APPENDIX D

SUPPORTING DATA FOR MOST STRINGENT EMISSION LIMITS FOR PROCESS EQUIPMENT AT BIOREFINERIES

Table Notes:

(1) Calculated values, in *italics*, are shown for comparative purposes.

(2) Calculated VOC values are calculated as methane unless otherwise specified.

(3) N/A indicates that BACT was not triggered, or the rule, guideline, or policy does not cover that particular pollutant.

(4) F factor for waste gas is assumed to be 9,570 dscf/MMBtu.

(5) Efficiency for reciprocating IC engines is assumed to be 35%.

(6) SCAQMD BACT Clearinghouse is organized such that guidelines for non-major facilities are contained in Part D and guidelines for major facilities are included in Part B. For major sources in the District, the project proponent should not automatically assume it will meet District BACT requirements if proposed emission levels are consistent with Part D guidelines. The project proponent should check the Part B guidelines and consult with District permitting staff.

Table D-1. Grain Receiving, Conveying, Grinding, and Storage Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Pacific Ethanol; Brawley, CA	Biomass fuel receiving, handling, and storage		Permit	2007					Baghouse w/ 99% control
2	SJVAPCD Guideline 6.4.5[1]	Biomass fuel receiving, handling, and storage		BACT (AIP)	9/7/1998					Use of wet suppression system on all emission units, transfer points, and raw material stockpiles to maintain moisture to prevent visible emissions >20%

[1] Based on Chrysler Corp., Mendota, CA.

Table D-1. Grain Receiving, Conveying, Grinding, and Storage Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	SCAQMD Guidelines for Non-Major Facilities	Bulk solid material handling – other (feed and grain handling)		BACT	1988					Baghouse
4	SCAQMD Guidelines for Non-Major Facilities	Bulk solid material handling – other (pneumatic conveying, except paper and fiber)		BACT	1988					Baghouse
5	SCAQMD Guidelines for Non-Major Facilities	Bulk solid material handling – other (other dry materials handling)		BACT	7/11/1997					Enclosed conveyors and baghouse
6	SCAQMD Guidelines for Non-Major Facilities	Bulk solid material handling – other (other wet materials handling)		BACT	1988					Water spray or adequate material moisture

Table D-2. Methanol/Sodium Methoxide Receiving and Storage

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	American Biodiesel, Inc. dba Community Fuels; Stockton, CA		Vapor recovery system	Permit	6/4/2007			99.5% control		
2	Blue Sky Bio-Fuel, Inc.; Oakland, CA		Vapor balance system	Permit				95% control		
3	Crimson Renewable Energy, LP; Bakersfield CA		Vapor control system	Permit	12/13/2008			95% control		

Table D-2. Methanol/Sodium Methoxide Receiving and Storage

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	Golden Gate Petroleum Company; San Jose, CA		Vapor balance system	Permit				95% control		

Table D-3. Fermentation Process: Yeast, Liquefaction, Beerwell, and Process Condensate Tanks

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Pacific Ethanol; Madera, CA	Ethanol fermentation process tanks	Wet scrubber to Regenerative Thermal Oxidizer	Source test	2/20/2007			>99.9% control		
2	Phoenix Bio Industries, LLC; Goshen, CA	Ethanol fermentation process tanks including fermentation tanks and beerwell storage tanks	Wet scrubber vented to CO_2 wet scrubber w/ Regenerative Thermal Oxidizer	Source test	4/18/2007			99.7% control		
3	SJVAPCD Guideline 4.12.4[2]	Ethanol fermentation process tanks including fermentation tanks and beerwell storage tanks		BACT (AIP)	2/17/2004			99.5% VOC control efficiency (fermentation wet scrubber vented to CO_2 recovery plant w/ condenser and high pressure scrubber, or equivalent)		

[2] Based on Pacific Ethanol, Madera, CA.

Table D-4. Distillation and Wet Cake Processes										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Pacific Ethanol; Madera, CA	Ethanol distillation process	Distillation wet scrubber	Source test	2/20/2007			>99% control		
2	Calgren Renewable Fuels; Pixley, CA	Emissions units involved in ethanol distillation and wet cake process (excluding wet cake dryer)	Distillation wet scrubber w/ regenerative thermal oxidizer	Authority to Construct	7/7/2005			95% VOC control		
3	Calgren Renewable Fuels; Pixley, CA	Emissions units involved in ethanol distillation and wet cake process (excluding wet cake dryer)	Distillation wet scrubber w/ regenerative thermal oxidizer	Source test	1/12/2010			>99.9% VOC control		
4	Pacific Ethanol; Madera, CA	Emissions units involved in ethanol wet cake process (excluding wet cake dryer)	Distillation wet scrubber	Permit	(Authority to Construct issued in 2005)			95% control		
5	Pacific Ethanol; Madera, CA	Emissions units involved in ethanol wet cake process (excluding wet cake dryer)	Distillation wet scrubber	Source test	1/25/2008			>99% control		
6	SJVAPCD Guideline 4.12.5[3]	Emissions units involved in ethanol distillation and wet cake process (excluding wet cake dryer)	Wet scrubber or equivalent	BACT (AIP)	2/17/2004			95% VOC control		

[3] Based on Pacific Ethanol, Madera, CA.

Table D-5. Natural Gas-Fired Boiler

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Rule 4307 Boilers, Steam Generators, and Process Heaters – 2.0 MMBtu/hr to 5.0 MMBtu/hr	Units 2.0 MMBtu/hr to ≤5.0 MMBtu/hr		Rule	Last amended 10/16/2008	Atmospheric units: 12 ppmvd @ 3% O_2 or 0.014 lb/MMBtu Non-atmospheric units: 9 ppmvd @ 3% O_2 or 0.011 lb/MMBtu	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A
2	SCAQMD Rule 1146.1 Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	Units >2 MMBtu/hr to <5 MMBtu/hr		Rule	Last amended 9/5/2008	Atmospheric units: 12 ppm @ 3% O_2 or 0.015 lb/MMBtu Non-atmospheric units: 9 ppmvd @ 3% O_2 or 0.011 lb/MMBtu	N/A	N/A	N/A	N/A
3	La Paloma Generating Company, LLC; McKittrick, CA	6.2 MMBtu/hr natural gas boiler	Low NOx burner	BACT (AIP)	3/24/2000	12 ppmv @ 3% O_2 *(0.0146 lb/MMBtu)*	50 ppmv @ 3% O_2 *(0.037 lb/MMBtu)*	30 ppmv @ 3% O_2 *(0.0127 lb/MMBtu)*	N/A	0.007 lb/MMBtu

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	SJVAPCD Rule 4306 Boilers, Steam Generators, and Process Heaters – Phase 3	Units >5 MMBtu/hr to ≤20.0 MMBtu/hr (non-refinery units, non-load following units, units not subject to fuel use restriction)		Rule	Last amended 10/16/2008	Standard Option: 15 ppmvd @ 3% O_2 or 0.018 lb/MMBtu Enhanced Option: 9 ppmvd @ 3% O_2 or 0.011 lb/MMBtu	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A
5	SCAQMD BACT Guidelines – Part D	<20 MMBtu/hr natural gas or propane fired boiler	Ultra low NOx burner, or equal	BACT	10/20/2000 (NOx, SOx), 4/10/1998 (CO, PM10)	≤12 ppmvd @ 3% O_2 *(0.015 lb/MMBtu)*	Firetube type: ≤50 ppmvd @ 3% O_2 *(0.037 lb/MMBtu)* Watertube type: ≤100 ppmvd @ 3% O_2 *(0.074 lb/MMBtu)*	N/A	Natural gas	Natural gas
6	BAAQMD Regulation 9 Rule 7 NOx and CO from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	20 MMBtu/hr to <75 MMBtu/hr gaseous fuel-fired boiler		Rule	Last amended 7/30/2008	9 ppmvd @ 3% O_2 *(0.011 lb/MMBtu)*	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
7	SJVAPCD Rule 4306 Boilers, Steam Generators, and Process Heaters – Phase 3	Units >20.0 MMBtu/hr (non-refinery units, non-load following units, units not subject to fuel use restriction)		Rule	Last amended 10/16/2008	Standard Option: 9 ppmvd @ 3% O_2 or 0.011 lb/MMBtu Enhanced Option: 6 ppmvd @ 3% O_2 or 0.007 lb/MMBtu	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A
8	SCAQMD BACT Guidelines – Part D	≥20 MMBtu/hr natural gas or propane fired boiler	Ultra low NOx burner or equal; SCR or equal	BACT	10/20/2000 (NOx, SOx), 4/10/1998 (CO, PM10)	With low NOx burner: ≤9 ppmvd @ 3% O_2 *(0.011 lb/MMBtu)* With add-on controls: ≤7 ppmvd @ 3% O_2 *(0.009 lb/MMBtu)* NH_3: ≤5 ppmvd @ 3% O_2	Firetube type: ≤50 ppmvd @ 3% O_2 *(0.037 lb/MMBtu)* Watertube type: ≤100 ppmvd @ 3% O_2 *(0.074 lb/MMBtu)*	N/A	Natural gas	Natural gas
9	SJVAPCD (Facility unknown)	>20 MMBtu/hr natural gas fired boiler	Ultra low NOx burner or equal	BACT (AIP)	6/30/1999	9 ppmv @ 3% O_2 or 0.0108 lb/MMBtu	N/A	N/A	N/A	N/A

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
10	SJVAPCD (Facility unknown)	≥5 MMBtu/hr steam generator		BACT (AIP)	5/24/2004	14 ppmv @ 3% O_2 *(0.017 lb/MMBtu)*	50 ppmv @ 3% O_2 *(0.037 lb/MMBtu)*	Gaseous fuels	Natural gas, LPG, waste gas treated to remove 95% by weight of sulfur compounds or treated such that the sulfur content does not exceed 1 gr/100 scf, or use of a continuously operating SO_2 scrubber and either achieving 95% by weight control of sulfur compounds or achieving an emission rate of 30 ppmvd SO_2 at stack O_2	Natural gas, LPG, waste gas treated to remove 95% by weight of sulfur compounds or treated such that the sulfur content does not exceed 1 gr/100 scf, or use of a continuously operating SO_2 scrubber and either achieving 95% by weight control of sulfur compounds or achieving an emission rate of 30 ppmvd SO_2 at stack O_2

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
11	BAAQMD BACT Guideline 17.3.1	≥50 MMBtu/hr	Ultra low NOx burner + FGR, good combustion practice SCR + low NOx burners + FGR, oxidation catalyst	BACT (AIP) BACT (tech. feasible)	9/22/2005	9 ppmvd @ 3% O_2 *(0.011 lb/MMBtu)* 7 ppmvd @ 3% O_2 *(0.009 lb/MMBtu)*	50 ppmv @ 3% O_2 *(0.037 lb/MMBtu)* For units ≥250 MMBtu/hr: 10 ppmvd @ 3% O_2[4] *(0.007 lb/MMBtu)*	N/A	Natural gas or treated refinery gas fuel w/ <100 ppmv total reduced sulfur Natural gas or treated refinery gas fuel w/ <50 ppmv H_2S and <100 ppmv total reduced sulfur	Natural gas or treated refinery gas fuel
12	SCAQMD Rule 1146 Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	Units ≥5 MMBtu/hr (excluding electric utility boilers, >40 MMBtu/hr boilers and process heaters used in petroleum refineries, sulfur plant reaction boilers)		Rule	Last amended 9/5/2008	≥5 to <75 MMBtu/hr: 9 ppm @ 3% O_2 or 0.011 lb/MMBtu ≥75 MMBtu/hr: 5 ppm @ 3% O_2 or 0.0062 lb/MMBtu	N/A	N/A	N/A	N/A
13	CalResources; Western Kern County Oil Fields, CA	62.5 MMBtu/hr natural gas boiler	FGR and O_2 controller	BACT (AIP)	11/30/1993	0.036 lb/MMBtu *(30 ppmvd @ 3% O_2)*	0.02 lb/MMBtu *(27 ppmvd @ 3% O_2)*	0.003 lb/MMBtu *(7 ppmvd @ 3% O_2)*	0.0006 lb/MMBtu	0.005 lb/MMBtu

[4] CO limit does not apply to boilers smaller than 250 MMBtu/hr unless an oxidation catalyst is found to be cost effective or is necessary for TBACT or VOC control.

