2022 California Envirothon
"Waste to Resources"
Current Issue Scenario
March 21, 2022

Background

Environmental and Public Health Impacts
A greenhouse gas of primary concern is methane. It has a global warming potential 25 times that of carbon dioxin. A significant source of methane is organic waste, or organic residuals, disposed of in municipal landfills. As food and other organic matter break down in landfills, they emit methane and other planet warming gasses (e.g., nitrogen oxide and volatile organic compounds or VOCs, creating ozone). This makes up roughly 20% of California's methane emissions. Therefore, composting is no longer just a concern for trash haulers and organic farmers, but for the future of a warming and increasingly wildfire-prone state and its residents.

There are three significant waste streams generated by communities, industries (e.g., agriculture, forestry), and other commercial businesses. Food waste makes up the largest percentage of all materials hauled to municipal landfills. Sources include households, grocery stores, hotels, restaurants, schools, and the like. Other significant sources of green waste include landscape materials; yard waste such as tree and yard trimmings, grass clippings, brush, plants; non hazardous wood waste and biodegradable paper products; and to a lesser extent, biosolids, a nutrient-rich product of the wastewater treatment processing of human waste. In agricultural areas, livestock manure (e.g., dairy cows) and residues from crops, trees, and vines, also generate significant quantities of methane. The accumulation of forestry waste such as dead trees and brush debris, also poses a threat. This is especially apparent after catastrophic wildfires, prolonged drought, tree disease, and timber harvests.

Legislation, Regulations, Mandates, and Governance
The California State Air Resources Board (CARB) and the local Air Quality Management Districts implement the provisions and requirements of the USEPA Clean Air Act (CAA) to control mobile and stationary sources of air emissions. USEPA retains oversight of their efforts and actions to comply with the federal CAA and its implementing regulations and policies to protect public health.

CalRecycle implements the USEPA Resource Conservation and Recovery Act (RCRA), along with the county Environmental Health Departments and the State's solid waste and recycling requirements for organic residuals.

The State Water Resources Control Board (SWRCB) and the local Regional Water Quality Control Boards (RWQCBs), in accordance with the USEPA Clean Water Act (CWA) and California's Porter-Cologne Act, regulate any discharge of pollutants from landfills, compost operations, livestock operations, and other organics operations to surface water and groundwater. This is achieved through issuance of a CWA's National Pollutant Discharge Elimination System (NPDES) permit or/and a Waste Discharge Order. USEPA regulates use and disposal of municipal biosolids by composting, direct land application, or landfilling.

Traditionally, most large municipalities in the San Francisco Bay Area and South Coast regions have

sent significant amounts of food waste, green waste, and biosolids to remote sites in the Central Valley or other remote inland areas for disposal, composting, or land application.

In 2017, the California Air Resources Board (CARB) published a Short-Lived Climate Pollutant Reduction Strategy (www.arb.ca.gov/our-work/programs/slcp). The CAA defines non-attainment areas and particulate matter (PM 10 and PM 2.5). The Central Valley is an extreme non-attainment area for ozone, PM 2.5, and high levels of ozone precursors including volatile organic compounds (VOCs) and nitrogen oxide (NOx). These potent greenhouse gasses, including methane, pose serious public health concerns for the San Joaquin Valley especially during temperature inversions in the hot summer months. Other sources contributing to air quality violations include diesel emissions from heavy trucks hauling container goods, including organic residuals to facilities, along the highways in the Central Valley.

California is now experiencing the effects of a climate crisis: hotter summers with world record-breaking temperatures, even more devastating fire seasons, more extreme droughts, and rising sea levels eroding our coastlines.

Scientists tell us that greenhouse gasses released by human activities, like landfilling food and yard waste, cause climate change.

