

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

Final 2015 Agricultural Burning Review

December 2015

1 Executive Summary

Historically, the practice for disposing of agricultural materials has been through the open burning of the materials in the field. Burning agricultural materials provided an economically feasible method for the timely disposal of these materials, helped prevent the spread of plant diseases, and controlled weeds and pests. Addressing the air quality impact from open burning has been a priority, and the District, ARB and Valley farmers have implemented a number of measures to minimize that impact over the years.

In 2003, California Senate Bill (SB) 705 (California Health and Safety Code Section (H&SC) 41855.5 and 41855.6) established a schedule for specific types of agricultural material to no longer be openly burned in the field, but provided for a postponement of the phase-out where justified by technical and economic impediments. The San Joaquin Valley Air District (District) has implemented SB 705 through Rule 4103 (Open Burning) and the District's smoke management program and have reduced the total acreage of agricultural materials burned in the Valley by 80%.

In 2010, the District prepared the *2010 Final Staff Report and Recommendations on Agricultural Burning*¹ (2010 Report) which evaluated each crop category identified in H&SC Section 41855.5 and provided recommendations for allowing or prohibiting the open burning of categories as outlined by the senate bill. Based upon the 2010 Report, the California Air Resources Board (ARB) provided a two year concurrence on the District's recommended postponements, based on the lack of feasible alternatives to open burning.

In 2012, the District prepared the *2012 Update: Recommendations on Agricultural Burning* (2012 Report) which re-evaluated the technological and economical impediments for the crop categories that had been postponed. Based upon the 2012 Report, the California Air Resources Board (ARB) provided an additional three year concurrence on the District's recommended postponements, based on the continued lack of feasible alternatives to open burning.

This *2015 Agricultural Burning Review* (2015 Review) shows that in the three years since the 2012 evaluation, the availability of technologically achievable and economically feasible alternatives to agricultural burning has significantly worsened due to the severe drought conditions and the demise of the biomass industry that historically has provided an alternative to open burning for a considerable amount of the agricultural waste generated in the Valley. This situation will likely get worse since there

¹ SJVAPCD. *2010 Final Staff Report and Recommendations on Agricultural Burning*. 2010.

are no federal or state funding commitments for the continued operation of biomass facilities.

Currently the District is facing numerous requests from growers to burn agricultural materials due to the decreasing demand for chipped agricultural waste by the biomass industry. If the biomass industry does not return to previous levels, this situation will only worsen, especially given the hundreds of thousands of acres of orchards, vineyards and other agricultural crops that have been fallowed in response to the drought or have been switched out due to crop change out.

The District, therefore, requests continued ARB concurrence for the postponement of the remaining crop categories through 2020. The District will continue to evaluate these categories on an ongoing basis and as required under Rule 4103. If the long-term viability of the Valley's biomass power plants continue to decline and feasible alternatives to open burning are not found, consistent with the provisions specified in California Health and Safety Code, the District may be forced to re-evaluate the open burn prohibitions currently in place.

The District will continue to carefully manage all remaining agricultural burning with its Smoke Management System (SMS) to ensure that there is no violation of the National Ambient Air Quality Standards. The District will also work closely with farm bureaus, County Ag Commissioners and agricultural representatives to explore and advance agricultural wood waste disposal techniques as alternatives to open burning and traditional biomass power plants.

2 Regulatory Background

2.1 Senate Bill 705

In 2003, Senate Bill 705 amended state law to require the District to limit open burning of agricultural material in accordance with a phased-in schedule of deadlines. In addition to those requirements, the state law directs the District to postpone the burn prohibition dates for specific types of agricultural material if the District makes three specific determinations and the Air Resources Board (ARB) concurs.

- (1) There are no economically feasible alternatives to open-burning of the specific type of material;
- (2) Open-burning the specific type of material will not cause or substantially contribute to a violation of a National Ambient Air Quality Standard (NAAQS); and
- (3) There is no long-term federal or state funding commitment for the continued operation of biomass facilities in the Valley or the development of alternatives to burning.

SB 705 prohibits the issuance of a burn permit for specific categories of agricultural material and requires the District to regulate the burning of diseased crops and establish best management practices (BMP) for the maintenance and control of other weeds. The following table shows the requirements for specific categories of agricultural material and their corresponding prohibition dates.

Table 1 Timeline for SB705-Specific Crop Category Requirements

Effective Date	Category of Agricultural Material
June 1, 2005	Prohibit burning for Field Crops, Prunings, and Weed Abatement
	Establish BMP for Other Weeds and Maintenance
	Regulate burning of diseased crops
June 1, 2007	Prohibit burning for Orchard Removals
June 1, 2010	Prohibit burning for Vineyard Removals, Prunings from Surface Harvested Crops and Other Materials

2.2 District Rule 4103 (Open Burning)

District Rule 4103 (Open Burning) was first adopted on June 18, 1992 to permit, regulate, and coordinate the use of open burning while minimizing smoke impacts on the public. Rule 4103 has subsequently been amended numerous times to incorporate state law requirements. The provisions of Rule 4103 apply to open burning conducted in the Valley; this rule is not applicable to prescribed and hazard reduction burning, as defined and regulated by District Rule 4106 (Prescribed Burning and Hazard Reduction Burning).