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
14	BAAQMD Regulation 9 Rule 7 NOx and CO from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	≥75 MMBtu/hr gaseous fuel-fired boiler		Rule	Last amended 7/30/2008	5 ppmvd @ 3% O_2 *(0.006 lb/MMBtu)*	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A
15	Berry Petroleum; Heavy Oil Central, SJVAPCD, CA	84 MMBtu/hr boiler	SCR, low NOx burner	BACT (AIP): SOx, PM10, VOC BACT (tech. feasible): NOx	3/11/2005	With SCR: 7 ppmvd @ 3% O_2 *(0.009 lb/MMBtu)*; With low NOx burner: 9 ppmvd @ 3% O_2 *(0.0109 lb/MMBtu)*	N/A	Natural gas, treated waste gas or recovered gas as a primary fuel. LPG as backup fuel	Natural gas, treated waste gas or recovered gas as a primary fuel. LPG as backup fuel	Natural gas, treated waste gas or recovered gas as a primary fuel. LPG as backup fuel
16	Genentech, Inc.; San Mateo, CA	97 MMBtu/hr Nebraska Model NS-E-64-ST-CA-HM-AL natural gas watertube boiler	Ultra low NOx burner	BACT	9/27/2005 (startup: 6/14/2006)	9 ppmvd @ 3% O_2 *(0.011 lb/MMBtu)*	50 ppmv @ 3% O_2 *(0.037 lb/MMBtu)*	N/A	N/A	N/A
17	AES Huntington Beach; Huntington Beach, CA	2,088 MMBtu/hr natural gas boiler	Low NOx burners, FGR, SCR, oxidation catalyst	BACT (AIP)	2/1/2006	5 ppmvd @ 3% O_2 *(0.006 lb/MMBtu)*	5 ppmvd @ 3% O_2 *(0.004 lb/MMBtu)*	1354 lb/mo	0.2 lb/MMBtu *(120 ppmvd @ 3% O_2)*	0.01 gr/scf @ 12% CO_2

Table D-5. Natural Gas-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
18	SJVAPCD Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters with a Total Rated Heat Input Greater than 5.0 MMBtu/hr	Units >5.0 to ≤20.0 MMBtu/hr[5] Units >20.0 MMBtu/hr		Rule	10/16/2008	Standard Schedule: 9 ppmvd @ 3% O_2 or 0.011 lb/MMBtu Enhanced Schedule: 6 ppmvd @ 3% O_2 or 0.007 lb/MMBtu Standard Schedule: 7 ppmvd @ 3% O_2 or 0.008 lb/MMBtu Enhanced Schedule: 5 ppmvd @ 3% O_2 or 0.0062 lb/MMBtu	400 ppmvd @ 3% O_2 *(0.296 lb/MMBtu)*	N/A	N/A	N/A

[5] The NOx limits listed here do not apply to oilfield steam generators, refinery units, units with fuel use restrictions, units at wastewater treatment facilities firing on <50% by volume PUC quality gas, and units operated by a small producer where each burner <5 MMBtu/hr but the total rating is 5-20 MMBtu/hr. See rule for additional restrictions.

Table D-6. Biomass-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Musco Olive Products; Tracy, CA	25 MMBtu/hr combined Solar Technologies Model Steamboy fluidized bed boiler producing 3 MW	FGR, SCR, catalyst PM control system (cyclone or in-line bag filter upstream of SCR), baghouse	Authority to Construct	10/2/2009	17.5 ppmvd @ 3% O_2 (*0.023 lb/MMBtu)* NH_3 slip: 10 ppmvd @ 3% O_2	183 ppmvd @ 3% O_2 (*0.144 lb/MMBtu)*	0.02 lb/MMBtu *(45 ppm @ 3% O_2)*	23 ppmvd @ 3% O_2 (*0.041 lb/MMBtu)*	0.045 lb/MMBtu *(0.002 gr/scf @ 12% CO_2)*
2	Massachusetts Department of Environmental Protection BACT Guidance for Biomass Projects	Solid biomass fuel-fired steam electric generating units, ≥1 to <10 MW		BACT (AIP)	4/18/2007[6]	0.093 lb/MMBtu *(72 ppm @ 3% O_2)* NH_3 slip: 25 ppm @ 3% O_2	0.25 lb/MMBtu *(320 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.025 lb/MMBtu *(14 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*
				BACT (tech. feasible)		0.093 lb/MMBtu *(72 ppm @ 3% O_2)* NH_3 slip: 10 ppm @ 3% O_2	0.25 lb/MMBtu *(320 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.02 lb/MMBtu *(11 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*

[6] The guidance indicates it expired on December 31, 2009, and prior to expiration, MassDEP would review its experience with the guidance and initiate a public discussion to determine next steps, such as affirming and/or revising the guidance, or proposing regulations to codify biomass performance standards. According to MassDEP staff, other matters have taken precedence and the public process to update or revise the guidance has not been initiated. However, the guidance is still valid and continues to be available to the public on the MassDEP website at: http://www.mass.gov/dep/air/laws/policies.htm.

Table D-6. Biomass-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	Rio Bravo; Fresno, CA	352 MMBtu/hr circulating fluidized bed boiler with steam turbine producing 24.3 MW	SNCR, ESP	Permit	2009	0.08 lb/MMBtu (*62 ppmvd @ 3% O_2)*; 27.5 lb/hr	22.0 lb/hr; 0.06 lb/MMBtu ; 400 ppmv @ 3% O_2; 310 ppmv @ 12% CO_2 and 7% O_2	10.4 lb/hr; 0.03 lb/MMBtu	10.0 lb/hr; 0.2% by volume	Filterable: 0.01 gr/dscf @ 12% CO_2; 5.8 lb/hr, 0.02 lb/MMBtu Condensable : 17.4 lb/hr; 0.05 lb/MMBtu
4	Massachusetts Department of Environmental Protection BACT Guidance for Biomass Projects	Solid biomass fuel-fired steam electric generating units, ≥10 to <25 MW		BACT (AIP)	4/18/2007	0.075 lb/MMBtu *(58 ppm @ 3% O_2)* NH_3 slip: 13 ppm @ 3% O_2	0.17 lb/MMBtu *(220 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.025 lb/MMBtu *(14 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*
				BACT (tech. feasible)		0.015 lb/MMBtu *(12 ppm @ 3% O_2)* NH_3 slip: 2 ppm @ 3% O_2	0.01 lb/MMBtu *(13 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.02 lb/MMBtu *(11 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*

Table D-6. Biomass-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
5	Massachusetts Department of Environmental Protection BACT Guidance for Biomass Projects	Solid biomass fuel-fired steam electric generating units, ≥25 MW		BACT (AIP)	4/18/2007	0.075 lb/MMBtu *(58 ppm @ 3% O_2)* NH_3 slip: 13 ppm @ 3% O_2	0.1 lb/MMBtu *(128 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.025 lb/MMBtu *(14 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*
				BACT (tech. feasible)		0.015 lb/MMBtu *(12 ppm @ 3% O_2)* NH_3 slip: 2 ppm @ 3% O_2	0.01 lb/MMBtu *(13 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.02 lb/MMBtu *(11 ppm @ 3% O_2)*	Filterable: 0.012 lb/MMBtu *(0.006 gr/scf @ 12% CO_2)*
6	Valley Bio-Energy; Modesto, CA	402 MMBtu/hr McBurney Corporation biomass-fired boiler with Detroit stoker vibrating grate feeder serving a steam turbine producing 33 MW (gross)	SNCR, SCR, dry powder scrubber w/ trona injection, multiclone, ESP	Authority to Construct		0.012 lb/MMBtu (24-hr block avg.)[7] *(9 ppm @ 3% O_2)* NH_3 slip: 50 ppmvd @ 3% O_2	0.046 lb/MMBtu (24-hr block avg.) *(59 ppm @ 3% O_2)*	0.005 lb/MMBtu *(11 ppm @ 3% O_2)*	0.012 lb/MMBtu (1-hr avg.) *(7 ppm @ 3% O_2)*	0.024 lb/MMBtu *(0.011 gr/scf @ 12% CO_2)*

[7] This limit is subject to a 12-month evaluation period to assess the operational variability and optimum control effectiveness of the emission control system to meet the target emission limit. In no event shall emissions exceed 0.065 lb/MMBtu (3-hr rolling avg.), except during startup and shutdown.

Table D-6. Biomass-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
7	SJVAPCD BACT analysis for San Joaquin Solar 1 & 2	(4) 425 MMBtu/hr Energy Products of Idaho (EPI) fluidized bubbling bed boiler with (1) 15 MMBtu/hr and (3) 50 MMBtu/hr natural gas-fired startup burners serving two steam turbines producing 53.4 MW each	RSCR or equal, limestone injection, baghouse or ESP, natural gas auxiliary fuel	BACT (AIP)	10/8/2009	0.075 lb/MMBtu *(58 ppm @ 3% O_2)*	0.1 lb/MMBtu *(128 ppm @ 3% O_2)*	0.01 lb/MMBtu *(22 ppm @ 3% O_2)*	0.025 lb/MMBtu *(14 ppm @ 3% O_2)*	0.045 lb/MMBtu *(0.002 gr/scf @ 12% CO_2)*
			Option 1: SNCR + SCR + wet scrubber or equal, limestone injection, baghouse + multiclones+ wet scrubber or equal, natural gas auxiliary fuel Option 2: SCR or equal, limestone injection, baghouse + multiclones+ wet scrubber or equal, natural gas auxiliary fuel	BACT (tech. feasible)		Option 1: 0.012 lb/MMBtu *(9 ppm @ 3% O_2)* Option 2: 0.065 lb/MMBtu *(50 ppm @ 3% O_2)*	0.046 lb/MMBtu *(59 ppm @ 3% O_2)*	0.005 lb/MMBtu *(11 ppm @ 3% O_2)*	0.012 lb/MMBtu *(7 ppm @ 3% O_2)*	0.024 lb/MMBtu *(0.011 gr/scf @ 12% CO_2)*
8	Wheelabrator; Delano, CA (changed name to AES Delano)	400 MMBtu/hr circulating fluidized bed boiler with steam turbine producing 31 MW	SNCR, limestone injection, sodium bicarbonate injection, multiclone and baghouse	Authority to Construct	1998	0.1 lb/MMBtu *(78 ppm @ 3% O_2)*	181 ppmv @ 3% O_2 *(0.14 lb/MMBtu)*	0.02 lb/MMBtu *(50 ppm @ 3% O_2)*	23 ppm @ 3% O_2 *(0.041 lb/MMBtu)*	0.01 gr/scf @ 12% CO_2 *(0.022 lb/MMBtu)*

