COLUSA COUNTY
DEPARTMENT OF AGRICULTURE - AIR POLLUTION CONTROL DISTRICT
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100 SUNRISE BLVD., SUITE F, COLUSA, CALIFORNIA 95932

April 3, 2007

Mr. Jack Caswell, Project Manager
Energy Facilities Siting Division
California Energy Commission
1516 9th Street
Sacramento, CA 95814

Subject: Preliminary Determination of Compliance – Colusa Generating Station

Dear Mr. Caswell:

The Colusa County Air Pollution Control District submitted, via email, an electronic copy of the Preliminary Determination of Compliance (PDOC) for the Colusa Generating Station to the California Energy Commission and their consultant Aspen on March 1, 2007. The PDOC was submitted three weeks ahead of schedule to expedite the review process as requested by the California Energy Commission (CEC) members at the informational hearing in Williams on January 25, 2007.

The District is currently reviewing comments on the PDOC that were submitted electronically by Aspen on March 7, 2007. Amendments to the PDOC will be made after more information is obtained, reviewed and analyzed. The District will consult with CEC staff and Aspen's representative prior to finalizing the Determination of Compliance.

We understand that the CEC has asked for more copies of the PDOC, with the appendices, to distribute to other agencies and the public. The District has asked that URS respond to the CEC request for five hardcopies and five compact disks of the PDOC. This will provide the quickest response to your request.

If you have any further questions please contact the District or our consultant Les Fife at (530) 668-1559.

Sincerely,

Harry A. Krug,
Director of Air Quality Standards

DRAFT March 1, 2007

PRELIMINARY
DETERMINATION OF COMPLIANCE

COLUSA GENERATING STATION
E&L Westcoast, L.L.C.
Application submitted November 22,2006

COLUSA COUNTY
AIR POLLUTION CONTROL DISTRICT
100 Sunrise Blvd, Suite F
Colusa CA 95932

November 28, 2006

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COLUSA GENERATING STATION PROJECT

I APPLICANT

This Authority to Construct/Permit to Operate (ATC/PTO) application is for the construction and operation of a nominally rated 660 megawatt (MW) combined cycle power plant in Colusa County by E&L Westcoast, L.L.C. (E&L Westcoast).

E&L Westcoast, LLC
8403 Colesville, Suite 915
Silver Spring, Maryland 20910

Contact:
Mr. Andrew Welch, P.E.
Project Manager
E&L Westcoast, LLC

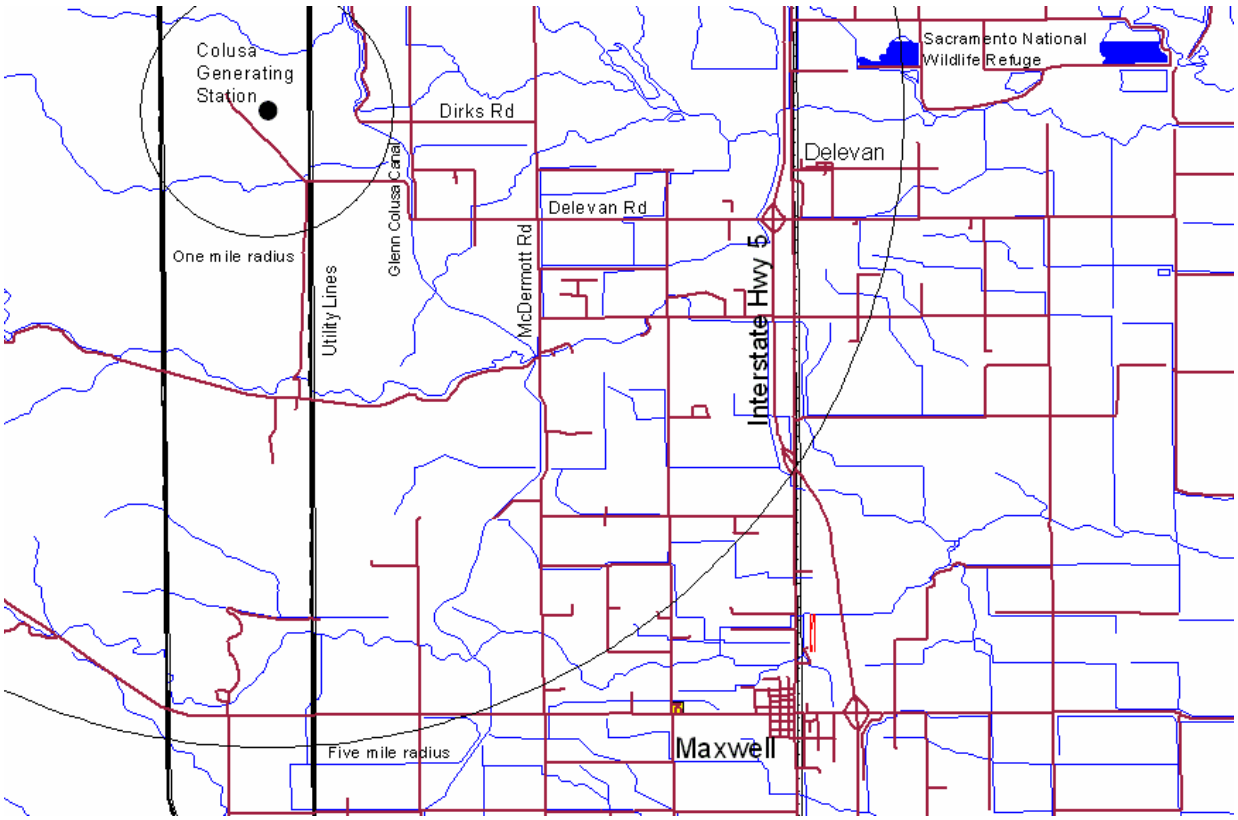
II BACKGROUND INFORMATION

The application was submitted to the Colusa County Air Pollution Control District (CCAPCD) on November 22, 2006 with the intention of obtaining a Determination of Compliance. The submittal was also intended to serve as an application for an Authority to Construct from the District.

The proposed project is sited adjacent to existing industrial facilities in an unincorporated area of Colusa County (Section 35, Township 18N, Range 4W) designated Agricultural-General (A-G) and zoned Exclusive Agriculture (EA). The Colusa Generating Station (CGS) is compatible with these industrial facilities. The closest resident is approximately 1.7 miles southeast of the site. E&L Westcoast has applied to Colusa County for a change in General Plan Land Use Designation and Zoning, and a subdivision of the 100-acre parcel. The application to the County will be processed in conjunction with the California Energy Commission's (CEC) review of this project utilizing the CEC's role as lead agency for the California Environmental Quality Act (CEQA) and its environmental analysis.

III FACILITY LOCATION

The CGS is proposed to be located about 4 miles west of Interstate 5 (I-5) in Colusa County, California on a 200-acre parcel of land. The site is adjacent to the PG&E Delevan Compressor Station near Maxwell. The power plant and switchyard will occupy approximately 26.6 acres within the 100-acre project site. The site is presently undeveloped agricultural land used for grazing cattle. Site topography is rolling hills from 175 to 190 feet above mean sea level. The map below shows the site in relation to nearby roads and the towns of Delevan and Maxwell.



IV FACILITY DESCRIPTION

The proposed CGS power plant will consist of two General Electric (GE) Frame 7-FA combustion gas turbines (CTGs) equipped with dry, low nitrogen oxide (DLN) combustors; two heat recovery steam generators (HRSGs), each equipped with a duct burner, an oxidation catalyst, and an aqueous ammonia selective catalytic reduction (SCR) system; a multistage steam turbine generator (STG); dry cooling tower technology; an auxiliary boiler with ultra lowNOx burner and SCR; and associated support equipment. Each CTG will generate an average of 172 MW. Up to 320 MW will be produced by the steam turbine.

PROCESS EQUIPMENT

The CGS will include two GE Frame 7-FA combustion gas turbines with electrical generators. They will burn natural gas fuel. Gas purchased from suppliers will be delivered to the project site via a new 8-inch pipeline interconnected to the Pacific Gas Transmission/PG&E gas transmission lines. The CTGs will each be equipped with evaporative inlet air coolers/filters to enhance turbine performance in hot weather. An auxiliary boiler will be installed at the facility. The boiler is used to generate steam that is vented to the CTG trains to preheat the equipment which allows for quicker startup.

Hot exhaust gases from the CTGs will be directed to parallel HRSGs where steam will be generated at three pressures. The steam produced by the HRSGs will be combined to drive a single steam turbine. The HRSGs will include duct burners to increase steam output and achieve higher levels of power output in selected modes of operation. Cooled exhaust gases from each HRSG will be exhausted to the atmosphere through a stack that will be approximately 175 feet in height.

Steam from the HRSGs will be directed to the steam turbine, then exhausted and condensed in an air-cooled condenser. Condensate from the condenser is returned to the steam cycle. The CGS will use "dry" cooling technology for its operation.

Each of the CTGs and the steam turbine are connected to electric generators, which generate electrical energy at 18 kilovolts.

The proposed facility will have a backup emergency generator (1,000 kW) powered by a diesel engine. Also, two emergency firewater pumps are planned, one electric powered and the other by a diesel fired internal combustion engine. The engine will be tested periodically but otherwise only operate to pump water from the firewater storage tank in the event of a fire.

The CGS will have one remote reservoir cold solvent degreasing station. This equipment will employ low VOC solvent used at room temperature. The solvent will be stored within an enclosed remote reservoir and sprayed on parts within a basin that drains back to the solvent reservoir. The degreasing station will be equipped with a lid that will be closed when the degreaser is not in use. No rags or other porous material will be stored in the degreaser. Spent solvent will be recycled or disposed of in an appropriate manner by an approved contractor.

Major Project Equipment

Equipment	Quantity	Make/Model/Size/Capacity
Combustion Turbine Generators	2	General Electric 7-FA 1917.2 MMbtu/hr
Steam Turbine Generator	1	320 MW condensing reheat STG
Heat Recovery Steam Generators	2	Duct burners rated at 688 MMbtu/hr
Auxiliary Boiler	1	NBC or equivalent 44 MMbtu/hr
Firewater Pump Engines	2	One a 300 hp diesel fired
Emergency Generator 1,000 kW	1	1,340 hp diesel engine powered
Degreaser	1	Cold degreaser with low VOC solvent
Aqueous Ammonia Storage Tank	1	20,000 US gal for NOx control
SCR Catalysts	2	NOx control
Oxidation Catalysts	2	VOC and CO control

OPERATING CONDITIONS

The CGS plant will be operated 7 days a week, 24 hours a day. In any given hour, the plant may be operating at peak load, base load, or part load with both CTGs or with one CTG running. Peak load operation will most likely occur during summer on-peak hours, and minimum load operation during non-summer off-peak hours. Shutdown periods for annual maintenance will be scheduled during extended periods of low demand, which typically occur in the winter or early spring.

The CGS facility will burn natural gas fuel in the turbines, duct burners and auxiliary boiler.

Natural Gas Analysis

Constituent	Percent by Volume
Methane	94
Ethane	3
Propane	0.1
n-Butane	0.01
i-Butane	0.01
n-Pentane	0.00
i-Pentane	0.01
Hexane+	0.01
Oxygen	0.00
Nitrogen	2.2
Carbon dioxide	0.66
Total	100.00
Sulfur (grains per 100 scf)	<0.20
Specific Gravity (air = 1.00)	0.59
Higher Heating Value (Btu/scf)	1010

Source: PG&E 2006.
Btu = British thermal unit(s)
scf = standard cubic feet

Heat and material balances are presented in the following table. These are four typical operating cases. Further clarification of the duct burner and evaporative cooler operations is presented as it relates to ambient weather conditions. Prevailing temperature and relative humidity influence the need for operation of these systems.

Case	Description	Ambient Temp, °F	Duct Fire Status	Evaporation Cooler Status	CGT Firing Rate LHV	HRSG Duct Firing Rate LHV	Net Facility Output CGT&STG
1	July Peak	94	On	On	1,558.3	574.2	640.0
2	ISO	59	On	Off	1,601.9	565.6	666.3
3	ISO	59	Off	Off	1,601.9	0.0	519.4
4	ISO, minimum	59	Off	Off	1,045.4	0.0	130.0
Note	Independent System Operator (ISO) – Firing Rates in MM Btu/hr – LHV is 20,300 Btu/lb – Output MW						

Case	Description	Ambient Temp, °F	Duct Fire Status	Evaporation Cooler Status	CGT A Output	CGT B Output	STG Output
1	July Peak	94	On	On	166.4	166.4	327.9
2	ISO	59	On	Off	172.9	172.9	341.3
3	ISO	59	Off	Off	172.9	172.9	188.1
4	ISO, minimum	59	Off	Off	86.4	0.0	55.9
Note	Independent System Operator (ISO) – Output in MW before subtracting the auxiliary load ~ 20-14 MW						

Two CTG operations (base load and cycling load) are described below in terms of the anticipated number of startups per year and annual hours online with and without duct firing.

These definitions apply to the following tables: "Hot Start" means less than 8 hours since time of last firing (90 minutes); "Warm Start" means between 8 and 72 hours since time of last firing (130 minutes); and "Cold Start" means more than 72 hours since time of last firing (300 minutes).

Quarterly and Annual Turbine Estimated Operating Conditions (if base load)					
Operating Condition	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
Number of Startups	14	14	14	14	56
Hot Starts	10.5	10.5	10.5	10.5	42
Warm Starts	0	0	0	0	0
Cold Starts	3.5	3.5	3.5	3.5	14
Startup/Shutdown Time (hours)	38.5	38.5	38.5	38.5	154
Turbines w/o Duct Burners (hours)	1,082	1,106	1,129	1,129	4,446
Turbines w/ Duct Burners (hours)	1,040	1,040	1,040	1,040	4,160
Total CTG Operating Hours	2,160	2,184	2,208	2,208	8,760

Quarterly and Annual Turbine Estimated Operating Conditions (if cycling load)					
Operating Condition	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
Number of Startups	74	74	74	74	296
Hot Starts	61	61	61	61	244
Warm Starts	12	12	12	12	48
Cold Starts	1	1	1	1	4
Startup/Shutdown Time (hours)	168	168	168	168	672
Turbines w/o Duct Burners (hours)	0	0	0	0	0
Turbines w/ Duct Burners (hours)	1,040	1,040	1,040	1,040	4,160
Total CTG Operating Hours	1,208	1,208	1,208	1,208	4,832

Hourly fuel use rates of the facility's main combustion equipment are indicated in the next table. Natural gas is the primary fuel with diesel being used in the emergency generator and firewater pump engines.

Source	**Fuel – Units/Hr**	**Maximum**
Combustion Gas Turbine, each	Gas MMBtu-LHV	1,601.9
Duct Burner, each	Gas MMBtu	574.2
Auxiliary Boiler	Gas MMBtu	44
Emergency Generator	Diesel MMBtu	9.9
Firewater Pump Engine	Diesel MMBtu	1.9

For gas turbines "normal" conditions are 100% load and 60F average annual ambient temperature and "maximum" conditions are 100% load and 18F winter minimum temperature. For the duct burners "normal" conditions are 100% load and 60F average annual ambient temperature and "maximum" conditions are full fire and 114F summer maximum temperature. The boiler's "maximum" fuel use rate

is at the nameplate rating. The emergency generator's "normal" conditions are weekly testing (one hour) at 50% load and "maximum" conditions are 100% load or 1,340 brake horsepower (bhp). The firewater pump engine's "normal" conditions are weekly testing (one hour) at 50% load and "maximum" conditions are 100% load or 300 brake horsepower (bhp).

AIR POLLUTION CONTROL EQUIPMENT / STRATEGIES

Air pollution emissions from the combustion of natural gas in the CTG and HRSG duct burners are controlled by the best available control technology (BACT) systems. Emissions that are controlled include NO_X, CO, VOCs, PM_{10}, and SO_2. A continuous emissions monitoring system (CEMS) will be installed to monitor NO_X, CO, and oxygen (O_2) concentrations in the stack emissions. The CEMS generates a log of emissions data for compliance documentation and activates an alarm in the plant control room when stack emissions exceed specified limits.

The facility will include selective catalytic reduction (SCR) with ammonia injection emissions control equipment for reduction of nitrogen oxides (NO_x) and an oxidation catalyst for reduction of carbon monoxide (CO) and volatile organic compound (VOC) emissions in the exhaust gas.

NOx Control

Dry low NOx (DLN) combustors in the combustion turbines, low NOx duct burners, and SCR will be used to control NO_x concentrations in the exhaust gas emitted to the atmosphere. DLN combustors in the CTGs followed by SCR in the HRSGs will control stack NO_X emissions to a maximum 2.0 ppmvd corrected to 15 percent oxygen (1-hour average excluding startups). The DLN combustors control NO_X emissions to approximately 9 ppmvd at the CTG exhausts by pre-mixing fuel and air immediately prior to combustion. The SCRs equipment will include a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors. The SCR process uses aqueous ammonia as a reagent.

The auxiliary boiler will be equipped with an ultra low NOx burner.

CO and VOC Control

An oxidation catalyst installed in the HRSG will control the CO and VOC emissions from the CTG combustors and HRSG duct burners. The HRSG limit for CO emissions will be 3 ppmvd to ensure that VOC emissions are controlled to less than 2 ppmvd at 15 percent oxygen. This catalytic system will promote the oxidation of CO to carbon dioxide (CO_2) and VOCs to CO_2 and water vapor without the need for additional reagents such as ammonia.

PM_{10} Particulate Control

Particulate emissions will be controlled using clean-burning natural gas as the exclusive fuel for the CTGs and duct burners. PM_{10} emissions consist primarily of hydrocarbon particles formed during combustion. In addition, the CTGs will be equipped with high-efficiency inlet air filters.

SOx Control

Sulfur oxides will be controlled using pipeline-quality, clean-burning natural gas as the exclusive fuel for the CTGs and duct burners. The amount of SO_x emissions is dependent upon the amount of sulfur compounds in the natural gas. The Public Utilities Commission has established standards for the sulfur content in natural gas. The level of sulfur will be limited to 0.5 grains per 100 standard cubic feet of gas.

Toxic Control

Use of natural gas and state-of-the-art combustion technology will minimize the quantities of potentially toxic air emissions that will be created. The SCR process will use aqueous ammonia. Ammonia slip will be limited to 5.0 ppmvd corrected to 15 percent oxygen.

Mitigation Measures for Dust Control

Dust emissions from construction activities are expected to be 90 percent with the following measures.

