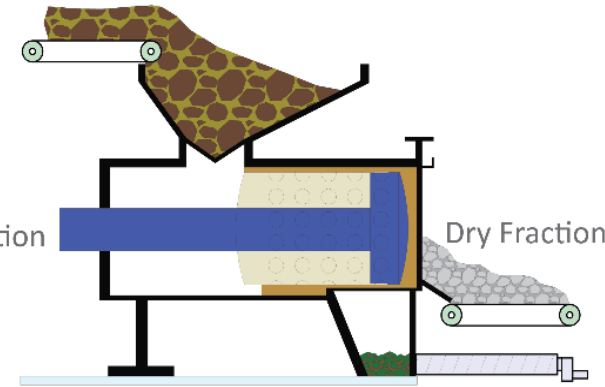
MSW Feed



Feed Phase (Low Pressure)



Compression Phase (High Pressure)



Expulsion Phase (Low Pressure)

Organics Extracted from MSW by OREX



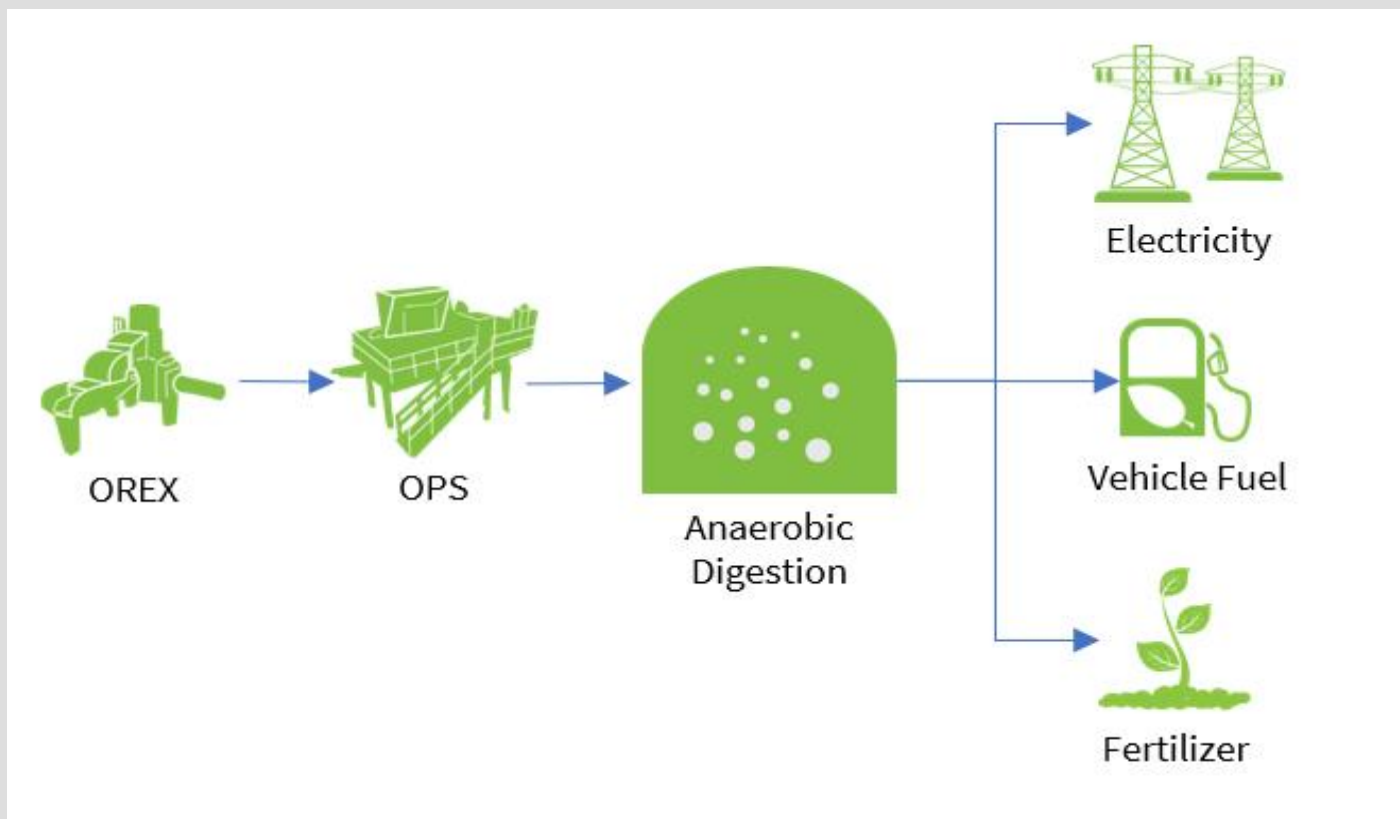
Anaergia Organics Polishing System (OPS)