Table D-6. Biomass-Fired Boiler										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
9	Thermal Energy Development Corporation, Ltd.; Tracy, CA	259 MMBtu/hr boiler (powers a 20.5 MW steam turbine electric generator)	Lime/ limestone injection, ammonia injection, ESP, SNCR	Permit	7/31/2005	0.105 lb/MMBtu *(82 ppm @ 3% O_2)* NH_3 slip: 100 ppm @ 3% O_2	0.21 lb/MMBtu *(270 ppm @ 3% O_2)*	0.049 lb/MMBtu *(110 ppm @ 3% O_2)*	0.024 lb/MMBtu *(13 ppm @ 3% O_2)*	0.034 lb/MMBtu *(0.016 gr/scf @ 12% CO_2)*
10	AES Unit 2; Delano, CA	400 MMBtu/hr bubbling fluidized bed boiler with (2) steam turbines producing 32 MW total	SNCR, limestone and sand injection, baghouse	Source test	6/12 to 13/2007	0.08 lb/MMBtu; 63 ppmvd @ 3% O_2	0.05 lb/MMBtu; 60 ppmvd @ 3% O_2	<0.0005 lb/MMBtu as methane	0.0001 lb/MMBtu as SO_2; 0.07 ppmvd @ 3% O_2	0.002 gr/dscf @ 12% CO_2 (total); (*0.004 lb/MMBtu*)
11	Rio Bravo; Fresno, CA	352 MMBtu/hr circulating fluidized bed boiler with steam turbine producing 24.3 MW	SNCR, ESP	Source test	11/11/2009	0.068 lb/MMBtu; 52 ppmvd @ 3% O_2 NH_3: 11.7 ppm @ 3% O_2	0.0004 lb/MMBtu; 0.47 ppmvd @ 3% O_2	0.75 lb/hr as methane; 4.1 ppm @ 3% O_2	0.0003 lb/MMBtu; 0.15 ppmvd @ 3% O_2	0.002 gr/dscf @ 12% CO_2 (filterable); 1.6 lb/hr (filterable); 7.7 lb/hr (condensable)
12	Pacific Industries; Lincoln, CA	289.3 MMBtu/hr fixed grate boiler with steam turbine producing 20 MW	SNCR, multiclone, ESP	Source test	2/9/2006	54 ppmvd @ 12% CO_2	N/A	N/A	N/A	0.0005 gr/dscf @ 12% CO_2 (total)
13	Madera Power; Madera, CA	460 MMBtu/hr fluidized bed boiler with steam turbine producing 28.5 MW	SNCR	Source test	8/25/2004	0.09 lb/MMBtu; 69 ppm @ 3% O_2	N/A	N/A	N/A	0.006 gr/dscf @ 12% CO_2 (total)

Table D-6. Biomass-Fired Boiler

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
14	Colmac Energy Inc.; Mecca, CA (Cabazon Reservation)	Boilers 1 and 2 – (2) 300 MMBtu/hr circulating fluidized bed boilers producing 47 MW total[8]	Thermal de-NOx system, cyclone / baghouse, limestone injection	Permit	8/2/2000	30.0 lbs/hr per boiler; 94 ppmvd @ 3% O_2 (3-hr avg.); 648 lbs/day per boiler; 0.30 lb/MMBtu (30-day rolling avg.)	45.0 lbs/hr per boiler; 231 ppmvd @ 3% O_2 (3-hr avg.)	10.0 lbs/hr per boiler	12.0 lbs/hr per boiler; 27 ppmvd @ 3% O_2 (3-hr avg.); 70 tpy daily rolling avg.	7.5 lbs/hr per boiler; 0.010 gr/dscf @ 12% CO_2; 0.10 lb/MMBtu

Table D-7. Sewage Digester and Landfill Gas-Fired Fuel Cell

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	ARB Distributed Generation Certification Regulation	DG unit subject to regulation and fueled by digester gas, landfill gas, or oil-field waste gas	Not specified	Regulation (effective date 9/7/2007)	On or after 1/1/2008 On or after 1/1/2013	0.5 lb/MWh 0.07 lb/MWh	6.0 lb/MWh 0.10 lb/MWh	1.0 lb/MWh 0.02 lb/MWh		
2	El Estero Wastewater Treatment Plant; El Estero, CA	(2) Fuel Cell Energy Model DFC 300A fuel cells	Digester gas cleanup system to remove excess sulfur compounds, moisture, particulates, H_2S, halogenated compounds, and silohexanes (total sulfur content ≤12 ppmv)	Permit		0.07 lb/MWh; 0.018 lb/hr	0.10 lb/MWh; 0.025 lb/hr	0.02 lb/MWh; 0.005 lb/hr	0.007 lb/hr	0.026 lb/hr

[8] Boiler may be fired on natural gas and petroleum coke in addition to biomass (i.e., wood). Permit limits listed reflect biomass combustion.

Table D-7. Sewage Digester and Landfill Gas-Fired Fuel Cell										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	New York Power Authority/Red Hook Water Pollution Control Plant; Red Hook, NY	United Technologies Corp. PC25C phosphoric acid fuel cell producing 200 kW		Source test	5/19 to 6/19/2004	0.013 lb/MWh; 0.43 ppm @ 15% O_2	0.029 lb/MWh; 1.64 ppm @ 15% O_2	0.78 lb/MWh; 120 ppm @ 15% O_2		
4	Orange County Sanitation District; Fountain Valley, CA	Fuel Cell Energy Model DFC300 fuel cell		Permit (Manufacturer emission factor data)	11/12/2008	0.01 lb/MWh; 0.0035 lb/hr; 0.08 lb/day	0.1 lb/MWh; 0.035 lb/hr; 0.84 lb/day	0.01 lb/MWh; 0.003 lb/hr; 0.07 lb/day	0.0001 lb/MWh; 0.00003 lb/hr; 0 lb/day	0.00002 lb/MWh; 0.000007 lb/hr; 0 lb/day
5	Palmdale Water Reclamation Plant; Palmdale, CA	Fuel Cell Energy Model DFC300 fuel cell producing 251 kW		Source test	1/19/2005	0.0017 lb/MWh; 0.05 ppm @ 15% O_2; 0.1 ppm @ 3% O_2	0.025 lb/MWh; 1.2 ppm @ 15% O_2; 3.7 ppm @ 3% O_2	0.016 lb/MWh (as CH_4); 0.30 ppm @ 3% O_2 (as hexane)		
6	Penrose Landfill; Los Angeles, CA	International Fuel Cells PC25 phosphoric acid fuel cell producing 200 kW		Source test	2/17/1995	0.0053 lb/MWh; 0.12 ppmvd @ 15% O_2	0.021 lb/MWh; 0.77 ppmvd @ 15% O_2		<0.014 lb/MWh; <0.23 ppmvd @ 15% O_2	

Table D-8. Pumps and Compressor Seals

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	BAAQMD BACT Guideline 137.1	Pumps	Double mechanical seals w/ barrier fluid and BAAQMD approved quarterly I&M Program	BACT (AIP)	1/18/2006			500 ppm expressed as methane measured using EPA Reference Method 21		
			Double mechanical seals w/ barrier fluid; magnetically coupled pumps; canned pumps; magnetic fluid sealing technology or gas seal system vented to thermal oxidizer or other BAAQMD approved control device; all w/ BAAQMD approved quarterly I&M Program	BACT (tech. feasible)				100 ppm expressed as methane using EPA Reference Method 21		

Table D-8. Pumps and Compressor Seals

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
2	BAAQMD BACT Guideline 48B.1	Compressors	Double mechanical seals w/ barrier fluid and BAAQMD approved quarterly I&M Program	BACT (AIP)	1/18/2006			500 ppm expressed as methane measured using EPA Reference Method 21		
			Double mechanical seals w/ barrier fluid; or gas seal system vented to thermal oxidizer or other BAAQMD approved control device; all w/ BAAQMD approved quarterly I&M Program	BACT (tech. feasible)				100 ppm expressed as methane using EPA Reference Method 21		

Table D-8. Pumps and Compressor Seals										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	SJVAPCD Guideline 4.12.1 – Chemical Plants – Pumps and Compressor Seals[9]	Chemical plants pump and compressor seals	I&M Program	BACT (AIP)	11/27/2006			Leak defined as a reading of methane in excess of 500 ppmv above background when measure per EPA Method 21 and an Inspection and Maintenance Program pursuant to SJVAPCD Rule 4455		
4	BAAQMD Regulation 8 Rule 18 Equipment Leaks	Pumps and compressors		District approved rule	Last amended 9/15/2004			500 ppm maximum leak rate using a hydrocarbon detector that meets the specifications and performance criteria of and has been calibrated using EPA Reference Method 21		

[9] Based on Lone Star Gas Liquids Processing, Inc., Bakersfield, CA.

Table D-9. Valves, Flanges, and Other Types of Connectors										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Pacific Ethanol; Madera, CA	Piping, valves and flanges	I&M program	Authority to Construct	2005			100 ppmvd as methane maximum leak valves and flanges; 500 ppmvd as methane pumps and compressor seals		
2	SJVAPCD Guideline 4.12.1 – Chemical Plants - Valves and Connectors	Chemical plants valves and connectors	I&M Program	BACT (AIP)	11/26/2006			Leak defined as a reading of methane in excess of 100 ppmv above background when measured per EPA Method 21 and Maintenance Program pursuant to SJVAPCD Rule 4455		
3	BAAQMD BACT Guideline 78.1	Flanges	Graphitic gaskets and BAAQMD approved I&M Program	BACT (AIP)	1/18/2006			100 ppm expressed as methane measured using EPA Reference Method 21		

Table D-9. Valves, Flanges, and Other Types of Connectors

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	BAAQMD Regulation 8 Rule 18 Equipment Leaks	Valves and connections		District approved rule	Last amended 9/15/2004			100 ppm maximum leak rate from valves and connections using a hydrocarbon detector that meets the specifications and performance criteria of and has been calibrated using EPA Reference Method 21		

Table D-10. Wet Cooling Tower

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 8.3.10	Cooling Tower – Induced Draft, Evaporative Cooling		BACT (tech. feasible)	6/19/2000					Cellular type drift eliminator
2	Los Esteros Critical Energy Facility Phase 2; San Jose, CA	Cooling tower, six-cell		Final Commission Decision	October 2006					High efficiency mist eliminator with maximum guaranteed drift rate of 0.0005%
3	Walnut Creek Energy, LLC; City of Industry, CA	Cooling tower, five-cell		Authority to Construct	10/27/2006					Maximum 0.0005% drift loss

Table D-10. Wet Cooling Tower

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	Homeland Energy Solutions, LLC; Chickasaw County, IA	Cooling tower		BACT-PSD	7/21/2008					Drift eliminator/ demister with 0.0005% drift loss
5	Archer Daniels Midland (ADM) Corn Processing; Linn County, IA	Cooling tower		BACT-PSD	10/9/2007					Drift eliminator with 0.0005% drift loss

Table D-11. Landfill Gas-Fired Flare

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 1.4.3	Landfill gas-fired flare	Enclosed flare	BACT (tech. feasible)	1/8/2001	0.05 lb/MMBtu *(40 ppm @ 3% O_2)*	N/A	N/A	Wet scrubber w/ 98% control efficiency	Steam injection
2	SJVAPCD Guideline 1.4.3	Landfill gas-fired flare	Enclosed flare	BACT (AIP)	1/8/2001	N/A	N/A	98% control efficiency; 20 ppmv @ 3% O_2	N/A	N/A
3	SCAQMD Guidelines for Non-Major Facilities	Landfill gas-fired flare		BACT	2000	0.06 lb/MMBtu *(50 ppm @ 3% O_2)*	N/A	N/A	N/A	Knockout vessel
4	Altamont Landfill; Livermore, CA	Landfill gas-fired flare		Permit	2005	0.06 lb/MMBtu *(50 ppm @ 3% O_2)*	0.30 lb/MMBtu *(400 ppm @ 3% O_2)*	N/A	N/A	N/A
5	SCAQMD BACT Guidelines Part B, Section II (Waste Management of New Hampshire; Rochester, NH)	Flare, landfill gas from non-hazardous waste landfill (115.5 MMBtu/hr)	Enclosed flare	BACT	4/18/2006	0.025 lb/MMBtu	0.06 lb/MMBtu	98% destruction efficiency or 20 ppm @ 3% O_2 as hexane	1.66 lb/hr; 0.014 lb/MMBtu	2.32 lb/hr; 0.02 lb/MMBtu