1. Frequent watering of unpaved roads and disturbed areas (at least twice a day).
2. Limit speed of vehicles on the construction areas to no more than 10 miles per hour.
3. Sweep paved internal roads after the evening peak period.
4. Increase frequency of watering when wind speeds exceed 15 miles per hour.
5. Employ tire washing and gravel ramps prior to entering a public roadway to limit accumulated mud and dirt deposited on the roads.
6. Pave the entrance roadways to the construction site.
7. Place sandbags adjacent to roadways to prevent run-off to public roadways.
8. Employ dust sweeping vehicles at least twice a day to sweep public roadways that are used by construction and worker vehicles.
9. Sweep newly paved roads at least twice weekly.
10. Replace ground cover in disturbed areas as quickly as possible.
11. Cover all trucks hauling dirt, sand, soil or other loose materials and maintain a minimum of six inches of freeboard between the top of the load and the top of the trailer.
12. Limit equipment idle times to no more than 15 minutes.
13. Employ electric motors for construction equipment when feasible.
14. Apply covers or dust suppressants to soil storage piles and disturbed areas that remain inactive for over two weeks.
15. Pre-wet the soil to be excavated during construction.

V FACILITY EMISSIONS

Construction Emissions

The primary emission sources during the construction phase include fugitive dust from disturbed areas due to grading, excavating, and construction at the site and heavy equipment emissions. A particulate matter emission factor of 0.11 ton of PM_{10} per acre per month was used to estimate fugitive dust emissions (MRI, 1996). The construction schedule calls for approximately the following maximum amounts of acreage to be disturbed during various construction phases (these are not cumulative acres):

Months 1-2: 73.7 acres
Months 3-5: 35.9 acres
Months 6-20: 38.0 acres
Months 21-24: 2.6 acres

The sites and related preparations include: construction trailer and parking lot, construction laydown area, power block area, switchyard, plant access road, transmission line, water supply pipeline, and Teresa Creek bridge.

Based on the 24-month construction schedule, the worst-case monthly emissions would occur during the

first and second months of construction when 73.7 acres of land are disturbed. This would result in uncontrolled emissions of approximately 8.11 tons of PM_{10} per month. Assuming 90 percent control efficiency from the fugitive dust suppression program outlined above to mitigate construction related emissions, the controlled worst-case construction dust emissions are estimated to be 7.4 lb/hour, 74 lb/day, 0.81 tons/month and approximately 5.7 tons/year, based on the average disturbed land acreage listed above for Months 1 through 12.

Estimated Controlled Emissions from Site Preparation			
Scenario	**Time period**	**Units**	**PM_{10}**
Worst case months 1-12	Annual	Tons	5.7
Worst case month 1	Monthly	Tons	0.81
Worst case 24 hours	Daily	Pounds	74.0
Worst case 1 hour	Hourly	Pounds	7.4

Another source of PM_{10} dust emissions from the project construction phase includes earth moving with heavy equipment. Controlled PM_{10} emissions of fugitive dust from this activity come from the several pieces of equipment listed in the table below. A second source of emissions during construction is equipment exhaust. Emissions from equipment would occur over a 24-month construction period.

	Controlled Fugitive Dust as PM_{10} Emissions from Earth Moving					
Construction Equipment	**Source**	**Lbs/Month 1**		**Lbs/Month 2**	**Lbs/Month 3**	
Excavator Loader	Loading trucks	420.9		210.4	210.4	
Excavator Backhoe	Unloading trucks	22.8		11.4	11.4	
Dozer Tractor Crawler	Unpaved roads	766.9		383.5	383.5	
Front End Loader	Bulldozing	224.6		224.6	224.6	
Trenching Machine	TOTAL	1,435.2		829.9	829.9	
Excavator Motor Grader						
Vibrating Plate Compactor	**Estimated Emissions From Construction Equipment Exhaust**					
Roller Vibrator	Worst Case	NOx	CO	VOCs	SOx	PM_{10}
Water Truck	Lbs/Hour	33	19.7	5.8	0.03	2.2
Concrete Mixer	Lbs/Month	6,589.70	3,941.50	1,166.4	6.2	447.6
Concrete Pump, trailer mount	Lbs/Year	66,110.50	39,157.60	11,661.20	61.1	4,624.1
Mortar Mixer	Worst-case hourly emissions estimated by dividing worst-case monthly by 200 hours (20 days of 10 hours)					
Paving Machine	Worst-case annual emissions were estimated by summing emissions for each 12-month period					
Dump Truck						
Cranes (6-500 tons)	**Estimated Peak PM_{10} Emissions During Construction**					
Manlift, telescoping	Worst Case Scenario	Fugitive Dust		Exhaust	Total PM_{10}	
Welder (250 amp)	Lbs/Hour	15.3		1.6	16.9	
AirCompressors(185-750cfm)	Lbs/Day	152.83		16.38	169.2	
Generator (6 kW)	Lbs/Month	3,056.60		327.6	3,384.20	
Forklifts (2-4 tons)	Lbs/Year	14,532		4,624	19,156	
Fuel/Lube Truck	Exhaust PM_{10} peak month does not occur in same month as Fugitive Dust Emissions peak month.					
Pickup Truck (1/2-ton)	Total emissions were based on projected daily hours of equipment operation in a given month.					
Stakebed Truck						
Hydraulic Boom Truck						
Concrete Trowel						
Concrete Floor Saw						
Bobcat Skip Loader						
Hydrotest Pump						

Operational Emissions

Operational equipment emissions covered are from the two turbines, under various operating conditions, the auxiliary boiler, emergency generator engine and firewater pump engine. A description of the various turbine operational scenarios and emissions are included in the following tables.

Gas Turbines

Emissions from the two turbines were estimated for all applicable scenarios using base emission rates and startup/shutdown emissions. The base criteria pollutant emission rates provided by the turbine vendor and the engineer for three load conditions (50 , 75 , and 100 percent) and three ambient temperatures (18ºF, 59ºF, and 114ºF).

Estimated Emission Rates for Gas Turbines and SCR with Ammonia Injection Normal Operation (pounds/hour - two turbines)				
		Ambient Temperature		
Load	**Pollutant**	**18ºF**	**59ºF**	**114ºF**
100%	VOCs	6.8	6.2	6.0
	Ammonia Slip	28.4	26.2	25.0
	CO	28.0	26.0	24.6
	NO_X	30.6	28.4	27.0
	SO_2	2.4	2.2	2.2
	PM_{10}	25.8	25.6	25.6
75%	VOCs	5.4	5.0	5.0
	Ammonia Slip	22.8	21.2	20.4
	CO	22.6	21.0	20.0
	NO_X	24.6	23.0	22.0
	SO_2	2.0	1.8	1.8
	PM_{10}	25.4	25.4	25.2
50%	VOCs	4.4	4.2	4.2
	Ammonia Slip	18.0	16.8	15.8
	CO	17.8	16.6	15.6
	NO_X	19.4	18.2	17.2
	SO_2	1.6	1.4	1.4
	PM_{10}	25.2	25.0	25.0
100% with Duct Burners	VOCs	14.4	13.6	13.2
	Ammonia Slip	38.4	36.4	35.2
	CO	37.8	35.8	34.8
	NO_X	41.4	39.2	38.0
	SO_2	3.2	3.0	3.0
	PM_{10}	40	39.8	40.2

Startup and shutdown events typically have higher emission rates than normal operating conditions.

Estimated Emission Rates for One Gas Turbines During Startup and Shutdown								
	Cold Startup		**Warm Startup**		**Hot Startup**		**Shutdown**	
	270 Minutes		**180 Minutes**		**90 Minutes**		**30 Minutes**	
Pollutant	**Max lb/hour**	**Total lb/270 min**	**Max lb/hour**	**Total lb/180 min**	**Max lb/hour**	**Total lb/90 min**	**Max lb/hour**	**Total lb/30 min**
NO_X	333.3	779.10	152.00	456.20	249.90	259.90	115.00	115.00
CO	373.60	1355.60	370.30	790.50	429.60	679.60	483.50	483.50

VOCs	27.7	106.70	27.7	47.40	27.7	38.00	23.9	23.90
SO_2	0.40	1.01	0.40	0.58	0.40	0.33	0.20	0.20
PM_{10}	12.00	48.80	12.00	30.80	12.00	12.80	6.00	6.00

The number of startups was estimated for each quarter. To calculate quarterly emissions, emissions from these startups were added to operational emissions, assuming 100 percent load and 59ºF for the specified number of hours per quarter and duct burner operation at 59°F for the specified number of hours. The analysis is conservative because no credit was taken for downtime associated with each shutdown.

Estimated Quarterly and Annual Emissions for Two Turbines					
Pollutant	**1st Quarter Emissions (tons)***	**2nd Quarter Emissions (tons)***	**3rd Quarter Emissions (tons)***	**4th Quarter Emissions (tons)***	**Annual Emissions (tons)***
NO_X	45.1	43.1	50.9	43.8	182.9
CO	53.4	51.6	106.3	53.1	264.4
VOCs	12.3	11.6	11.8	11.7	47.4
PM_{10}	35.1	35.2	35.4	35.5	141.2
SO_2	3	2.8	2.6	2.8	11.2

Worst-case short-term emissions from the turbines were calculated for use in the air quality modeling. For worst 1-hour emissions, the worst-case startup condition was used. Based on the startup information, NO_X, CO, and VOC emissions during a cold startup are the worst-case condition. PM_{10} and SO_X emissions are maximized at peak fuel usage. The maximum amount of fuel is used when the turbines and duct burners are running 100 percent and the ambient temperature is 18°F.

The 24-hour NO_X, CO, and VOC emission rates were calculated assuming one cold start, one shutdown, and the balance (19 hours) operating at the worst-case operating condition (turbine and duct burners are running 100 percent and the ambient temperature is 18°F). PM_{10} and SO_X worst-case 24-hour emission rates were calculated assuming the turbine and duct burners are running at 100 percent for 24 hours and the ambient temperature is 18°F for SO_X and 114°F for PM_{10}.

Estimated Worst-Case Short-Term Emission (per turbine excluding commissioning)	
1-Hour Emissions (lb/hour)	
NO_X	333.30
CO	483.50
VOCs	27.7
PM_{10}	20.1
SO_2	1.60
24-Hour Emissions (lb/day)	
NO_X	1,497.30
CO	3,829.50
VOCs	315.30
PM_{10}	482.4
SO_2	38.4

The gas turbine commissioning period has a unique emissions profile because the air pollution control equipment is not fully functional. The gas turbine commissioning periods begin when the turbines first burn natural gas. Every effort will be made to minimize CO, VOC, and NO_x emissions during the commissioning period. Cold, pre-operational equipment checks will be required. However, these checks will not require the equipment to be running or emitting air pollutants. The applicant proposes a commissioning period of approximately 6 months during which all installed equipment will be run and tested. Applicant requests 500 hours maximum of partially abated emissions for each gas turbine train.

Once installed, the oxidation catalyst in each train will abate CO and VOC emissions from the gas turbine and the duct burners because it is essentially a passive device. While the SCR catalyst can in some cases be installed prior to initial startup of the combustion turbines, it may not be installed until later in the commissioning period, after completion of steam blows, which could deposit debris and otherwise damage the catalyst.

The SCR catalyst may not be installed at the same time as the oxidation catalyst. NO_x emissions from the gas turbines and the duct burners may be only partially abated during times that the gas turbine burners are being tuned and the SCR system is being tested. Regardless of the fact that the oxidation catalyst and SCR may not be installed until late in the commissioning process, the inherent low emissions of NO_x, CO, and VOCs associated with the DLN combustors will ensure that the impacts of these emissions are minimized.

The commissioning period will be divided into four phases:

1. Gas combustion turbine 1 (CT#1) duct burner (DB#1);
2. Gas combustion turbine 2 (CT#2) duct burner (DB#2);
3. Commissioning of both HRSGs and the steam turbine; and
4. Performance and reliability testing of the entire plant together

Commissioning emission estimates were conservatively estimated as worst case by assuming that the control efficiency of the applicable abatement systems is essentially zero during significant portions of the commissioning phase. The CEMS will also undergo commissioning at this time. Once the CEMS is commissioned, it will record emissions of NO_x and CO. Emissions of SO_2 and PM_{10} may be quantified by using emission factors based on fuel flow. Peak emission rates of CO and NO_x will only occur from one gas turbine at a time. Where applicable, emission offsets are proposed as mitigation of the emissions.

Commissioning Emissions	**Unit**	**Load**	**Time (hrs)**	**SO_X (lb/hr)**	**NO_X (lb/hr)**	**CO (lb/hr)**	**VOC (lb/hr)**	**PM_{10} (lb/hr)**
Phase Tests								
First fire	CT # 1	10.0%	4.0	0.3	146.0	250.0	24.2	12.0
	CT # 2	10.0%	4.0	0.3	146.0	250.0	24.2	12.0
Green rotor run-in	CT # 1	25.0%	12.0	0.4	217.3	1,287.3	47.1	12.0
	CT # 2	25.0%	12.0	0.4	217.3	1,287.3	47.1	12.0
Steam blows	CT # 1	25.0%	168.0	0.4	217.3	1,287.3	47.1	12.0
	CT # 2	25.0%	168.0	0.4	217.3	1,287.3	47.1	12.0
Restoration	CT # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	CT # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Turbine roll/ overspeed	CT # 1	10.0%	16.0	0.3	146.0	250.0	24.2	12.0
	CT # 2	10.0%	16.0	0.3	146.0	250.0	24.2	12.0
Part load DLN tuning	CT # 1	50.0%	12.0	0.6	475.0	808.0	8.2	12.0
	CT # 1	100.0%	18.0	0.9	58.0	29.0	2.8	12.0
	CT # 2	50.0%	12.0	0.6	475.0	808.0	8.2	12.0
	CT # 2	100.0%	18.0	0.9	58.0	29.0	2.8	12.0
Outage/ Water Wash	CT # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Commissioning Emissions Phase Tests	Unit	Load	Time (hrs)	SO_X (lb/hr)	NO_X (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM_{10} (lb/hr)
	CT # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fine DLN tuning/ Finalize control constants	CT # 1	50.0%	40.0	0.6	475.0	808.0	8.2	12.0
	CT # 1	75.0%	24.0	0.7	58.0	29.0	2.8	12.0
	CT # 1	100.0%	96.0	0.9	58.0	29.0	2.8	12.0
	CT # 2	50.0%	40.0	0.6	475.0	808.0	8.2	12.0
	CT # 2	75.0%	24.0	0.7	58.0	29.0	2.8	12.0
	CT # 2	100.0%	96.0	0.9	58.0	29.0	2.8	12.0
Duct burners and safety valves	CT # 1	100.0%	144.0	0.9	58.0	29.0	2.8	12.0
	CT # 2	100.0%	144.0	0.9	58.0	29.0	2.8	12.0
	DB # 1	50.0%	24.0	0.2	23.9	23.9	3.0	3.0
	DB # 1	100.0%	96.0	0.3	47.9	47.9	6.0	6.0
	DB # 2	50.0%	24.0	0.2	23.9	23.9	3.0	3.0
	DB # 2	100.0%	96.0	0.3	47.9	47.9	6.0	6.0
Outage (strainers/ catalyst, etc.)	CT # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	CT # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	DB # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	DB # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CEMS drift and Source testing	CT # 1	100.0%	64.0	0.9	12.8	11.6	2.0	12.0
	CT # 2	100.0%	64.0	0.9	12.8	11.6	2.0	12.0
	DB # 1	100.0%	64.0	0.3	10.5	19.2	4.2	6.0
	DB # 2	100.0%	64.0	0.3	10.5	19.2	4.2	6.0
Functional tests	CT # 1	100.0%	96.0	0.9	12.8	11.6	2.0	12.0
	CT # 2	100.0%	96.0	0.9	12.8	11.6	2.0	12.0
	DB # 1	100.0%	96.0	0.3	10.5	19.2	4.2	6.0
	DB # 2	100.0%	96.0	0.3	10.5	19.2	4.2	6.0
Outage/ Water Wash	CT # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	CT # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	DB # 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	DB # 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Performance test	CT # 1	100.0%	24.0	0.9	12.8	11.6	2.0	12.0
	CT # 2	100.0%	24.0	0.9	12.8	11.6	2.0	12.0
	DB # 1	100.0%	24.0	0.3	10.5	19.2	4.2	6.0
	DB # 2	100.0%	24.0	0.3	10.5	19.2	4.2	6.0
Continuous operation test	CT # 1	100.0%	192.0	0.9	12.8	11.6	2.0	12.0

Commissioning Emissions Phase Tests	Unit	Load	Time (hrs)	SO_X (lb/hr)	NO_X (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM_{10} (lb/hr)
	CT # 2	100.0%	192.0	0.9	12.8	11.6	2.0	12.0
	DB # 1	100.0%	192.0	0.3	10.5	19.2	4.2	6.0
	DB # 2	100.0%	192.0	0.3	10.5	19.2	4.2	6.0

Totals for CGS Commissioning	Oxides of Sulfur	Oxides of Nitrogen	Carbon Monoxide	Volatile Organics	Particulate PM_{10}
Pounds lbs/hour*time	1,679.0	194,021.2	607,266.1	26,273.3	27,633.6
Tons	0.8	97.0	303.6	13.1	13.8
Tons/CT & DB	0.4	48.5	152	6.57	7

Auxiliary Boiler

Auxiliary boiler emissions are based on 3,744 hours of operation per year. A summary of auxiliary boiler emissions is presented in table below.

Auxiliary Boiler Emissions			
Pollutant	AP42Emission Factors (lb/MMBtu)	Emissions	
		lb/hr	ton/yr
NO_X	0.049	2.16	4.04
CO	0.082	3.61	6.75
PM_{10}	0.0075	0.33	0.62
SO_2	0.0006	0.03	0.05
VOC	0.0054	0.24	0.44

Emergency Generator Engine

The project will include one 1,340 brake hp diesel fired engine to power an emergency, backup electrical generator. The applicant proposes a USEPA Tier 2 and CARB-Certified candidate engine for this application. Annual emissions from the engine included in the table are based on a maximum non-emergency use rate of 50 hours of operation per year. SO_2 emissions were estimated using ultra-low sulfur diesel fuel containing 15ppm sulfur. The manufacturer estimated emissions for NO_X, CO, PM_{10}, and VOCs.