Rule 4103 was last amended in April 2010 to incorporate the provisions of Senate Bill 705 (CH&SC §41855.5 and §41855.6) directly into the rule to more efficiently allow the District to consider the feasibility of non-burning alternatives for specific crops and materials, and postpone the burn prohibition.

Rule 4103 contains requirements for collecting, sorting, drying, and igniting agricultural materials; the timing, monitoring, and maintenance of burns; and specific requirements for field crop burning, ditch bank and levee maintenance, contraband materials, Russian thistle (tumbleweeds), and diseased materials. Additionally, the rule details a set of conditions that must be met for a burn permit to be issued.

The rule provides for the APCO to restrict and allocate burning based on meteorology and the predicted smoke production. Rule 4103 prohibits issuing permits for the burning of field crops, prunings, weed abatements, orchard removals, vineyard removal materials, surface harvest prunings, and other materials described in the rule.

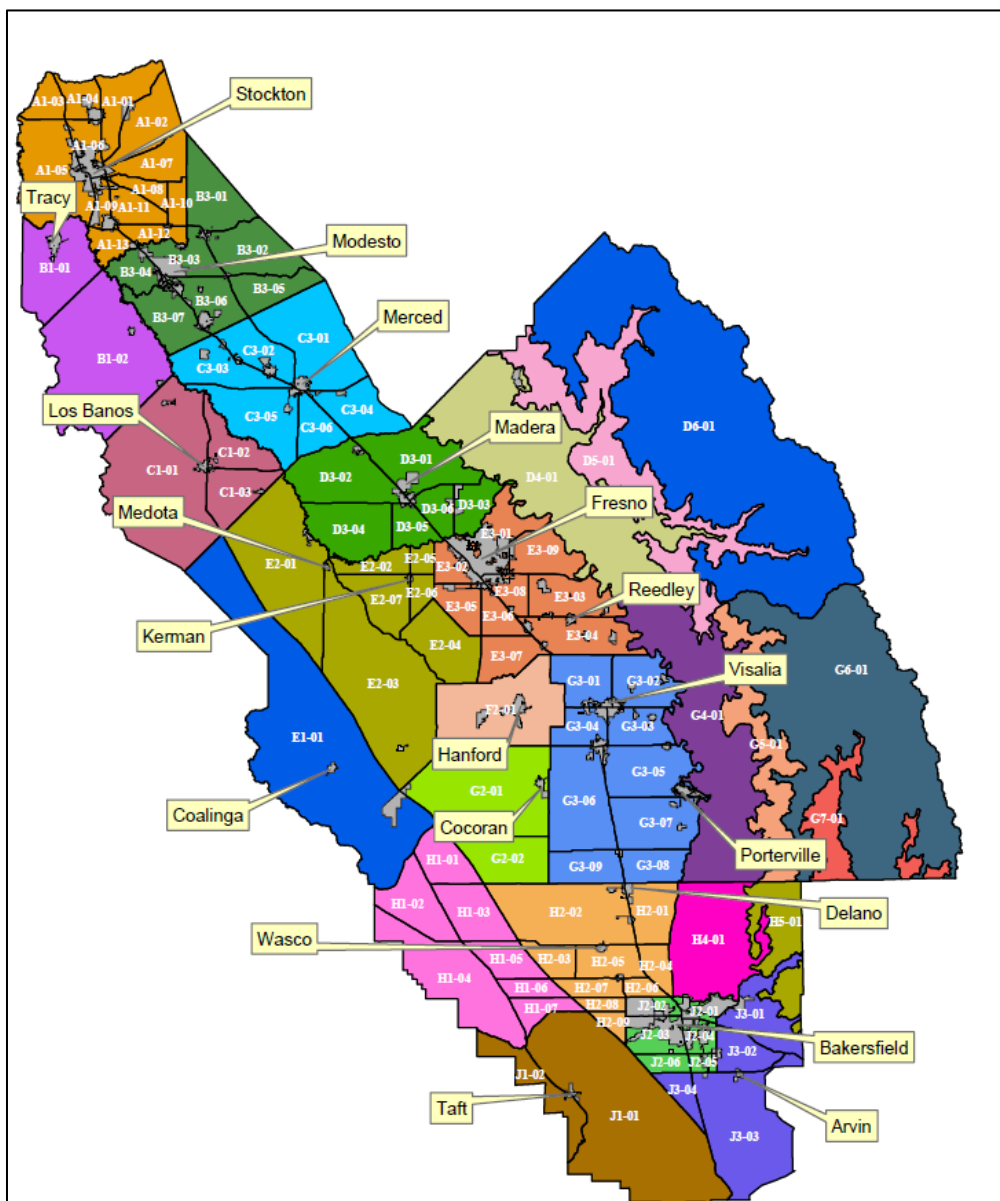
2.3 The District's Smoke Management System