Table D-11. Landfill Gas-Fired Flare										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
6	SCAQMD BACT Guidelines Part B, Section II (NEO Tajiguas Energy LLC; Goleta, CA)	Flare, landfill gas from non-hazardous waste landfill (63.68 MMBtu/hr)	Enclosed flare	BACT	9/8/2004	35 ppmvd @ 3% O2; 0.048 lb/MMBtu	N/A	1.25-second residence time and 1500 °F minimum temperature and 15 ppmvd @ 3% O2 as hexane; 0.038 lb/MMBtu	N/A	N/A

Table D-12. Manure Digester Gas-Fired Flare

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 1.4.4	Digester gas-fired flare	Ultra low NOx flare	BACT (tech. feasible)	5/16/2006	≤0.03 lb/MMBtu *(25 ppm @ 3% O_2)*	N/A	N/A	1. Dry absorption of H_2S from the fuel gas 2. Wet absorption of H_2S from the fuel gas 3. Influent fuel H_2S reduction by addition of chemicals to the digester gas sludge 4. Water scrubbing of H_2S from the fuel gas	N/A
2	SJVAPCD Guideline 1.4.4	Digester gas-fired flare	Enclosed flare	BACT (AIP)	5/16/2006	≤0.06 lb/MMBtu *(50 ppm @ 3% O_2)*	Operate per manufacturer specifications to minimize CO	≤0.068 lb/MMBtu *(161 ppm @ 3% O_2)*	LPG or natural gas-fired pilot	Smokeless combustion and LPG or natural gas-fired pilot
3	SJVAPCD Guideline 1.4.6 (Biorecycling Solutions)	Biogas-fired flare, limited use		BACT (tech. feasible)	1/20/1998	0.06 lb/MMBtu *(50 ppm @ 3% O_2)*	N/A	0.03 lb/MMBtu *(71 ppm @ 3% O_2)*	N/A	N/A
4	SJVAPCD Guideline 2.2.3	Cheese wastewater-fired flare	Enclosed flare, ultra low NOx burner, low NOx burner	BACT (tech. feasible)	6/28/2004	≤0.03 lb/MMBtu *(25 ppm @ 3% O_2)*	N/A	N/A	99% H_2S removal (dry or wet scrubber)	Smokeless combustion and LPG or natural gas-fired pilot

Table D-13. Flare (Ethanol Production)										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	ADM Corn Processing; Cedar Rapids, Iowa	Loadout flare		Permit	7/17/2008	0.15 lb/MMBtu	N/A	95% control; 4.82 lb/hr; 12.2 tpy	0.02 lb/hr; 0.09 tpy	0.1gr/dscf
2	Center Ethanol Company, LLC; East St. Louis, IL	Loadout flare		Permit		0.23 tons/month; 2.31 tpy	0.39 tons/month; 3.87 tpy	1.55 tons/month; 2.31 tpy	N/A	N/A
3	Pacific Ethanol; Madera, CA	Loadout flare	Low NOx burner	Permit	7/8/2008	0.05 lb/MMBtu	0.84 lb/MMBtu	0.327 lb/MMBtu	0.00285 lb/MMBtu	0.0076 lb/MMBtu
4	Pacific Ethanol; Oregon	Loadout flare		Permit		1.62 tpy	2.71 tpy	7.47 tpy	N/A	N/A
5	Phoenix Bio Industries; Goshen, CA	Loadout flare	Air assist	Permit	9/20/2004	0.068 lb/MMBtu	0.37 lb/MMBtu	0.063 lb/MMBtu	0.00285 lb/MMBtu	0.008 lb/MMBtu
6	Pixley Ethanol; Pixley, CA	Loadout flare	Enclosed	Permit	7/20/2005	0.068 lb/MMBtu	0.37 lb/MMBtu	0.063 lb/MMBtu	0.00286 lb/MMBtu	0.026 lb/MMBtu

Table D-14. Storage Tank (Fixed Roof)										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	American Biodiesel; Stockton, CA	Methanol storage tank	Vapor recovery routed to distillation column and two-stage vapor condenser	Authority to Construct	6/4/2007			99.5% control		
2	SJVAPCD Guideline 7.3.1 - Petroleum and Petrochemical Production - Fixed Roof Organic Liquid Storage or Processing Tank, <5,000 bbl tank capacity[10]	Methanol storage tank	Waste gas incinerated in steam generator, heater treater, or other fired equipment and inspection and maintenance program: transfer of noncondensable vapors to gas pipeline; or equal	BACT (tech. feasible)	10/1/2002			99% control		
3	BAAQMD BACT Guideline 167.3.1	≥20,000 gallon storage tank – fixed roof, organic liquids	Thermal incinerator; or carbon adsorber; or refrigerated condenser; or BAAQMD approved equivalent	BACT (AIP)	3/3/1995			Vapor recovery system w/ an overall system efficiency ≥98%		
4	NSPS 40 CFR Part 60 Subpart Kb	Methanol storage tank	Closed vent system and 95% VOC control efficiency					95% control		

[10] Based on District facility S-1339 heavy oil western stationary source.

Table D-15. Storage Tank (Floating Roof)

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	BAAQMD BACT Guideline 167.1.1 and Guideline 167.4.1	Storage tank – external floating roof, organic liquids; storage tank – internal floating roof, organic liquids	BAAQMD approved roof and seal design	BACT (AIP)	3/3/1995			BAAQMD approved roof w/ liquid mounted primary seal and zero gap secondary seal, all meeting design criteria of Reg. 8, Rule 5; no ungasketed roof penetrations, no slotted pipe guide pole unless equipped w/ float and wiper seals, and no adjustable roof legs unless fitted w/ vapor seal boots or equivalent		
			Thermal incinerator; or carbon adsorber; or refrigerated condenser; or BAAQMD approved equivalent	BACT (tech. feasible)				Vapor recovery system w/ an overall system efficiency ≥98%		

Table D-15. Storage Tank (Floating Roof)

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
2	Calgren Renewable Fuels LLC; Pixley, CA	Ethanol tank (from 67,700 to 1,000,000 gallons)	Tank equipped with double seals, one mounted on top of the other (meeting SJVAPCD Rule 4623)	Authority to Construct	8/24/2005			95% control		

Table D-16. Dryer

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 4.12.6 A	Distillers Dried Grains with Solubles (DDGS) Dryer	Low NOx burners, cyclone, thermal or catalytic incinerator	BACT (AIP)	5/25/2004	33 ppmv @ 3% O_2; 0.04 lb/MMBtu	N/A	VOC capture and control with thermal or catalytic incineration (98% control) or equivalent	Natural gas fuel	High efficiency (1D-3D) cyclones and thermal incinerator in series (98.5% control) or equivalent
2	SJVAPCD Guideline 4.12.6 A	Distillers Dried Grains with Solubles (DDGS) Dryer	Ultra low NOx burners, wet scrubber	BACT (tech. feasible)	5/25/2004	15 ppmv @ 3% O_2; 0.018 lb/MMBtu	N/A	N/A	Wet scrubber (95% control)	N/A
3	Golden Grain Energy; Cerro Gordo County, IA	Distillers Dried Grains with Solubles (DDGS) Dryer (42 MMBtu/hr)	Low NOx burners, FGR, thermal oxidizer	BACT-PSD	4/19/2006	8.36 lb/hr; 0.04 lb/MMBtu (30-day avg.)	25.5 lb/hr; 0.61 lb/MMBtu	98% control; 2.75 lb/hr (*0.065 lb/MMBtu)*	N/A	4.5 lb/hr; 0.03 lb/MMBtu (3-hr avg.)
4	Abengoa Bioenergy of Illinois, LLC; Madison, IL	Indirect Feed Dryer (76.7 MMBtu/hr)	Integral cyclone and burner/kiln	Permit	7/13/2007	6.52 lb/hr (*0.085 lb/MMBtu)*	7.97 lb/hr (*0.104 lb/MMBtu)*	1.96 lb/hr (*0.026 lb/MMBtu)*	0.04 lb/hr (*0.0005 lb/MMBtu)*	3.71 lb/hr (*0.048 lb/MMBtu)*

Table D-16. Dryer										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
5	Bluefire Ethanol; Lancaster, CA	Biomass dryer (shared stack with CFB biomass boiler[11])	Baghouse, SOx scrubber with limestone, and SNCR with aqueous NH_3 injection	Permit	12/16/2008	144 lb/day; 0.075 lb/MMBtu (Combined boiler and dryer daily emission limit; lb/MMBtu limit from district engineering evaluation)	134.4 lb/day; 0.07 lb/MMBtu (Combined boiler and dryer daily emission limit; lb/MMBtu limit from district engineering evaluation)	103.5 lb/day; 0.013 lb/MMBtu (Combined boiler and dryer daily emission limit; lb/MMBtu limit from district engineering evaluation)	132.5 lb/day; 0.069 lb/MMBtu (Combined boiler and dryer daily emission limit; lb/MMBtu limit from district engineering evaluation)	42.3 lb/day; 0.022 lb/MMBtu (Combined boiler and dryer daily emission limit; lb/MMBtu limit from district engineering evaluation)
6	American Biodiesel; Stockton, CA	Steam-heated feedstock Dryer (completely enclosed)	Vapor recovery system	Permit	6/4/2007			99.5 % control		

[11] Dual fuel firing occurs at startup using 25 MMBtu/hr natural gas-fired burner for overbed air and 15 MMBtu/hr natural gas-fired burner for underbed air.

Table D-17. Pyrolyzer

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	International Environmental Solutions Corp.; Romoland, CA	Non-hazardous feedstocks pyrolysis system, including pyrolytic thermal converter (retort), indirectly heated with (4) Eclipse Therm Jet low NOx burners, Model TJ150, natural gas-fired, 1.5 MMBtu/hr each, with a combustion air blower and hydraulically driven variable speed helical screw	Low-NOx burners, pyrolytic converter vented to control system consisting of: multiclone, thermal oxidizer, waste heat boilers, activated carbon injection system, baghouse, wet scrubber, exhaust stack with in-stack mounted carbon filter	Permit to Construct and Operate Experimental Research Project[12] Note: This was an experimental research demonstration project and is no longer operating, nor is the permit valid anymore.	3/7/2006	Pyrolysis gas burner stack: 6 lbs/day Scrubber stack: 34 lbs/day (NH_3: 2.5 lbs/day)	Pyrolysis gas burner stack: 5 lbs/day Scrubber stack: 9 lbs/day	Pyrolysis gas burner stack: 1 lb/day Scrubber stack: 11 lbs/day	Pyrolysis gas burner stack: 0.1 lb/day Scrubber stack: 1 lb/day	Pyrolysis gas burner stack: 1 lb/day Scrubber stack: 1 lb/day

Table D-18. Liquid Fuel Loading Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Abengoa Bioenergy of Illinois, LLC; Madison, IL	Ethanol Loadout Racks		Permit	7/13/2007			1.45 tons/month; 14.45 tpy		
2	Bluefire Ethanol; Lancaster, CA	Ethanol Loadout	Vapor recovery and control system, beer vent scrubber	Permit	12/16/2008			50 ppmv; 2.8 lb/day		

[12] Permit conditions were crafted to limit operating hours and emissions to just below the levels that would trigger federal requirements for small municipal solid waste combustors. According to SCAQMD staff, is it likely that more efficient air pollution control would have been required if the company requested either more operating time and/or higher throughput.