Non-Emergency Emissions	Generator
Estimated brake horsepower	1,340
	Hourly Emissions (pounds)
NO_X	13.88
CO	0.32
VOCs	0.15
PM_{10}	0.09

SO_2	0.01
Annual Emissions (tons)	
NO_X	0.347
CO	0.008
VOCs	0.004
PM_{10}	0.002
SO_2	0.0003

Firewater Pump Engine

One 300 brake hp diesel engine will be purchased to power a firewater pump. The applicant also proposes a USEPA Tier 2 and CARB-Certified candidate engine for this application. SO_2 emissions were estimated using ultra-low sulfur diesel fuel containing 15 ppm sulfur. Emissions were estimated based on hourly emission rates provided by the manufacturer for NO_X, CO, PM_{10}, and VOCs. Annual emissions from these engines included in the table are based on a maximum non-emergency use rate of 50 hours of operation per year.

Non-Emergency Emissions	**Firewater Pump**
Estimated brake horsepower	300
Hourly Emissions (pounds)	
NO_X	2.82
CO	0.22
VOCs	Included in NOx
PM_{10}	0.08
SO_2	<0.01
Annual Emissions (tons)	
NO_X	0.071
CO	0.006
VOCs	Included in NOx
PM_{10}	0.002
SO_2	0.0003

Combined Emissions

Total combined annual emissions are shown below. The table includes emissions from two gas turbines, duct burners, auxiliary boiler, and emergency generator and emergency firewater pump engines.

Quarterly and Annual Estimated Combustion Emissions from CGS Facility					
Pollutant	**1st Quarter Emissions (tons)**	**2nd Quarter Emissions (tons)**	**3rd Quarter Emissions (tons)**	**4th Quarter Emissions (tons)**	**Annual Emissions (tons)**
NO_X	45.77	43.77	51.57	44.47	185.58
CO	55.35	53.55	108.25	55.05	272.20
VOCs	12.51	11.81	12.01	11.91	48.24
PM_{10}	35.36	35.46	35.66	35.76	142.24
SO_2	3.03	2.83	2.63	2.83	11.32

Toxic Air Contaminant Emissions

Facility operations at the proposed Colusa Generating Station were evaluated to determine whether toxic substances would be used or generated that may cause adverse health effects if released to the air. The primary sources of potential emissions from facility operations are the natural gas fired CTGs and the aqueous ammonia used in the SCR control system located in the HRSGs. Natural gas combustion in the auxiliary boiler is also a source of potential emissions. The diesel fuel combusted in the two emergency engines (i.e., generator and fire pump) produces air toxic contaminants. Ammonia emissions associated with potential ammonia slip from the SCR system were also included as well as all air toxics associated with the auxiliary boiler, diesel generator, and the diesel firewater pump.

Gas Turbines

Conservative assumptions were made for estimating air toxic emissions. These assumptions may not be consistent in all cases with the assumptions made for estimating emissions of criteria pollutants. However, they result in higher estimated emissions than the assumptions used in the air quality section. Worst-case estimates of annual turbine emissions were made by assuming that both turbines would operate simultaneously under full load conditions (100 percent load at 59°F annual average) for 8,760 hours per year with full duct burner firing. The exit temperature and velocity for each turbine stack used in the model represented the 100 percent load, with duct firing, at 59°F ambient temperature operating mode. Ammonia slip emissions were estimated to be 5 ppmvd at 15% oxygen. For maximum hourly emissions, the maximum natural gas consumption rate of about 2,452 MMBtu (higher heating value) per hour per combustion turbine including duct burners was used represented the 100 percent load, with duct firing, at 59°F ambient temperature operating mode. Estimated emissions shown below:

Emissions from CTG/HRSG with SCR and Oxidation Catalyst

Chemical Species	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Maximum Hourly Emissions per CTG (lb/hour)	Annual Emissions Per CTG (lb/year)
Ammonia	5 ppm[c]	5 ppm[c]	18.2	1.59E+05
1,3-Butadiene	1.24E-07	1.27E-04	3.04E-04	2.66E+00
Acetaldehyde	1.34E-04	1.37E-01	3.28E-01	2.87E+03
Acrolein	1.85E-05	1.89E-02	4.53E-02	3.96E+02
Benzene	1.30E-05	1.33E-02	3.18E-02	2.79E+02
Ethylbenzene	1.75E-05	1.79E-02	4.29E-02	3.75E+02
Formaldehyde	8.96E-04	9.17E-01	2.20E+00	1.92E+04
Hexane	2.53E-04	2.59E-01	6.20E-01	5.43E+03
Propylene	7.53E-04	7.71E-01	1.85E+00	1.62E+04
Propylene oxide	4.67E-05	4.78E-02	1.14E-01	1.00E+03
Toluene	6.93E-05	7.10E-02	1.70E-01	1.49E+03
Xylenes	2.55E-05	2.61E-02	6.25E-02	5.47E+02
Polycyclic Aromatic Hydrocarbons				
Benzo(a)anthracene	2.21E-08	2.26E-05	5.41E-05	4.74E-01
Benzo(a)pyrene	1.36E-08	1.39E-05	3.98E-05	1.32E-01
Benzo(b)fluoranthene	1.10E-08	1.13E-05	2.71E-05	2.37E-01
Benzo(k)fluoranthene	1.07E-08	1.10E-05	2.63E-05	2.31E-01
Chrysene	2.46E-08	2.52E-05	6.03E-05	5.29E-01
Dibenz(a,h)anthracene	2.29E-08	2.35E-05	5.63E-05	4.93E-01
Indeno(1,2,3-cd)pyrene	2.29E-08	2.35E-05	5.63E-05	4.93E-01
Naphthalene	1.62E-06	1.66E-03	3.97E-03	3.48E+01

Auxiliary Boiler

Emission factors for the natural gas fired auxiliary boiler were obtained from the CATEF Database (CARB 2001). Annual emissions were calculated based on 2,400 hours per year. Emission factors and estimated maximum hourly and annual auxiliary boiler emissions are summarized in the following table.

Emissions from Auxiliary Boiler				
Chemical Species	**Emission Factor (lb/MMBtu)**	**Emission Factor[1] (lb/MMcf)**	**Maximum Hourly Emissions (lb/hour)**	**Annual Emissions[2] (lb/year)**
Acetaldehyde	8.66E-06	8.87E-03	3.81E-04	9.15E-01
Benzene	4.21E-06	4.31E-03	1.85E-04	4.44E-01
Formaldehyde	2.16E-04	2.21E-01	9.50E-03	2.28E+01

Emergency Generator Engine

Toxic emissions from the diesel generator engine were estimated using the PM_{10} emissions as a surrogate for the toxic compound, diesel exhaust. Emergency diesel generator emissions were estimated assuming it would run at its full rated capacity (1,340 hp) for 1 hour per week for emergency preparedness. Emissions are summarized in the table.

Emissions from Emergency Generator				
Source	**Chemical Species**	**Emission Factor (grams/hp-hour) [1]**	**Maximum Hourly Emissions (lb/hour)**	**Annual Emissions[2] (lb/year)**
Emergency Generator	Diesel particulate (PM_{10})	0.13	3.84E-01	1.92E+01

Firewater Pump Engine

Toxic emissions from the diesel firewater pump engine were estimated using the PM_{10} emissions as a surrogate for the toxic compound, diesel exhaust. Emergency diesel firewater pump emissions were estimated assuming it would run at its full rated capacity (300 hp) for 1 hour per week for emergency preparedness. Emissions are summarized in the table.

Emissions from Emergency Firewater Pump				
Source	**Chemical Species**	**Emission Factor (grams/hp-hour) [1]**	**Maximum Hourly Emissions (lb/hour)**	**Annual Emissions[2] (lb/year)**
Emergency Firewater Pump	Diesel particulate (PM_{10})	0.13	4.58E-02	2.29E+00

The air toxic emissions presented in the above tables were used in estimating the potential public health risks due to operation of the proposed equipment and the results of the Health Risk Assessment (HRA). Significant impacts are defined as a maximum incremental cancer risk greater than ten in one million population, a chronic Threshold Hazard Index (THI) over one, or an acute THI over one.

VI AIR QUALITY CONCENTRATIONS

The US Environmental Protection Agency (EPA), in response to the federal Clean Air Act of 1970, established federal Ambient Air Quality Standards (AAQS) in Title 40 Code of Federal Regulations (CFR) Part 50. The federal AAQS include both primary and secondary standards for six "criteria" pollutants. These criteria pollutants are ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ten micron particulate (PM_{10}), and lead. Primary standards were established to protect human health, and secondary standards were designed to protect property and natural ecosystems from the effects of air pollution.

The 1990 Clean Air Act Amendments established attainment deadlines for all designated areas that were not in attainment with the federal AAQS. In addition to the federal EPA AAQS described above, a new federal standard for $PM_{2.5}$ and a revised ozone standard were promulgated in July 1997. In a court case filed in1998 these new AAQS issues were resolved and the 1-hour ozone standard was revoked in 2005 while the revised $PM_{2.5}$ standard was made effective in 2006. The State of California Air Resources Board (ARB) has adopted AAQS that are in some cases more stringent than the federal AAQS. The state and federal AAQS relevant to the CGS are summarized in the table.

Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	California AAQS[a,b]	Federal AAQS[b,c]	
			Primary	Secondary
Ozone	1-hour	0.09 ppm (180 μg/m^3)	0.12 ppm (235 μg/m^3)	Same as primary standard
	8-hour[d]	0.07 ppm (137 μg/m^3)	0.08 ppm (157 μg/m^3)	
Carbon Monoxide (CO)	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	NA
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	
Nitrogen Dioxide (NO_2)[e]	Annual (Arithmetic Mean)	NA	0.053 ppm (100 μg/m^3)	Same as primary standard
	1-hour	0.25 ppm (470 μg/m^3)	NA	
Sulfur Dioxide (SO_2)	Annual (Arithmetic Mean)	NA	0.03 ppm (80 μg/m^3)	NA
	24-hour	0.04 ppm[f] (105 μg/m^3)	0.14 ppm (365 μg/m^3)	NA
	3-hour	NA	NA	0.05 ppm (1,300 μg/m^3)
	1-hour	0.25 ppm (655 μg/m^3)	NA	NA
Respirable Particulate Matter (PM_{10})	Annual (Geometric Mean)	20 μg/m^3 [h]	NA [g]	Same as primary standard
	24-hour	50 μg/m^3	150 μg/m^3	
	Annual (Arithmetic Mean)	NA	NA	
Fine Particulate Matter ($PM_{2.5}$)[d]	24-hour	NA	35 μg/m^3 [g]	Same as primary standard
	Annual (Arithmetic Mean)	12 μg/m^3 [g]	15 μg/m^3	
Visibility Reducing Particles	1 observation	See footnote h.	No federal standard	No federal standard

Notes:

[a] Title 17, California Code of Regulations, California AAQS for ozone (as VOCs), CO, SO_2 (1-hour), NO_2, and (PM_{10} are values that are not to be exceeded. The visibility standard is not to be equaled or exceeded.

[b] 40 CFR 50. National AAQS, other than those for ozone and based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1.

[c] Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality area to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

Federal and California Ambient Air Quality Standards
[d] USEPA promulgated new federal 8-hour ozone and $PM_{2.5}$ standards on July 18, 1997. The federal 1-hour ozone standard continues to apply in areas that violated the standard. [e] NO_2 is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all NO_X. [f] At locations where the state standards for ozone and/or PM_{10} are violated. National standards apply elsewhere. [g] The federal (PM_{10} standard was revoked on September 22, 2006. The $PM_{2.5}$ standard was modified on September 22, 2006. The California PM_{10} standard was modified and a new $PM_{2.5}$ standard promulgated on July 5, 2003. [h] Insufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70 percent. "Prevailing visibility" is defined as the greatest visibility, which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors. NA = not applicable mg/m^3 = milligram(s) per cubic meter $\mu g/m^3$ = microgram(s) per cubic meter ppm = part(s) per million

The EPA, ARB, and the local air pollution control districts determine air quality attainment status by comparing local ambient air quality measurements from the state or local ambient air monitoring stations with the federal and California AAQS. Those areas that meet AAQS are classified as "attainment" areas; areas that do not meet the standards are classified as "nonattainment" areas. Areas that have insufficient air quality data may be identified as unclassifiable areas. These attainment designations are determined on a pollutant-by-pollutant basis. The Colusa County Air Pollution Control District is designated a state nonattainment area for PM_{10} and ozone based on air quality monitoring data showing exceedances of the State standards. The table below presents the status (both federal and State) for Colusa County.

Federal and State Air Quality Status for Colusa County*		
Pollutant	**Federal Attainment Status**	**State Attainment Status**
Ozone	Unclassifiable/Attainment	Nonattainment/Transitional**
CO	Unclassifiable/Attainment	Unclassified*
NO_2	Unclassifiable/Attainment	Attainment
SO_2	Unclassifiable	Attainment
PM_{10}	Unclassifiable	Nonattainment
$PM_{2.5}$	Unclassifiable/Attainment	Unclassified*
Notes: * Attainment status obtained from 40 CFR 81. ** Proposed designations for 2006.		

California Designations:

Unclassified: a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or non-attainment.

Attainment: a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a three year period.

Non-attainment: a pollutant is designated non-attainment if there was at least one violation of a State standard for that pollutant in the area.

Non-attainment/Transitional: is a subcategory of the non-attainment designation. An area is designated non-attainment/transitional to signify that the area is close to attaining the standard for that pollutant.

Federal EPA Designations:

Non-attainment: any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Attainment: any area (other than an area identified in clause (i)) that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable: any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Background Ambient Air Quality Data Used in Modeling Analyses				
Pollutant	**Site**	**Year**	**Averaging Time**	**Concentration**
Nitrogen Dioxide	Yuba City – Almond Street Station	2003	Annual average	0.014 ppm
Nitrogen Dioxide	Yuba City – Almond Street Station	2004-2005 average	Max 1 hour average	0.064 ppm
Sulfur Dioxide	Sacramento – Del Paso Manor Station	2003	Annual average	0.001 ppm
Sulfur Dioxide	Sacramento – Del Paso Manor Station	2003	Max 24 hour average	0.003 ppm
Carbon Monoxide	Yuba City – Almond Street Station	2005	Max 8 hour average	3.39 ppm
Carbon Monoxide	Yuba City – Almond Street Station	2004	Max 1 hour average	5.8 ppm
Particulate $Matter_{10}$	Colusa – Sunrise Boulevard Station	2005	Annual Arithmetic Mean	25.5 $\mu g/m^3$
Particulate $Matter_{10}$	Colusa – Sunrise Boulevard Station	2005	Max 24 hour average	92 $\mu g/m^3$
Particulate $Matter_{2.5}$	Colusa – Sunrise Boulevard Station	2005	3-Year Maximum Annual Arithmetic Mean	11 $\mu g/m^3$
Particulate $Matter_{2.5}$	Colusa – Sunrise Boulevard Station	2005	3-yr Ave. 98th Percentile, Max 24 hour average	26 $\mu g/m^3$

Air Dispersion Modeling

The purpose of the air dispersion modeling analysis is to demonstrate that air emissions from the CGS will not cause or contribute to exceeding any State or federal AAQS and will not negatively impact visibility in Class I areas, and to evaluate impacts relative to applicable the Prevention of Significant Deterioration (PSD) increments. The modeling addresses emissions from construction activities and routine plant operations. The impacts from construction activities include fugitive dust and emissions associated with combustion byproducts from diesel and gasoline fueled equipment. The impacts from routine plant operations are associated with combustion byproducts from the turbines, duct burners, auxiliary boiler, and the two emergency diesel engines. Separate modeling analyses were performed for the construction and the plant operation sources because they will occur during different time periods and have different emission rates. The modeling approach for assessing the CGS impacts is discussed below.

The modeling was conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) (USEPA 2004). For this analysis, AERMOD was selected, because it is consistent with the most recent USEPA policy and the data needed to support its application are available in Colusa County. AERMOD was run with the following additional options: Final plume rise at all receptors, Stack-tip downwash, Buoyancy-induced dispersion, Calms processing, Default wind profile exponents, Default vertical potential temperature gradients, and Rural dispersion coefficients. The

effect of building wakes (i.e., downwash) on the stack plumes was evaluated for the routine plant operating emissions (downwash is not applicable to area sources, i.e., construction activities) in accordance with USEPA guidance (USEPA 1985).

Meteorological data suitable for input to AERMOD were obtained from a meteorological observation station, outside the town of Maxwell (population about 1,300), located approximately 8 miles south of the CGS project site. The 5 years of meteorological data to be used in this modeling analysis include data from 2001 through 2005. Supplemental cloud cover data from Red Bluff were also used.
AERMOD used the following receptor spacing:

25-meter spacing along the property line and extending from the property line out to 100 meters
100-meter spacing within 1 km of project sources for any locations not covered by the 25-meter grid
500-meter spacing within 1 to 5 km of project sources
1,000-meter spacing within 5 to 10 km of project sources

If maximum concentrations are predicted where the grid spacing is less dense than 25 meter, a 25-meter spaced nested grid of receptors was placed surrounding the receptor where the maximum concentration was predicted. This nested grid extended out 500 m in all directions or until the next regular grid receptors was encountered. The receptor locations were designated using Universal Transverse Mercator (UTM) coordinates. Receptor elevations were obtained from U.S. Geological Survey 7.5-minute electronic data.

The modeling for the CGS required the determination of worst-case emissions scenarios for the following averaging periods and pollutants to demonstrate compliance with AAQS:
1-hour for CO, NO2, and SO2
3-hour for SO2
8-hour for CO
24-hour for PM10, PM2.5 and SO2
Annual for PM10, PM2.5, NO2, and SO2

Site Construction Modeling

For construction activities at the project site, it was assumed that the equipment exhaust emissions would be emitted from two volume sources within the construction zone. PM_{10} emissions from fugitive dust were modeled using two area sources. The area sources were placed to include the construction, laydown, and contractor parking areas. The worst-case hourly and annual emission rates were used to model short-term and annual emissions, respectively. Fugitive dust emissions were included for both annual and 24-hour PM_{10} impacts. The modeling parameters are shown below:

Construction Emissions Release Parameters for the Proposed Project			
	Stack Characteristics (for the Construction Zone)		
Equipment Exhaust Emissions Source	**Release Height (m)**	**Horizontal Dimension (m)**	**Vertical Dimension (m)**
Volume 1	10	58.14	2.326
Volume 2	10	37.21	2.326
Fugitive Dust Areas	**Release Height (m)**	**East-West Distance (m)**	**North-South Distance (m)**
Fugitive Dust Area 1	3	240	240
Fugitive Dust Area 1	3	150	150

The modeling results are presented in the following table ????

