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Anaerobic Digestion and Conversion Technologies Deployment in California: An Update

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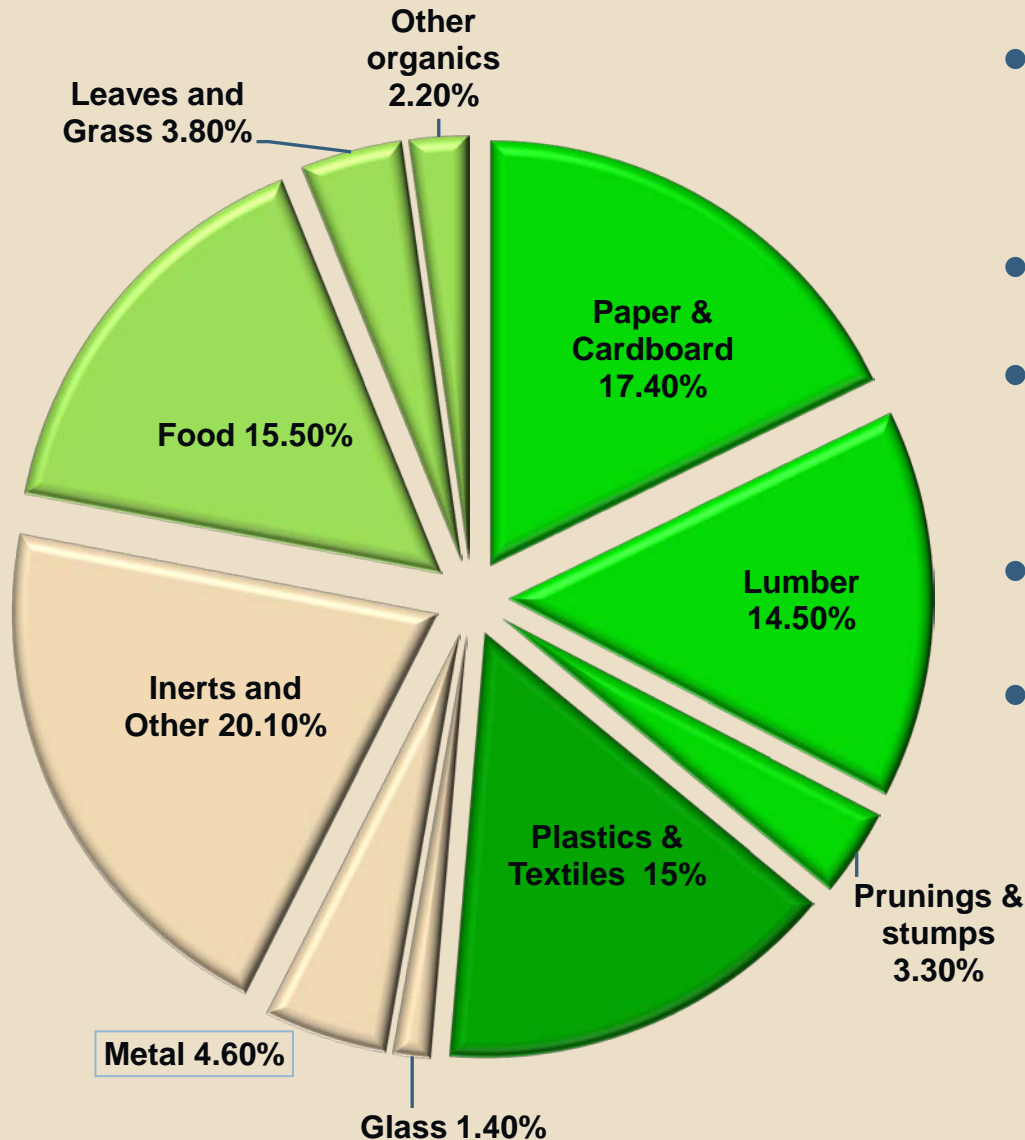
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Overview

- Resource base and policy drivers
- Conversion Technologies in a nutshell
- California Projects
- Resources

California landfilled waste stream



- 39 million tons MSW landfilled per year
- 70% carbon based
- Energy potential 15,000 GWh/year
- 5% of CA power demand
- About 22% suitable for Anaerobic Digestion

Source: CalRecycle 2007 & 08

California Policy Drivers

(a partial list)