Generates clean slurry from organic fraction of solid waste

- 12-16% TS
- <0.1 % (dry basis) inert contamination

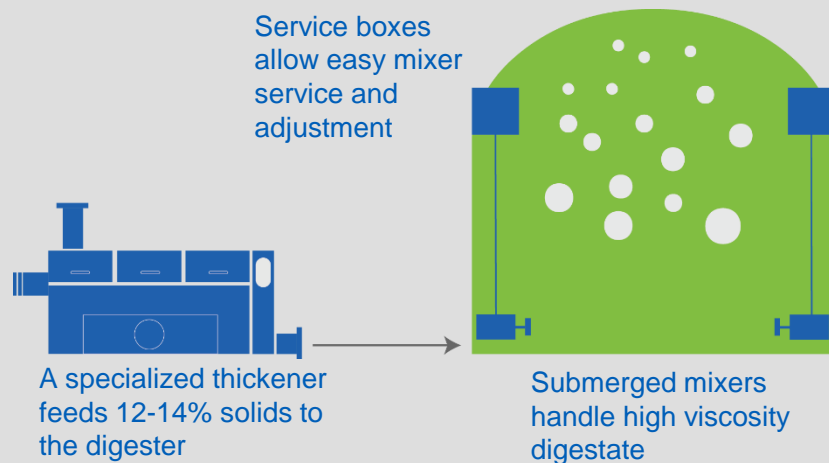
Increasing Digester Capacity



Omnivore™ = High Solids Digestion

Omnivore™ is similar to conventional digestion with two changes:

1. The addition of thickening
2. An advanced mixing system



RETROFIT WASTEWATER TREATMENT PLANT TO PRODUCE ENERGY FROM ORGANICS IN SOLID WASTE



Omnivore™

1 Service boxes allow high-solids hydraulic mixers to be accessed for maintenance without shutting down the digester

2 At the heart of the Omnivore™ system, a recuperative thickener that facilitates high solids digestion. It decouples solids retention time from hydraulic retention time

3 External feedstock such as FOG and food waste is fed to the Omnivore™ through the waste reception station

Omnivore[®] Component Service Box



Reliable

- Mixers can be accessed for inspection and maintenance while the digester remains in service

Easy to Operate and Maintain

- Easy adjustment of mixer height and direction
- Maintenance and inspection is simplified by automated mixer retrieval