Turbine Impact Screening Modeling

Screening modeling was performed to determine which turbine operating modes (i.e., load level, duct burner firing, ambient temperature) produced "worst-case" impacts for each pollutant and averaging time.

The model simulated natural gas combustion emissions from two 19-foot-diameter 175-foot-tall stacks. The stacks were modeled as point sources at their proposed locations. The stack parameters for each of the 12 operating modes are shown in the table as well as the AERMOD modeling results.

Turbine Impact Screening Results												
	Winter Minimum (18ºF)				**Yearly Average (59ºF)**				**Summer Maximum (114ºF)**			
CTG Load	**100%**	**100%**	**75%**	**50%**	**100%**	**100%**	**75%**	**50%**	**100%**	**100%**	**75%**	**50%**
Duct Burner Status	On	Off	Off	Off	On	Off	Off	Off	On	Off	Off	Off
Stack Velocity (ft/sec)	68.6	71	55.1	44.3	63.7	66	52.3	42.8	63.1	63.7	51.5	42
Stack Temperature (ºF)	162	193	181	175	161	193	181	175	186	202	188	167
AERMOD Results (μg/m^3/grams per second)												
1-hour	14.54	12.46	15.29	22.37	15.38	12.69	16.62	23.24	13.61	12.65	15.85	**25.21**
3-hour	7.92	5.87	8.48	10.22	8.58	6.37	8.88	10.52	7.10	6.21	8.63	**11.37**
8-hour	4.70	4.46	5.26	7.63	5.29	4.58	5.70	7.98	4.67	4.55	5.44	**8.80**
24-hour	1.55	1.43	1.76	2.43	1.69	1.46	1.84	2.54	1.51	1.46	1.81	**2.80**
Annual	0.22	0.17	0.25	0.33	0.25	0.19	0.26	0.34	0.21	0.18	0.25	**0.37**
Bolded screening result represent maximum.												

Refined modeling was performed to identify off-site, criteria pollutant impacts from operational emissions of the proposed project. The modeling was performed as previously described. However, in addition to the turbine/HRSG, the generator and fire pump engines and auxiliary boiler were also included in the refined modeling analysis.

Based on the screening results, stack parameters from the 50 percent load, with no duct firing, at 114°F ambient temperature simulate worst-case 1-hour dispersion. These parameters were used in the modeling to provide a conservative value for the pollutant dispersion. Pollutant emission rates for warm startups and cold startups were applied to these dispersion impacts to represent worst-case, short-term impacts of CO (1-hour) and NO_2 (1-hour), respectively. The SO_2 1-hour impact was estimated using the actual emission rate and stack parameters for the 100 percent load, with duct firing, at 18°F ambient temperature operating mode. Annual average impacts were estimated using the stack parameters for the 100 percent load, with duct firing, at 59F ambient temperature operating mode. Annual emission rates for NO_2, $PM_{10,}$ and SO_2, were used in the analysis. PM_{10} 24-hour impacts were based on the actual emission rate and stack parameters for the 100 percent load, with duct firing, at 114°F ambient temperature operating mode. Short-term, worst-case emission rates are summarized in the table below.

Proposed Colusa Generating Station Project AERMOD Modeling Results (μg/m^3)								
Pollutant	**Averaging Period**	**Max Modeled Impact**	**PSDLevel[a] Significant Impact**	**Background[b] Concentration**	**Total Predicted Concentration**	**AAQS**	**UTM Coordinates**	
							East (m)	**North (m)**
Construction Impacts								

Proposed Colusa Generating Station Project AERMOD Modeling Results (μg/m^3)								
Pollutant	**Averaging Period**	**Max Modeled Impact**	**PSDLevel[a] Significant Impact**	**Background[b] Concentration**	**Total Predicted Concentration**	**AAQS**	**UTM Coordinates**	
							East (m)	**North (m)**
CO	1-hour	1,354.7	NA	6,444	7,799	23,000	562,750	4,357,230
	8-hour	190.0	NA	3,768	3,958	10,000	563,060	4,357,131
NO_2	1-hour[c]	230.81	NA	120.3	351.1	470	562,750	4,357,230
	Annual[c]	8.40	NA	26.3	34.7	100	562,750	4,357,523
PM_{10}	24-hour	332.60	NA	92	424.6	50	563,060	4,357,131
	Annual	3.33	NA	25.5	28.8	20	562,750	4,357,523
$PM_{2.5}$	24-hour	26.61	NA	26	52.6	35	562,750	4,357,500
	Annual[d]	0.69	NA	11	11.7	12	562,750	4,357,523
SO_2	1-hour	2.06	NA	15.6	17.7	655	562,750	4,357,230
	3-hour[e]	0.69	NA	15.6	16.3	1,300	562,750	4,357,230
	24-hour	0.100	NA	7.8	7.9	105	563,060	4,357,131
	Annual	.0083	NA	2.6	2.6	80	562,750	4,357,523
Routine Plant Operation Impacts								
CO	1-hour	1,396	2,000	6,444	7,840	23,000	558,375	4,359,450
	8-hour	293	500	3768	4,061	10,000	558,325	4,359,325
NO_2	1-hour[c]	336.3	NA	120.3	456.6	470	558,800	4,353,925
	Annual[e]	0.64	1	26.3	27.0	100	562,750.2	4,357,572
PM_{10}	24-hour	4.35	5	92	96.4	50	562,600	4,357,800
	Annual	0.5	1	25.5	26.0	30	562,425	4,358,075
$PM_{2.5}$	24-hour[d]	2.73	NA	26	28.6	35	562,325	4,358,200
	Annual	0.51	NA	11	11.5	12	562,425	4,358,075
SO_2	1-hour	10.94	NA	15.6	26.5	655	558,350	4,359,500
	3-hour[e]	4.62	NA	15.6	20.2	1,300	559,025	4,355,700
	24-hour	0.87	NA	7.8	8.7	105	562,600	4,357,800
	Annual	0.04	NA	2.6	2.6	80	562,425	4,358,075

Notes:

[a] Source: 40 CFR 52.21.
[b] Background represents the maximum value measured at various air monitoring stations around the CGS site, 2003-2005 (except for 1-hour NO_2 which uses the arithmetic average of 2004-2005 measurements).
[c] Results used OLM to estimate NO_2 impacts.
[d] $PM_{2.5}$ results are 98th percentile and background is 3-year average, 98th percentile
[e] Background 3-hour SO_2 not reported, used 1-hr background

AAQS = Most stringent ambient air quality standard for the averaging period
NA = Not applicable
NR = Not reported
m = meters
OLM = ozone limiting method
μg/m^3 = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10}= particulate matter less than or equal to 10 microns in diameter
SO_2 = sulfur dioxide

Fumigation occurs when a plume with pollution emissions that was originally emitted into a stable layer of air is mixed rapidly to ground level when unstable air below the plume reaches plume level. Fumigation can cause very high ground-level pollution concentrations. Fumigation can occur during the break up of the nocturnal radiation inversion by daytime solar warming of the ground surface. Such conditions are short-lived and are typically compared only with 1-hour standards. A fumigation analysis was performed using the USEPA SCREEN3 model. Fumigation impacts are summarized in the table.

Proposed Project Operations Fumigation Impact Results			
Pollutant	**Source**	**Inversion Impact ($\mu g/m^3$)**	**Distance to Max. Impact (m)**
NO_2 1 hour	Normal Operation Turbine	3.09	15,953
NO_2 1 hour	Turbine Startup	52.45	15,953
CO 1 hour	Normal Operation Turbine	76.09	15,953
CO 1 hour	Turbine Startup	2.82	15,953
SO_2 1 hour	Turbine – Normal Operations or Startup	0.25	15,953
SO_2 3 hour	Turbine – Normal Operations or Startup	0.25	15,953
Note: 1-hour SCREEN3 results multiplied by 0.9 to convert to 3-hour and 0.7 to convert to 8-hour.			

Fumigation impacts were estimated and summarized above. Fumigation impacts are all below PSD significance thresholds. Predicted Class 1 Area pollutant concentrations from the CGS project are compared to proposed and adopted significant impact levels (SILs) listed in the table. The maximum, modeled impacts are below applicable federal PSD SILs for all criteria pollutants.

Predicted Class I Area Pollutant Concentrations from CGS Compared to Proposed and Adopted Significant Impact Levels (µg/m3)						
Class I and Other Areas of Interest	**Maximum Predicted Concentration**					
	NO_2[a]	**PM_{10}**		**SO_2**		
	Annual Average	**24-Hour Average**	**Annual Average**	**3-Hour Average**	**24-Hour Average**	**Annual Average**
USEPA Proposed SIL[b]	0.1	0.3	0.2	1	0.2	0.1
Federal Land Manager - Recommended SIL[b]	0.03	0.27	0.08	0.48	0.07	0.03
Class I Area PSD Increment[c]	2.5	8	4	25	5	2
CGS Maximum Impact	0.008	0.198	0.018	0.031	0.009	0.001

Notes:
[a]NO was conservatively assumed to be 100 percent converted to NO_2.
[b]USEPA proposed and Federal Land Manager recommended from Federal Register, Vol. 61, No. 142, p. 38292, July 23, 1996.
[c]Adopted PSD level from 40 CFR 52.21(c).

VII COMPLIANCE ANALYSES

The Colusa County Air Pollution Control District Rules and Regulations contain various requirements that must be met by this proposed project. The rules are grouped into six basic categories 1) General

requirements; 2) Authority to Construct; 3) Prohibitory Rules; 4) Air Toxics; 5) New Source Performance Standards; and 6) Title V Federal Operating Permit.

The District expects all general requirements, prohibitory rules, new source performance standards, air toxic policies and the Title V provisions to be met by the proposed facility.

GENERAL REQUIREMENTS

Regulation 1 – General Provisions, Rule 1.11 "Field Inspection" - Each source of air pollution subject to permit or registration shall be inspected or tested at such intervals of time so that no extended periods of violations will occur. *FINDING - this will be a permit condition*

Regulation 1 – General Provisions, Rule 1.12 "Air Pollution Equipment, Scheduled Maintenance" - In the case of shut-down or re-start of air pollution control equipment for necessary scheduled maintenance, the intent to shut down such equipment shall be reported to the Air Pollution Control Officer at least twenty-four (24) hours prior to the planned shutdown. *FINDING - this will be a permit condition*

Regulation 1 – General Provisions, Rule 1.13 "Equipment Breakdown" - In the event that any emission source, air pollution control equipment, or related facility breaks down in such a manner which may cause the emission of air contaminants in violation of this article, the person responsible for such equipment shall immediately notify the Air Pollution Control Officer of such failure or breakdown and subsequently a written statement giving all pertinent facts, including the estimated duration of the breakdown. The Air Pollution Control Officer shall be notified when the condition causing the failure or breakdown has been corrected and the equipment is again in operation. *FINDING - this will be a permit condition*

AUTHORITY TO CONSTRUCT

Regulation 3 – Permits, Rule 3.0 "General Requirements" - No person shall cause or permit the construction or modification of any new source of air contaminants without first obtaining an Authority to Construct from the Air Pollution Control Officer so as to comply with applicable regulations and rules and ambient air quality standards of the District. The Control Officer shall not approve such construction or modification unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that the new source can be expected to comply with all the applicable state laws and District regulations and rules. *FINDING - this is being done.*

Regulation 3 – Permits, Rule 3.1 "Permits Required" - Any person building, erecting, altering or replacing any article, machine, equipment or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate or reduce or control the issuance of air contaminants, shall first obtain written authorization for such construction from the Air Pollution Control Officer. *FINDING - this is being done.*

NEW SOURCE REVIEW RULE

Regulation 3 – Permits, Rule 3.6 "Standards for Authority to Construct (New Source Review)"

The federal Clean Air Act, U.S. EPA regulations, California Clean Air Act and the Colusa County APCD establish the criteria for siting new and modified emission sources. The federally mandated process for permitting new or modified sources in federal non-attainment areas is referred to as Non-attainment New Source Review (NNSR). The Colusa District is responsible for NSR rule enforcement for sources in Colusa County. The District's NSR rules are contained in Regulation 3, Rule 3.6. The rule requires that

Best Available Control Technology (BACT) be applied to any new or modified emissions unit that emits above a specified level. The rule requires all potential emission increases of non-attainment pollutants or their precursors above specified thresholds be offset by real, quantifiable, surplus, permanent, and enforceable emission decreases in the form of emission reduction credits. An ambient air quality impact assessment must be conducted to confirm that the proposed project does not cause or contribute to a violation of a federal or California ambient air quality standard (AAQS) or jeopardize public health. Finally, the project proponent must certify that all major sources owned or operated in the State of California are either in compliance or on an approved schedule for compliance with applicable air quality regulations.

BEST AVAILABLE CONTROL TECHNOLOGY

An Applicant shall apply BACT to any new emissions unit or modification of an existing emissions unit, which results in an emissions increase and the potential to emit for the emissions unit that equals or exceeds the following amounts:

Pollutant	**BACT Rule Limit**	**CGS Project Emissions - (hours)**		
	Pounds/Day	1 Turbine (24)	Boiler (24)	Generator (1)
Volatile organic compounds	25	315.3	4.32	0.15
Nitrogen oxides	25	1,497.3	11.52	13.88
Sulfur oxides	80	96.0	1.58	0.01
Particulate matter (PM_{10})	80	482.4	5.28	0.09
Carbon monoxide	500	3,829.5	39.12	0.32

As indicated by the data presented in the table above the gas turbines with associated duct burners must have BACT installed for all pollutants. The auxiliary boiler nitrogen oxides number represents controlled emissions with a low NOx burner. This would be considered BACT. The emergency generator engine operates only one hour per week and does not exceed the BACT thresholds.

FINDING - The CTGs will meet the following BACT emission limits: VOC of 2.0, NOx of 2.0 and CO of 3.0. All limits are ppmvd at 15 percent oxygen. BACT for SOx and PM_{10} is the use of natural gas as fuel.

OFFSET REQUIREMENTS

Offsets are required for a new stationary source with a potential to emit non-attainment pollutants or their precursors equal to or exceeding 25 tons per year. The amount of offsets required shall be at least equal to that portion of the potential to emit that exceeds 25 tons per year. Location of offsets and offsets ratios by corresponding distances from the proposed source shall be:

Onsite, at a ratio of	1:1
Within 20 miles, at a ratio of	1.2:1
20 to 50 miles, at a ratio of	1.5:1
Over 50 miles, at a ratio of	2:1

The Air Pollution Control Officer may approve inter-pollutant offsets on a case-by-case basis, provided that the applicant demonstrates to the satisfaction of the Air Pollution Control Officer, through the use of an impact analysis, that the emission increases from the new or modified source will result in a net air quality benefit and will not cause or contribute to a violation of any air quality standard.

The applicant has proposed a 1.4:1 ratio as a VOC for NOx interpollutant offset ratio based upon the two nearest relevant studies: the Sacramento Area Ozone Study (CARB, 1995) and the San Francisco Bay Area Ozone Attainment Plan (OAP) (ABAG, BAAQMD, and MTC, 2001). The rate of ozone formation is heavily dependent on initial NO_X and VOC concentrations, as well as local meteorological conditions. The relationship between ozone formation and the initial concentrations of NO_X and VOC has been the subject of many studies and is often depicted graphically through ozone isopleth diagrams. Ozone isopleth diagrams illustrate the dependence of ozone production on the initial amounts of VOC and NO_X. The total 2005 VOC and NO_X emissions for Colusa County were 6.81 tons per day VOC and 10.12 tons per day NO_X. The peak 1-hour ozone level, used as the background in the AFC was 89 ppb. There is consistency between the peak ozone reading predicted by the Colusa isopleth and the actual peak ozone concentration measured in Colusa. Although theoretically the ratio predicted is 1.4:1 NOx to VOC the applicant is proposing to reverse the ratio and provide 1.4 tons of VOC emission reductions to offset a 1.0 ton increase in NOx emissions.

E&L Westcoast needs to offset emissions increases of the following amounts:

NO_x : 160.55 tpy
VOC : 23.24 tpy
PM_{10} : 117.24 tpy

The applicant has prepared the following tables (with distance factor adjustments from the project site) describing available stationary and area source emission reduction credits that could be used as offsets for the project's emissions increase. Two stationary sources are located in the Sacramento Valley Air Basin in adjacent air districts. The Colusa County Air District consultant inspected both sources while they were still in operation. The stationary sources are located northeast of the proposed CGS facility.