- 1- Lack of landfill space close to population centers & other local Jurisdiction goals
- 2- AB 32 - Global Warming Solutions Act of 2006
Anaerobic Digestion measure
- 3- Renewable Portfolio Standard - 33% by 2020
- 4- Low Carbon Fuel Standard - Deliver automotive energy by 2020 with 10% less greenhouse gases than 2010
- 5- CalRecycle Strategic directives 6.1 & 9.2 – Organics diversion and Bioenergy & Biofuels R&D

Feedstocks

Technologies

Products



Solid waste



Green waste



Food waste



Paper waste



Wood waste



Fats Oil Grease



MRF residuals **

Anaerobic Digestion

Fermentation

Gasification

Pyrolysis

Hybrid

Electricity

Biogas

Biodiesel

Ethanol

Hydrogen

Heat

Chemicals

Syngas

Liquid Fuels

Compost

** MRF: Material Recovery Facility

Evaluation of Conversion Technologies for Municipal Waste Management

Jurisdiction Sponsored Evaluations (a partial list)

- City of Los Angeles
- County of Los Angeles
- City & County of Santa Barbara
- Salinas Valley Solid Waste Authority
- Cities of San Jose, Tulare, San Diego & Santa Cruz

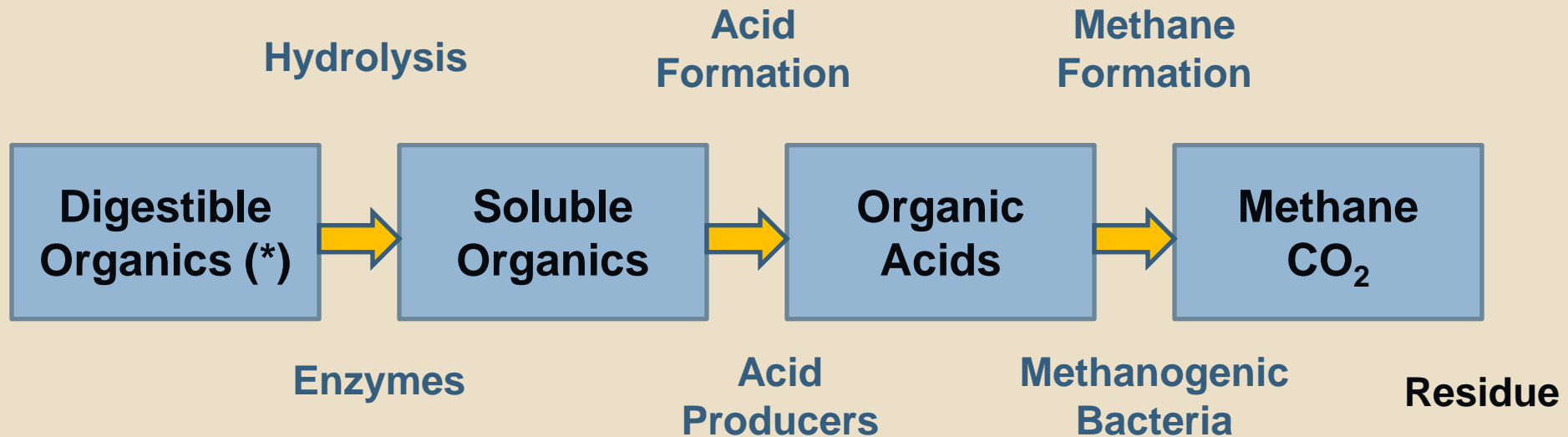
Evaluation of Conversion Technologies for Municipal Waste Management

Jurisdiction Sponsored Evaluations (partial list)

- City of New York
- Toronto, Ontario, Canada
- San Lucie County, Florida
- Delaware Solid Waste Management Authority
- Connecticut Resources Recovery Authority

