# Food Waste Diversion Working Group

ANAEROBIC DIGESTION OF FOOD WASTE (SB1383)

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# Background

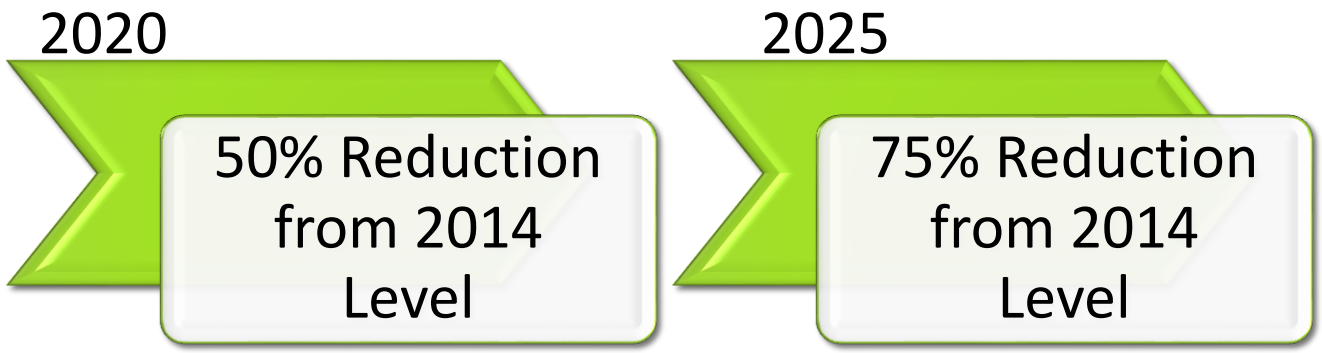
- On January 4, 2019, the South Coast AQMD adopted Rule 1118.1 - Control of Emissions from Non-Refinery Flares
- During rule development, data was presented to staff that indicated there may be an increase in NH3 and NOx emissions from the digestion of food waste
- Senate Bill 1383 requires the diversion of food waste from landfills to digesters
- A Governing Board resolution directed staff to work with stakeholders to better understand the potential impacts

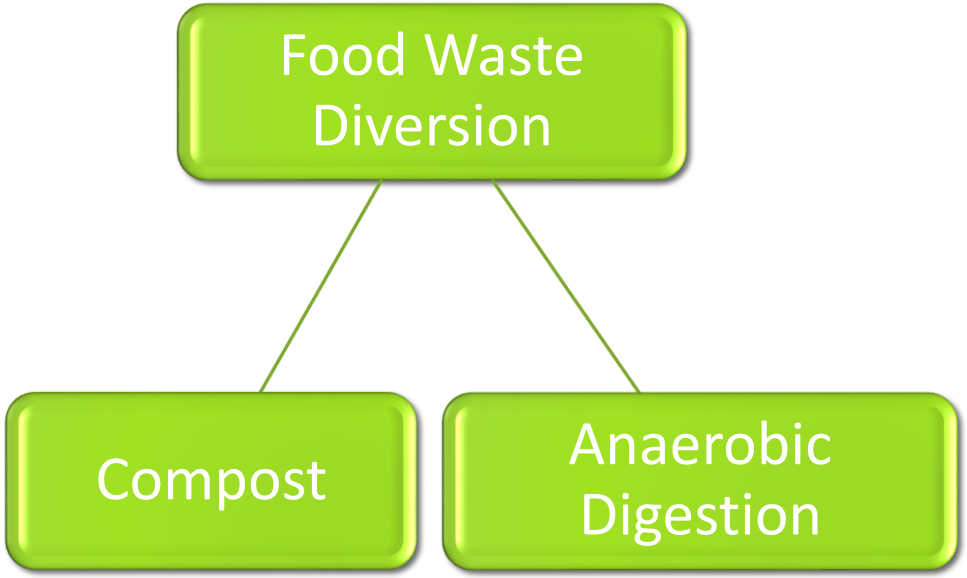
# Resolution Language

*"**BE IT FURTHER RESOLVED**, that the SCAQMD Governing Board directs staff to work with the California Air Pollution Control Officers Association, California Department of Resources Recycling and Recovery (CalRecycle), California Association of Sanitation Agencies (CASA) and Southern California Alliance of Publicly Owned Treatment Works (SCAP) in an effort to balance air quality requirements with the state-wide effort to divert organics from landfills as required under Senate Bill 1383, and shall report back to the Stationary Source Committee within 12 months of rule adoption to present findings and potential recommendations"*