Rialto BioEnergy Facility



RBF Feedstock Flow

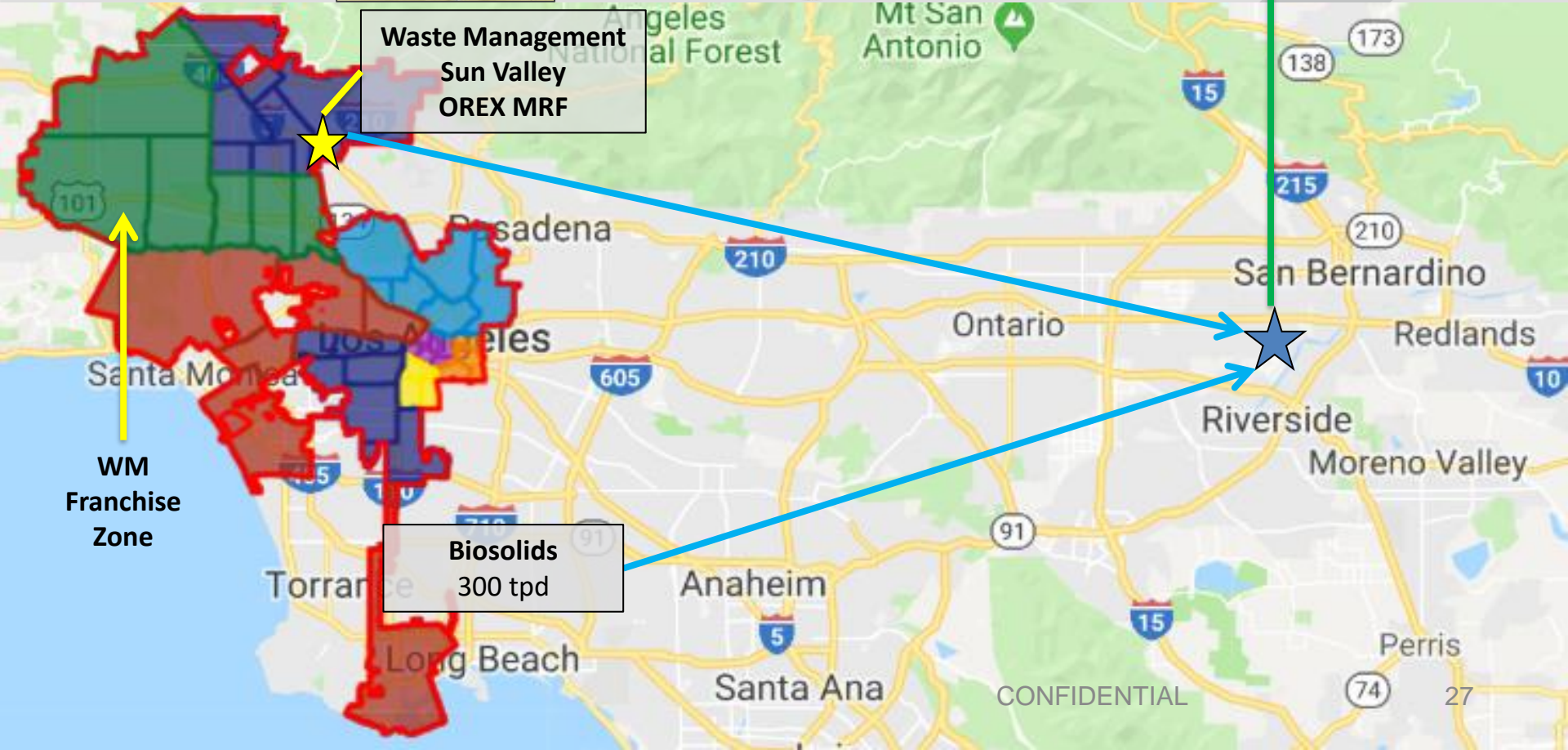
Solid Waste



Organics Separation from
Solid Waste (OREX)