Anaerobic Digestion

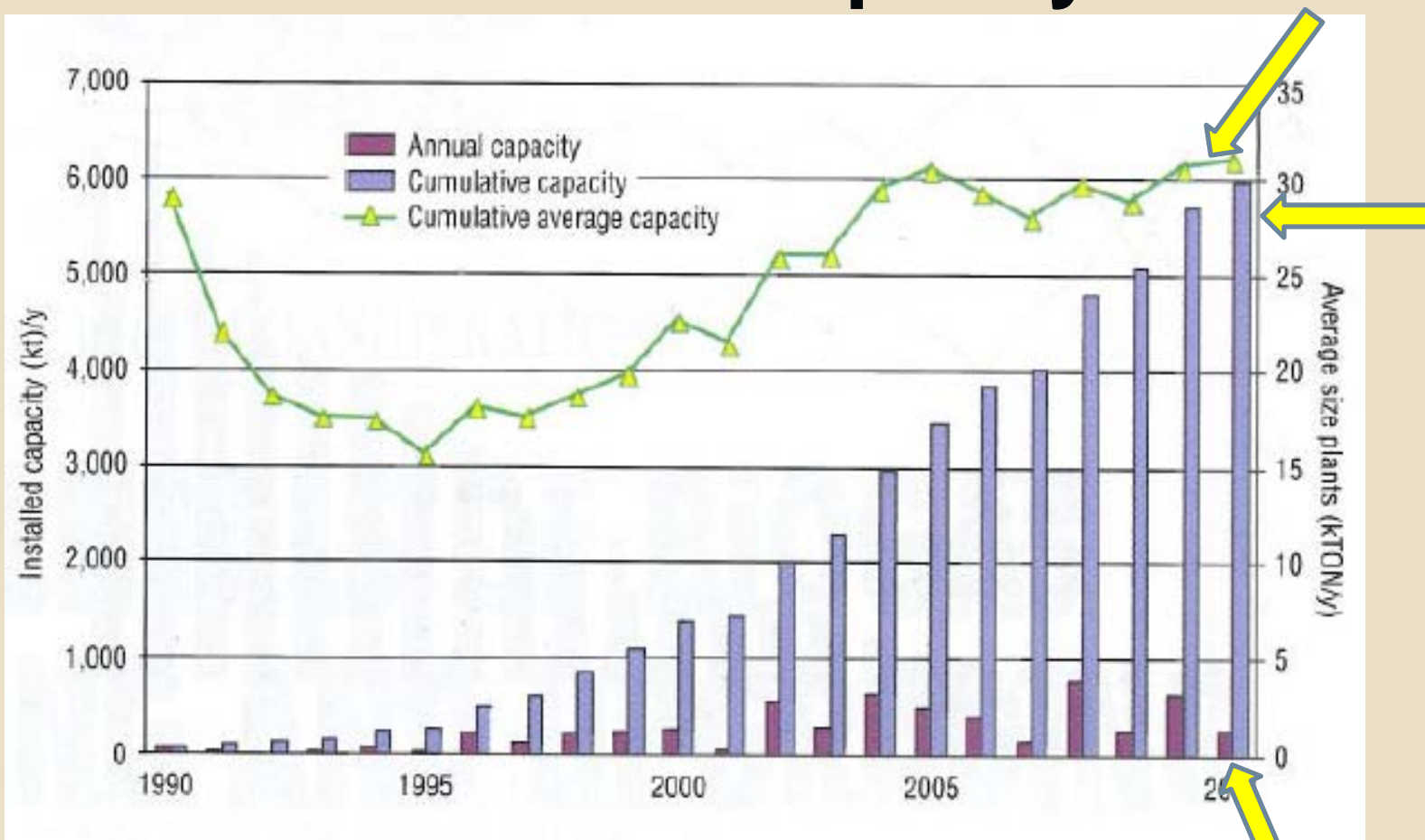
(In a nutshell)



(*) Digestible Organics: food waste, green yard waste, biosolids, manure
(woody material is NOT digestible)

Residue can be composted

European Anaerobic Digestion Installed Capacity



Source: De Baere & Mattheeuws, Biocycle – Feb '10

Anaerobic Digestion of Food Waste in Waste Water Treatment plants

(A partial list)

- East Bay Municipal Utility District
- Sacramento Co. Regional WWTP – SMUD
- Central Marin Sanitation, San Rafael
- Humboldt Co. Waste Authority
- City of Riverside