Highway 70 Industrial Park, LP // Oroville, CA // Butte County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 08-05-36, 08-05-37)	NO_X	23,333.3	23,333.3	23,333.3	23,333.3	93,333.3
(Cert.08-05-39)	VOC	58,333.3	58,333.3	58,333.3	58,333.3	233,333.3
> 20 < 50 miles	PM_{10}	22,333.3	22,333.3	22,333.3	22,333.3	89,333.3

Jack W. Baber // Sierra Mountain Mills, Camptonville, CA // Yuba County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. ERC-9937006-00T)	NO_X	210.0	353.5	320.5	250.5	1,134.5
	VOC	99.5	167.5	152.0	119.0	538.0
	PM_{10}	3,017.0	5,078.0	4,609.0	3,600.5	16,304.5
> 50 miles	SO_2	83.0	139.5	127.0	99.0	448.5

Emissions will also be offset through the purchase of ERCs generated by the cessation of agricultural burning. Colusa County is an agricultural county. The primary crop is rice, with additional acres of wheat, corn, safflower and other crops also under cultivation. ERCs generated by elimination of agricultural burning are calculated by a methodology that takes into account the following factors:

Historical burn fraction (*i.e.,* what percentage of the crop land is actually burned in a given year), or HBF; Quarterly burn fraction (how much of the total annual burning takes place in a given quarter), or QBF;

Fuel loading factor (how many tons of crop residue there are per acre), or FL; and Emission factors (pounds of emissions per ton of crop residue burned), or EF. Proposed agricultural burning ERCs are:

Baber Family Trust // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-03)	NO_X	837.3	675.3	270.1	918.3	2,701.0
	VOC	756.8	610.3	244.1	830.0	2,441.2
	PM_{10}	1,014.4	818.1	327.3	1,112.6	3,272.3
< 20 miles	SO_2	177.1	142.8	57.2	194.3	571.3

Jack W. Baber and Judith S. Baber // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-04)	NO_X	2,001.5	1,614.1	645.7	2,195.2	6,456.4
	VOC	1,809.0	1,458.9	583.6	1,984.1	5,835.6
	PM_{10}	2,424.8	1,955.5	782.3	2,659.5	7,822.1
< 20 miles	SO_2	423.4	341.4	136.6	464.3	1,365.8

Estate of Jack W. Baber Jr. // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-05)	NO_X	707.1	570.3	228.1	775.6	2,281.0
	VOC	639.2	515.4	206.2	701.0	2,061.8
	PM_{10}	856.7	690.9	276.3	939.6	2,763.5
< 20 miles	SO_2	149.6	120.7	48.3	164.1	482.6

Pixie E. Baber // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-05.2)	NO_X	674.2	521.3	217.5	739.4	2,152.3
	VOC	609.3	491.4	196.6	668.3	1,965.7
	PM_{10}	816.8	658.8	263.5	895.8	2,634.9
< 20 miles	SO_2	142.6	115.0	46.0	156.4	460.0

Jack W. Baber and Judith S. Baber // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-06)	NO_X	489.8	395.1	158.0	537.3	1,580.2
	VOC	442.8	357.1	142.8	485.6	1,428.3
	PM_{10}	593.5	478.6	191.4	650.9	1,914.4
< 20 miles	SO_2	103.6	83.6	33.4	113.7	334.3

Inez Garrette // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-07)	NO_X	163.3	131.7	52.7	179.1	526.7
	VOC	147.6	119.0	47.6	161.8	476.0
	PM_{10}	197.8	159.5	63.8	217.0	638.2
< 20 miles	SO_2	34.5	27.8	11.2	37.9	111.4

Jack W. Baber and Judith S. Baber // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-08)	NO_X	1,736.3	1,400.2	560.1	1,904.3	5,600.8
	VOC	1,569.3	1,265.6	506.3	1,721.2	5,062.3
	PM_{10}	2,103.5	1,696.3	678.6	2,307.1	6,785.5
< 20 miles	SO_2	367.3	296.2	118.5	402.8	1,184.8

Jack W. Baber Jr. // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-09)	NO_X	1,314.3	1,059.9	424.0	1,441.5	4,239.8
	VOC	1,187.9	958.0	383.3	1,302.9	3,832.1
	PM_{10}	1,592.3	1,284.2	513.7	1,746.4	5,136.6
< 20 miles	SO_2	278.0	224.3	89.7	304.9	896.8

Jon B. Chaney // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-01)	NO_X	1,753.4	1,414.1	565.4	1,923.2	5,656.1
	VOC	1,584.8	1,278.1	511.3	1,738.3	5,112.4
	PM_{10}	2,124.4	1,713.2	685.3	2,330.0	6,852.8
< 20 miles	SO_2	370.9	299.2	119.7	406.8	1,196.6

Gunnersfield Ent., Inc. // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-02-02)	NO_X	4,680.0	3,774.2	1,509.7	5,132.8	15,096.7
	VOC	4,230.0	3,411.3	1,364.5	4,639.3	13,645.1
	PM_{10}	5,669.9	4,572.5	1,829.0	6,218.7	18,290.1
< 20 miles	SO_2	990.0	798.4	319.3	1,085.8	3,193.6

Jerry Maltby et. al. // Williams, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-06-11-01)	NO_X	3,768.8	3,039.3	1,215.8	4,133.5	12,157.3
	VOC	3,406.4	2,747.1	1,098.8	3,736.1	10,988.4
	PM_{10}	4,566.0	3,682.3	1,472.9	5,007.9	14,729.1
< 20 miles	SO_2	797.3	642.9	257.2	874.4	2,571.8

A & R Farms // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-05-02-01)	NO_X	1,328.5	1,079.5	442.3	1,457.3	4,307.6
	VOC	1,200.8	982.8	411.4	1,317.3	3,912.3
	PM_{10}	1,609.3	1,318.1	552.8	1,765.8	5,246.0
< 20 miles	SO_2	281.0	228.3	93.5	308.3	911.2

Jim Lagrande // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-01-03-01)	NO_X	1,099.2	956.8	472.5	1,207.4	3,735.9
	VOC	993.5	925.6	528.9	1,092.9	3,540.9
	PM_{10}	1,331.7	1,247.4	720.3	1,465.3	4,764.7
< 20 miles	SO_2	232.5	202.3	99.7	255.4	789.8

Charles Tuttle, Gordon Ranch // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-07-02-01)	NO_X	1,327.0	1,207.0	657.6	1,459.0	4,650.6
	VOC	1,199.4	1,209.2	792.5	1,321.9	4,522.9
	PM_{10}	1,607.7	1,634.1	1,084.3	1,772.3	6,098.3
< 20 miles	SO_2	280.7	255.0	138.5	308.6	982.9

Charles Tuttle, Helphenstine Ranch // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-07-02-02)	NO_X	0.0	71.5	119.8	1.9	193.3
	VOC	0.0	126.4	211.8	3.4	341.6
	PM_{10}	0.0	176.3	295.4	4.8	476.5
< 20 miles	SO_2	0.0	15.0	25.1	0.4	40.5

Charles Tuttle, Tenant Ranch // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-07-02-03)	NO_X	1.3	99.0	294.0	2.7	397.0
	VOC	4.3	175.0	714.6	4.8	898.6
	PM_{10}	4.3	244.1	912.9	6.6	1,167.8
< 20 miles	SO_2	0.2	20.8	51.8	0.6	73.3

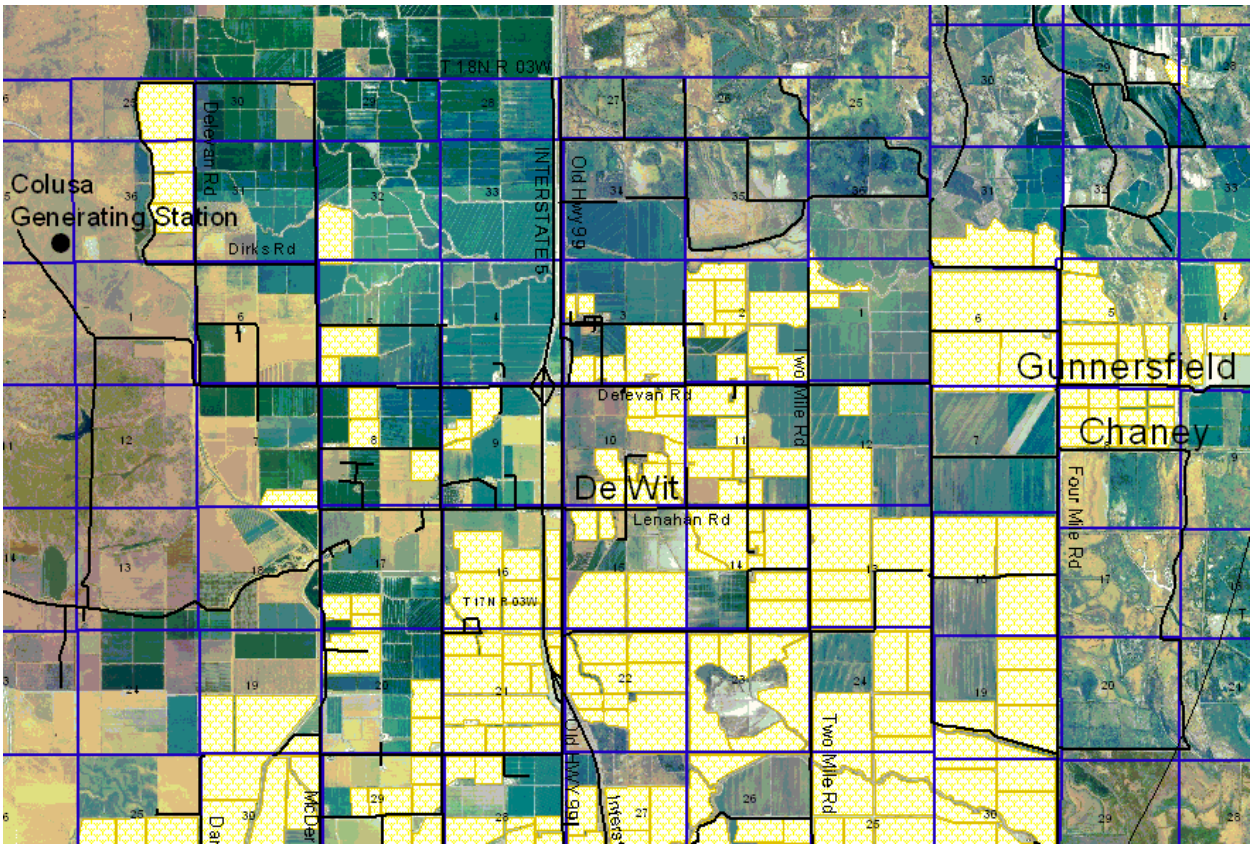
Charles Tuttle, Williams Ranch // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-07-02-04)	NO_X	0.0	50.8	85.1	1.4	137.2
	VOC	0.0	89.7	150.4	2.4	242.5
	PM_{10}	0.0	125.2	209.7	3.4	338.3
< 20 miles	SO_2	0.0	10.6	17.8	0.3	28.7

Jack DeWit // Maxwell, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-07-02-05)	NO_X	952.5	768.2	307.3	1,044.8	3,072.7
	VOC	860.9	694.3	277.8	944.3	2,777.3
	PM_{10}	1,154.0	930.7	372.3	1,265.7	3,722.6
< 20 miles	SO_2	201.5	162.5	65.0	221.0	650.0

Davis Ranches // Colusa, CA // Colusa County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. 06-7-2001-1)	NO_X	8,689.5	7,007.7	2,803.1	9,530.4	28,030.6
	VOC	7,853.9	6,333.8	2,533.5	8,614.0	25,335.3
	PM_{10}	10,527.6	8,490.0	3,396.0	11,546.4	33,960.0
> 20 miles < 50 miles	SO_2	1,834.8	1,482.4	592.9	2,016.1	5,926.2

William Payne // Woodland, CA // Sutter County						
Certificate(s) and Distance	Pollutant	1st Quarter (lbs)	2nd Quarter (lbs)	3rd Quarter (lbs)	4th Quarter (lbs)	Annual (lbs)
(Cert. ERC 2001-26)	NO_X	1,134.0	1,249.3	2,022.0	1,267.3	5,672.7
	VOC	1,025.3	1,574.7	5,356.0	1,145.3	9,101.3
	PM_{10}	1,374.0	2,160.0	6,620.7	1,535.3	11,690.0
> 20 miles < 50 miles	SO_2	240.0	263.3	326.0	268.0	1,097.3

The map presented below is a portion of Colusa County with sections, township and range outlined, the CGS site identified and surrounding rice fields (highlighted in yellow crosshatching). Three nearby grower fields are noted that are part of the agricultural ERCs proposed as offsets.



FINDING - the ERC offset information and quarterly pollutant amounts will need to be verified by District analyses. Applicant will be required to have the ERC certificate ownerships transferred to them from the current owners and then surrender the certificates to the Colusa County Air Pollution Control District. Offsets coming from other air districts will need to have a signed MOU between the Colusa County Air Pollution Control District and those districts approving the transfer of emission reduction credits. All of these actions must take place before the facility is allowed to operate.

AIR QUALITY IMPACT ANALYSES

One provision of the NSR Rule regards analyzing project emissions as they might affect ambient air quality levels. The rule states, "In no case shall the emissions from the new or modified stationary source cause or make worse the violation of an Ambient Air Quality Standard." An impact analysis shall be used to estimate the effects of a new or modified source. In considering the project's emission impacts, the Air Pollution Control Officer will take into account the mitigation of emissions through offsets and determine that there is a net air quality benefit**. "Net air quality benefit" means a net improvement in air quality resulting from actual emission reductions impacting the same general area affected by the new or modified source.** The Colusa County Air Pollution Control District has conducted analyses of the emission reduction credits proposed by the applicant. The analyses describe the burning management program, impacts from burning on non-attainment pollutants, how agricultural ERCs are calculated, enforcing agricultural ERCs and modeling of pollution emissions from agricultural burning.

The analyses are found in appendices A through E.

1) Appendix A – Agricultural Burning in Colusa County
2) Appendix B – Impact of Agricultural Burning on Particulate Matter and Ozone Concentrations
3) Appendix C – Emission Reduction Credits and Offsets
4) Appendix D – Enforcement of Emission Reduction Credits and Offsets
5) Appendix E – Modeling of Emissions from Agricultural Burning ERC Fields

E&L Westcoast's consultant has performed air quality modeling using the AERMOD model. This model is EPA recognized and approved. Ozone modeling was not done although the precursor emissions of NOx and VOC will exacerbate current levels. The PM_{10} and $PM_{2.5}$ emissions from both construction activities and routine plant operations showed levels above the California Ambient Air Quality Standards. *FINDING - the offsets provided for the facility will mitigate all of the air quality impacts.*

Colusa Generating Station Project Modeling Results – Routine Plant Operations					
Pollutant	**Averaging Period**	**Maximum modeled**	**Background ug/m3**	**Total**	**CA&EPA AAQS ug/m3**
NO_2	1-hour	336.3	120.3	456.6	470
NO_2	Annual	0.64	26.3	26.9	100
PM_{10}	24-hour	4.35	92	96.4	50
PM_{10}	Annual	0.5	25.5	26.0	20
$PM_{2.5}$	24-hour	2.73	26	28.7	35
$PM_{2.5}$	Annual	0.51	11	11.5	12

PROHIBITORY RULES

Regulation 2 – Prohibitions, Rule 2.10 "Nuisance" - In accordance with Section 41700 of the California Health and Safety Code a person shall not discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such person or the public or which cause or have a natural tendency to cause injury or damage to business or property. *FINDING - this facility is not expected to cause a nuisance.*

Regulation 2 – Prohibitions, Rule 2.13 "Visible Emissions" - As provided by Section 41701 of the California Health and Safety Code, a person shall not discharge into the atmosphere from any single source of emissions whatsoever, any air contaminants for a period or periods aggregating more than three minutes in any one hour which is: as dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines; or of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in the phrase above. *FINDING - because of the use of natural gas this facility is expected to meet these rule limits.*

Regulation 2 – Prohibitions, Rule 2.15 "Particulate Matter Concentration" - A person shall not discharge into the atmosphere from any source, particulate matter in excess of 0.3 grains per standard dry cubic foot of gas. *FINDING - because of the use of natural gas this facility is expected to meet this limit.*

Regulation 2 – Prohibitions, Rule 2.16 "Dust and Fumes" - A person shall not discharge in any one

hour from any source whatsoever, dust or fumes in total quantities in excess of the amounts shown in the table. To use the table, take the process weight per hour as such is defined in Rule 1.2 Definitions.

"Process Weight Per Hour" means the total weight excluding water added for processing or air used in processing introduced into any specific process may cause and discharge into the atmosphere. Solid fuels charged will be considered as part of the process weight, but liquid and gaseous fuels and combustion air will not. The "process weight per hour" will be derived by dividing the total process weight by the number of hours in one complete operation from the beginning of any given process to the completion thereof, excluding any time during which the equipment is idle."

Then find this figure on the table opposite, which is the maximum number of pounds of contaminants which may be discharged into the atmosphere in any one hour. *FINDING - this rule will be met.*

Regulation 2 – Prohibitions, Rule 2.22 "Sulfur Oxides" - A person shall not discharge into the atmosphere from any single source of emission whatsoever, any sulfur oxides in excess of 0.2 percent by volume (2,000 ppm) collectively calculated as sulfur dioxide (SO_2). *FINDING - this rule will be met.*

Regulation 2 – Prohibitions, Rule 2.23 "Reduced Sulfur Compounds" - It shall be unlawful for any person to permit the emissions of air contaminants from any premises which will result in ground level concentrations of total reduced sulfur compounds, expressed as hydrogen sulfide, in excess of 0.03 ppm for a period of sixty (60) minutes. *FINDING - this rule will be met.*

Regulation 2 – Prohibitions, Rule 2.25 "Organic Solvent Degreasing Operations" - To control volatile organic compound emissions from solvent cleaning and degreasing operations to levels consistent with reasonably available control technology (RACT). This rule shall apply to all volatile organic compound solvent cleaning and degreasing operations. *FINDING - the degreaser is expected to comply with this rule.*

Regulation 2 – Prohibitions, Rule 2.36 "Stationary Internal Combustion Engines" - To limit emissions of nitrogen oxides (NOx) and carbon monoxide (CO) from stationary internal combustion engines. The provisions of this rule apply to any gaseous, diesel, or any other liquid-fueled stationary internal combustion engine within the boundaries of the District. Except for the administrative requirements of Section f.3. the provisions of this rule shall not apply to the following engines: Engines operated exclusively for fire fighting or flood control. *FINDING - this rule will be met because the emergency firewater pump engine is exempt.*

Regulation 2 – Prohibitions, Rule 2.39 "Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters Oxides of Nitrogen Control Measure" - To reduce Oxides of Nitrogen emissions during the operations of Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters to levels consistent with reasonably available control technology (RACT). This rule applies to all boilers, steam generators, and process heaters used in industrial, institutional, and commercial operations that exist within the boundaries of the Colusa County Air Pollution Control District on the date of adoption of this Rule.

No later than one year following District adoption of this Rule, all existing units with a rated heat input capacity greater than or equal to 5 million BTU per hour shall demonstrate final compliance with the following Reasonably Available Control Technology (RACT) emission limitations dependent upon the specific fuel fired in the unit and based upon a three-hour averaging period.

RACT: Gaseous only fuel firing: 0.084 lbs/MMBtu of heat input or 70 ppmv

FINDING - the new auxiliary boiler will comply with the requirements of District Rule 3.6 - Standards for Authority to Construct (New Source Review - BACT) and thereby also meet this rule.

Regulation 2 – Prohibitions, Rule 2.41 "Determination of Reasonably Available Control Technology for the Control of Oxides of Nitrogen from Stationary Gas Turbines" - To limit the emissions of nitrogen oxides (NOx) to the atmosphere from the operation of stationary gas turbines. Except as provided in Section c., this determination shall apply to all existing stationary gas turbines rated by the manufacturer as 0.3 megawatt (MW) power output and larger.

Unless opting for the alternative compliance strategy, the owner or operator of any stationary gas turbine unit subject to the provisions of this rule shall not operate such unit under load conditions, excluding the thermal stabilization period, which results in the measured NOx emissions concentration exceeding the emissions limit listed below averaged over three (3) hours.

		Gas	Oil
RACT:	0.3 MW and Greater	42	65 ppmvd @ 15%O_2

FINDING - the new gas turbine units will comply with the requirements of District Rule 3.6 - Standards for Authority to Construct (New Source Review - BACT) and thereby also meet this rule.