To respond to this climate crisis, California is implementing a statewide organic waste recycling and surplus food recovery plan.11

California Senate Bill 1383 (SB 1383)
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383

1. *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals (DRRR-2020-1693) https://www2.calrecycle.ca.gov/Publications/Details/1693*
2. *State of Disposal and Recycling in California for Calendar Year 2020 (DRRR-2021-1706) https://www2.calrecycle.ca.gov/Publications/Details/1706*

SB 1383, signed by Governor Brown in 2016, sets methane emissions reduction targets with ambitious goals to reduce methane emissions from landfills–the third largest source of methane. Its objective is to divert 75% of organic waste, including biosolids, out of landfills by 2025 and use it as compost. It is using the baseline year of 2014. In addition, 50% of organic waste disposal must be reduced by 2020.

CalRecycle was required to set regulations by 2020, and municipalities were required to adopt ordinances implementing the regulations by January 1, 2022 www.calrecycle.ca.gov/organics/slcp. The state is far behind its goals, missing its 2020 mark of cutting in half how much organic waste ends up in landfills. Local jurisdictions are scrambling to get their programs up and running, or to qualify for a waiver to extend the deadlines. They potentially face fines of up to $10,000 per violation per day.

Municipalities are required to begin capacity planning for diversion of organics by January 2022, and report to CalRecycle on their plans for 2022 – 2024 by August, 2022. There are a number of various municipal departments responsible for waste management, waste reduction and recycling throughout the state. Depending on location and municipal charter, a large municipality such as Los Angeles, is the responsible authority and oversees many public works and public health programs. Many city officials and city departments play important roles such as city managers and city councils; the

departments responsible for planning, environmental health, public works, finance, purchasing, legal and public transportation. Los Angeles' organic waste program includes an array of diverse projects including small community-based compost operations working with nonprofits such as LA Compost www.lacompost.org. LA Compost provides local hubs throughout LA County for organic waste collection and composting. Los Angeles also contracts with large composters in the Central Valley.

In less populated areas, the authority and responsibility may rest with the county board of supervisors in collaboration with many local jurisdictions. The private sector also plays a key role in providing collection, treatment, and distribution of organic residuals. Cooperation and coordination is vital to achieving the goals of SB 1383.

CalRecycle estimated in 2020 that a total of 27 million tons of organic wastes need to be diverted from landfills to meet SB 1383 goals. Of this, 9 million tons is edible food that can be redistributed, and 18 million tons is other "compostable materials" that can be treated by composting or other treatment and reused.

SB 1383 did not authorize funding sources when it was signed into law. The benefits of increased composting are many, but the change won't come cheap.

Last year the State Legislature earmarked more than $100 million for the effort to ramp up composting, but it may not be enough given the scale of what is required: build 100 new facilities to handle the estimated 20 million tons or more of organic waste that would otherwise end up emitting methane in landfills.

CalRecycle received close to $170 million from legislators for 2021 and 2022 to build more infrastructure for organic waste, improve composting opportunities and cut down on edible food waste. Of that, about $60 million was set aside as technical assistance grants for cities to get their programs in order. https://www.calrecycle.ca.gov/blogs/grants-loans/1. California's Strategic Growth Council has funds available through its Transformative Climate Connections:https://sgc.ca.gov/programs/tcc. A general list of available grants is available through the California Finances Coordinating Committee: www.cfcc.ca.gov.

Some other sites for grant opportunities are:
Community Composting for Green Spaces Grant Program;
https://www.csuchico.edu/regenerativeagriculture/resources/funding-opportunities.shtml

Possible Treatment Options
SB 1383 envisions composting of organic residuals as a main treatment process to create products which can replace synthetic fertilizers and soil amendments. Anaerobic digesters have also been a key focus. There are a number of other possible treatment options, each with benefits and challenges,

Composting: A widely studied process for the last century, with the ability to destroy pathogens at given times and temperatures well documented. Mixes of various organic residuals with various levels of carbon, nitrogen, and micronutrients, provide optimum soil benefits. However, outdoor windrow composting releases VOCs and noxious odors in air quality nonattainment areas such as the San Joaquin Valley. It raises valid concerns to the health and economy of low income communities and poses environmental justice issues.