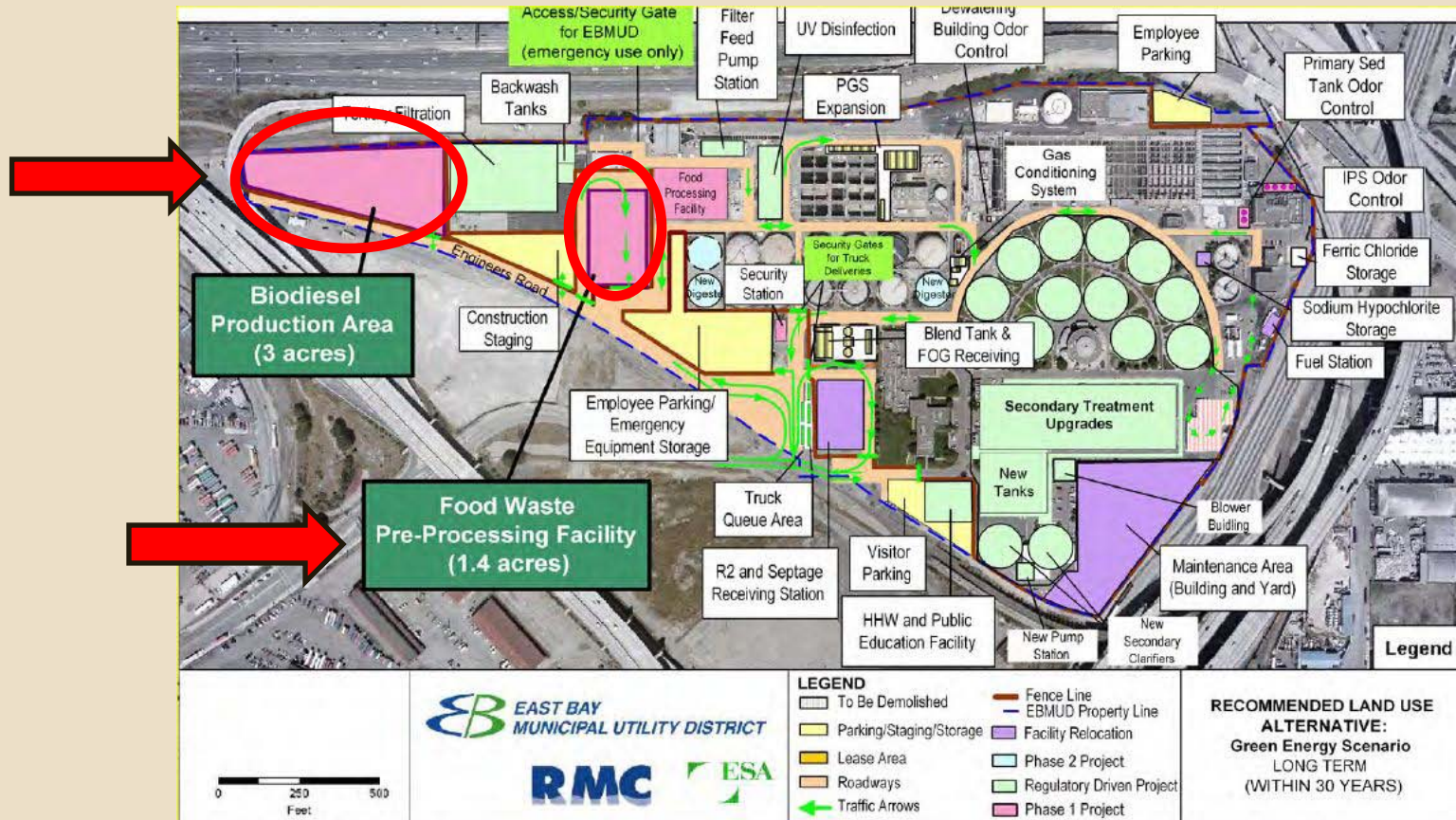
Photo: J. Franco – City of San Jose WWTP

East Bay Municipal Utility District Food waste digestion project



Photos by EBMUD

East Bay Municipal Utility District Food waste digestion project



Photos by EBMUD

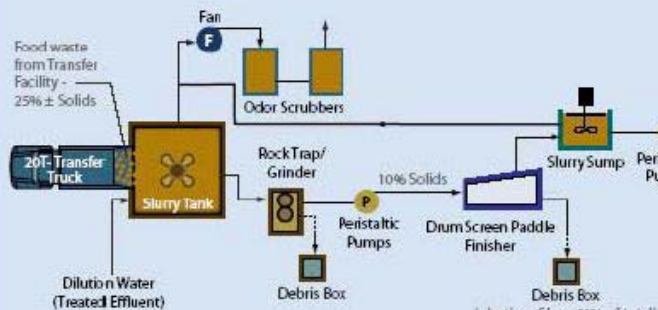
Central Marin Sanitation/Marin San Service