Table D-18. Liquid Fuel Loading Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	Lomita Rail Terminal, LLC; Carson, CA	Ethanol Unloading	Carbon adsorber	Permit	12/2/2003			Leak defined as a reading of methane greater than 500 ppm but less than 1000 ppm above background when measured per EPA Method 21. Leak greater than 1000 ppm above background shall be repaired according to SCAQMD Rule 1173		
4	Verenium Biofuels; Jennings, Jefferson Davis Parish, LA	Ethanol loadout	Carbon adsorption canister	Permit	5/13/2008			98% control		

Table D-18. Liquid Fuel Loading Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
5	West Colton Rail Terminal LLC; Rialto, CA	Railcar unloading/truck loading, ethanol	Carbon adsorber, vapor balance system	Permit	11/10/2009			0.08 lbs/1000 gallons loaded (SCAQMD Rule 462 – Organic Liquid Loading) and leak defined as a reading of methane greater than 500 ppm but less than 1000 ppm above background when measured per EPA Method 21. Leak greater than 1000 ppm above background shall be repaired according to SCAQMD Rule 1173		

Table D-19. Compressed Gas Dispensing Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Los Angeles County Sanitation District, aka Puente Hills Landfill; Whittier, CA	Landfill gas treating and dispensing system (250 scfm collected and treated to produce CNG for pick-up trucks)	All vent gases and excess processed gas shall be directed to combustion or processing facility that can adequately process the gas and has been issued a valid District permit	Permit	2/12/1997	No direct emissions – operation of equipment shall not result in release of any gas or condensate into the atmosphere				
2	Sonoma County Central Landfill; Petaluma, CA	Landfill gas compression plant, pilot scale (100 scfm collected and treated to produce CNG for vehicles)	Closed loop system w/ no vents or exhaust stacks; all waste gas transferred to treatment systems or flared	Permit	4/18/2008	No direct emissions – closed loop system				

Table D-20. Liquid Fuel Transfer and Dispensing Operations

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SCAQMD Rule 461 Gasoline Transfer and Dispensing	Fuel[13] transfer into stationary storage tanks and mobile fuelers	Phase I vapor recovery system[14]	Rule	3/7/2008					

[13] Applies to biofuel blends that meet the definition of "gasoline" as defined in Rule 461.

[14] Rule 461 exempts the dispensing of E-85 into a mobile fueler of vehicle fuel tank from Phase II vapor recovery requirements until April 1, 2012.

Table D-21. Sewage Digester and Landfill Gas-Fired Microturbine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	Capstone Turbine Corporation; Chatsworth, CA	Capstone CR65 digester gas-fueled microturbine		Source test (for ARB DG Certification Program)	6/8/2007	0.15 lb/MWh; 8.73 ppmvd @ 3% O_2; *3 ppmvd @ 15% O_2*	4.52 lb/MWh; 385.92 ppmvd @ 3% O_2; 127 *ppmvd @ 15% O_2*	0.23 lb/MWh; 42.06 ppmvd @ 3% O_2 as CH_4 (total non-methane, non-ethane organic compounds); 14 *ppmvd @ 15% O_2*	8.64 ppmvd @ 3% O_2; *3 ppmvd @ 15% O_2*	
2	Capstone Turbine Corporation; Chatsworth, CA	Capstone CR65 landfill gas-fueled microturbine		Source test (for ARB DG Certification Program)	8/8/2007	0.10 lb/MWh; 4.56 ppmvd @ 3% O_2; 2 *ppmvd @ 15% O_2*	0.61 lb/MWh; 31.48 ppmvd @ 3% O_2; 10 *ppmvd @ 15% O_2*	0.13 lb/MWh; 18.46 ppmvd @ 3% O_2 as CH_4 (total non-methane, non-ethane organic compounds); 6 *ppmvd @ 15% O_2*	32.11 ppmvd @ 3% O_2; 11 *ppmvd @ 15% O_2*	
3	Ingersoll Rand Energy Systems; Portsmouth, NH	Ingersoll Rand 250 kW 250ST digester gas-fueled microturbine		Source test (for ARB DG Certification Program)	1/16/2008	0.114 lb/MWh; 2.2 ppmvd @ 15% O_2	0.029 lb/MWh; 0.9 ppmvd @ 15% O_2	0.13 lb/MWh; 1.3 ppmvd @ 15% O_2 (as hexane)	0.018 lb/hr	
4	Ingersoll Rand Energy Systems; Portsmouth, NH	Ingersoll Rand 250 kW 250SW landfill gas-fueled microturbine		Source test (for ARB DG Certification Program)	1/9/2008	0.36 lb/MWh; 6.5 ppmvd @ 15% O_2	0.041 lb/MWh; 1.2 ppmvd @ 15% O_2	0.10 lb/MWh; 0.92 ppmvd @ 15% O_2 (as hexane)	0.017 lb/hr	

Table D-22. Landfill Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SCAQMD Rule 1110.2 Emissions from Gaseous- and Liquid-Fueled Engines	Stationary and portable engines >50 bhp, landfill and digester gas-fired		Rule	2/1/2008	<500 bhp: 45 x ECF[15] ppmvd @ 15% O_2 ≥500 bhp: 36 x ECF ppmvd @ 15% O_2 On and after 7/1/2012: 11 ppmvd @ 15% O_2	2,000 ppmvd @ 15% O_2 On and after 7/1/2012: 250 ppmvd @ 15% O_2	40 ppmvd @ 15% O_2 On and after 7/1/2012: 30 ppmvd @ 15% O_2	N/A	N/A
2	8309 Tujunga Ave. Corp. (Austin Rd. Landfill); Stockton, CA	1,100 hp landfill gas-fired IC engine		Source test	12/13/2006	0.3 g/bhp-hr; 20 ppmv @ 15% O_2	3.0 g/bhp-hr; 291 ppmv @ 15% O_2	0.2 g/bhp-hr; 38 ppmv @ 15% O_2	Non-detected	0.01 g/bhp-hr; 0.001 gr/dscf
3	ARB DG Guidance[16]	Waste gas-fired reciprocating engine used in electrical generation (that are required to obtain a district permit)	Lean-burn technology	BACT	2002	0.6 g/bhp-hr; 50 ppmvd @ 15% O_2; 1.9 lb/MWh	2.5 g/bhp-hr; 300 ppmvd @ 15% O_2; 7.8 lb/MWh	0.6 g/bhp-hr; 130 ppmvd @ 15% O_2; 1.9 lb/MWh	N/A	N/A
4	Apollo Energy III (Bowerman Landfill); Irvine, CA	1,468 bhp landfill gas IC engine, producing 1.06 MW	Lean burn technology, turbocharged, aftercooled	Permit		0.5 g/bhp-hr	0.3 g/bhp-hr	0.2 g/bhp-hr (NMHC)	N/A	N/A
5	Apollo Energy III (Bowerman Landfill); Irvine, CA	1,468 bhp landfill gas IC engine, producing 1.06 MW	Lean burn technology, turbocharged, aftercooled	Source test	7/05 to 06/2007	0.4 g/bhp-hr; 32 ppm @ 15% O_2	0.2 g/bhp-hr; 19 ppm @ 15% O_2	0.01 g/bhp-hr (CH_4) TGNMO	N/A	0.004 gr/dscf @ 12% CO_2

[15] ECF is the efficiency correction factor. ECF = 1.0 unless the engine operator has measured the engine's net specific energy consumption, in compliance with ASME Performance Test Code PTC 17-1973, at the average load of the engine (see rule for details).

[16] Emission levels based on permit and source test data from the following facilities: County of Sacramento (Kiefer Landfill), Energy Developments (Azusa Landfill), Minnesota Methane (Tajiguas Landfill), Riverside County Waste Management (Badlands), Minnesota Methane (Lopez Landfill), Minnesota Methane (Corona), Ogden Power Pacific (Stockton), Orange County Sanitation District (Huntington Beach).

Table D-22. Landfill Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
6	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Permit		0.4 g/bhp-hr OR 30.0 ppmv @ 15% O_2 (both 3-hr avg)	2.6 g/bhp-hr OR 366 ppmv @ 15% O_2 (both 3-hr avg)	0.1 g/bhp-hr	0.3 g/bhp-hr	0.1 g/bhp-hr
7	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 1	11/10/2005	0.3 g/bhp-hr; 24 ppm @ 15% O_2	1.9 g/bhp-hr; 253 ppm @ 15% O_2	Failed	Fuel: 0.6 gr/100 scf	0.06 g/bhp-hr
8	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 1	10/25/2006	0.3 g/bhp-hr; 2 ppm @ 15% O_2	2.2 g/bhp-hr; 241 ppm @ 15% O_2	N/A	Fuel: 29 ppmv	Failed
9	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 1	1/31/2007	N/A	N/A	N/A	Fuel: 22 ppmv	0.04 g/bhp-hr
10	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 1	3/28/2007	0.3 g/bhp-hr; 23 ppm @ 15% O_2	2.0 g/bhp-hr; 241 ppm @ 15% O_2	0.06 g/bhp-hr; 2.3 ppmv @ 15% O_2 as hexane	Fuel: 22 ppmv	0.04 g/bhp-hr
11	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 2	11/09/2005	0.3 g/bhp-hr; 26 ppm @ 15% O_2	2.0 g/bhp-hr; 224 ppm @ 15% O_2	Failed	Fuel: 0.2 gr/100 scf	0.10 g/bhp-hr
12	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 2	10/26/2006	0.4 g/bhp-hr; 24 ppm @ 15% O_2	1.7 g/bhp-hr; 233 ppm @ 15% O_2	N/A	Fuel: 29 ppmv	0.07 g/bhp-hr
13	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 2	3/27/2007	0.3 g/bhp-hr; 25 ppm @ 15% O_2	1.9 g/bhp-hr; 245 ppm @ 15% O_2	0.05 g/bhp-hr; 2.2 ppmv @ 15% O_2 as hexane	Fuel: 22 ppmv	0.04 g/bhp-hr
14	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 3	11/08/2005	0.3 g/bhp-hr; 21 ppm @ 15% O_2	1.8 g/bhp-hr; 220 ppm @ 15% O_2	0.08 g/bhp-hr as CH_4	Fuel: 0.3 gr/100 scf	0.05 g/bhp-hr
15	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 3	1/30/2007	0.3 g/bhp-hr; 23 ppm @ 15% O_2	1.7 g/bhp-hr; 199 ppm @ 15% O_2	0.1 g/bhp-hr as CH_4	Fuel: 22 ppmv	0.05 g/bhp-hr