Aerated Static Pile composting reduces air emissions, but at a significant cost and additional use of energy. The Inland Empire Regional Compost Facility composts biosolids, green waste and food waste. It is an example of an aerated static pile operation that can operate within an urbanized area: https://www.ieua.org/inland-empire-regional-composting-facility

Vermicomposting: Worms are fed the organic residuals and break them down into a compost with higher nitrogen, phosphorus and potassium content than other types of compost, and that is especially good in improving soil structure and water-holding capacity. The worms work at a lower temperature than is needed to ensure pathogen destruction (for biosolids and manure, a temperature of over 131 degrees F is needed to ensure pathogen destruction; worms prefer temperatures in the 50 to 80 degree F range). Worms can be added to biosolids and manure composts after they have gone through the high temperature phase and are in the curing phase.

Anaerobic Digestion: Anaerobic digesters break down organic material in the absence of oxygen, producing methane which can be captured for energy use, while killing off most pathogens and reducing odiferous compounds. Most larger wastewater treatment plants in California have anaerobic digesters with excess capacity which accept food waste. Several cities such as San Jose have started up food-waste digesters: https://www.epa.gov/transforming-waste-tool/zero-waste-case-study-san-jose. In the Central Valley, several dairies have installed anaerobic digesters to produce energy from manure. UC Davis has installed an anaerobic digester to handle campus food wastes https://bae.ucdavis.edu/about/facilities/renewable-energy-anaerobic-digester . Anaerobic digesters require advanced technology and are very expensive to build to meet strict specifications in areas of nonattainment. Anaerobic digesters in the San Joaquin Valley have to be built in order to meet strict air quality standards. The methane produced during anaerobic digestion can be captured and used to fuel the dairy's daily operations.

It reduces some but not all pathogens, (unless heated to thermophilic temperatures). The final product usually has fertilizer-grade nitrogen levels. The final product may still be somewhat odiferous.

Excess energy may be provided as renewable fuel for vehicles or other uses (e.g., compressed natural gas). There may be less demand for this if vehicles are powered by electricity in the future, but there may be a demand for "alternative diesel" for some time ahead.

Heat Drying: This process raises the temperature to at least 176 degrees F and dries the material to > 90% solids. The process reduces pathogens to non-detectable levels. It is somewhat energy-intensive. It is also a precursor step to pyrolysis /gasification. The Encina wastewater treatment plant in Carlsbad has installed a heat dryer: https://www.encinajpa.com/environment-resource-management/biosolids-use

Biochar from Pyrolysis / Gasification: Heating to several hundred degrees F in the absence of oxygen kills off all pathogens. There is evidence that this process breaks down PFAS / PFOA (per- and polyfluoroalkyl substances / perfluorooctanic acid). It can be more energy intensive. The process produces **biochar**, which can be used directly as a soil amendment or added to compost. Biochar - an overview | ScienceDirect Topics

Other Treatment Options: There are many that are mainly in the design or pilot stage and include advanced microbial and electrochemical processes, thermochemical processing, and production of

processed engineered fuels.

Biomass Facilities: The number of "biomass" facilities that burn woody wastes to create energy has declined. The San Joaquin Air Pollution Control District has shut down many of these facilities due to high-level releases of particulate matter and volatile organic compounds.

Challenges to setting up these treatment technologies include separating organic residues from other materials such as packaging and other contaminants (e.g. plastic bags), transportation of the materials, addressing air emissions from treatment facilities, acquiring up-front funding sources, finding markets for the products, and addressing environmental justice, public health, and nuisance issues. Obtaining necessary regulatory permits required from numerous state and local agencies, in addition to CalRecycle and the county. These authorities include the CA Air Resources Board, local Air Quality Management Districts, the State Water Resources Control Board and local Regional Water Quality Control Boards. Siting and constructing new facilities will likely require an environmental analysis mandated by the California Environmental Quality Act to avoid, mitigate or minimize impacts to the public health and natural resources.