Figure ES-1 Food Waste Handling for Anaerobic Energy Recovery and Volume Reduction

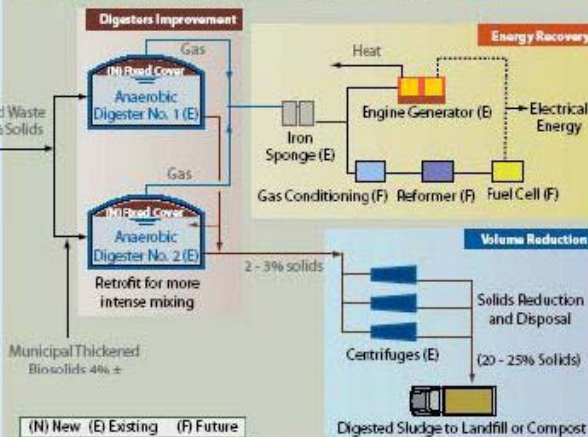
New Food Waste Separation Facility at Solid Waste Transfer Facility



New Receiving /Processing Facility at Wastewater Treatment Plant



Existing and Future Facilities at Wastewater Treatment Plant

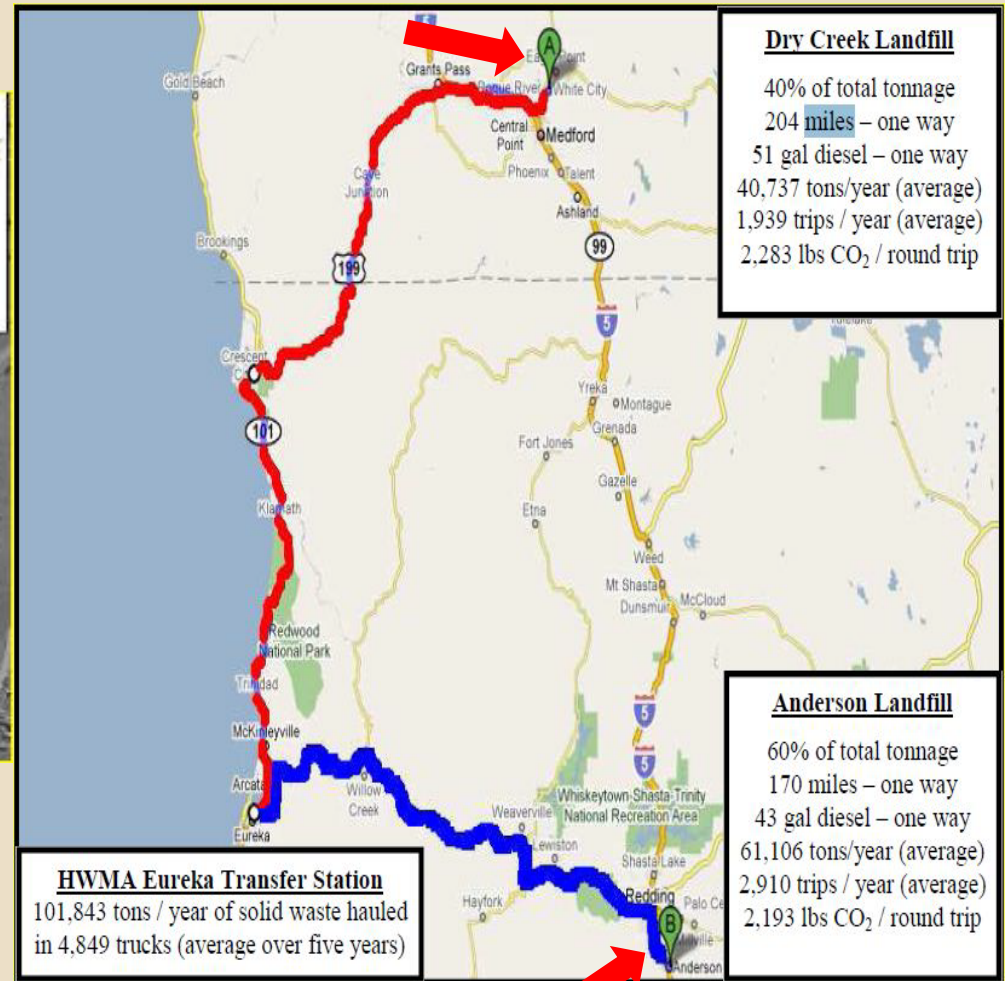


City of San Rafael and Central Marin Sanitation Agency - Methane Capture Feasibility Study