Table D-22. Landfill Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
16	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 4	5/11/2006	0.3 g/bhp-hr; 21 ppm @ 15% O_2	1.6 g/bhp-hr; 209 ppm @ 15% O_2	0.05 g/bhp-hr as hexane	Fuel: 34 ppmv	0.08 g/bhp-hr
17	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 4	4/04/2007	0.3 g/bhp-hr; 26 ppm @ 15% O_2	2.4 g/bhp-hr; 304 ppm @ 15% O_2	0.10 g/bhp-hr; 4.0 ppmv as hexane	Fuel: 22 ppmv	0.09 g/bhp-hr
18	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 5	5/12/2006	0.3 g/bhp-hr; 22 ppm @ 15% O_2	1.7 g/bhp-hr; 205 ppm @ 15% O_2	0.06 g/bhp-hr as hexane	Fuel: 34 ppmv	0.08 g/bhp-hr; 0.009 gr/dscf
19	Kiefer Landfill; Sacramento, CA – 5 units	4,230 bhp landfill gas-fired IC engine, producing 3.05 MW each	Lean burn technology, turbocharged	Source test Unit 5	3/29 to 30/2007	0.4 g/bhp-hr; 27 ppm @ 15% O_2	2.0 g/bhp-hr; 253 ppm @ 15% O_2	0.07 g/bhp-hr; 2.9 ppmv as hexane	Fuel: 22 ppmv	0.08 g/bhp-hr; 0.009 gr/dscf
20	MM San Bernardino Energy, LLC (Milliken Landfill); Ontario, CA	1850 bhp (14.7 MMBtu/hr) Deutz Model TBG620V16K landfill gas-fired IC engine	Engine design, air/fuel ratio controller, turbocharger, intercooler	BACT (NOx, CO, VOC)	2/20/2003	0.6 g/bhp-hr	2.5 g/bhp-hr	0.8 g/bhp-hr	0.10 lb/hr; *0.02 g/bhp-hr; 0.007 lb/MMBtu*	0.20 lb/hr; *0.05 g/bhp-hr*; *0.014 lb/MMBtu*
21	Minnesota Methane Tajiguas Corp.; Goleta, CA	4314 bhp Caterpillar Model 3616 landfill gas-fired engine driving a 3 MW generator with exhaust routed to afterburner/standby flare	Lean-burn technology w/ spark ignition controls, air/fuel ratio controls, intake air turbocharger and intercooler, fuel pretreatment to remove gas condensate and filter particles	BACT	1/9/1998	0.59 g/bhp-hr	N/A	0.24 g/bhp-hr	N/A	0.34 g/bhp-hr
22	Puente Hills Landfill; Whittier, CA – 3 units	4,261 bhp landfill gas-fired engine, with natural gas as secondary fuel	Lean burn technology, turbocharged, aftercooled, producing 3 MW	Permit		0.6 g/bhp-hr	2.5 g/bhp-hr	ROC: 0.8 g/bhp-hr; NMHC: 20 ppmv @ 3% O_2 OR 98% reduction	N/A	N/A

Table D-22. Landfill Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
23	Puente Hills Landfill, Whittier, CA Unit 1	4,261 bhp landfill gas-fired IC engine, with natural gas as secondary fuel	Lean burn technology, turbocharged, aftercooled, producing 3 MW	Source test	7/11 to 14/2006	0.4 g/bhp-hr	1.7 g/bhp-hr	0.2 g/bhp-hr; 18.4 ppm @ 3% O_2 (as hexane)	N/A	N/A
24	Ridgewood Olinda Management, LLC; Brea, CA – 3 units	2,650 bhp landfill gas-fired IC engine, no auxiliary fuel, producing 1.875 MW each	Siloxane scrubber	Permit	11/17/2004	36 ppm @ 15% O_2; *0.7 g/bhp-hr*	2000 ppm @ 15% O_2; 22.7 g/bhp-hr	250 ppm as CH_4 @ 15% O_2	N/A	N/A
25	Ridgewood Olinda Management, LLC; Brea, CA Unit 1	2,650 bhp landfill gas-fired IC engine, no auxiliary fuel, producing 1.875 MW each	Siloxane scrubber	Source test[17]	6/13/2007	31 ppm @ 15% O_2; 0.5 g/bhp-hr	2 ppm @ 15% O_2; 0.0 g/bhp-hr	4 ppm @ 15% O_2 as CH_4, TGNMO; 0.02 g/bhp-hr	1.85 ppm	0.0006 gr/dscf @ 12% CO_2
26	Simi Valley Landfill; Simi Valley, CA – 2 units	1,877 bhp landfill gas-fired IC engine	Lean burn technology, turbocharged, aftercooled	Permit		35 ppmvd @ 15% O_2 OR 0.6 g/bhp-hr	280 ppmvd @ 15% O_2; *3.2 g/bhp-hr*	28 ppmvd @ 15% O_2; *1.0 g/bhp-hr*	0.02 lb/MMBtu	N/A
27	Waste Management; Livermore, CA	(2) 1,877 bhp Deutz IC engines fueled by landfill gas, LNG, or LNG Plant waste gas (Units S-23 and S-24)		Permit		0.6 g/bhp-Hr OR 36 ppmvd @ 15% O2	2.1 g/bhp-hr OR 207 ppmvd @ 15% O2	98% destruction efficiency by weight OR <120 ppmv @ 3% O2[18]	N/A	N/A
28	BAAQMD Guideline 96.2.2	IC engine – landfill gas fired <250 bhp output	Modified rich burn technology	BACT (AIP)	6/15/2006	2.5 g/bhp-hr	10.0 g/bhp-hr	1.5 g/bhp-hr	0.5 g/bhp-hr	N/A

[17] There are two test result tables for this test. The numbers differ between the tables. The data shown here came from the table with the higher reported emissions.

[18] Requirement from District Rule 8-34-301.4 (last amended June 15, 2005).

Table D-22. Landfill Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
29	BAAQMD Guideline 96.2.2	IC engine – landfill gas fired >250 bhp output, low-NOx engine bias	Lean burn technology	BACT (AIP)	3/5/2009	0.5 g/bhp-hr	Initial standard: 2.5 g/bhp-hr Not to exceed standard: 3.9 g/bhp-hr CO emissions based on overhaul schedule	120 ppm @ 3% O2 (0.16 g/bhp-hr)	N/A	N/A
30	BAAQMD Guideline 96.2.2	IC engine – landfill gas fired >250 bhp output, low-CO engine bias	Lean burn technology	BACT (AIP)	3/5/2009	0.6 g/bhp-hr	Initial standard: 2.1 g/bhp-hr Not to exceed standard: 3.6 g/bhp-hr CO emissions based on overhaul schedule	120 ppm @ 3% O2 (0.16 g/bhp-hr)	N/A	N/A

Table D-23. Sewage Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SCAQMD Rule 1110.2 Emissions from Gaseous- and Liquid-Fueled Engines	Stationary and portable engines >50 bhp, landfill and digester gas-fired		Rule	2/1/2008	<500 bhp: 45 x ECF[19] ppmvd @ 15% O_2 ≥500 bhp: 36 x ECF ppmvd @ 15% O_2 On and after 7/1/2012: 11 ppmvd @ 15% O_2	2,000 ppmvd @ 15% O_2 On and after 7/1/2012: 250 ppmvd @ 15% O_2	250 x ECF ppmvd @ 15% O_2 On and after 7/1/2012: 30 ppmvd @ 15% O_2	N/A	N/A
2	ARB DG Guidance[20]	Waste gas-fired reciprocating engine used in electrical generation (that are required to obtain a district permit)	Lean-burn technology, pre-stratified charge system	BACT	2002	0.6 g/bhp-hr; 50 ppmvd @ 15% O_2; 1.9 lb/MWh	2.5 g/bhp-hr; 300 ppmvd @ 15% O_2; 7.8 lb/MWh	0.6 g/bhp-hr; 130 ppmvd @ 15% O_2; 1.9 lb/MWh	N/A	N/A
3	Hill Canyon Wastewater Treatment Plant; Camarillo, CA – 2 units	396 bhp sewage digester gas-fired IC engines, producing 250 kW each	Catalytic carbon control systems for removing H_2S and ROCs, lean burn technology, turbocharged and aftercooled, low NO_x combustion chambers	Permit		0.6 g/bhp-hr OR 35 ppmvd @ 15% O_2	*13.6 g/bhp-hr;* 1200 ppmvd @ 15% O_2	*1.0 g/bhp-hr;* 28 ppmvd @ 15% O_2	Fuel: 20 ppmvd	N/A

[19] ECF is the efficiency correction factor. ECF = 1.0 unless the engine operator has measured the engine's net specific energy consumption, in compliance with ASME Performance Test Code PTC 17-1973, at the average load of the engine (see rule for details).

[20] Emission levels based on permit and source test data from the following facilities: City of Stockton, Hemet/San Jacinto Regional Water Reclamation Facility, South East Regional Reclamation Authority (Dana Point).

Table D-23. Sewage Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	San Bernardino City Municipal Water Dept.; San Bernardino, CA – 2 units	999 bhp sewage digester gas (w/ natural gas augmentation)-fired IC engine	Lean burn technology, turbocharged and aftercooled	Permit		0.6 g/bhp-hr; 36 ppmvd @ 15% O_2	2.5 g/bhp-hr; 2000 ppmvd @ 15% O_2	0.3 g/bhp-hr; 250 ppmvd @ 15% O_2	500 ppmv	0.1 gr/dscf @ 12% CO_2
5	San Bernardino City Municipal Water Dept.; San Bernardino, CA Unit 1	999 bhp sewage digester gas (w/ natural gas augmentation)-fired IC engine	Lean burn technology, turbocharged and aftercooled	Source test (85% load, 100% digester gas)	11/3 to 4/2005	0.2 g/bhp-hr; 13 ppmvd @ 15% O_2 (1 run)	1.3 g/bhp-hr; 115 ppmvd @ 15% O_2 (1 run)	0.1 g/bhp-hr; 18 ppmvd @ 15% O_2 TGNMNEO (2-run avg)	N/A	0.002 gr/dscf @ 12% CO_2 (1 run)
6	San Bernardino City Municipal Water Dept.; San Bernardino, CA Unit 2	999 bhp sewage digester gas (w/ natural gas augmentation)-fired IC engine	Lean burn technology, turbocharged and aftercooled	Source test (85% load, 100% digester gas)	11/1 to 2/2005	0.2 g/bhp-hr; 11 ppmvd @ 15% O_2 (1 run)	1.4 g/bhp-hr; 121 ppmvd @ 15% O_2 (1 run)	0.1 g/bhp-hr; 13 ppmvd @ 15% O_2 TGNMNEO (2-run avg)	N/A	0.001 gr/dscf @ 12% CO_2 (1 run)
7	San Francisco South East Treatment Plant; San Francisco, CA	21 MMBtu/hr sewage digester gas +/or natural gas-fired IC engine		Permit		0.5 g/bhp-hr	2.1 g/bhp-hr	0.6 g/bhp-hr (POC)	0.3 g/bhp-hr (equivalent to fuel H_2S content of 300 ppmv)	N/A
8	Stockton RWCF; Stockton, CA	1,408 bhp sewage digester/natural gas-fired IC engine	Lean burn technology, with precombustion chamber and siloxane scrubber	Source test (digester gas)	10/11 to 12/2006	0.4 g/bhp-hr; 22 ppm @ 15% O_2	2.6 g/bhp-hr; 264 ppm @ 15% O_2	0.1 g/.bhp-hr TNMHC	0.1 g/bhp-hr	<0.1 g/bhp-hr; <0.01 gr/dscf @ 12% CO_2

Table D-23. Sewage Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
9	BAAQMD Guideline 96.5.2	IC engine – digester gas fired, >50 bhp output	Lean burn technology, digester gas pretreatment to remove H_2S	BACT (AIP)	5/14/2009	1.25 g/bhp-hr	Initial standard: 2.65 g/bhp-hr Not to exceed standard: 3.77 g/bhp-hr CO emissions based / minimum overhaul schedule	1.0 g/bhp-hr	0.3 g/bhp-hr	N/A
10	BAAQMD Guideline 96.5.2	IC engine – digester gas fired, >50 bhp output	Digester gas pretreatment w/ >80% H_2S removal	BACT (tech. feasible)	5/14/2009	1.0 g/bhp-hr	2.1 g/bhp-hr	0.6 g/bhp-hr	N/A	N/A

Table D-24. Manure Digester and Co-Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SCAQMD Rule 1110.2 Emissions from Gaseous- and Liquid-Fueled Engines	Stationary and portable engines >50 bhp, landfill and digester gas-fired		Rule	2/1/2008	<500 bhp: 45 x ECF[21] ppmvd @ 15% O_2 ≥500 bhp: 36 x ECF ppmvd @ 15% O_2 On and after 7/1/2012: 11 ppmvd @ 15% O_2	2,000 ppmvd @ 15% O_2 On and after 7/1/2012: 250 ppmvd @ 15% O_2	250 x ECF ppmvd @ 15% O_2 On and after 7/1/2012: 30 ppmvd @ 15% O_2	N/A	N/A
2	Fiscalini Farms & Fiscalini Dairy; Modesto, CA	1,057 bhp Guascor Model SFGLD-560 dairy digester gas-fired lean-burn IC engine driving 750 kW generator	Oxidation catalyst, SCR	Authority to Construct	12/17/2008	0.15 g/bhp-hr (11.0 ppmvd @ 15% O2) and shall not exceed 0.60 g/bhp-hr (44 ppmvd @ 15% O2)[22] NH3 limit: 10 ppmvd @ 15% O2	1.75 g/bhp-hr (210 ppmvd @ 15% O2)	0.13 g/bhp-hr (28 ppmvd @ 15% O2)	Fuel sulfur content ≤50 ppmv	0.036 g/bhp-hr

[21] ECF is the efficiency correction factor. ECF = 1.0 unless the engine operator has measured the engine's net specific energy consumption, in compliance with ASME Performance Test Code PTC 17-1973, at the average load of the engine (see rule for details).