In 2004, the District established the Smoke Management System (SMS), a refined method of authorizing or prohibiting individual open burns based on modeling the air quality impacts of smoke. The entity requesting a burn permit must first provide the District with the acres and type of burn material, the specific location of the burn, and the date of the burn. This information is entered into the SMS, where acres are converted to tons of fuel burned using a fuel loading factor based on the specific crop to be burned. Emissions are calculated by multiplying the tons of fuel burned by a crop-specific emission factor.² A burn request will be authorized after analysis and review from the compliance staff, and only if sufficient emissions have been allocated to the burn zone.

The proper management of burning allocations under the SMS ensures that open burning of agricultural materials does not cause any violations of health-based ambient air quality standards, open burning has only been permitted under the District's comprehensive Smoke Management System (SMS), which uses real-time meteorological information to analyze the impact of burning on air quality and appropriately limit burn allocations by area. Under the District's SMS program, the Valley is divided into 103 zones, depicted in Figure 1. The amount of burning allowed in a given zone on a specific day is based on factors such as the local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved or happening in a given area, and the potential impacts on downwind populations. In order to avoid violations of relevant NAAQS, District staff must reduce and balance the impacts of agricultural burning, wildfires, and prescribed burning. In some cases when the wildfire smoke impacts are severe, no agricultural burning is allowed. In the summer of 2015 when wildfire smoke impacted the Valley's air quality, the agricultural community had to be flexible to wait for the next burn window to appear. During this period, District staff worked hard to find burn windows under good to marginal dispersion conditions to allow agricultural burning to continue in the middle of the wildfire season.

² ARB. *District Miscellaneous Process Methodologies – Managed Burning and Disposal*. Retrieved on 11/19/14 from <http://www.arb.ca.gov/ei/areasrc/distmiscprocwstburndis.htm>

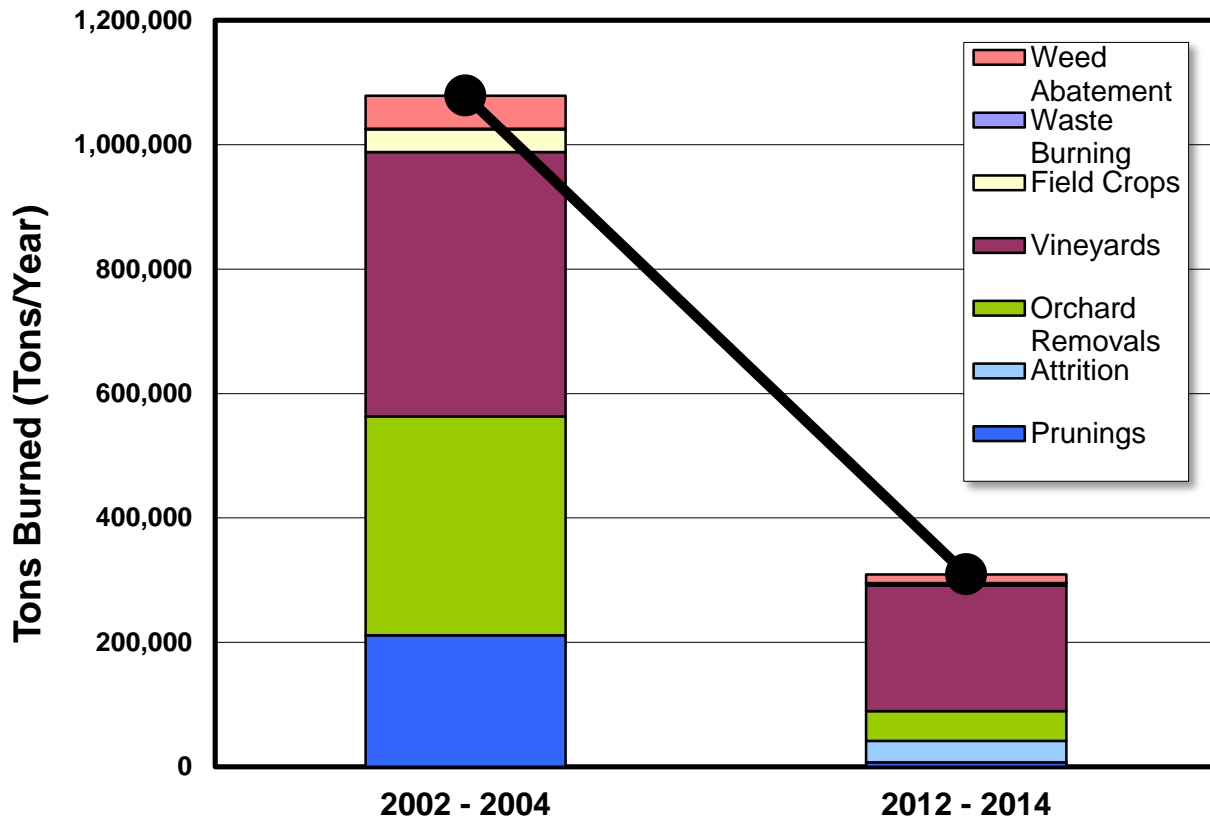
Figure 1. 103 Burn Allocation Zones in the Valley