AIR TOXICS

Facility operations were evaluated to determine whether certain substances would be used or generated that may cause adverse health effects if released into the air. The primary sources of potential emissions from facility operations are the natural gas–fired combustion turbine generators (and duct burners) and the aqueous ammonia slipstream from the selective catalytic reduction control system. Toxic emissions from the auxiliary boiler were also evaluated. Emissions from the emergency generator and fire pump engines were estimated using PM_{10} emissions as a surrogate for the toxic compound, diesel exhaust.

The potential human health risks posed by the Project's emissions were assessed using procedures consistent with the Air Toxics Hot Spots Program Risk Assessment Guidelines – The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (Cal-EPA and OEHHA 2003). The OEHHA guidelines were developed to provide health risk assessment (HRA) procedures as required under the Air Toxics Hot Spots Information and Assessment Act of 1987. The HRA was conducted in four steps using the Hotspots Analysis and Reporting Program (HARP [CARB 2005]):

1. Hazard Identification and Emission Quantification
2. Exposure Assessment
3. Dose-Response Assessment
4. Risk Characterization

First, hazard identification was performed to determine the potential health effects that may be associated with project emissions. Second, an exposure assessment was conducted to estimate the extent of public exposure to the CGS project emissions. Third, a dose-response assessment was performed in HARP to characterize the relationship between pollutant exposure and the incidence of an adverse health effect in exposed populations. Fourth, risk characterization was performed to integrate the health effects and public exposure information and provide qualitative estimates of health risks from project emissions. Risk modeling was performed using HARP to estimate cancer and non-cancer health risks for the project. . From the OEHHA guidelines a list of pollutants with potential cancer and non-cancer health effects associated with the emissions from the project are presented in the following table. Unit risk factors for cancer and both chronic (long term) and acute (short term) reference exposure levels (REL) are indicated.

Toxicity Values Used To Characterize Health Risks				
Compound	**Sources of Emissions**	**Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$**	**Chronic REL (µg/m^3)**	**Acute REL (µg/m^3)**
Diesel particulate (PM_{10})	Two diesel engines	1.1E+00	5.0E+00	--
Ammonia	Gas turbine stacks	--	2.0E+02	3.2E+03
1,3-Butadiene	Gas turbine stacks	6.0E-01	2.0E+01	--
Acetaldehyde	Gas turbine stacks/aux boiler	1.0E-02	9.0E+00	--
Acrolein	Gas turbine stacks	--	6.0E-02	1.9E-01
Benzene	Gas turbine stacks/aux boiler	1.0E-01	6.0E+01	1.3E+03
Ethylbenzene	Gas turbine stacks/	--	2.0E+03	--
Formaldehyde	Gas turbine stacks/aux boiler	2.1E-02	3.0E+00	9.4E+01
Hexane	Gas turbine stacks	--	7.0E+03	--
Propylene	Gas turbine stacks	--	3.0E+03	--
Propylene oxide	Gas turbine stacks	1.3E-02	3.0E+01	3.1E+03
Toluene	Gas turbine stacks	--	3.0E+02	3.7E+04
Xylenes	Gas turbine stacks	--	7.0E+02	2.2E+04
Polycyclic Aromatic Hydrocarbons				
Benzo(a)anthracene	Gas turbine stacks	3.9E-01	--	--
Benzo(a)pyrene	Gas turbine stacks	3.9E+00	--	--
Benzo(b)fluoranthene	Gas turbine stacks	3.9E-01	--	--
Benzo(k)fluoranthene	Gas turbine stacks	3.9E-01	--	--
Chrysene	Gas turbine stacks	3.9E-02	--	--
Dibenz(a,h)anthracene	Gas turbine stacks	3.9E-01	--	--
Indeno(1,2,3-cd)pyrene	Gas turbine stacks	3.9E-01	--	--
Naphthalene	Gas turbine stacks	1.2E-01	9.0E+00	--
Source: Cal-EPA/OEHHA 2005 -- = not applicable [1]mg/kg-day = milligram(s) per kilogram per day				

RISK ASSESSMENT

The HRA was conducted using worst-case turbine, auxiliary boiler, and emergency diesel engine emissions. Cancer and chronic non-cancer health effects were estimated using the annual turbine and other source emission estimates. Acute non-cancer health effects were estimated using the worst-case maximum hourly emissions for the turbines and other sources. The maximum hourly emissions in lb/hour were used as input to the HARP model. Toxicological data, unit risk factors and RELs are built into the CARB's HARP model. Risk values were modeled for all sensitive receptors within 3 miles of the CGS project and all grid, boundary and census receptors within 6 miles of the CGS project.

Adverse health effects are expressed as cancer or non-cancer health risks. Cancer risk is typically reported as "lifetime cancer risk," which is the estimated maximum increase of risk of developing cancer caused by long-term exposure to a pollutant suspected of being a carcinogen. The calculation of cancer risk assumes an individual is exposed continuously to pollutants for 24 hours per day for 70 years. For carcinogenic health effects, an exposure is considered potentially significant when the predicted lifetime cancer risk exceeds 10 in 1 million (1.0×10^{-5}).

Non-cancer risk is reported as a "total hazard index" (THI). The THI is calculated for each target organ as a fraction based on the maximum acceptable exposure level to a pollutant. The acceptable exposure level is generally the level at (or below) which no adverse health effects are expected. The THI is

calculated for short-term (acute) and long-term (chronic) exposures. For non-carcinogenic health effects, an exposure that affects each target organ is considered potentially significant when the THI exceeds a value of 1.

Results of the emission modeling and risk assessment analyses are shown in the table below.

Cancer Risk at Maximum Point of Impact	Chronic Risk at Maximum Point of Impact	Acute Risk at Maximum Point of Impact
1.194 Excess risk in 1 million	0.03055 THI	0.4205 THI

The estimated cancer risks at all locations are well below the significance criteria of 10 in 1 million. The estimated chronic and acute THIs are well below the significance criterion of 1. *FINDING - the proposed project emissions pose no significant health effects relative to the criteria established for carcinogenic and non-carcinogenic health effects.*

NEW SOURCE PERFORMANCE STANDARDS

New Source Performance Standards (NSPS) have been established by U.S. EPA to limit air pollutant emissions from certain types of new and modified stationary sources. The NSPS regulations are contained in 40 CFR 60 and cover many source categories. Stationary gas turbines are regulated under Subpart GG.

The Colusa County Air District BACT requirements are more restrictive than the NSPS requirements. For example, the controlled NOx emissions from the CGS's gas turbines will be controlled to 2.0 parts per million by volume dry (ppmvd) at 15 percent oxygen, significantly less than the NSPS limit of 75 ppmvd at 15 percent oxygen.

The NSPS fuel requirements for SO_2 will be satisfied by the use of natural gas, and emissions and fuel monitoring will be required to assure compliance with NSPS, acid rain, and other regulatory provisions.

TITLE V FEDERAL OPERATING PERMIT

Title V of the federal Clean Air Act requires U.S. EPA to develop a federal operating permit program that is implemented under 40 CFR 70. This program is administered by CCAPCD under Regulation 3, rule 3-17. Permits must contain emission estimates based on potential-to-emit, identification of all emission sources and controls, a compliance plan, and a statement indicating each source's compliance status. The permits must also incorporate all applicable federal, state, or District orders, rules and regulations.

Because the facility will constitute a new stationary source, the facility owner will be required to submit a complete application for a Title V permit to operate within 12 months after plant startup.

VIII PERMIT CONDITIONS

1) All facility operating staff shall be advised of and familiar with these permit conditions.

2) The "Right of Entry", as provided by the California Health and Safety Code Section 41510 of Division 26, shall apply at all times.

3) In the case of shut-down or re-start of air pollution control equipment for necessary scheduled maintenance, the intent to shut down such equipment shall be reported to the Air Pollution Control Officer at least twenty-four (24) hours prior to the planned shutdown. Such notification

does not exempt the facility from complying with all permit limits and requirements.

4) If any upset or breakdown occurs with equipment under permit in such a manner that may cause excess emissions of air contaminants, the APCO shall be notified of such failure or breakdown within twenty-four (24) hours or by 9:00 a.m. by the following working day. The person responsible shall also submit a written statement of full disclosure of the upset/breakdown to the District within 72 hours. The report shall contain the date, time, duration, estimated emissions, cause, and remedy.

5) Fugitive emissions, including dust and odors shall be controlled at all times such that a nuisance is not created at any point beyond the facility's property lines.

6) A person shall be designated to oversee the fugitive dust control program described in the application and this document. Entry roads to the proposed facility site will be paved prior to commencing construction. During construction, the people onsite shall access real-time weather information from the Western Weather Group to determine the prevailing local wind speed. If wind gusts at the Maxwell weather station exceed 15 mph construction personnel shall increase the frequency of watering the exposed soil. All of the mitigation measures will be implemented.

7) Stack gas testing using approved reference methods (i.e., EPA 1,2,4,10, (18 or SCAQMD 25.3), 19, 20 and (5/202 or other acceptable methods)) shall be required on an annual basis for NOx, SOx, VOC, CO, and PM_{10} on the HRSG stacks and the auxiliary boiler stack and NOx, VOC, and CO in subsequent years. The emergency generator and firewater pump engines shall be tested for NOx, SOx, VOC, CO, and PM_{10} during the first year and thereafter only as requested by the APCO. Testing of the HRSG stacks shall include quantification of ammonia and formaldehyde emissions for compliance with permitted limits.

8) The gas turbines, duct burners, and auxiliary boiler shall be fired exclusively on pipeline quality natural gas.

9) The sulfur content limit in the natural gas used at the facility shall be less than or equal to 0.25 grains per 100 scf. Quarterly testing, at the site, using approved methods (i.e., EPA 19 and ASTM D-3246) is required to determine the sulfur content of the natural gas.

10) The sulfur content limit in diesel fuel used in the construction equipment and emergency generator and firewater pump engines shall be no more than 15 ppm. Emissions from the two engines mentioned above shall not exceed Ringelmann 1 or 10 percent opacity for an aggregate of three minutes in a one hour period.

11) The CTGs will meet a VOC limit of 2.0 ppmvd @ 15% O_2 with and without duct burner firing over 1 hour.

12) The CTGs will meet a NOx limit of 2.0 ppmvd @ 15% O_2 over a 3-hour rolling average except during the commissioning phase.

13) The CTGs will meet a CO limit of 3.0 ppmvd @ 15% O_2 over an 8-hour rolling average except during the commissioning phase.

14) The auxiliary boiler will meet a NOx limit of 15.0 ppmvd @ 3% O_2 over 1 hour.

15) Ammonia slip will be limited to 5.0 ppmvd @ 15% O_2 over 1 hour. Formaldehyde emissions will be limited to 0.917 lbs per MMscf of exhaust gas.

16) Continuous emission monitoring (CEM) systems will be installed to sample, analyze, and record NO_x, CO, O_2 concentration in the exhaust gas of both stacks. This system will generate reports of emissions data in accordance with permit requirements and will send alarm signals to the plant distributed control system (DCS) control room when the level of emissions approaches or exceeds pre-selected limits.

17) The Colusa County APCD will have access to a datalogger at the facility to enable District staff to monitor realtime emissions as recorded by the CEMs.

18) The CEMs shall be installed, calibrated and operational prior to the first firing of the gas turbines. The commissioning phase of the turbines and heat recovery steam generators without abatement of emissions shall not exceed 500 total hours. All reasonable efforts will be made to shorten the length of time of the commissioning phase. Emissions from the commissioning phase of the turbines and heat recovery steam generators shall accrue toward the quarterly and annual emission limits specified in these conditions.

19) Monthly reports of CEM and process data, including startup information, shall be submitted to the District within 10 days after the end of each month. Format of the data submission will be determined by the District and may include both electronic spreadsheet and hard copy files.

20) The emissions from the emergency generator and firewater pump engines shall not exceed the hourly limits established in the table below. Total annual operating hours shall not exceed 50 per engine. The generator engine must comply with the Tier rating emissions for the model year.

One Hour Maximum Emissions (lbs)		
Source	**Generator**	**Fire Pump**
NO_X	13.88	2.82
CO	0.32	0.22
VOC	0.15	Incl. in NO_X
PM_{10}	0.09	0.08
SO_2	0.01	<0.01

21) The emission rates from the auxiliary boiler shall not exceed the hourly limits established in the table below. The boiler shall not exceed a 15 ppmvd NOx concentration @ 3 percent oxygen.

One Hour Maximum Emissions (lbs)		
Source		**Auxiliary Boiler**
NO_X		0.48
CO		1.63
VOC		0.18
PM_{10}		0.22
SO_2		0.07

22) The total emissions from the CTGs and HRSGs shall not exceed those established below for hourly and daily routine operations. The CTGs shall not exceed a 2 ppmvd NOx concentration @ 15 percent oxygen.

Maximum Emissions Both Turbines (lbs)		
Pollutant	**1-Hour Emissions**	**24-Hour Emissions**
NO_X	666.60	2,994.60
CO	967.00	7,659.00
VOC	55.40	630.60
PM_{10}	40.20	964.80
SO_2	8.00	192.00

23) The total emissions from the Colusa Power Plant shall not exceed the limits established below.

Quarterly and Annual Estimated Combustion Emissions from CGS Facility					
Pollutant	**1st Quarter Emissions (tons)**	**2nd Quarter Emissions (tons)**	**3rd Quarter Emissions (tons)**	**4th Quarter Emissions (tons)**	**Annual Emissions (tons)**
NO_x	45.77	43.77	51.57	44.47	185.58
CO	55.35	53.55	108.25	55.05	272.20
VOCs	12.51	11.81	12.01	11.91	48.24
PM_{10}	35.36	35.46	35.66	35.76	142.24
SO_2	3.03	2.83	2.63	2.83	11.32

24) Offsets for the Colusa Power Plant will be in effect prior to operation of the facility and will not be less than the following numbers at any time. Sufficient ERCs for PM_{10} will be provided prior to start of construction activities to offset construction PM_{10} emissions.

Emission Offsets by Calendar Quarter				
Pollutant in tons	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**
Oxides of nitrogen (NO_2)	48.70	44.97	34.97	51.60
Volatile organic compounds (CH_4)	2.51	11.81	12.01	11.91
Particulate Matter PM_{10}	31.08	29.17	22.66	33.17
Oxides of sulfur (SO_2)	3.25	2.70	1.24	3.58

25) The construction of the facility cannot commence until all construction permits, including the USEPA PSD permit are obtained.

26) Total facility emissions of Hazardous Air Pollutants (HAP) shall not exceed 10 tons per year for any single pollutant or 25 tons per year for all combined HAPS.

IX APPENDICES

Appendix A – Agricultural Burning in Colusa County
Appendix B – Impact of Agricultural Burning on Particulate Matter and Ozone Concentrations
Appendix C – Emission Reduction Credits and Offsets
Appendix D – Enforcement of Emission Reduction Credits and Offsets
Appendix E – Modeling of Emissions from Agricultural Burning ERC Fields

ssion Reduction Credits, Project Emissions (on-site only), and ERC/Emission Ratios

Appendix A – Agricultural Burning in Colusa County

The Sacramento Valley Air Basin air districts initiated a comprehensive and sophisticated Agricultural Burning Management Program in 1981. In concert with the Air Resources Board (ARB) the Program was tested and refined over a two-year period. Key provisions of the Program are outlined below:

Local authority. The Program places responsibility and authority on local air districts for implementation. Current air quality and meteorological information are provided to enable districts to make informed decisions.

Strengthened enforcement. The Program strengthens enforcement of the agricultural burning requirements through aerial and ground surveillance to ensure compliance.

Daily variable acreage allocation system. The Program contains a formula to allocate burn acreage to the Sacramento Valley Air Basin. The burning management program matches the daily basinwide acreage allocation to each day's expected air quality and meteorological dispersion conditions. The system is designed to minimize air quality impacts.

Basinwide acreage distribution system. The Program contains a formula to distribute the basinwide acreage allocation to local air districts. This computerized formula is based upon need (prorated acres), air quality (particulate matter levels), and meteorological conditions (zone ventilation ratings).

Spatial and temporal burn placement. Optimal distribution of burning throughout the air basin and over time minimizes air quality impacts. These management procedures reduce smoke concentrations. Burning management zones are established within each air district and help to geographically manage the burning.

Collection and dissemination of meteorological data. Local air districts receive reliable real-time data on wind speeds, directions, inversion heights, and overall dispersion capacity throughout the region. Hourly data are provided from the automatic meteorological observation stations (AMOS) sites and Valley airports with operating control towers. Inversion and mixing height information is available from the Sutter Buttes AMOS, pibals, aircraft flights and profilers.

Collection and dissemination of air quality data. Local air districts also receive information on how agricultural burning is impacting air quality. This information feed-back is available through airport visibility observations, PM10 and PM2.5 data and smoke complaints.

Collection and dissemination of burn data. Air pollution control agencies compile their information on the amount of acres ready to burn, burned yesterday, burned by zone, and burned by crop category. This information is collected, summarized, totaled, and provided on a county-by-county, zone-by-zone, and crop- by-crop basis through the Central Computer Operations (CCO).

During the fall, with poor meteorological dispersion conditions and the beginning of post harvest rice straw burning, the intensive Program is administered. Each day the ARB, Fife Environmental and a meteorological consultant prepare files for access by Sacramento Valley air district burning management staff on a website. The files contain information describing the type of burn day, burn acreage allocation from the ARB, acreage distribution to counties, $PM_{2.5}$ air quality levels, meteorological conditions and Program summary data. Examples of files from the fall of 2006 are included below:

California Air Resources Board - Meteorology Section
Basinwide Ag-Burn Acreage Allocation & Complaints - Sacramento Valley Air Basin

Date: 8-Nov-06 Local Time: 07:50 AM Meteorologist: Lancero

Ag Burn Decision Above 3000 ft: Good Burn Day

A.M. Stability (°F) = 1	Wind Speed (mph) = 12
500 millibar height (decameters) = 585	Average Rainfall (in) = 0.01
Meteorological (MET) Factor	= 0.9
Air Quality (AQ) Factor (Basinwide 00-06 PST Average $PM_{2.5}$)	= 3.4
Allocation Equation:	= 8332
ARB/CCO REVISED Basinwide Allocation	= 3000

District	Yesterday's 24-Hr Avg $PM_{2.5}$	Yesterday's $PM_{2.5}$ (0-6 PST)	Reduction Factor	Yesterday's $PM_{2.5}$ MAX	Hour of Yesterday's MAX	Avg $PM_{2.5}$ (0-6 PST) Conc	Stn
Colusa	21.3	23	1	53	19	2.8	COL
Butte	16.4	14.9	1	28	18	4	CIC-GRD
Glenn	27.8	16.7	1	57	21	4.5	WLW
Placer	10.9	10	1	26	12	4	ROS
Sacramento	14.8	20.8	1	37	8	3.8	SAC
Sutter	15.7	13.8	1	79	16	1	YUB
Yolo/Solano	8.2	12	1	19	8	0	DAV
Yuba	15.7	13.8	1	79	16	1	YUB
Tehama	27.8	16.7	1	57	21	4.5	WLW
Shasta	27.8	16.7	1	57	21	4.5	WLW

When any district's 0-6 am average $PM_{2.5}$ is >= 45 ug/m^3 each 5 ug/m^3 increase will result in a 20% reduction in allocation acres (e.g. 45-49 : 20%, 50-54 : 40%, 55-59 : 60%, 60-64 : 80%)

ARB Comments

Cautionary Comments:
Permissive Burn Day Still Dry
A weak cold front moved through this morning, with light showers of only 0.01" of measurement. Winds will be Southerly for most of the day, switching NW late in the day.