# Senate Bill No. 1383 Short-lived Climate Pollutants

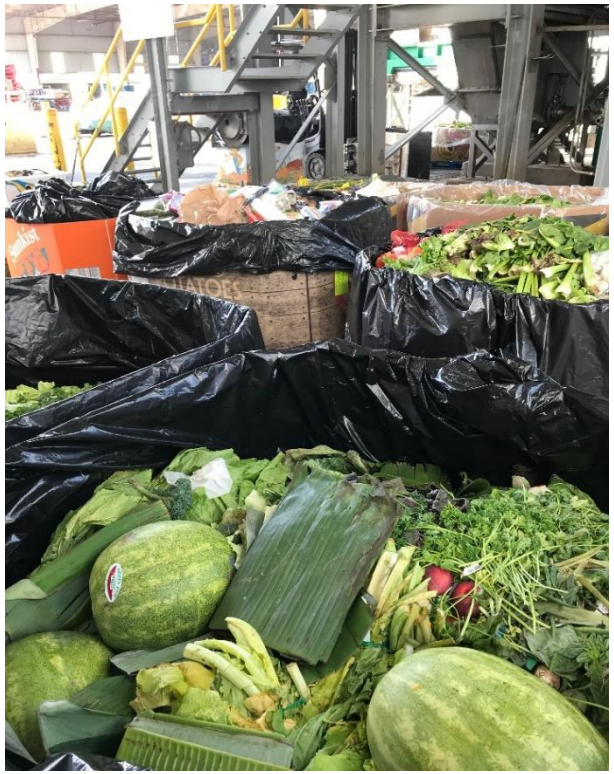
- Establishes targets for reducing organic waste in landfills to achieve methane emission reductions and increase the sustainable production and use of renewable gas