3 Valley’s Success in Achieving Major Reductions in Open Burning

District staff has worked closely with stakeholders over the years to identify economically feasible alternatives to open burning of various agricultural materials and to meet its legal obligation under state law. These efforts have resulted in more than an 80% reduction in agricultural burning. Figure 2 below shows the reductions in agricultural material burned since 2002.

Figure 2. Annual Average Agricultural Open Burning (Tons of Material Burned)



4 Burn Prohibition Date Postponements

4.1 2010 Final Staff Report and Recommendations on Agricultural Burning

In the *2010 Report*, the District evaluated each crop category identified in CH&SC §41855.5 to determine any technologically and economically feasible alternatives to open burning. After working extensively with stakeholders to understand viable alternatives and associated costs, the District provided recommendations for allowing or prohibiting the open burning of agricultural material categories.

In the *2010 Report*, the District made a determination, consistent with CH&SC requirements, to postpone the burn prohibition dates and allow continued burning of certain crop categories. The District determined the following for the crop categories specified in the third column of Table 2 below:

- The continued conditional issuance of burn permits under the District’s SMS would not cause or substantially contribute to a violation of an applicable federal ambient air quality standard.
- There were no economically feasible alternatives for these crop categories.
- There were no long-term funding commitments for the continued operation of biomass facilities in the Valley in place.

Table 2 Crop Category Prohibitions

Crop Category	Specific Crop Types	
	Burn Permits Prohibited	Burn Permits Allowed
Field Crops	Alfalfa, asparagus, barley stubble, beans, corn, cotton, flower straw, hay, lemon grass, oat stubble, pea vines, peanuts, safflower, sugar cane, vegetable crops, and wheat stubble	Rice stubble up to 70% of the total acreage of rice farmed by the operator per year Residual rice stubble, spot burning of rice stubble, and burning of weeds and vegetative materials on rice field levees and banks
Prunings	Apricot crops, avocado crops, bushberry crops, cherry crops, Christmas trees, citrus crops, date crops, eucalyptus crops, kiwi crops, nectarine crops, nursery prunings, olive crops, pasture or corral trees, peach crops, persimmon crops, pistachio crops, plum crops, pluot crops, pomegranate crops, prune crops, rose crops, and fig crops	Apple crops, pear crops, and quince crops
Weed Abatement	Berms, fence rows, pasture, grass, and bermuda grass	Weed abatement activities affecting ponding and levee banks
Orchard Removals	Orchard removal matter of more than 15 acres at a single location, per calendar year, citrus crops > 3,500 acres	Citrus crops < 3,500 acres, apple crops, pear crops, quince crops, and orchard removal matter from a total of 15 acres or less of orchard removal at a single location, per calendar year
Vineyard Removals	None at this time	Vineyard removal materials from grape and kiwi crops
Surface Harvested Prunings	Grape canes (defined as "vineyard materials"), grape vines, and prunings of almond, walnut, and pecan crops for each agricultural operation whose total nut acreage at all agricultural operation sites is 3,500 acres or more	Raisin trays (defined as "vineyard materials"), and up to 20 acres of prunings per year for almond, walnut, and pecan crops for agricultural operations whose total nut acreage at all agricultural operation sites is less than 3,500 acres with a case-by-case allowance of additional burn requests based on economic feasibility
Other Materials	Brooder paper and deceased goats	Diseased beehives

On May 27, 2010, ARB provided a two-year concurrence with the District's extension of the burning prohibition date for specific crop categories³. ARB's evaluation concurred that there continues to be a number of impediments to fully implementing alternatives to burning for selected crop categories.

³ CARB. (2010). *Resolution 10-24*. Retrieved 9/21/15 from <http://www.arb.ca.gov/smp/district/finalres1024.pdf>.

4.2 2012 Review of 2010 Report⁴

In compliance with ARB's two-year concurrence, the District revisited the *2010 Report* in 2012. The 2012 review of the *2010 Report* determined there were no significant changes in the economic feasibility of alternatives to agricultural burning since 2010 and therefore concurred with the results of the *2010 Report*. On May 31, 2012, ARB issued a letter to the District explaining its concurrence with the 2012 review and approved an additional three years for the postponement of the remaining crop categories.⁵

5 Effects of the Drought on Agricultural Burning

California is currently suffering through the worst drought in recorded history. Despite improved atmospheric conditions during the winter of 2014-2015, precipitation remained well below average for most of the Valley. Snow pack levels during winter of 2014-2015 hit a record low at 6% of normal. Since January 2014, the Governor declared California to be in a state of Drought Emergency, and the entire Valley is under "exceptional" drought conditions. Federal and state surface water deliveries are at an all-time low of zero- to twenty-percent allocation, and cities and towns have implemented a mandatory 25% reduction in water usage.