24 Hour Outlook:
Weak Ridge before the next system around fri/sat.
Mixing Height Discussion:
Valley: 3000 feet.
Winds:
North Valley: Southerly 5-15 mph, with slight NW winds 5-10mph by mid-late aftn.
South Valley: Southerly 5-15 mph most of the day, switching NW 5-10 by late aftn-eve.
Delta: Southwesterly 10-20 mph.

Complaints:	Col	Sut	But	Yol	Gle	Sac	Yub	Pla	Teh	Sha	Total
05-Nov-06	0	0	0	0	0	0	0	0	0	0	0
06-Nov-06	0	0	0	0	0	0	0	0	0	0	0
7-Nov-06	0	0	0	0	0	0	0	0	0	0	0

```
CCO COMMENTS: DATE: 08-Nov 09:17 AM
Rainfall: 0.01    TODAY       CHANGE      TREND
0-6AM avg PM2.5   3.4         -12.8       Decreased
500 MB height     585         -3          Decreased
6AM inversion 0F  1.0         -14.0       Decreased
ARB windspeed mph 12.0          2.0       Increased
Atmospheric instability is good BUT there are north winds in NW valley.
Check hourly winds in your area and conduct field burning observations.
Spread fires out and be cautious in your burn placement decisions.
=====================================================================
BASIN DISTRIBUTION Date: Wednesday 11/08 Nov-06
---------------------------------------------------------------------
                        00-06AM     Ventilate   Ready    Yesterday's
Today's Distribution    PM2.5       Ratings     Acres    Distribution
Butte       409         4.0         3.33        26608.0     328
Colusa      507         2.8         3.50        36250.0     376
Glenn       396         4.5         3.50        22616.0     358
Placer      230         4.0         3.00        200.0       214
Sacramento  226         3.8         2.67        200.0       224
Sutter      346         1.0         3.00        20076.6     292
Yolo/Solano 249         0.0         2.67        3855.0      231
Yuba        237         1.0         2.67        3281.0      597
Shasta      200         4.5         3.50        200.0       200
Tehama      200         4.5         4.00        200.0       200
BASIN      3000         3.0         3.18        113486.6   3020
---------------------------------------------------------------------
Historical Synopsis Ventilation ratings 1 (poor) to 5 (best)
---------------------------------------------------------------------
                  Yesterday                 Season-to-Date
            Complaints  Acres             Complaints        Acres
            ARB APCD    Burned            ARB APCD    Total Burned
Butte       0     0     365.5             0     1     1     5756.8
Colusa      0     0     374.0             0     3     3     10103.6
Glenn       0     0     351.0             0     0     0     9135.0
Placer      0     0     23.0              0     2     2     764.0
Sacramento  0     0     215.0             0     0     0     1134.5
Sutter      0     1     221.0             0     10    10    5824.2
Yolo/Solano 0     0     226.0             0     0     0     2158.0
Yuba        0     1     585.0             0     2     2     2186.8
```

Shasta	0	0	0.0	0	0	0	0.0
Tehama	0	0	113.0	0	0	0	895.0
BASIN	0	2	2473.5	0	18	18	37957.9

BURNING AROUND THE SVAB TODAY: Prescribed Burn/Wildfire: no
Bay Area: yes SJ Valley: yes Mountain Counties: yes

ZONES - YESTERDAY CCO - ZONE/CROP SUMMARY FILE 07-Nov

COUNTY	1	2	3	4	5	6	TOTAL
Butte	109.0	58.5	198.0				365.5
Colusa	159.0	5.0	75.0	85.0	50.0		374.0
Glenn	121.0	77.0	137.0	16.0			351.0
Placer	0.0	0.0	23.0				23.0
Sacramento	203.0	12.0	0.0				215.0
Shasta	0.0	0.0					0.0
Sutter	6.0	57.0	15.0	0.0	4.0	139.0	221.0
Tehama	113.0						113.0
Yolo/Solano	0.0	186.0	30.0	10.0	0.0	0.0	226.0
Yuba	200.0	5.0	380.0				585.0
							2473.5

ZONES - SEASON TO DATE

COUNTY	1	2	3	4	5	6	TOTAL
Butte	1731.0	1390.1	2635.8				5756.8
Colusa	3003.0	2834.6	333.5	1981.5	1951.0		10103.6
Glenn	1398.0	3575.5	2530.0	1631.5			9135.0
Placer	128.0	523.0	113.0				764.0
Sacramento	550.7	284.4	299.4				1134.5
Shasta	0.0	0.0					0.0
Sutter	1059.1	2112.0	383.7	624.0	585.4	1060.0	5824.2
Tehama	895.0						895.0
Yolo/Solano	31.0	966.0	492.0	411.0	82.0	176.0	2158.0
Yuba	1469.0	287.5	430.3				2186.8
							37957.9

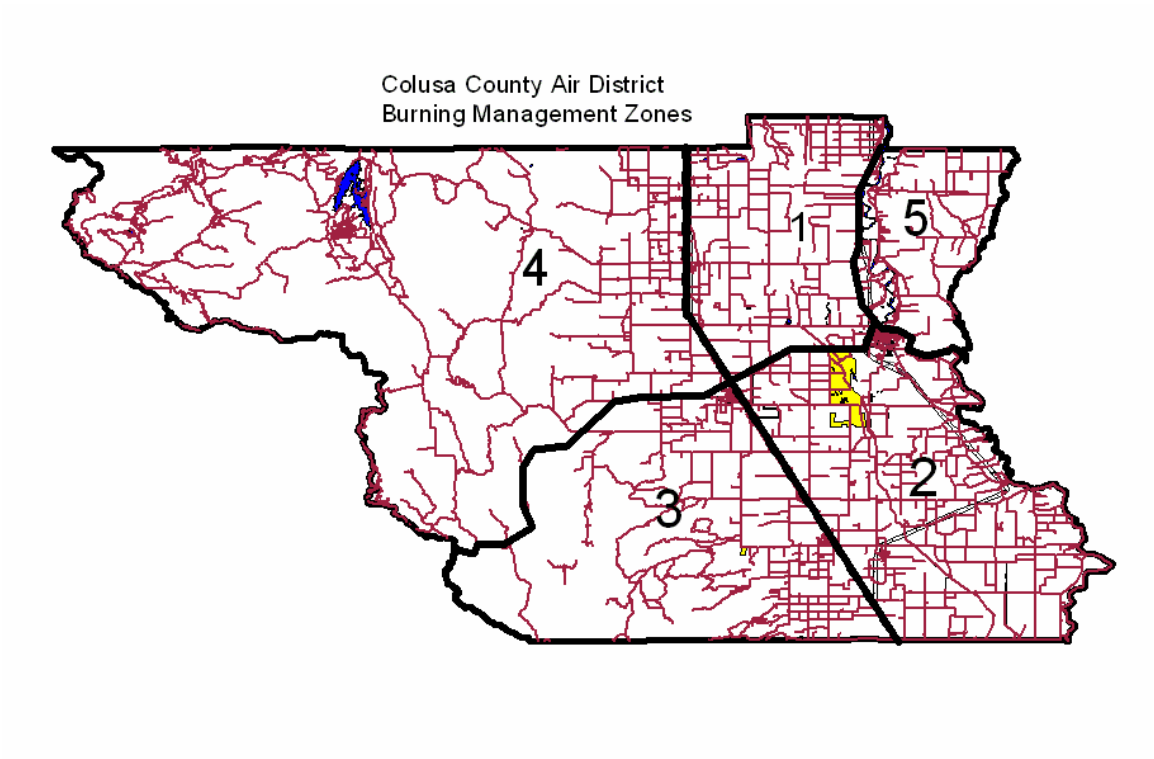
CROPS - YESTERDAY

COUNTY	Rice	Other Field	Prunings Removal	Prescribe	Misc	TOTAL
Butte	295.0	0.0	70.5	0.0	0.0	365.5
Colusa	374.0	0.0	0.0	0.0	0.0	374.0
Glenn	259.0	75.0	16.0	0.0	1.0	351.0
Placer	23.0	0.0	0.0	0.0	0.0	23.0
Sacramento	203.0	0.0	0.0	0.0	12.0	215.0
Shasta	0.0	0.0	0.0	0.0	0.0	0.0
Sutter	189.0	0.0	30.0	0.0	2.0	221.0
Tehama	0.0	1.0	112.0	0.0	0.0	113.0
Yolo/Solano	185.0	0.0	40.0	0.0	1.0	226.0
Yuba	189.0	0.0	16.0	380.0	0.0	585.0
	1717.0	76.0	284.5	380.0	16.0	2473.5

CROPS - SEASON TO DATE

COUNTY	Rice	Other Field	Prunings Removal	Prescribe	Misc	TOTAL
Butte	4205.0	0.0	1534.8	0.0	17.0	5756.8
Colusa	9638.1	355.0	106.5	0.0	4.0	10103.6
Glenn	6319.0	2177.0	402.0	136.0	101.0	9135.0
Placer	756.0	0.0	0.0	0.0	8.0	764.0
Sacramento	544.0	471.0	30.1	0.0	89.4	1134.5
Shasta	0.0	0.0	0.0	0.0	0.0	0.0
Sutter	4062.0	496.0	812.2	0.0	454.0	5824.2
Tehama	0.0	66.0	829.0	0.0	0.0	895.0
Yolo/Solano	1005.0	184.0	769.0	0.0	200.0	2158.0
Yuba	1484.0	99.0	172.8	404.0	27.0	2186.8
	28013.1	3848.0	4656.4	540.0	900.4	37957.9

Colusa County is divided into five burning management zones to assist in the spatial management of the burning. The map below shows the zones:



In 1996, David McBride and Les Fife wrote an upgraded software database program to manage the individual growers and their crop fields that needed to be tracked for effective Program implementation. This relational database program included grower name and contact information, crop and acreage data, and three methods of identifying field location. Colusa and other air districts employed the software to administer the Sacramento Valley Air Basin Agricultural Burning Management Program (aka Smoke Management Program).

Program management data are complied throughout the year as growers call in fields or orchard piles that they want to burn. Grower and field or orchard information are entered into the database. The following table shows data extracted from the database.

FIELD ID	LOCATION	SEC/TWN/RGE	ZONE	ACRES	CROP
1	WADLEIGH AND MCDERMOTT RDS	20/17N/3W	4	22	RICE
22	WADLEIGH RD	21/17N/3W	4	20	RICE
100A	LODI AT GRAINO	26/14N/1W	2	180	RICE
VR10	W. WILLIAMS / S. HWY 20 / S. E ST.	14/15N/3W	3	65	RICE
8	W. PIRES	21/16N/1W	5	107	RICE
A13	W. OF GRIMES	29/15N/2W	2	52	SAFFLOWER
HAY FLD	W. GRIDLEY HWY	03/17N/1W	5	79	RICE
JF1	GIBSON / S. LURLINE	28/16N/3W	4	141	RICE
SJ RD W	SAN JOSE 1.5 N. LURLINE RD	18/16N/2W	1	35	RICE

When a field is ready to burn and air quality and weather conditions are appropriate the Colusa Air District staff calls the grower to allocate the acres to burn a specific field. The burning data are archived at the end of each year for emission inventory purposes and further analyses. Examples of Colusa burning data from the past three years, by calendar quarter, are presented in the following tables. The different crops are listed on the left side and the location in the five burning management zones and number of acres is included. Quarters one through four are shown sequentially.

QUARTER 1

		ZONES					
CROP	Data	1	2	3	4	5	Grand Total
ALMOND	Count of ZONE		1		1	9	11
	Sum of ACRES		20		16	276	312
GRAPE	Count of ZONE					1	1
	Sum of ACRES					5	5
ORCHARD REMOVAL	Count of ZONE					1	1
	Sum of ACRES					30	30
OTHER-MISCELLANEOUS	Count of ZONE		5	1		4	1	11
	Sum of ACRES		379	5		1002	5	1391
OTHER-PRUNINGS	Count of ZONE				1			1
	Sum of ACRES				100			100
PRUNE	Count of ZONE		3	3			1	7
	Sum of ACRES		300	65			17	382
RICE	Count of ZONE		57	12	7	162	5	243
	Sum of ACRES		1763	674	402	5944	430	9213
WALNUT	Count of ZONE		8	2	7	1	4	22
	Sum of ACRES		298	14	68	80	67	527
WEEDS	Count of ZONE					1		1
	Sum of ACRES					10		10
Total Count of ZONE			74	18	16	178	12	298
Total Sum of ACRES			2760	758	586	7317	549	11970

QUARTER 2

		ZONES					
CROP	Data	1	2	3	4	5	Grand Total
ALMOND	Count of ZONE		1	3	6	1	11
	Sum of ACRES		70	123	383	20	596
BARLEY	Count of ZONE		2				2
	Sum of ACRES		80				80
BEAN	Count of ZONE		2				2
	Sum of ACRES		35				35
GRASS	Count of ZONE			2		2	4
	Sum of ACRES			36		15	51
OATS	Count of ZONE			4			4
	Sum of ACRES			239			239
OTHER-FIELD CROPS	Count of ZONE					1	1
	Sum of ACRES					90	90
OTHER-MISCELLANEOUS	Count of ZONE		5	11	2	9	7	34

	Sum of ACRES	133	305	12	674	89	1213
OTHER-PRUNINGS	Count of ZONE	1	2		2		5
	Sum of ACRES	30	30		94		154
PEA VINES	Count of ZONE	2					2
	Sum of ACRES	85					85
PRUNE	Count of ZONE	4	1				5
	Sum of ACRES	100	20				120
RICE	Count of ZONE	53	53		88	6	200
	Sum of ACRES	1579	2822		3545	192	8138
WALNUT	Count of ZONE	5	2	2	2	5	16
	Sum of ACRES	140	20	19	70	97	346
WEEDS	Count of ZONE	2	3		3	4	12
	Sum of ACRES	167	71		151	65	454
WHEAT	Count of ZONE	11	18	4	7	19	59
	Sum of ACRES	696	1637	164	329	1112	3938
Total Count of ZONE		88	99	14	113	43	357
Total Sum of ACRES		3115	5303	578	4973	1570	15539

QUARTER 3

		ZONES					
CROP	Data	1	2	3	4	5	Grand Total
ALFALFA	Count of ZONE		1	1			2
	Sum of ACRES		17	12			29
ALMOND	Count of ZONE				2		2
	Sum of ACRES				15		15
BEAN	Count of ZONE		1	5		1	7
	Sum of ACRES		15	325		10	350
CORN	Count of ZONE		4	1			5
	Sum of ACRES		124	55			179
GRASS	Count of ZONE			3		1	4
	Sum of ACRES			84		5	89
OATS	Count of ZONE			2			2
	Sum of ACRES			76			76
OTHER-FIELD CROPS	Count of ZONE		1	5		2	8
	Sum of ACRES		90	34		29	153
OTHER-MISCELLANEOUS	Count of ZONE		14	20		2	11	47
	Sum of ACRES		338	262		15	163	778
OTHER-PRUNINGS	Count of ZONE			1		1		2
	Sum of ACRES			20		50		70
PEA VINES	Count of ZONE			1				1
	Sum of ACRES			28				28
PRUNE	Count of ZONE		4	1				5
	Sum of ACRES		35	40				75
RICE	Count of ZONE		95	11	2	20	7	135
	Sum of ACRES		2268	806	100	843	426	4443
SAFFLOWER	Count of ZONE		1	24		1		26
	Sum of ACRES		58	1213		16		1287
WALNUT	Count of ZONE		2	3			3	8
	Sum of ACRES		24	29			60	113
WEEDS	Count of ZONE		4	15		1	5	25

	Sum of ACRES	205	181		95	103	584
WHEAT	Count of ZONE	15	75	3	3	7	103
	Sum of ACRES	882	6155	158	89	480	7764
Total Count of ZONE		142	168	7	30	35	382
Total Sum of ACRES		4056	9320	273	1137	1247	16033

QUARTER 4

		ZONES					
CROP	Data	1	2	3	4	5	Grand Total
ALMOND	Count of ZONE	1		1	7		9
	Sum of ACRES	20		40	30		90
BEAN	Count of ZONE	1				3	4
	Sum of ACRES	9				45	54
CORN	Count of ZONE	1					1
	Sum of ACRES	23					23
OTHER-FIELD CROPS	Count of ZONE					1	1
	Sum of ACRES					15	15
OTHER-MISCELLANEOUS	Count of ZONE	3			4		7
	Sum of ACRES	215			29		244
OTHER-PRUNINGS	Count of ZONE		2		3		5
	Sum of ACRES		21		80		101
PRUNE	Count of ZONE		2				2
	Sum of ACRES		34				34
RICE	Count of ZONE	346	190	41	218	73	868
	Sum of ACRES	13223	11162	700	7873	5258	38216
SAFFLOWER	Count of ZONE		1				1
	Sum of ACRES		52				52
SORGHUM (MILO)	Count of ZONE				1		1
	Sum of ACRES				8		8
WALNUT	Count of ZONE	1	2			1	4
	Sum of ACRES	40	50			3	93
WEEDS	Count of ZONE		1				1
	Sum of ACRES		5				5
Total Count of ZONE		353	198	42	233	78	904
Total Sum of ACRES		13530	11324	740	8020	5321	38935

Appendix B – Impact of Agricultural Burning on Particulate Matter and Ozone Concentrations

The Colusa County Air Pollution Control District analyzed the impact of agricultural burning emissions on air quality levels in the County. Analyses included impacts from combustion of agricultural residues on both particulate matter and ozone concentrations. Agricultural burning emissions include particulate emissions less than ten microns in size as-well-as precursors to ozone (i.e., oxides of nitrogen and volatile organic compounds).