Organic Fraction



Waste Management
Sun Valley
OREX MRF

WM
Franchise
Zone

Biosolids
300 tpd

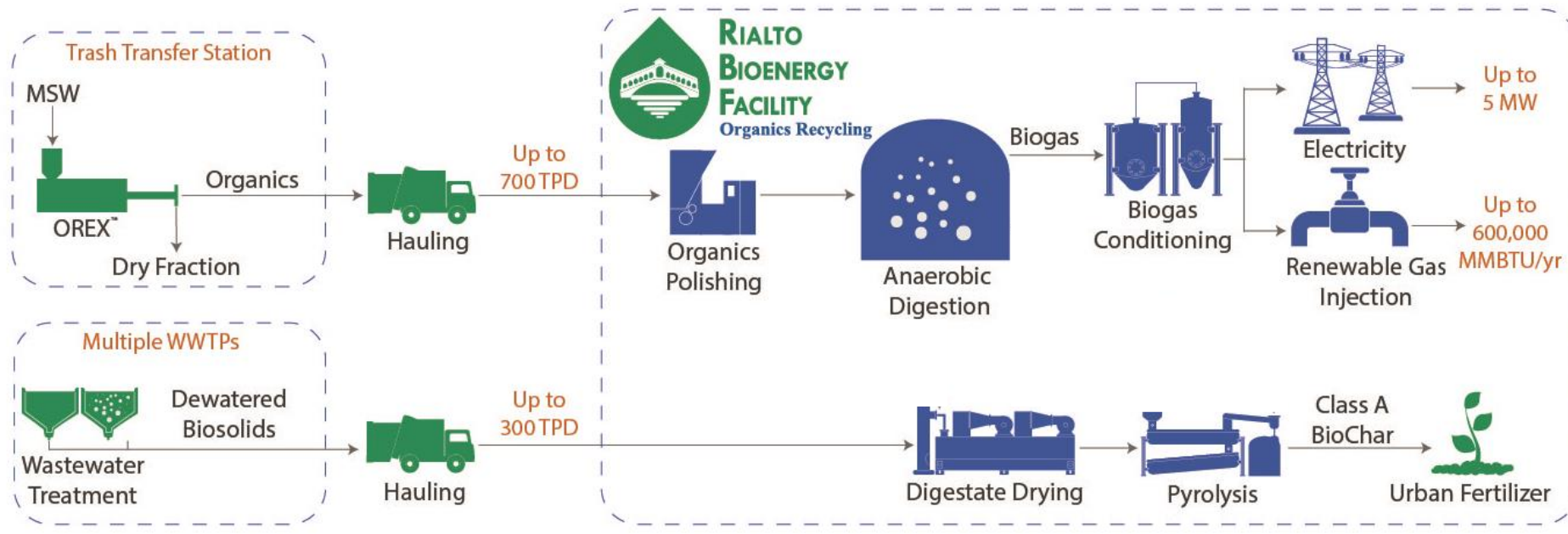
CONFIDENTIAL

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OREX IN SUN VALLEY AT WASTE MANAGEMENT'S MRF SEPARATING ORGANICS FROM MSW



Rialto Bioenergy Process Diagram



Rialto Bioenergy Facility



Delivery of Organic Fraction of MSW



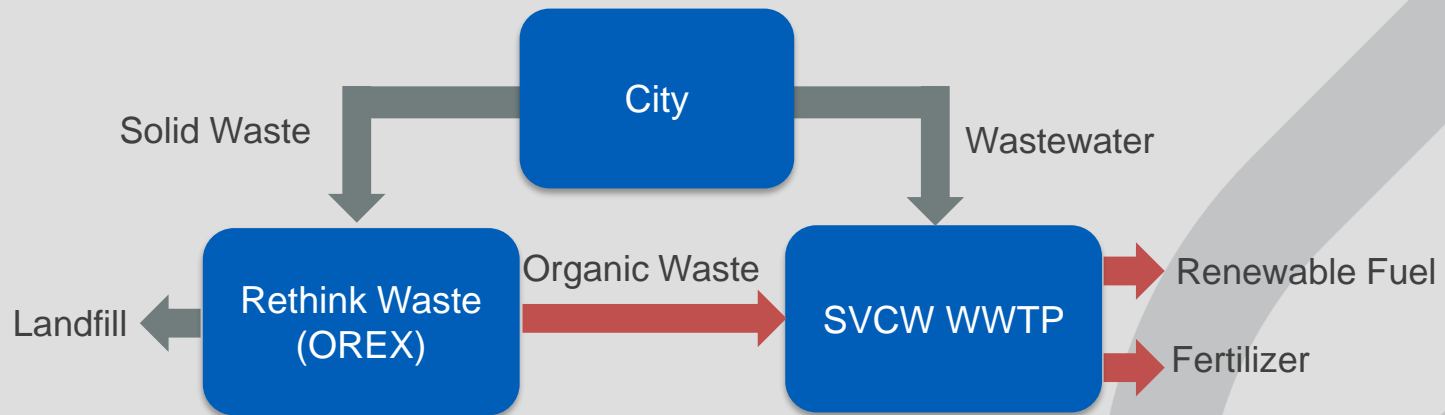
Sterling Natural Resource Center East Valley Water District