Kennedy/Jenks Consultants
Engineers & Scientists



Humboldt Food Waste Digester



Link to 2010 Feasibility Study:
www.hwma.net/counter.php

Stand alone Anaerobic Digestion projects

(A partial list)

- Inland Empire Utility Agency, Chino
- Zero Waste Energy LLC, San Jose
- CR&R, Perris
- City of Orange

Photo: J. Franco – City of San Jose WWTP

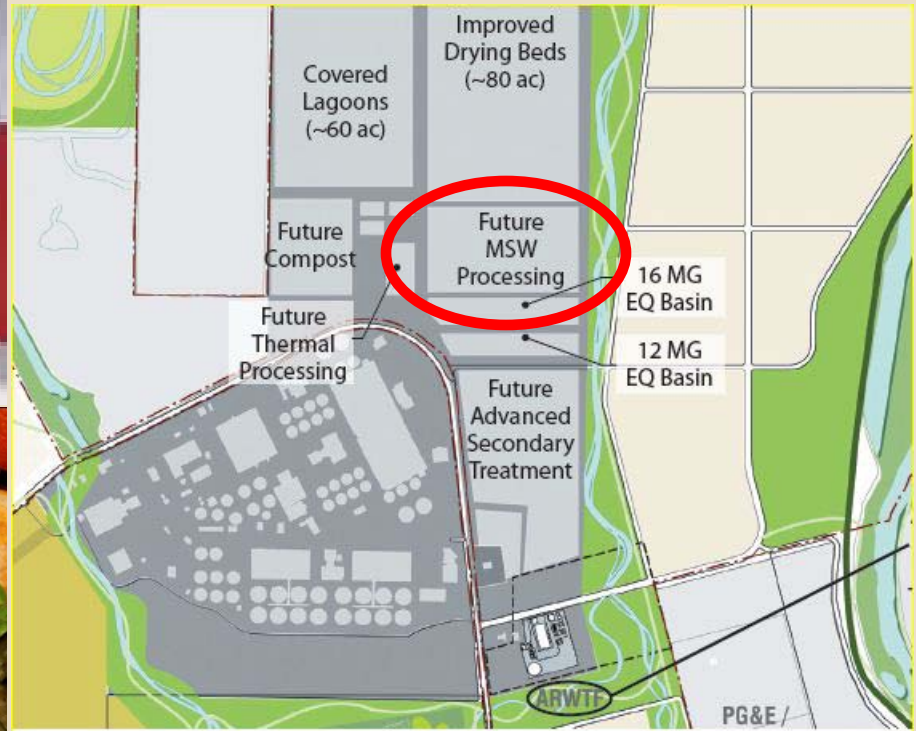
Inland Empire Utility Agency (IEUA), Chino



Food waste slurry tank

Photos: J. Franco, CalRecycle 12/10

Zero Waste Energy LLC, San Jose



Proposed CR&R, Perris AD Project (150 tpd)



- Will digest various organic residuals
- In negotiations with City and County of Los Angeles