The drought conditions described above have resulted in a significant increase in fallowed land, with far more expected to follow. To date hundreds of thousands of acres of orchards, vineyards and other agricultural crops have been fallowed in the San Joaquin Valley in response to the drought. Removal of agricultural material has increased significantly and is expected to continue increasing for several more years. With the biomass industry in jeopardy, the extra agricultural material has nowhere to go.

⁴ SJVAPCD. *2012 Update: Recommendations on Agricultural Burning*. 2012

⁵ Air Resources Board. (2012, May 31). *2012 Ag Burn Concurrence Letter* May 16.

6 Current Economic Feasibility of Alternatives to Open Burning

6.1 Biomass Power Plants in Jeopardy

Biomass power plants are a significant alternative to the open burning of agricultural waste and the emissions associated with it. Biomass burning of agricultural material is preferable to open burning as it combusts the material more completely, results in fewer emissions, and provides an alternative source of energy in the Valley.

6.1.1 Challenges for Biomass Power Plants

The biomass industry is primarily the product of the Public Utility Regulatory Policy Act (PURPA) which was enacted in 1978 at the height of the energy crisis to promote the use of alternative nonutility power generation. Today, these facilities are fully depreciated and have lost, or are nearing the ends of, their long-term contracts to sell their power to the utilities. In addition, biomass facilities are facing numerous obstacles to remain in operation including price disadvantage, demand for intermittent power instead of baseload power, and lack of federal and state funding.

Much has changed in the energy markets since PURPA was implemented. Natural gas has replaced oil for electricity generation, and supplies of natural gas have increased, driving down the wholesale cost of electricity. California has adopted a Renewable Portfolio Standard (RPS) that requires 33% of the power that is purchased by utilities be renewable. This has driven competition to fill the renewable energy needs of the state. Under the RPS, Investor Owned Utilities (IOUs) have tended to favor lower cost intermittent sources of renewable power, such as solar and wind. This has left the biomass industry in a position where the power that they produce is not desirable, since most biomass plants provide baseload power instead of intermittent power, and the current rate being paid for power does not allow them to remain viable.

Given the current energy policy, the biomass industry does not compete well under the current procurement policies of the state's IOUs. Historically, the biomass facilities have demanded 12-13 cents per kilowatt-hour, which has been necessary to retain economic viability. Pricewise, this places biomass facilities at a competitive disadvantage with other renewable fuels that can be procured at a much lower cost. Under the state's RPS, program pricing information is confidential, however, anecdotal evidence is that currently the IOUs are purchasing power from solar and wind facilities at approximately 8 cents per kilowatt-hour.

Another factor that negatively impacts the competitive position of biomass generated power is due to the fact that such plants provide "baseload" power. As baseload generators, biomass facilities cannot produce power that can be turned on quickly, and therefore, cannot meet the power system's demand for "ramping services". The demand for ramping services is compounded by continued increase in the use of wind and solar renewable sources, which is partially triggered by the state's RPS goals. If

current trends persist, this issue will worsen in the future. It is estimated that by 2020, solar and wind will account for three-quarters of the state's renewable power and 20% of the state's total electricity supply. The net effect of this is a further transition away from baseload generators to more flexible generators that can be turned-on and turned-off when needed. Under this scenario, not only do biomass facilities have difficulty competing directly on price, but they also do not provide the type of power that is desired. While under this scenario the state can meet its renewable power goals, the potential loss of biomass plants can impact the state's broader greenhouse gas reduction goals under AB 32 by increasing GHG emissions in sectors that currently rely on biomass plants for disposal of materials including the agricultural industry, landfills, and forests.

The biomass industry also struggles to provide consistent service to farmers needing timely removal of material to ensure the land is ready for the next planting season. In the past, lack of coordination and available storage for biomass fuels has caused uncertainty over the timing of material removal. The inability to guarantee consistent acceptance of agricultural biomass offers further confirmation that remaining crop categories should be allowed to continue open burning. A complete prohibition of open burning would result in a massive increase in agricultural material requiring disposal, placing an even greater strain on an already precarious situation.

6.1.2 Effects of Biomass Power Plant Shutdowns

As shown in Table 3, since 2012, five Valley biomass facilities, have shut down operations. In addition, the Valley's largest biomass plant (Covanta Delano) has stopped receiving new material as of November 1, 2015, and has informed the District that they plan to shut down operations at the end of the year because they have been unable to secure a viable Purchase Power Agreement.