Victor Valley Wastewater Reclamation Authority



Using Existing Infrastructure: Solid Waste MRF - WWTP AD



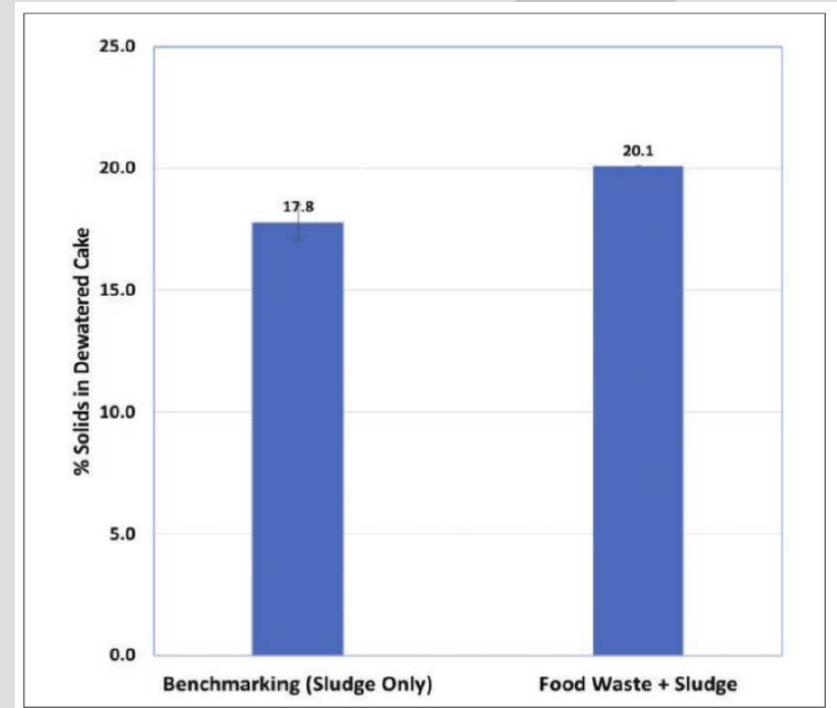
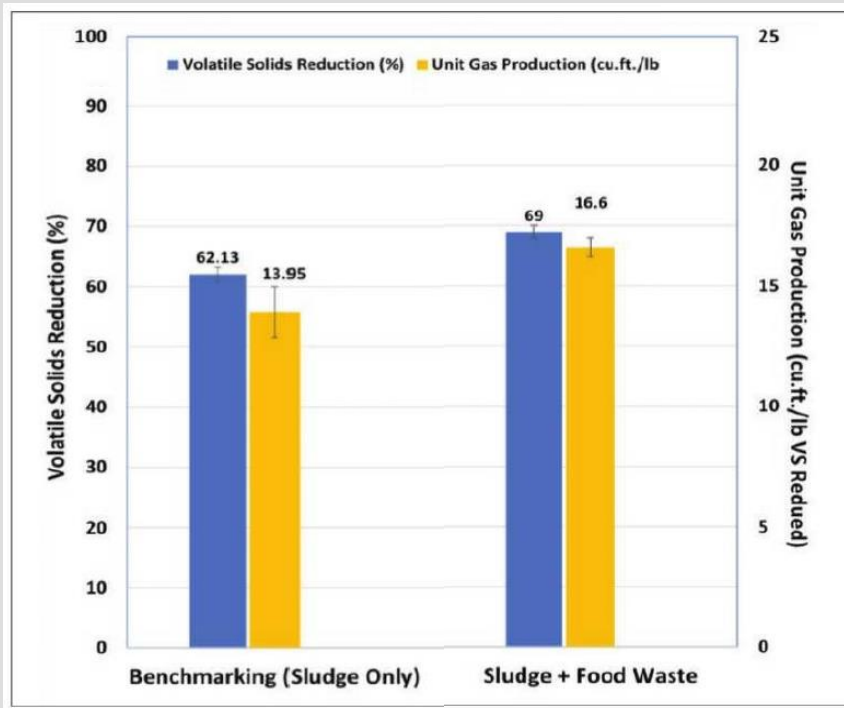
Receiving Infrastructure at Bay Area WWTPs Outlets for SBWMA



MSW Co-Digestion at WWTP using OREX

Silicon Valley Clean Water Prepares for **Food Waste Co-Digestion Program**

By Arvind Akela, Aniruddha Bhagwat, Chuck Fenton, Silicon Valley Clean Water; Bhargavi Subramanian, Ganesh Rajagopalan, Kennedy/Jenks Consultants



Organics from MSW enhance digestion at WWTP AD with following benefits:
(1) Higher unit gas production (2) Greater solids destruction (3) Fewer Biosolids for disposal

Thank You

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