There are some grant and loan funds available through CalRecycle and several other agencies. There may also be available financing with investors interested in renewable technologies.

Scenario

Setting

The municipality, Los Diablos, is located in a densely populated coastal area. It has a population of two million residents and during the summer months, the number of visitors significantly enlarges this number. As a tourist destination, there are many hotels, restaurants, malls, and the like to attract visitors. The commercial center features grocery stores, flower shops, bakeries, coffee shops, and big box stores such as a WalMart. There are a dozen or more public schools, hospitals, nursing homes, and other institutions, each generating their own food scraps and trash.

Los Diablos generates about 1,350,000 tons of organic residuals per year, including 450,000 tons of edible food and 900,000 tons of food residuals, greenwaste, biosolids, and other organic residuals. To date, it has achieved a 45% reduction in disposal to landfills since 2014, with diversion of edible food to distribution centers, digestion of some non-edible food wastes to its municipal wastewater treatment plant followed by land application in the Central Valley, and diversion of some of its green wastes to the Green Thumb Compost Facility in the San Joaquin Valley.

While the anaerobic digesters at Los Diablos' wastewater treatment plant have sufficient capacity for adding more food wastes, the plant may need to add more dewatering capacity. After being digested at about 2 % solids, the biosolids are dewatered using centrifuges to a cake consistency of about 25% solids so they can be hauled to the compost facility or land application sites at a reasonable hauling price and with no free liquids. Additional dewatering units will be needed if the amount of food waste added to the digesters is increased.

Los Diablos is behind the goals set forth by SB 1383 to divert 75% of organic waste out of landfills by 2025 and use it as compost. It has missed its 2020 mark of cutting in half how much organic waste ends up in landfills compared with 2014. They are concerned with a January 1, 2022 deadline for

jurisdictions to have a plan to keep organic waste out of landfills or potentially face fines of up to $10,000 per violation per day. They are scrambling to get their program up and running, or to qualify for a waiver to extend the deadlines.

Los Diablo's main practice has been hauling most of its organic waste to a landfill. The Basura Landfill is located in an agricultural area of the San Joaquin Valley about 150 miles away to the east. Los Diablos, in compliance with SB 1383, must now divert all its organic waste. City officials are committed to the reduced use of fossil fuels and have concerns over the lack of available landfill space.

Los Diablos also has a contract with a medium-scale compost operation, Green Thumb Compost Facility. It recently converted from windrow to aerated static pile in order to meet the San Joaquin Valley Air Pollution Control District's (SJVAPCD) requirements. Green Thumb Compost takes a portion of Los Diablos' biosolids and green waste for processing into compost. Green Thumb has connections with several farmers in the vicinity (e.g., vineyards, orchards, dairies, etc.) interested in quality compost for soil application and amendments. The City is also interested in producing a different compost at the facility without biosolids to create a safer compost for growing crops for human consumption.