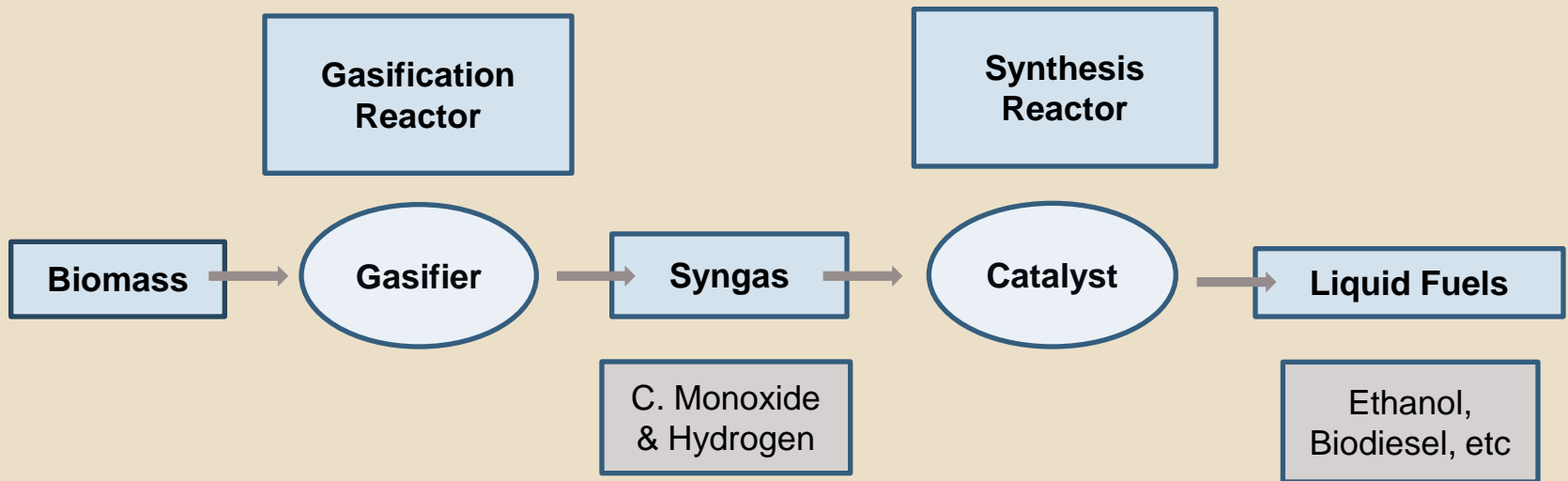
City of Orange Material Recovery Facility Pilot



CR3 Autoclave Pilot, Salinas



Simplified conversion of biomass to liquid fuels (Gasification)



Phoenix Energy LLC., Merced Gasifier



Feedstock:

Waste wood pallets (4,000 tons/year)

Generating Capacity: 750 Kwh

Power purchase agreement with PG&E in place

Funding: CalRecycle's Recycling Marked Development Zones (RMDZ) loan

RMDZ Loan Info:

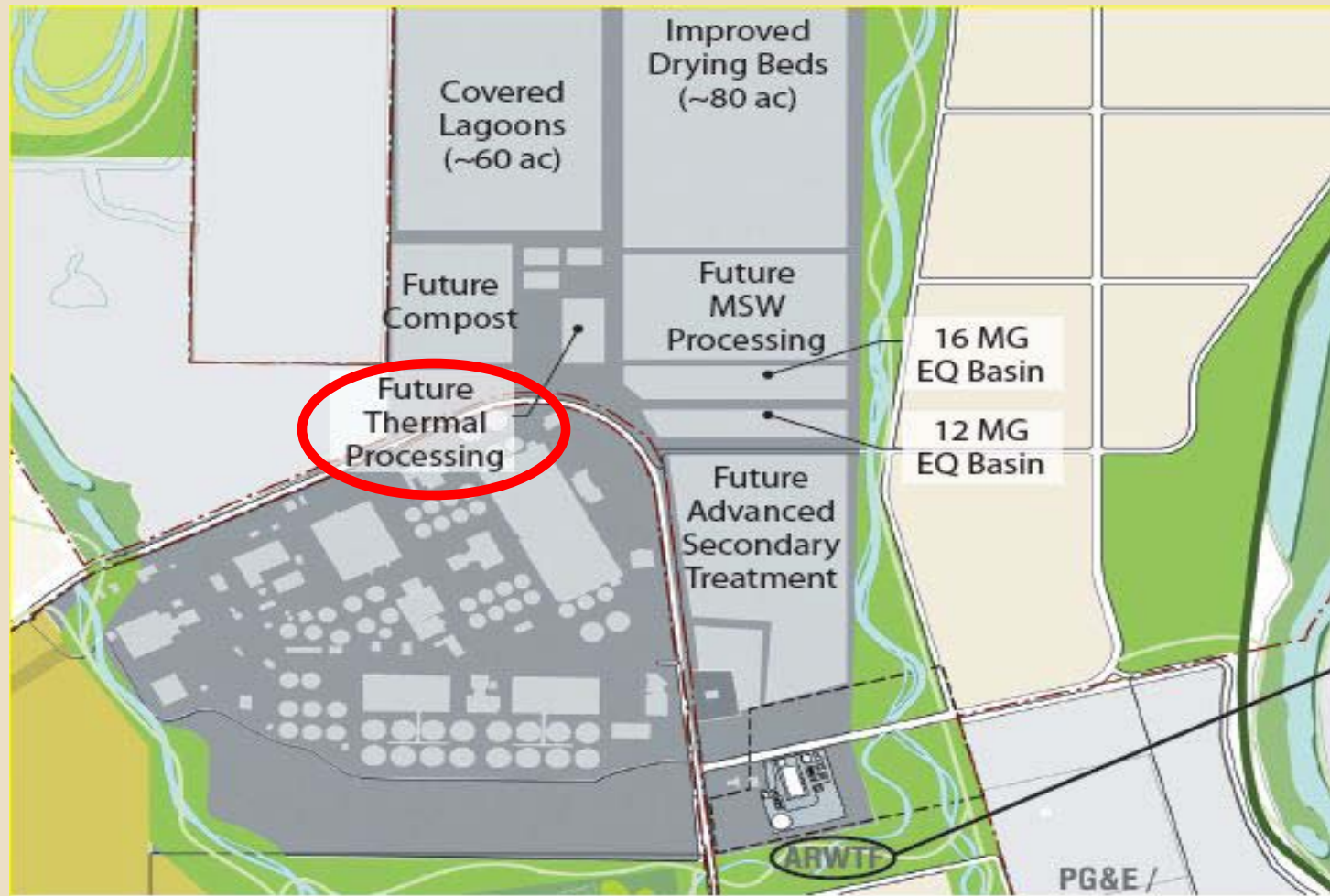
www.calrecycle.ca.gov/RMDZ/Loans/

Dixon Ridge Farms Walnut Shell Gasifier, Yolo Co.



Project Funding: CA Energy Commission & others

San Jose Pilot Gasifier



Dockside Green - Nexterra Waste Wood Gasifier, Victoria, BC - Canada



Resources

CalRecycle Conversion Technologies (CT) page:

www.calrecycle.ca.gov/Organics/Conversion/

CT mailing list: www.calrecycle.ca.gov/Listservs/

California Energy Commission AB 118 funding:

<http://www.energy.ca.gov/altfuels/index.html>

Jurisdictions CT Evaluation Reports:

www.calrecycle.ca.gov/Organics/Conversion/Events

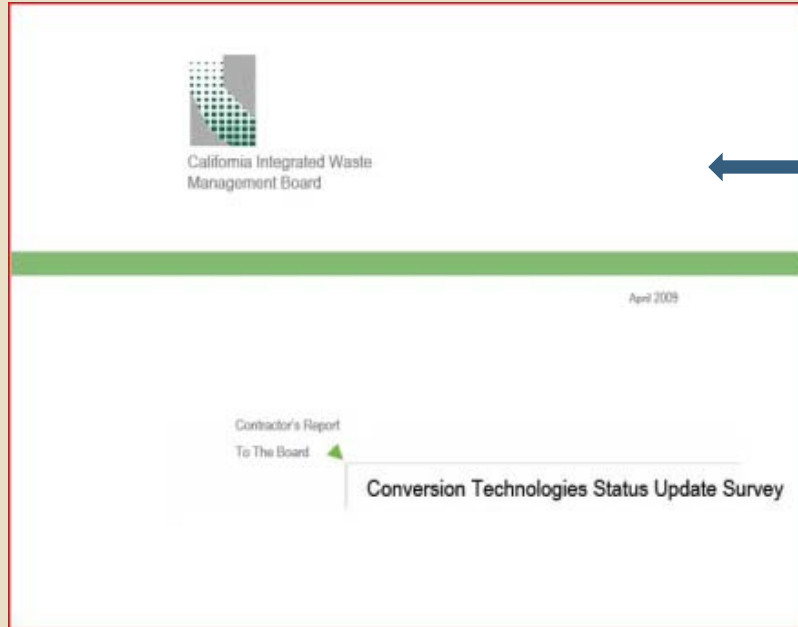
Anaerobic Digestion Program Environmental Impact Report (EIR)

Draft EIR available

<http://www.calrecycle.ca.gov/SWFacilities/Compostables/AnaerobicDig/default.htm>

Contact: Ken Decio, 916-341-6313
Ken.Decio@CalRecycle.ca.gov

Recent CalRecycle Publications



← **Conversion Technologies Status Survey (4/09)**

Current Anaerobic Digestion Technologies Used for MSW organics treatment (3/08)



www.calrecycle.ca.gov/Organics/Conversion/

Questions?

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