Table 3 Status of Biomass Facilities in the Valley

Facility Name	City	Capacity (MW)	Status
Rio Bravo Fresno	Fresno	28.5	
Covanta Mendota, LP	Mendota	30.0	CLOSED Dec. 2015
Madera Power, LLC	Madera	28.5	CLOSED Feb. 2012
Ampersand Chowchilla Biomass, LLC	Chowchilla	12.5	
Merced Power, LLC	Merced	13.0	
Thermal Energy Energy Dev Partnership, LP	Tracy	20.5	CLOSED Oct. 2014
DTE Stockton, LLC	Stockton	54.0	
Covanta Delano, Inc.	Delano	56.5	STOPPED RECEIVING Nov. 2015; CLOSING Dec. 2015
Sierra Power Corporation	Terra Bella	9.4	CLOSED Jan. 2014
Mt. Poso Cogeneration Company, LLC	Bakersfield	49.9	
CRES Inc. d/b/a Dinuba Energy	Dinuba	11.5	CLOSED Sep. 2015

The loss of these facilities has considerably reduced the available options to dispose of agricultural wood waste, especially material from large orchard removals. As a result, many agricultural growers have lost the primary economically feasible disposal option for their orchard removal material. This could not come at a worse time as there has been an increase in the number of large orchard removals over the past year due in large part to the effects of the extreme drought emergency currently facing the state.

6.2 Availability of long-term federal or state funding commitments

The biomass industry has long relied on a combination of state and federal financial incentives to directly support their relatively higher production costs. These incentives have ranged from tax credits to monetary grants, but have all expired over the last decade. Examples of these programs include the federal Renewable Electricity Production Tax Credit, expired in 2013, state Existing Renewable Facilities Program, expired in 2011, and state Biomass-to-Energy incentive Grant Program, expired in 2003. Therefore, there are currently no long-term federal or state funding commitments for the operation of biomass facilities or development of alternatives to burning.

6.3 Specific Crop Categories

6.3.1 Vineyard Removal Materials from Grape and Kiwi Crops

Grape and kiwi vine cultivation requires use of extensive trellis systems to support the vines. The support system consists of wires and may include wood or metal posts and stakes. In many instances, grape canes remaining after pruning get wrapped around the wires to provide the needed support. As vines mature and age, trellis wires become deeply embedded into the canes or cordons. To avoid mechanical damage to chippers and biomass power plants, the embedded wires need to be removed. Wire removal requires intensive manual labor, adding significant potential cost to vineyard growers. Many chipping operators refuse to process these materials because of the wires. In addition, due to the limited number of chipping contractors operating in the Valley, service may not be available according to the vineyard grower's schedule, which can cause delays in planting for the following season. Furthermore, due to the deterioration of the biomass industry, limited biomass plant capacity could prevent the acceptance of this material. Thus there is currently no economically feasible alternative to open burning of this material.

Sending this material into landfills is not considered a viable alternative as landfills are required to divert wood and green materials. For these reasons, District staff concludes that there is no change to the determinations made in the 2012 assessment to continue to allow this category to be open burned through the District's smoke management system.

6.3.2 Citrus Crops Orchard Removal Matter less than 3,500 acres

Similar to vineyard removals, the chipping of citrus orchard removals with subsequent transport and processing at biomass power plants is considered the most technologically and viable alternative to open burning. As explained above, the biomass industry is in severe jeopardy and will have insufficient capacity to handle all of the orchard removal material generated in the Valley if open burning was completely prohibited for this category. Since conditions have worsened since the 2012 assessment, this category will continue to be allowed to be open burned through the District's smoke management system and are evaluated on a case-by-case basis.

6.3.3 Surface Harvested Prunings from Almond, Walnut, and Pecan Crops

Nut trees are usually pruned after harvesting, either late or early in the year. In the past, growers generally open burned nut prunings to dispose of the material. However, many growers have found alternative ways to convert prunings into something useful, such as soil amendment. Many nuts growers are currently shredding the prunings and leaving the materials on the orchard floor. The ability to shred the materials varies among growers of different size farms and regions, with commercial shredders potentially being infeasible due to either excessive cost or unavailability. Additionally, there are also concerns for this practice, including preventing the pruning material from interfering with the harvesting of the crop and potential build-up of chipped material on the ground. This situation can then cause the chipped material to be picked up during harvest. Although tilling could be done to bury the chipped material to promote faster decomposition, growers try to minimize the number of tractor passes in their orchards. Leaving chipped material on the ground has caused issues during harvesting; therefore, many growers have mostly relied on removing the pruning material from the field and open burning the pruning material. Due to harvesting and pruning practices, there is a short window of opportunity to have these types of prunings chipped. Some growers usually find it more conducive to their operations to gather the prunings and burn them.

The economic feasibility of using an alternative to open burning surface harvested prunings is evaluated for every burn permit application received. Since the 2012 assessment, there have been 81 applications to obtain approval to burn. There were 29 approved applications, meaning the price to implement an alternative was economically infeasible. Twelve applications were denied due to the cost of the alternative provided determined to be economically feasible. The remaining 40 applications were withdrawn due to a variety of reasons.