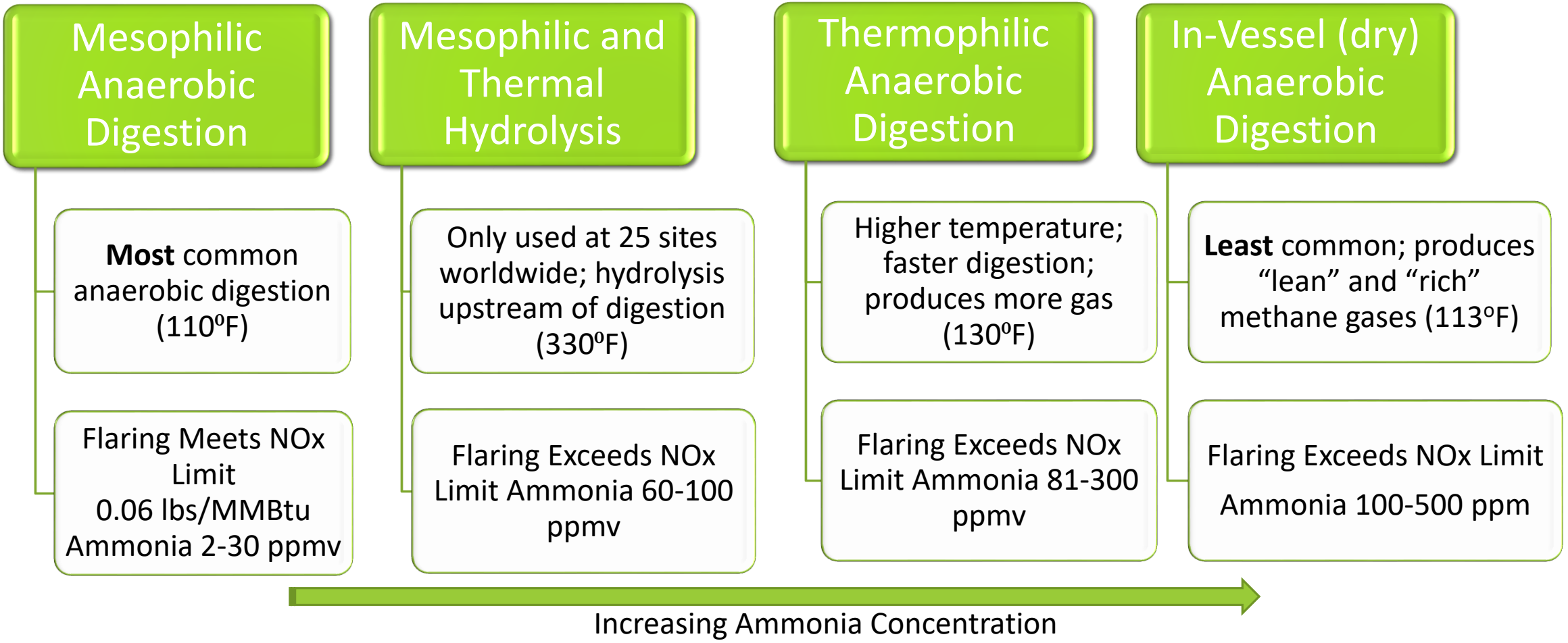



# Anaerobic Digestion of Organic Waste

- Several anaerobic digestion processes
  - Continuous or Batch Process
  - Wet or Dry (low or high solids content)
  - Mesophilic or Thermophilic Digestion (low or high temperature)
  - Single or Multi-stage
- South Coast AQMD existing anaerobic digestion predominantly:
  - Continuous Process
  - Wet Digestion
  - Mesophilic (conventional) or Thermophilic (advanced) Digestion
- One facility in Northern California utilized a dry batch process



# Ammonia/NOx Relationship



# Consultations

- During rule development, SCAP and consultant Black and Veatch presented information on potential increase of ammonia due to food waste digestion
- Due to Senate Bill 1383, 75 percent of food wastes will be diverted from landfills to anaerobic digesters at wastewater plants
- During the February Rethink Methane Conference, CalRecycle, SCAP, Black and Veatch, Lawrence Berkeley National Laboratory (Berkeley Lab), City of Fresno, East Bay Municipal Utility District (EBMUD) and South Coast AQMD held an informal meeting to discuss the potential issue and existing data
- Three facilities were cited as having known issues meeting NOx permit limits attributed to ammonia production during food waste diversion

# Case Study One

- East Bay Municipal Utilities District (EBMUD)
  Oakland, CA
  Sources of data: Black & Veatch; Brown & Caldwell
  - *Thermophilic* digestion
  - Processes food wastes, including animal blood and dairy waste
  - Measured between 90-150 ppm of ammonia in digester gas
  - Flare NOx emissions between 0.08-0.09 lbs./MMBtu
    - Permit limit of 0.06 lbs./MMBtu
  - Flare manufactured by Abutec Flare – company is out of business; bought by Aereon
  - No ammonia or flare NOx emissions data prior to accepting food waste

# Case Study Two

- Zero Waste Energy Development Company (ZWEDC)
  San Jose, CA
  Source of data: U.S. Department of Energy, Berkeley Lab
  - *In-vessel dry composting* with anaerobic digestion
  - Generates “lean” and “rich” digester gas
  - Lack of BACT cost-effectiveness allowed revision of NOx limits from 0.06 lbs./MMBtu to:
    - 0.48 lbs./MMBtu for lean gas
    - 0.17 lbs./MMBtu for rich gas
  - Process is not widely used or representative of wastewater treatment plant
  - No applications or permits for dry batch anaerobic digestion within South Coast AQMD
  - Study found up to 50% of the ammonia is converted to NOx

# Case Study Three

- DC Water Blue Plains WRRF
  Washington, D.C.
  Source of data: Black & Veatch
  - Advanced digestion – *thermal hydrolysis pretreatment* prior to mesophilic digestion
  - Measured approximately 85 ppmv ammonia in digester gas
  - Flare NOx permit limit raised from 0.06 lbs./MMBtu to 0.101 lbs./MMBtu
  - No applications or permits for thermal hydrolysis pretreatment within South Coast AQMD