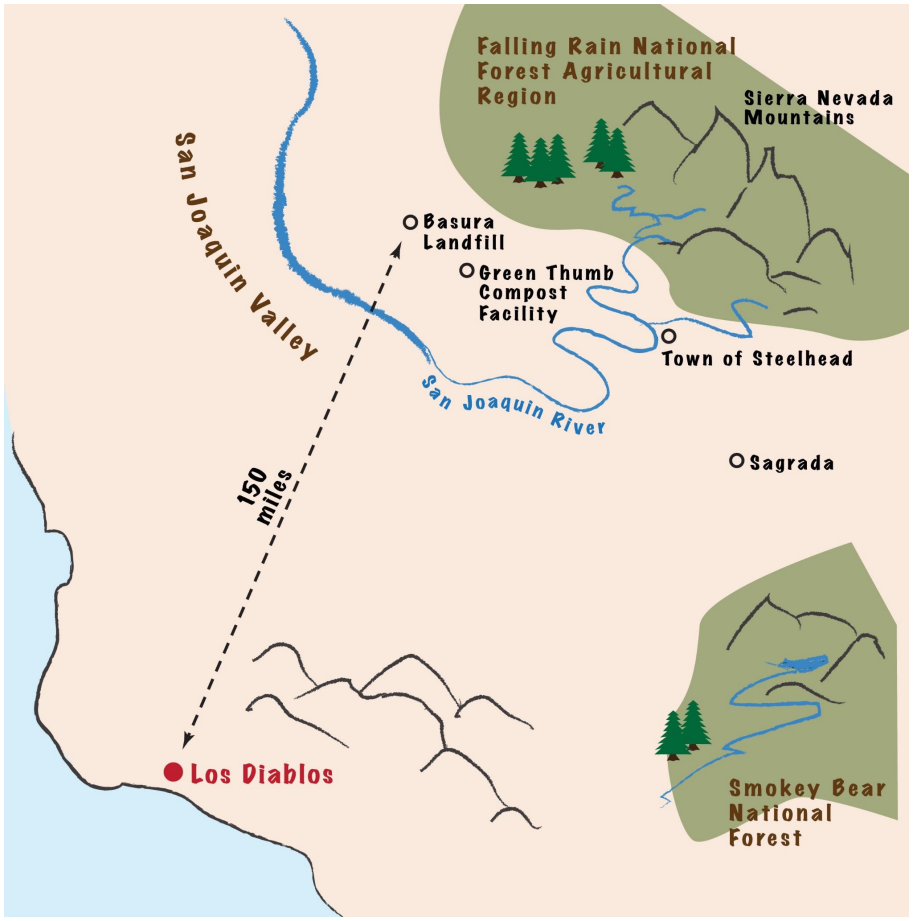
The City wants to open contractual negotiations to partner with the US Forest Service for removing and transporting woody debris from the Smokey Bear and Falling Rain National Forests as a source of carbon or biochar at the Green Thumb Compost Facility.

Both the Basura and Green Thumb facilities have approved permits issued to them by CalRecycle, SJVAPCD, and the local county health department, among the many required for siting, construction, and operations.

Local Stakeholders

Steelhead is a small semi-rural town, population 2,000, with businesses such as grocery stores, cafes, hotels, and a small number of public schools. It is located two miles from the Green Thumb Compost Facility. It was founded in 1930 and named for the once robust run of steelhead trout. The fish numbers have since diminished decades ago due to dam construction upstream of the San Joaquin River, resulting in low stream flows, loss of habitat, blocking fish migration and spawning. The expansion of agriculture and roads, and population growth have contributed to the loss of steelhead. Just outside of town is a local prison with a population of 800 inmates.

On the outskirts of Steelhead, is a small underserved and low income community known as the Sagrada. It is located near a stretch of the San Joaquin River which is now a dry river bed. The residents are predominantly Latino, Asian Americans, Pacific Islanders, and Black. They live in neighborhoods surrounded by industry such as agriculture, oil fields, highways, landfills, blight, and vacant lots. The vacant lots often attract illegal dumping or overgrown weeds, which can be a fire hazard. The rates of asthma, diabetes, and obesity are high and especially among children. They have keenly felt the impacts of the drought with water wells drying up or contaminated by chemicals such as pesticides and fertilizer. They also live in a veritable food desert where the closest grocery store is miles away. The local bodegas sell mostly liquor, junk food, and very little fresh produce. Despite being within a fertile agricultural region, there are no local farmers markets within reasonable distance. The pricing of organic produce makes it difficult to afford. For many years they have approached the county and other politicians to invest in their community to uplift the area.



There are two national forests, the Smokey Bear National Forest and the Falling Rain National Forest, both adjacent to this agricultural area. The forests recently burned due to catastrophic wildfires. The extreme drought, bark beetle infestation, and wildfires have had severe impacts to the forest ecosystem and the trees are dying or dead. The US Forest Service is required to aggressively thin the forest to prevent future fires and to protect the lives and property of people who live on the edges of the forest.