Based on the case-by-case evaluations of specific grower's permit requests, there has not been a significant change in the number of chipping contractors available, and the option of shredding is still economically infeasible for some growers. For these reasons, District staff concludes that there is no change to the determinations made in the 2012 assessment to continue to allow this category to be open burned through the District's smoke management system.

6.3.4 Other categories

6.3.4.1 Pome Fruit

Pome fruits include apple, pear, and quince crops. The primary concern for pome fruits is their susceptibility to fire blight, a bacterial disease that kills blossoms, shoots, limbs, and potentially the entire tree. Chipping/grinding and composting create a potential opportunity for transfer and infection of nearby orchards. Fire blight is prevalent in the Valley and is a difficult disease to control. Burning of infected material is a preventive measure used by growers to help ensure the disease does not spread. In light of the disease issue, the District concludes that there is no feasible alternative to burning pome fruit prunings or orchard removal matter at this time.

6.3.4.2 Raisin Trays

Raisin trays are paper trays used to dry the grapes on the ground. These trays contain polymer so that the moisture on the ground cannot be absorbed in the raisin tray. The grapes remain on the raisin trays until they meet the appropriate moisture content. In the past, growers used recycling firms to dispose of the trays. These recycling firms shipped the trays to China for reuse. However, due to the lower value of the U.S. dollar, China cut off the import of raisin trays and this alternative is no longer broadly viable. Since the polymer does not degrade quickly, soil incorporation is not a feasible alternative to burning raisin trays. In addition, due to the polymer, biomass facilities will not accept raisin trays.

6.3.4.3 Rice Stubble

Rice is planted in the spring and harvested in the fall. Once the rice is harvested, the rice straw remains in the field for disposition. Reducing the amount of post-harvest straw residue in the rice fields is important to the successful production of the next crop. Burning has been the historical cultural practice for removing straw and residues for the rice industry. Another potential alternative is soil incorporation, but this requires water to be delivered to the operations post-harvest season. Most rice growers in the Valley are in the northern region and, due to the annual distribution schedules designated by irrigation districts, water is not available to be delivered post-harvest as needed. Most rice growers in the Valley also do not have access to water wells for their rice fields. In addition, the extreme drought has exacerbated this situation. Therefore, rice growers in the Valley do not typically rely on soil incorporation as a feasible option to dispose of their rice straw.

In 2007, District staff believed that rice growers could sell the rice straw to baling operators who would then sell it to their customers such as dairies. Therefore, the District prohibited open burning for 30% of rice stubble per year. Selling rice straw to baling operators worked well when there was a market for the baled rice straw, but this has not consistently provided an economically feasible option for rice growers. Due to the fluctuation in market demand for rice stubble, which impacts growers ability to effectively remove the material, and issues with water allocation, District staff recommended that open burning of rice stubble be allowed to continue for burns at 70% per year of the total acreage of rice farmed by the operator after June 1, 2010 and until June 1, 2015. There has been no significant change to the economic feasibility of baling as an alternative to burning. Therefore, the District will continue to allow this category to be open burned through the District's smoke management system.

7 Potential technologies to Provide Alternatives to Agricultural Open Burning

The District has found no breakthroughs in technologically achievable and economically feasible alternatives to open burning and traditional biomass power plants. While every effort should be taken to save this existing resource, the District believes that there is an urgent need to investigate other alternatives for the disposal of agricultural waste material. The following are potential technologies that the District may pursue through the District's Technology Advancement Program. Funding from the California Energy Commission, Department of Energy, and others will also be needed.

Pyrolysis – Gasification: Pyrolysis is a possible path to convert agricultural biomass to higher value products. Pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen. It is the first step of producing a flammable gas called synthetic gas (syngas). Burning syngas to produce power offers certain advantages over directly burning the biomass because the gas can be cleaned and filtered to remove problematic chemical compounds. Using syngas is also potentially more efficient than direct combustion of biomass because the gas can be combusted at higher temperatures. Syngas can also be used to produce methanol and hydrogen, or converted into a liquid fuel. This is a viable alternative for farm-scale or small-scale power production, with lower emissions than existing biomass combustion power plants. There are currently a few operational units in California, including two in the Valley.

Bio-char: Bio-char is a name for charcoal when it is used for particular purposes, especially as a soil amendment. Like charcoal, bio-char is created by pyrolysis of biomass. Bio-char can increase soil fertility and agricultural productivity. Bio-char can also be processed into activated carbon that can be used for the removal of specific compounds from gaseous and liquid streams.

Bio-oil: Bio-oil, sometimes also known as bio-crude or pyrolysis oil is a mixture of organic compounds that is distilled from the products of fast pyrolysis of biomass at about 500°C. Bio-oil can be used as fuel in boilers and also used in power generation equipment. Bio-oil also can be upgraded to renewable transportation fuels, as well. Bio-oil with high cellulosic materials such as orchard debris is not currently commercially viable.