[22] Permit includes a 24-month trial period to reduce NOx to the target 0.15 g/bhp-hr. The final NOx BACT level shall be determined by the District after 24 months operating history.

Table D-24. Manure Digester and Co-Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	ARB DG Guidance	Waste gas-fired reciprocating engine used in electrical generation (that are required to obtain a district permit)	Lean-burn technology, pre-stratified charge system	BACT	2002	0.6 g/bhp-hr; 50 ppmvd @ 15% O_2; 1.9 lb/MWh	2.5 g/bhp-hr; 300 ppmvd @ 15% O_2; 7.8 lb/MWh	0.6 g/bhp-hr; 130 ppmvd @ 15% O_2; 1.9 lb/MWh	N/A	N/A
4	Chino Basin Desalter Authority; Chino, CA – 2 units	1,158 bhp manure digester gas- or natural gas-fired IC engine, producing 1.9 MW combined	Lean burn technology, turbocharged and aftercooled, custom engine control, air/fuel module	Permit		*0.9 g/bhp-hr;* 47 ppmv @ 15% O_2 (@ 32.7% eff.)	*22.7 g/bhp-hr;* 2000 ppmv @ 15% O_2	*11.3 g/bhp-hr;* 325 ppmv @ 15% O_2 (@ 32.7% eff.)	N/A	N/A
5	BAAQMD Guideline 96.5.2	IC engine – digester gas fired, >50 bhp output	Lean burn technology, digester gas pretreatment to remove H_2S	BACT (AIP)	5/14/2009	1.25 g/bhp-hr	Initial standard: 2.65 g/bhp-hr Not to exceed standard: 3.77 g/bhp-hr CO emissions based / minimum overhaul schedule	1.0 g/bhp-hr	0.3 g/bhp-hr	N/A
6	BAAQMD Guideline 96.5.2	IC engine – digester gas fired, >50 bhp output	Digester gas pretreatment w/ >80% H_2S removal	BACT (tech. feasible)	5/14/2009	1.0 g/bhp-hr	2.1 g/bhp-hr	0.6 g/bhp-hr	N/A	N/A
7	Gallo Cattle Company; Atwater, CA	575 bhp Caterpillar Model G399NA rich burn digester gas-fired IC engine, producing 400 kW	3-way non-selective catalyst, PCV or equivalent, fuel sulfur scrubber	Permit	9/30/2012 (expiration date)	9.0 ppmvd @ 15% O_2 (or 0.15 g/bhp-hr)	1,100 ppmvd @ 15% O_2	20 ppmvd @ 15% O_2 as methane	Fuel sulfur limit of 59 ppmv as H_2S	0.1 g/bhp-hr

Table D-24. Manure Digester and Co-Digester Gas-Fired Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
8	Gallo Cattle Company; Atwater, CA	575 bhp Caterpillar Model G399NA rich burn digester gas-fired IC engine, producing 400 kW	3-way non-selective catalyst, PCV or equivalent, fuel sulfur scrubber	Source test	1/28/2010	3.18 ppmvd @ 15% O_2	384.64 ppmvd @ 15% O_2	11.19 ppmvd @ 15% O_2	<1.0 ppm fuel H_2S	N/A

Table D-25. Biomass Syngas-Fueled Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 3.3.14	Full-time rich burn IC engine, syngas-fueled[23]		BACT (AIP)	1/12/2009	9 ppmvd @ 15% O2	N/A	25 ppmvd @ 15% O2	N/A	N/A
2	SJVAPCD Guideline 3.3.14	Full-time rich burn IC engine, syngas-fueled		BACT (tech. feasible)	1/12/2009	5 ppmvd @ 15% O2	N/A	N/A	N/A	N/A

[23] Syngas (synthetic gas) is derived from biomass (agricultural waste) by gasification or similar processes. Syngas is distinguished from waste gases by its low methane content (<5%) and comparatively high hydrogen gas content (15% or greater), although frequently over half of the syngas composition is non-combustible gases such as nitrogen and carbon dioxide.

Table D-26. Landfill and Sewage Digester Gas-Fired Turbine

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Rule 4703 Stationary Gas Turbines (Tier 3 standards)	Stationary gas turbines ≥0.3 to 10 MW		Rule	9/20/2007	<3 MW: 9 ppmvd @ 15% O_2 3-10 MW (pipeline gas): 8 ppmvd @ 15% O_2 (steady state) and 12 ppmvd @ 15% O_2 (non-steady) 3-10 MW, <877 hr/yr: 9 ppmvd @ 15% O_2 3-10 MW, ≥877 hr/yr: 5 ppmvd @ 15% O_2	200 ppmvd @ 15% O_2[24]	N/A	N/A	N/A
2	SJVAPCD Rule 4703 Stationary Gas Turbines (Tier 3 standards)	Stationary gas turbines >10 MW		Rule	9/20/2007	Simple cycle and ≤200 hr/yr: 25 ppmvd @ 15% O_2 Simple cycle and >200 to 877 hr/yr: 5 ppmvd @ 15% O_2 Combined cycle[25]: 5 ppmvd @ 15% O_2	200 ppmvd @ 15% O_2[26]	N/A	N/A	N/A

[24] Exceptions to CO limit: GE Frame 7 = 25 ppmvd; GE Frame 7 with quiet combustors = 52 ppmvd; and <2.0 MW Solar Saturn driving centrifugal compressor = 250 ppmvd.
[25] Tier 2 standard; there is no Tier 3 standard for combined cycle turbines.
[26] Exceptions to CO limit: GE Frame 7 = 25 ppmvd; GE Frame 7 with quiet combustors = 52 ppmvd; and <2.0 MW Solar Saturn driving centrifugal compressor = 250 ppmvd.

Table D-26. Landfill and Sewage Digester Gas-Fired Turbine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	SCAQMD Rule 1134 Emissions of Oxides of Nitrogen from Stationary Gas Turbines	Stationary gas turbines ≥0.3 MW		Rule	Last amended 8/8/1997	0.3-<2.9 MW: 25 ppmvd @ 15% O_2 2.9-<10.0 MW[27]: 25 ppmvd @ 15% O_2 2.9-<10.0 MW: 9 ppmvd @ 15% O_2 2.9-<10.0 MW, no SCR: 15 ppmvd @ 15% O_2 ≥10 MW: 9 ppmvd @ 15% O_2 ≥10 MW, no SCR: 12 ppmvd @ 15% O_2 ≥60 MW, combined cycle, no SCR: 15 ppmvd @ 15% O_2 ≥60 MW, combined cycle: 9 ppmvd @ 15% O_2	N/A	N/A	N/A	N/A

[27] Utilizing fuel containing a minimum of 60% sewage digester gas by volume on a daily average.

Table D-26. Landfill and Sewage Digester Gas-Fired Turbine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
4	BAAQMD Guideline 89.3.1	Gas turbine – landfill gas-fired	Water or steam injection or low-NOx turbine design; fuel selection; good combustion practice; strainer, filter, gas/liquid separator, or equivalent particulate removal device	BACT (AIP)	6/17/1999	25 ppmv @ 15% O_2	200 ppmv @ 15% O_2	N/A	150 ppmv sulfur limit as H_2S	Fuel gas pretreatment
5	ARB DG Guidance[28]	Waste gas-fired turbine rated at <50 MW used in electrical generation (that are required to obtain a district permit)	Water injection	BACT	2002	25 ppmvd @ 15% O_2; 1.25 lb/MWh	N/A	N/A	N/A	N/A
6	Ameresco Chiquita Energy, LLC; Valencia, CA – 2 units	53.13 MMBtu/hr landfill gas-fired turbine, simple cycle, producing 4.6 MW each	Ultra lean premix alular combustor, start up LPG augmentation	Permit		25 ppmvd @ 15% O_2	130 ppm @ 15% O_2	20 ppmv @ 15% O_2 as C6 OR 98% destruction	Fuel: 150 ppmv H_2S	N/A
7	Gas Recovery Systems, Inc.; Santee, CA	Landfill gas-fired turbine producing 3.108 MW		Permit		25 ppmvd @ 15% O_2	130 ppmvd @ 15% O_2	3.5 ppmvd @ 15% O_2 as CH_4	8.3 ppmvd @ 15% O_2	N/A
8	Gas Recovery Systems, Inc.; Santee, CA	Landfill gas-fired turbine producing 3.108 MW		Source test	12/1/2006	21 ppm @ 15% O_2 (2.540 MW)	32 ppm @ 15% O_2 (2.540 MW)	3.5 ppm @ 15% O_2 (2.540 MW)	2.8 ppm @ 15% O_2 (2.540 MW)	N/A

[28] Emission level based on the following: Joint Water Pollution Control Plant (Carson).

Table D-26. Landfill and Sewage Digester Gas-Fired Turbine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
9	Gas Recovery Systems, Inc.; Santee, CA	Landfill gas-fired turbine producing 3.108 MW		Source test	11/23/2004	19 ppm @ 15% O_2; (2.642 MW)	32 ppm @ 15% O_2; (2.642 MW)	1.6 ppm @ 15% O_2; (2.642 MW)	2.9 ppm @ 15% O_2; (2.642 MW)	N/A
10	Los Angeles County Sanitation Districts; Los Angeles, CA	(3) 113 MMBtu/hr Solar Model MARS-90-13000 digester/natural gas-fired combined-cycle turbines with unfired HRSG driving a 5.1 MW steam turbine generator	Water injection (fuel minimum 60% by volume digester gas)	BACT (for NOx and CO)	9/24/2003	25 ppmvd @ 15% O_2	60 ppmvd @ 15% O_2	4.5 lb/hr; *0.04 lb/MMBtu*	1.3 lb/hr; *0.01 lb/MMBtu*	5.7 lb/hr; *0.05 lb/MMBtu*
11	SCAQMD Guidelines for Non-Major Facilities	Digester or landfill gas-fired turbine		BACT	1990, 10/20/2000	25 ppmvd @ 15% O_2	130 ppmvd @ 15% O_2	N/A	Compliance w/ Rule 431.1	Fuel gas pretreatment for particulate removal
12	Waste Management; Livermore, CA	(2) 57.4 MMBtu/hr Solar Centaur landfill gas-fired turbines producing 3.33 MW each (Units S-6 and S-7)		Permit		0.1567 lb/MMBtu (*38.7 ppmvd @ 15% O2*)	0.2229 lb/MMBtu (*90.4 ppmvd @ 15% O2*)	N/A	N/A	N/A

Table D-27. Composting

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SCAQMD Rule 1133.2 Emission Reductions from Co-Composting Operations	Co-composting[29] (new)		Rule	1/10/2003			1. Conduct active composting w/in enclosure; 2. Conduct curing composting phase using aeration system under negative pressure for ≥90% of blower operating cycle; and 3. Vent exhaust from enclosure and aeration system to control device w/ ≥80% VOC and NH_3 control efficiency. OR Submit alternate plan w/ overall 80% VOC and NH_3 reduction		N/A

[29] Co-composting is composting where biosolids and/or manure are mixed with bulking agents to produce compost.