The USFS is searching for private/public partnerships to remove the woody debris and develop alternatives to beneficially reuse, recycle, or repurpose the fallen trees and debris. This could be an important source of carbon to integrate in the composting process. There once was a biomass burner in the area that accepted wood waste but it was shut down by the SJVAPCD as the San Joaquin Valley is designated an extreme nonattainment zone.

Los Diablos recently began diverting some organic waste to its wastewater treatment plant's anaerobic digesters to use methane and create renewable energy for its operations. The wastewater treatment plant sends its anaerobically-digested biosolids to the Basuras Landfill, the Green Thumb Compost Facility, or to land application sites in the San Joaquin Valley for growing non-food crops. However, a number of the land application sites for the compost are farms in the process of converting from feed to food crops such as vineyards and nut tree orchards. Other options for the biosolids are needed in the future.

The municipality is considering further actions to meet its goals of diverting organic waste from landfills. This may include siting and constructing another compost facility in the San Joaquin Valley or expanding current operations.

What is appealing to the City, is augmenting its local green waste diversion program with additional green bins to increase the collection of green waste, grow the number of community collection and composting hubs, and step up its support of urban community farming within its jurisdiction. It is looking for ideas to involve the community and community-based nonprofit organizations to organize and to collaborate.

The City is exploring how to branch out its operations to the San Joaquin Valley to create opportunities to deliver organic residuals for composting in rural communities. The finished compost could be an economic opportunity for local towns to market to farms, households, and community garden centers as important investments to the community. As in Los Diablos, the City understands the importance for these communities to have access to fresh produce by growing it themselves and sharing.

The City managers are also considering public/private partnerships in the San Joaquin Valley to set in motion a local plan to accept community and commercial green waste into its composting program. Their design includes involving community-based nonprofits in this collaborative and promoting community gardens to produce healthy organic vegetables and fruit. This program will result in benefits to both public health and the local economy for local residents and businesses.

The citizens of Steelhead and Sagrada have heard about Los Diablos' plans to increase transport of its organic wastes including biosolids near their communities. They resent and are upset that they will be forced to receive the "garbage" from a big city 150 miles away. They are very concerned about potential health and environmental impacts to their community from their proposed plans. Residents of Sagrada feel singled out as a low income community of color and believe this to be another case of environmental injustice. Other concerns include attracting wildlife to the composting site, thereby upsetting the ecological balance of resident wildlife and putting at greater risk, threatened or endangered species; creating vector problems such as rodents and flies; nuisance odors, and that any runoff generated from compost piles will pollute nearby waterways and drinking water supplies. Community leaders are organizing to push for mitigation, input, and dialogue with the City planners throughout the process. They want to offer meaningful feedback and to require implementation of best management practices (BMPs) to prevent, abate, or avoid any adverse impacts.

<u>Your Team's Assignment</u>

As a team of consultants with specialized expertise in soil, water, wildlife, and forestry, you have been contracted to provide your services to Los Diablos, to help them achieve the goals of SB 1383. The City is required to report to CalRecycle their capacity plan for diversion of organics by August, 2022. Los Diablos wants your recommendations to create a diverse portfolio of projects and plans to further their efforts to reduce organic waste to landfills; explore options for reuse or composting of organic waste; develop public/private partnerships and enterprises; ideas for collaborating with stakeholders and establishing a dialogue with the community to address concerns and get their ideas and input. The targeted communities include those of Los Diablos and the Town of Steelhead and Sagrada.

Your "Waste to Resources Portfolio" will focus on a range of proposed plans and options, or a combination of them, to further reduce organic waste to landfills by maximizing distribution to compost facilities and community-based composting centers for beneficial reuse. It will specifically consider the following:

Identify Treatment Options and Strategies for Reducing Organic Waste

- study and put forward ideas for the potential to add a compost site to the existing Basura Landfill and/or expand the Green Thumb Compost Facility. Include the feasibility of increasing the variety of feed stocks it may take and markets for its compost. Consider proposing the viability of adding a pyrolysis unit to produce biochar at either site and explain how this could enhance the quality of the finished compost and address the amount of woody debris and dead trees from the forests.