High Solids Anaerobic Digestion: Anaerobic digestion is a viable process that can be used to convert woody biomass, agricultural wastes, and municipal solid wastes into methane gas. Anaerobic digesters that process large amounts of woody biomass will require the use of chemical treatment or enzymes to speed the breakdown of cellulose.

Composting Biomass: Composting is the process by which organic material is broken down aerobically by bacteria and other microorganisms to form a biologically stable organic substance suitable as a soil amendment and plant fertilizer. Organic waste decomposes naturally in the presence of water, warmth, and oxygen. Composting

accelerates the process by adding moisture and maintaining an elevated temperature. Biomass is one of the sources of organic material for composting operations, but woody biomass must be well mixed with high nitrogen concentration materials to be an effective compost component.

Fiberboard: Biomass can be treated and processed to produce fiberboard that can be used in the manufacture of various products. Fiberboard is a type of engineered wood product that is made out of wood fibers that are bonded together with resin. Types of fiberboard include particleboard, medium-density fiberboard, and hardboard. Fiberboard is frequently used in many industries, such as furniture production, and is generally made with waste material from wood processing facilities.

Biomass Used as Mulch/Land Application/Soil Incorporation: Chipped or shredded agricultural biomass materials can be used to produce wood mulch. Wood mulch can be a mixture of shredded wood, bark, and compost. Wood mulch can be used in landscape projects or for erosion control. The material is primarily used to reduce erosion by protecting bare soil from rainfall impacts, increasing water infiltration, and reducing runoff. A significant portion of pruned orchard material is currently shredded in-row and used as mulch in the orchard. The shredded material can be left on the ground or can be incorporated into the soil when the field is tilled. Over time, the material decomposes into the soil, which adds valuable organic material to the soil and can lead to better water infiltration and soil quality.

Cellulosic Ethanol Production: Cellulosic ethanol is an advanced next-generation biofuel that can be made from agricultural wastes, wood chips, switch grass, corn stover, forest wastes, fast-growing trees, and other plant material. Currently, ethanol produced in the United States is most commonly produced from corn kernels. In the United States, corn ethanol is primarily used as an alternative or additive to gasoline. Advanced biofuels are those that do not rely on the starch in corn kernels. Production of large quantities of ethanol from woody biomass will likely require the use of chemical treatment or enzymes to speed the breakdown of the cellulose in the biomass. Currently, the production of cellulosic ethanol is still predominately in the demonstration phase of development.

8 Recommended Actions

This *2015 Agricultural Burning Review* (2015 Review) shows that in the three years since the 2012 evaluation, the availability of technologically achievable and economically feasible alternatives to agricultural burning has significantly worsened due to the severe drought conditions and the demise of the biomass industry that historically has provided an alternative to open burning for a considerable amount of the agricultural waste generated in the Valley. This situation will likely get worse since there are no federal or state funding commitments for the continued operation of biomass facilities.

The District, therefore, requests continued ARB concurrence for the postponement of the following crop categories through 2020. The District will continue to evaluate these categories on an ongoing basis and as required under Rule 4103. If the long-term viability of the Valley's biomass power plants continue to decline and feasible alternatives to open burning are not found, consistent with the provisions specified in California Health and Safety Code, the District may be forced to re-evaluate the open burn prohibitions currently in place.

The District will continue to carefully manage all remaining agricultural burning with its Smoke Management System (SMS) to ensure that there is no violation of the National Ambient Air Quality Standards. The District will also work closely with farm bureaus, County Ag Commissioners and agricultural representatives to explore and advance agricultural wood waste disposal techniques as alternatives to open burning and traditional biomass power plants.

Table 4 Postponement of Burn Prohibitions

Crop Category	Specific Crop Types Allowed to Burn
Field Crops	Rice stubble up to 70% of the total acreage of rice farmed by the operator per year Residual rice stubble, spot burning of rice stubble, and burning of weeds and vegetative materials on rice field levees and banks
Prunings	Apple crops, pear crops, and quince crops
Weed Abatement	Weed abatement activities affecting ponding and levee banks
Orchard Removals	Citrus crops < 3,500 acres, apple crops, pear crops, quince crops, and orchard removal matter from a total of 15 acres or less of orchard removal at a single location, per calendar year
Vineyard Removals	Vineyard removal materials from grape and kiwi crops
Surface Harvested Prunings	Raisin trays (defined as "vineyard materials"), and up to 20 acres of prunings per year for almond, walnut, and pecan crops for agricultural operations whose total nut acreage at all agricultural operation sites is less than 3,500 acres with a case-by-case allowance of additional burn requests based on economic feasibility
Other Materials	Diseased beehives

The District will continue to carefully manage all remaining agricultural burning with its Smoke Management System (SMS) to ensure that there is no violation the National Ambient Air Quality Standards. The District will reevaluate these categories in the next evaluation under Rule 4103 when more economic and other data is available.