# Summary of Case Studies

- Ammonia from non-mesophilic anaerobic digestion adds to NOx
  - Ammonia concentration increases with digestion temperature
- High-protein waste may result in higher ammonia and NOx concentrations
- Data suggests pre-heating of wastes increases ammonia and NOx concentration
- In-vessel dry composting with anaerobic digestion results in significant ammonia and NOx production but is uncommon

# Food Digestion in South Coast AQMD

- A second Governing Board resolution directed staff to conduct Best Available Control Technology (BACT) technical assessment for flares receiving biogas
  - BACT Technical Assessment to consider:
    - Advanced digestion processes
    - Organic waste digestion or co-digestion
    - Costs
    - Reliability issues
- Staff conducted six site visits

# Site Visit One

- Clifford, Ronnenberg, & Ronnenberg (CR&R)
  Perris, CA
  - Mesophilic anaerobic digestion
  - Mainly digesting green waste (lawn and tree trimmings)
  - Generates renewable natural gas to fuel trash trucks
  - Injecting biogas into SoCalGas pipeline
  - Installed flare as backup
    - Permitted at 0.06 lbs./MMBtu (meeting permit limits)
  - Second flare will be installed during second phase expansion

# Site Visit Two

- MillerCoors, LLC
  Irwindale, CA
  - Mesophilic anaerobic digestion
  - Mainly digesting fermentation waste from brewing
  - Generates biogas for generators
  - Fermentation waste is not typical of food waste
  - Installed flare as backup
    - Complies as Title V standby/emergency flare

# Site Visit Three

- Ventura Foods, LLC
  Ontario, CA
  - Mesophilic anaerobic digestion
  - Produces single-serving condiments (mayonnaise and ketchup)
  - Generates biogas for small boiler
  - Washing of tanks produces food wastes for digestion
  - Installed flare as backup
    - Permitted at 0.06 lbs./MMBtu
      (no source test data available)

# Site Visit Four

- **Ralphs Food Distribution Facility**
  **Compton, CA**
  - Mesophilic anaerobic digestion
  - Currently digesting food waste:
    - Perishable fruits and vegetables
    - No animal protein
  - Pre-treatment scrubber installed to control sulfur, not ammonia
  - Achieving permit limit of <0.06 lbs./MMBtu NOx
    (last source test 9/29/15)

# Site Visit Five

- City of Riverside Water Quality Control Plant Riverside, CA
  - Mesophilic anaerobic digestion of wastewater
  - Food waste digestion began June 2018
    - Small quantity of food waste co-digested with wastewater
  - Two ultra-low NOx flares permitted at 0.018 lbs./MMBtu
    - Flare 1 source test conducted on December 2017: 0.005 lbs./MMBtu
    - Flare 2 source test conducted on August 2016: 0.008 lbs./MMBtu

# Site Visit Six

- Los Angeles City Hyperion Wastewater Treatment Plant Playa Del Rey, CA
  - Thermophilic anaerobic digestion of waste water
  - One of the largest wastewater plants in South Coast AQMD treating 260 – 270 million gallons per day
  - Fats, Oils, and Greases are collected and digested twice a week
  - No recent source tests for flare NOx or ammonia emissions available

# Summary of Food Waste Diversion in South Coast AQMD

- Mesophilic anaerobic digestion is the most common method of digestion
- Thermophilic digestion typically used when bio-solids are applied to land (higher temperature eliminates pathogens)
- Only ultra-low NOx flares are being installed at Title V facilities
- Currently, no facilities digesting high protein food waste
- Fats, oils, and grease are being introduced slowly into wastewater treatment plants
  - No data yet on the impact to flare NOx emissions

# Next Working Group Topics

- NOx impacts from thermophilic versus mesophilic anaerobic digestion
- Possible areas of research and testing:
  - Locations currently not accepting food that intend to do so in the near future
  - Different digestion processes
  - Impacts from the composition of the feedstock (e.g., high protein waste digestion)