- include in your analysis the installation of a new aerated static pile compost operation at the Los Diablos municipal sewage treatment plant to accept organic waste

- examine the feasibility of expanding community-based composting programs to include the collection sites of green waste, backyard home composting, vermicomposting, and community-based compost education programs, gardens, and centers

- present options for small-scale composting facilities through private/public enterprises; opportunities for community gardens and compost programs; urban and organic farming; and the health benefits of local harvests of fresh fruit and vegetables. Include suggestions for where to locate such community-based composting and garden centers in Sagrada and Steelhead

- research other waste streams which may benefit large or small scale composting facilities to achieve optimal compost products: woody wastes such as wood chips or biochar, sources of food waste including ag (e.g., livestock manure) and biosolids

Program Development and Implementation

- propose a budget to fund the program, generate revenue, and a timeline from development to implementation

- identify potential funding sources such as grants, loans, private investment firms, etc.

- identify needed infrastructure, equipment (e.g., green bins and pick up vehicles), requisite vehicles, and associated maintenance costs

- describe how the program may create jobs for local residents

- recommend key private/public partnerships for projects and plans to advance the program at the local level such as enterprises in communities to collect green waste and food waste to create high quality compost ("black gold"), to commercially market to farmers, urban and community gardens, or for residential use. List prospective partners at the local level such as educators, farmers, local waste producers, RCDs, investors, local nonprofits, and government agencies. Explain what role each would play or offer toward meeting composting goals.

- outline small scale community compost programs to collect green waste and compost creating quality compost to sell or give back to the community; educational programs on the benefits of composting for healthy food for families to access, as well as the potential for increasing the population of community gardens. Explain the benefits of vermi-compost versus standard composting.

- explore partnership agreements and strategy with US Forest Service and CalFire to remove and transfer woody waste from fire-damaged lands as a feedstock for compost operations

- create a monitoring program for reporting the reductions of organic waste to landfill and the benefits of local, small scale operations

- recommend a compliance and enforcement program (e.g, penalties for violations) to ensure goals are met

- identify the challenges and barriers to implementing such a program

Environmental Assessment

- evaluate whether any runoff will result from the expansion of the existing compost site or of new sites. How will potential pollution to receiving waterways be evaluated, controlled, prevented or abated? Will any permits or implementation of BMPs be required? What regulatory agency needs to be contacted?

Cost/Benefit Analysis

- conduct a cost/benefit analysis or comparison on the transportation and fuel costs to haul organic residuals to distantly located compost operations in the San Joaquin Valley, a designated nonattainment areas for air quality standards (i.e., diesel emissions), versus an extensive and multiple small scale, community-based compost hubs or collection sites

- include in this analysis how costs or investments could benefit local public health, community food production and access, local businesses, the local economy (e.g., agriculture), and the environment

- project annual income from selling finished compost to offset costs of the program

Public Participation and Outreach

- suggest an effective general public outreach and communications program to businesses (e.g. restaurants, grocery stores, etc.), government agencies, stakeholders, and the affected communities, for input to address concerns (e.g., odor, vectors, wildlife, nuisance, etc.) and to build support, collaboration and cooperation for the program

- explore the establishment of a Local Community and Business Advisory Committee: what would be its role, membership and leadership

- an educational program to foster changes in behavior such as separating green waste, food waste, and plastics from garbage going to the landfill; and to promote the benefits of composting versus disposal to landfills for protecting public health, the environment, communities, and the local economy

- suggest ideas for a social media campaign to create awareness of the benefits of compost to soil health, healthy food and a healthy community, and a sustainable environment

You will present your findings and recommendations before the Los Diablos City Council at a public meeting scheduled April 2. 2022. The City will integrate the Waste to Resources Portfolio's recommendations in its report to CalRecycle due August, 2022 .