Table D-27. Composting

Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
2	SCAQMD Rule 1133.2 Emission Reductions from Co-Composting Operations	Co-composting (existing)[30]		Rule	1/10/2003			Submit compliance plan demonstrating overall reduction of 70% VOC and NH_3 from baseline		N/A
3	SJVAPCD Rule 4565 Biosolids, Animal Manure, and Poultry Litter Operations	Composting / co-composting facilities that use ≥100 wet tons per year of biosolids[31], animal manure, or poultry litter as part of their operation		Rule	3/15/2007			<u><20,000 wet tons/yr</u>: Implement at least three Class One measures OR Implement at least two Class One and one Class Two measure for active composting <u>≥20,000 to <100,000 wet tons/yr</u>: Implement at least four Class One measures OR Implement at least three Class One and one Class Two measure for active composting		N/A

[30] Existing operations defined as those that began operations on or before January 1, 2003.

[31] Organic material from treatment of sewage sludge or wastewater.

Table D-27. Composting										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
								≥100,000 wet tons/yr: Implement at least four Class One and one Class Two measures for active composting OR Implement at least two Class One and one Class Two measures for active composting and one Class Two measure for curing composting		
4	Inland Empire Regional Composting Authority; Rancho Cucamonga, CA	Biosolids co-composting operation consisting of enclosed aerated static piles, including materials handling and storage	Biofilter, baghouse	Permit				80% control (80% control NH_3)		No limit in permit, but 99% control expected due to baghouse

Table D-27. Composting										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
5	Los Angeles County Sanitation District (dba Westlake Farms Co-Composting); Mt. Diablo Baseline & Meridian, CA	Co-composting operation consisting of negative aerated static piles, including materials handling and storage	Biofilter	Permit[32]				80% control (90% control NH_3)		N/A
6	South Kern Industrial Center, LLC; Taft, CA	Biosolids co-composting operation consisting of negative aerated static piles, including materials handling and storage	Biofilter	Permit[33]				80% control (80% control NH_3)		N/A

[32] ARB staff received a draft copy of the permit; however correspondence with the District indicates the permit has been issued.

[33] ARB staff received a draft copy of the permit; however correspondence with the District indicates the permit has been issued.

Table D-28. Emergency Diesel Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
1	SJVAPCD Guideline 3.1.1	Emergency diesel IC engine		BACT (AIP)	7/10/2009	Latest EPA Tier Certification level for applicable hp range	Latest EPA Tier Certification level for applicable hp range	Latest EPA Tier Certification level for applicable hp range	Very low sulfur diesel fuel (15 ppmw sulfur or less)	0.15 g/bhp-hr or latest EPA Tier Certification level for applicable hp range, whichever is more stringent
2	ATCM for Stationary Compression Ignition Engines	New stationary emergency standby diesel-fueled compression ignition engines >50 bhp – non-emergency use limited to 50 hr/yr		Regulation (title 17 CCR sections 93115 to 93115.15)	10/18/2007	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards[34]	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards	CARB diesel (15 ppmw sulfur or less)	0.15 g/bhp-hr

[34] The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and maximum rated power as the new stationary emergency standby diesel-fueled compression ignition engine.

Table D-28. Emergency Diesel Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
3	ATCM for Stationary Compression Ignition Engines	New stationary emergency standby diesel-fueled compression ignition engines >50 bhp – non-emergency use limited to 51-100 hr/yr		Regulation (title 17 CCR sections 93115 to 93115.15)	10/18/2007	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards[35]	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards	Off-road compression ignition engine standards for an off-road engine of the model year and bhp rating of the engine stalled to meet the applicable PM standard, or Tier 1 standards	CARB diesel (15 ppmw sulfur or less)	0.01 g/bhp-hr
4	SCAQMD BACT Guidelines for Non-Major Polluting Facilities	IC Engine, Stationary, Emergency, Compression-Ignition, Other		BACT	10/3/2008	50≤hp<100: 4.7 g/kWh or 3.5 g/bhp-hr (Tier 3)[36] 100≤hp<175: 4.0 g/kWh or 3.0 g/bhp-hr (Tier 3) 175≤hp<300: 4.0 g/kWh or 3.0 g/bhp-hr (Tier 3) 300≤hp<750: 4.0 g/kWh or 3.0 g/bhp-hr	50≤hp<100: 5.0 g/kWh or 3.7 g/bhp-hr (Tier 3) 100≤hp<175: 5.0 g/kWh or 3.7 g/bhp-hr (Tier 3) 175≤hp<300: 3.5 g/kWh or 2.6 g/bhp-hr (Tier 3) 300≤hp<750: 3.5 g/kWh or 2.6 g/bhp-hr	50≤hp<100: 4.7 g/kWh or 3.5 g/bhp-hr (Tier 3)[37] 100≤hp<175: 4.0 g/kWh or 3.0 g/bhp-hr (Tier 3) 175≤hp<300: 4.0 g/kWh or 3.0 g/bhp-hr (Tier 3) 300≤hp<750: 4.0 g/kWh or 3.0 g/bhp-hr	On or after June 1, 2004, the user may only purchase diesel fuel with a sulfur content no greater than 0.0015% by weight (Rule 431.2)	50≤hp<100: 0.40 g/kWh or 0.30 g/bhp-hr (Tier 3) 100≤hp<175: 0.30 g/kWh or 0.22 g/bhp-hr (Tier 3) 175≤hp<300: 0.20 g/kWh or 0.15 g/bhp-hr (Tier 3) 300≤hp<750: 0.20 g/kWh or 0.15

[35] The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and maximum rated power as the new stationary emergency standby diesel-fueled compression ignition engine.

[36] These are all NOx+NMHC standards.

[37] These are all NOx+NMHC standards.

Table D-28. Emergency Diesel Reciprocating Internal Combustion Engine										
Ref. No.	Facility Name	Basic Equipment	Method(s) of Control	Type of Document	Date of BACT Det., Permit, or Rule	Emissions, per unit				
						NOx	CO	VOC	SO_2	PM10
						(Tier 3) ≥750 hp: 6.4 g/kWh or 4.8 g/bhp-hr (Tier 2)	(Tier 3) ≥750 hp: 3.5 g/kWh or 2.6 g/bhp-hr (Tier 2)	(Tier 3) ≥750 hp: 6.4 g/kWh or 4.8 g/bhp-hr (Tier 2)		g/bhp-hr (Tier 3) ≥750 hp: 0.20 g/kWh or 0.15 g/bhp-hr (Tier 2)
5	BAAQMD Guideline 96.1.3	IC Engine – Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump, >50 bhp output	Any engine certified or verified to achieve the applicable standard, CARB diesel fuel (ultra low sulfur diesel)	BACT (AIP)	4/13/2009	Current Tier standard for NOx at applicable horsepower rating	More stringent of either 2.75 g/bhp-hr (319 ppmvd @ 15% O2) or the current Tier standard	Current Tier standard for POC at applicable horsepower rating	Fuel sulfur content not to exceed 0.0015% (wt) or 15 ppm	More stringent of either 0.15 g/bhp-hr or the current Tier standard

Table D-29. Off-Road Compression Ignition Engine Certification Standards in g/bhp-hr (g/kW-hr)[38]

Engine hp (kW)	Tier 1[39]					Tier 2				Tier 3				Tier 4					
	HC	NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	NMHC	NOx	CO	PM	Years
50 - <75 (37 - <56)		6.9 (9.2)			1998 – 2003	5.6 (7.5)	3.7 (5.0)	0.30 (0.40)	2004 – 2007	3.5 (4.7)	3.7 (5.0)	0.22 (0.30)	2008 – 2012	3.5 (4.7)			3.7 (5.0)	0.02 (0.03)	2013+
75 - <100 (56 - <75)		6.9 (9.2)			1998 – 2003	5.6 (7.5)	3.7 (5.0)	0.30 (0.40)	2004 – 2007	3.5 (4.7)	3.7 (5.0)	0.30 (0.40)	2008 – 2011	3.5 (4.7)	0.14 (0.19)	0.30-2.5 (0.40-3.4)	3.7 (5.0)	0.01 (0.02)	2012 - 2013
															0.14 (0.19)	0.30 (0.40)	3.7 (5.0)	0.01 (0.02)	2014+
100 - <175 (75 - <130)		6.9 (9.2)			1997 - 2002	4.9 (6.6)	3.7 (5.0)	0.22 (0.30)	2003 – 2006	3.0 (4.0)	3.7 (5.0)	0.22 (0.30)	2007 – 2011	3.0 (4.0)	0.14 (0.19)	0.30-2.5 (0.40-3.4)	3.7 (5.0)	0.01 (0.02)	2012 - 2013
															0.14 (0.19)	0.30 (0.40)	3.7 (5.0)	0.01 (0.02)	2014+
175 - <300 (130 - <225)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	1996 – 2002	4.9 (6.6)	2.6 (3.5)	0.15 (0.20)	2003 – 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 – 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-2.0)	2.6 (3.5)	0.01 (0.02)	2011 – 2013
															0.14 (0.19)	0.30 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
300 - <600 (225 - <450)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	1996 – 2000	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2001 – 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 – 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-2.0)	2.6 (3.5)	0.01 (0.02)	2011 – 2013
															0.14 (0.19)	0.30 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
600 - <750 (450 - <560)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	1996 – 2001	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2002 – 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 – 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-2.0)	2.6 (3.5)	0.01 (0.02)	2011 – 2013
															0.14 (0.19)	0.30 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
≥750 (≥560)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	2000 – 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 – 2010						0.30 (0.40)	2.6 (3.5)	2.6 (3.5)	0.075 (0.10)	2011 – 2014
															0.14 (0.19)	2.6 (3.5)	2.6 (3.5)	0.03 (0.04)	2015+

[38] For California Exhaust Emission Standards and Test Procedures – Off-Road Compression-Ignition Engines, see title 13, California Code of Regulations, section 2423. For federal Nonroad Compression-Ignition Engine Certification Standards, consult title 40, United States Code of Federal Regulations, Chapter 1, Part 89, Subpart B and Part 1039, Subpart B.

[39] Engine manufacturers have several options for complying with NOx during the transitional implementation years of Tier 4, including a "phase-in/phase-out" or alternative NOx level approach.

Table D-29. Off-Road Compression Ignition Engine Certification Standards in g/bhp-hr (g/kW-hr)[38]																				
Engine hp (kW)	Tier 1[39]					Tier 2				Tier 3				Tier 4						
	HC	NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	NMHC	NOx	CO	PM	Years
>750 - ≤1200 (560 - ≤900) Gen. only	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	2000 – 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 – 2010						0.30 (0.40)	2.6 (3.5)	2.6 (3.5)	0.075 (0.10)	2011 – 2014
															0.14 (0.19)	0.50 (0.67)	2.6 (3.5)	0.02 (0.03)	2015+
>1200 (>900) Gen. only	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.4 (0.54)	2000 – 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 – 2010						0.30 (0.40)	0.50 (0.67)	2.6 (3.5)	0.075 (0.10)	2011 – 2014
															0.14 (0.19)	0.50 (0.6)	2.6 (3.5)	0.02 (0.03)	2015+