Particulate Matter

Several air quality studies were reviewed that addressed the impact of agricultural (vegetative) burning on particulate $PM_{2.5}$ levels. Excerpts from these studies are included below. We have changed to bold type, for emphasis, certain sentences from the studies.

Impact of Vegetative Burning on $PM_{2.5}$ Concentrations in the San Joaquin Valley
Countess Environmental, 22nd Annual AAAR Conference October 20-24, 2003 Anaheim, CA

"Vegetative burning produces aerosol in the $PM_{2.5}$ size fraction. **Soluble potassium was used as a unique chemical marker for ambient $PM_{2.5}$ levels resulting from vegetative burning.** Source profiles for residential wood combustion (RWC) and agricultural burning were used to calculate the contribution of vegetative burning to $PM_{2.5}$ concentrations. One (1) µg/m3 of Kveg is associated with 34 µg/m3 of $PM_{2.5}$ mass if the source is RWC and 10 µg/m3 of $PM_{2.5}$ mass if the source is agricultural burning. Large spatial and temporal variations in $PM_{2.5}$ mass are due to vegetative burning. The highest $PM_{2.5}$ concentration was due to vegetative burning resulting from agricultural burning in fall and RWC in winter."

Research and Development of Emission Inventories for Planned Burning Activities for the Central States Regional Air Planning Association
Sonoma Technology, Inc., 1360 Redwood Way, Suite C, Petaluma, CA 94954

"Regional haze is visibility impairment caused mainly by particles of less than 2.5 microns in diameter ($PM_{2.5}$). $PM_{2.5}$ directly emitted from emissions sources is termed "primary $PM_{2.5}$". $PM_{2.5}$ that forms from photochemical reactions of gaseous precursors, including sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOC), and ammonia (NH_3), is termed "secondary $PM_{2.5}$". Of particular interest in the region is the contribution of $PM_{2.5}$ from wood and grassland burning to visibility impairment at Class I areas. Smoke from these fires emits organic carbon (OC) and elemental carbon (EC). **Potassium (K) is also emitted during burning of natural materials and can be used as a marker for woodland or grassland burning.** Smoke constituents, specifically EC and K, are not a significant fraction of the $PM_{2.5}$ mass and light extinction, even on days when there was evidence of planned burning influence. On select days, influence from known prescribed burns was evident, though it was generally less than 10% of the $PM_{2.5}$ mass and light extinction."

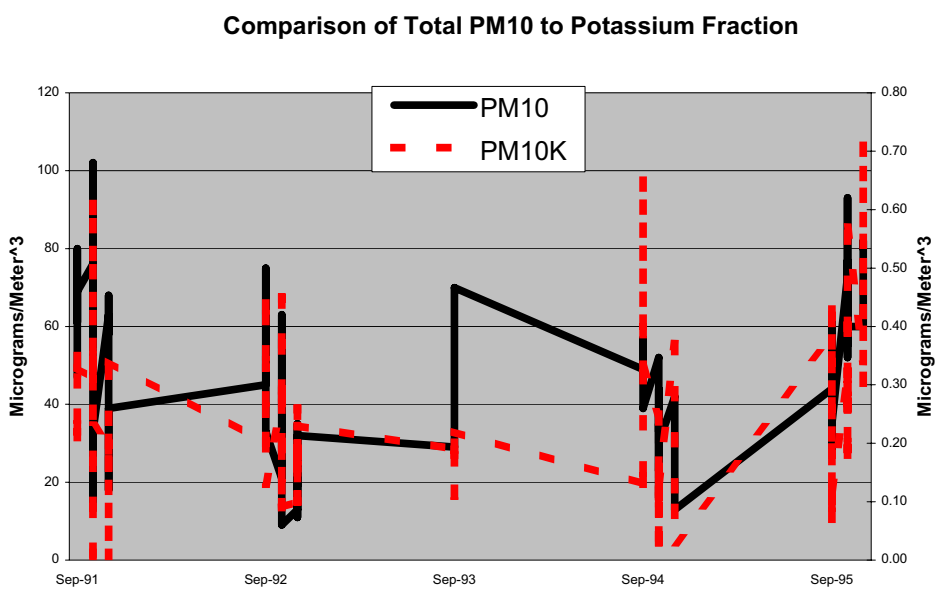
"A recent study at the University of California at Davis derived emission factors for the combustion of barley straw, corn stover, rice straw, wheat straw, and almond tree prunings (Jenkins et al., 1996). In this study, emission factors for CO, total hydrocarbons (THC), NO_x, SO_2, and PM were based on measurements collected during wind tunnel tests. Fuel loadings and emission factors were obtained from a variety of sources. For barley, corn, rice, wheat, and

almonds, emission factors were derived entirely from the Jenkins' study using average emission rates and moisture contents from two wind tunnel configurations."

Cross-border Transport of Fine Particulate Matter into Texas from Agricultural Burning
Department of Environmental and Civil Engineering, Texas A&M University
2004 Models-3 Conference Chapel Hill, NC October 18-20, 2004

"$PM_{2.5}$ level of Corpus Christi area is influenced by atypical episodes affected by the long-range transport of continental haze and smoke events attributed to agricultural burns in Texas and beyond. Sampling and Data: (1) Continuous PM2.5 data from TEOM located at the CAMS04 site in Corpus Christi. (2) FRM filter mass and fifty-three speciation elements measured at CAMS199 by the Texas Commission on Environmental Quality (TCEQ) - once every six days. Species: As, Br, Cr, Cu, Fe, Pb, Mn, Mo, Ni, Sn, V, Si, S, Ta, K, K^+, $NH4^+$, Na, Na^+, EC, Non Volatile Nitrates (NvN), OCX (Non Organic Carbonate Carbon) and OC. The multivariate receptor model, UNMIX, was used for source apportionment studies. UNMIX was then applied to a set of $PM_{2.5}$ and species data with and without data collected during the smoke events to identify unique source types associated with this event. **The UNMIX model was run with and without the smoke episode data and the primary difference was noted in the apportionment of potassium (K) in the six-source model. K is a strong indicator of burning sources and is linked to agricultural burns in the region.**"

The Air District reviewed particulate PM_{10} data from the Colusa air monitoring site operated by the California Air Resources Board at Sunrise Blvd. During the years of 1991 through 1995, for September, October and November, the Board's monitoring laboratory analyzed the particulate on the quartz, microfiber filters from the High Volume gravimetric (HVS10) sampler. The particulate captured on the filters was speciated into chloride, potassium ammonium, nitrates, sulfates and total carbon. The analyses were performed to help determine the amount of contribution from agricultural burning to the total particulate PM_{10} ambient level. A graph comparing total PM_{10} to potassium values is displayed below.



Speciated PM_{10} data (ug/m^3) from the Colusa Sunrise Blvd site are shown in the table:

DATE	CL	K	NH_4	NO_3	SO_4	Total C
9/15/91	0.2	0.21	0.3	2.6	2	6
9/18/91	0.06	0.22	0.6	3	2.4	9
9/21/91	0.32	0.24	0.2	2.2	1.9	8
9/24/91	0.23	0.3	0.3	2.5	1.2	9
9/27/91	0.11	0.35	0.7	3.7	3.9	7
9/30/91	0.41	0.33	0.2	2	1.4	9
10/3/91	0.17	0.31	0.3	2.6	1.4	10
10/6/91	0.81	0.35	0.7	4.8	2.9	7
10/9/91	0.47	0.33	0.2	2	1.2	8
10/12/91	0.37	0.61	0.6	3.5	2.4	11
10/15/91	0.13	0.31	0.8	3.9	2.5	12
10/18/91	0.01	0.26	0.9	3.7	3.3	10
10/27/91	0.48	0	0.1	0.5	0.6	2
10/30/91	0.23	0.23	0.1	0.5	1.3	4
11/2/91	0.08	0.2	0.9	4.7	1.5	10
11/5/91	0.05	0.16	0.5	3.3	1.1	12
11/8/91	0.09	0.21	2.7	12	2.3	12
11/14/91	0.56	0	0.1	1.7	1	2
11/20/91	0.11	0.34	1.4	7.6	1.2	11
9/15/92	0.13	0.2	0.1	2.4	1.2	6
9/18/92	0.03	0.25	0.5	1.2	2.6	8
9/21/92	0.08	0.33	0.7	1.6	2.6	8
9/27/92	0.1	0.44	0.2	1.7	1.1	12
9/30/92	0.09	0.13	0.2	0.7	1.1	3
10/3/92	0.1	0.27	0.1	1.1	0.7	5
10/6/92	0.17	0.14	0.1	0.6	0.8	4
10/9/92	0.17	0.19	0.2	0.8	0.9	6
10/12/92	0.1	0.29	0.6	1.8	1.6	8
10/15/92	0.69	0.45	0.4	9.3	3.2	7
10/18/92	0.03	0.29	0.3	1.8	1.9	6
10/21/92	0.09	0.1	0.1	0.8	0.6	2
10/30/92	1.9	0.09	0.1	0.7	0.7	1
11/2/92	0.13	0.1	0.1	0.6	0.4	3
11/5/92	0.09	0.19	0.4	1.1	1	9
11/8/92	0.08	0.2	0.4	1.8	1	11
11/11/92	0.08	0.14	0.3	1.1	0.9	9
11/14/92	0.06	0.18	0.9	2.6	1.1	9
11/17/92	0.07	0.1	0.2	0.7	0.8	4
11/20/92	0.09	0.26	0.6	2.5	0.6	11
11/23/92	0.07	0.17	0.4	1.4	0.5	7
11/26/92	0.08	0.15	0.4	1.3	0.6	7
11/30/92	0.08	0.23	0.6	2.2	0.8	11
9/16/93	0.08	0.19	0.2	1.5	2.5	4
9/19/93	0.06	0.18	0.3	2.4	2	4
9/22/93	0.09	0.11	0.1	0.7	0.8	4

9/25/93	0.09	0.22	0.2	1	1	9
9/17/94	0.03	0.13	0.5	1.4	2	7
9/20/94		0.15	0.5	1.4	2.3	9
9/23/94		0.44	0.4	1.2	2.1	9
9/26/94		0.65	0.8	2.3	2.8	12
9/29/94		0.33	0.1	0.7	1.3	8
10/2/94	0.03	0.25	0.2	0.9	1.3	9
10/5/94	0.05	0.03	0.1	0.8	0.5	4
10/8/94	0.03	0.15	0.1	0.7	1	10
10/11/94	0.08	0.12	0.2	2.4	2	7
10/14/94	0.06	0.11	0.1	1	0.8	7
10/17/94	0.03	0.08	0.3	1	1.5	7
10/20/94	0.03	0.13	0.1	0.6	0.8	6
10/23/94	0.03	0.03	0.1	0.7	0.7	5
10/26/94	0.03	0.16	0.1	0.7	0.5	6
10/29/94	0.03	0.13	0.1	0.7	1	7
11/1/94	0.17	0.37	0.8	3.7	1	15
11/4/94	0.03	0.09	0.1	1.4	0.6	9
11/7/94	0.03	0.03	0.1	1	0.5	3
9/15/95	0.03	0.38	0.3	1.5	2.4	
9/18/95	0.03	0.13	0.2	1.2	1.4	
9/21/95	0.03	0.09	0.4	1.3	1.4	
9/24/95	0.03	0.43	0.1	1.9	1.8	
9/27/95	0.13	0.07	0.1	1.3	0.7	
9/30/95	0.22	0.12	0.1	0.7	0.4	
10/3/95	0.11	0.31	0.1	1	0.6	7
10/6/95	0.015	0.41	0.5	2.7	1.1	12
10/9/95	0.08	0.3	0.4	1.7	1.1	10
10/12/95	0.32	0.18	0.1	0.8	0.4	5
10/15/95	0.04	0.27	0.1	1.3	0.6	8
10/18/95	0.03	0.19	0.2	1	1	6
10/21/95	0.05	0.3	0.7	3.4	1	8
10/24/95	0.05	0.26	0.4	2.3	1	8
10/27/95	0.06	0.31	2.5	5.4	2.8	7
10/30/95	0.015	0.57	2.1	4.5	3.4	10
11/2/95	0.015	0.34	1.8	3.6	2.7	9
11/5/95	0.015	0.71	0.6	3.4	1.5	19
11/8/95	0.015	0.28	0.7	3.3	1.2	11

Based on analyses of the amount of potassium in the PM_{10} it is evident that agricultural burning was a contributor to ambient levels in Colusa County. Below is an abbreviated table of days with the highest and lowest PM_{10} levels and corresponding potassium values.

DATE	PM10	PM10 K	DATE	PM10	PM10 K
10/15/91	102	0.31	10/27/91	13	0.00
10/9/95	93	0.30	11/2/92	13	0.10
10/18/91	92	0.26	11/7/94	13	0.03
10/6/95	88	0.41	10/21/92	11	0.10
10/12/91	87	0.61	11/17/92	11	0.10
11/5/95	82	0.71	10/30/92	9	0.09

Ozone

Many studies have been conducted showing the relationship of vegetative burning to ozone formation. Some of the air quality studies have occurred in the United States while other are from studies in foreign countries. Some quotes (emphasis added in bold type) from various reports are presented below:

Impact of biomass burning and biogenic emission on the evolution of Mexico City's air pollution plume Authors: Tie, X.; Madronich, S. Affiliation: ACD/NCAR, P O Box 300, Boulder, CO Publication: American Geophysical Union, Fall Meeting 2004

"We use a newly developed regional chemical/transport model (WRF-Chem) to study the air pollutions in mega cities and their effect on surrounding areas. The model is based on a state of the art regional dynamical/transport model, the Weather Research Forecasting (WRF) model developed at NCAR in collaboration with other institutions. The model includes on-line calculation of dynamical inputs (winds, temperature, boundary layer, clouds etc.), transport (advective, diffusive, and convective), dry and wet deposition, gas phase chemistry, aerosol formation, radiation and photolysis rates, and surface emissions. The horizontal resolution of the model is flexible, ranging from a few km to several hundred km. **In this study, we use a 6x6 km resolution located around Mexico City to study the air pollution inside the city and the impact of biomass burning and biogenic emissions on the chemical oxidants and ozone chemistry in the urban outflow plume**. Mexico City is a highly polluted city, with NOx (NO2 + NO) and hydrocarbons (HCs) emissions resulting in locally high ozone concentrations (150-200 ppb peak values). **The highly polluted city plume interacts strongly with the reactive emissions of the surrounding areas, esp. from vegetation and biomass burning.**"

Can large wildfires contribute to smog problems in distant places?
Gabriele Pfister, National Center for Atmospheric Research in Boulder, Colorado

"Fires also generate other harmful pollution. Fires can affect air quality. Fires emit CO—carbon monoxide—and hydrocarbons, plus nitrogen oxides, all of which, along with sunlight, are needed to make ozone. Unlike ozone in the stratosphere, which protects us from ultraviolet radiation, high levels of ozone in the troposphere, closer to ground level, can injure or destroy living tissue. **Although the ingredients for ozone can be found in urban pollution, pollutants from fires might cause a significant increase in ozone levels, even far downwind from the fires.**"

Impact of Vegetation Fires On The Composition and Circulation of The Atmosphere: Introduction of The Afo2000-research Project Efeu Authors: Wurzler, S.; The Efeu Team Publication: EGS XXVII General Assembly, Nice, 21-26 April 2002

"Biomass burning is a significant source of tropospheric trace gases and aerosol particles. The atmospheric effects of vegetation fires range from the microscale to the global scale. The joint research project EFEU aims to address the questions: 1) How much do vegetation fires affect the regional and global trace gas and particles budget of the troposphere? EFEU consists of 3 experimental and 5 modeling subprojects. The laboratory experiments include the determination of the optical, physical and chemical characteristics of biomass burning aerosol. The numerical

models are forming a hierarchy in order to simulate the effects of biomass burning from the microscale to the regional scale. The model simulations include radiative transfer, atmospheric dynamics and chemistry, interactions between aerosols and clouds from small to regional scale. **Model results indicate that there is fast ozone production in biomass burning plumes.**

From other studies conducted around the globe are the following conclusions:

"The tropics are changing rapidly. Biomass burning, largely by humans, has for centuries been ubiquitous in African savanna. Biomass burning was shown to be important by the Quemadas studies in Brazil in 1979 and 1982. Recently, additional studies have been completed in South America during the STARE/TRACE missions and in South Africa as part of TRACE/SAFARI. Together, these studies have shown the following:

Evidence for the impact of fires on atmospheric chemistry comes from satellite-based instruments, intensive field observation programs and ground based-monitoring networks. **In regions affected by tropical biomass fires ozone concentrations are found in the range of 50 to 100 ppb.** Near the transition between savanna and the forest, mixing ratios of ozone as large as 70 ppbv are commonly observed between 1 and 3 km altitude (Figure 2; cf. Andreae et al., 1992)."

Both the federal Environmental Protection Agency and California Air Resources Board have quantified emissions from the open burning of agricultural residues. Emissions of criteria pollutants and fuel loading factors are presented in the EPA document AP-42.

U.S. Environmental Protection Agency. "Compilation of air pollutant emission factors, AP-42.Vol. 1: stationary point and area sources. 5th ed., with Supplements A through F and Updates Through 2003." 2003.

The ARB paid for a study of combustion emissions from agricultural wastes such as barley straw, corn stover, rice straw, wheat straw, and almond tree prunings (Jenkins et al., 1996).

Jenkins, B. M.; Turn, S. Q.; Williams, R. B.; Goronea, M.; Abd-el-Fattah, H.; Mehlschau, J.; Raubach, N.; Chang, D. P. Y.; Kang, M.; Teague, S. V.; Raabe, O. G.; Campbell, D. E.; Cahill, T. A.; Pritchett, L.; Chow, J.; Jones, A. D. "Atmospheric pollutant emission factors from open burning of agricultural and forest biomass by wind tunnel simulations." California Air Resources Board Project No. A932-126, Final report prepared for the California Air Resources Board, Sacramento, CA 1996.

ARB staff compiled a comprehensive emission factor database utilizing the results of the Jenkins study in conjunction with AP-42 data.

Gaffney, P. "Emission factors for open burning of agricultural residues", California Air Resources Board Planning and Technical Support Division, 2000.

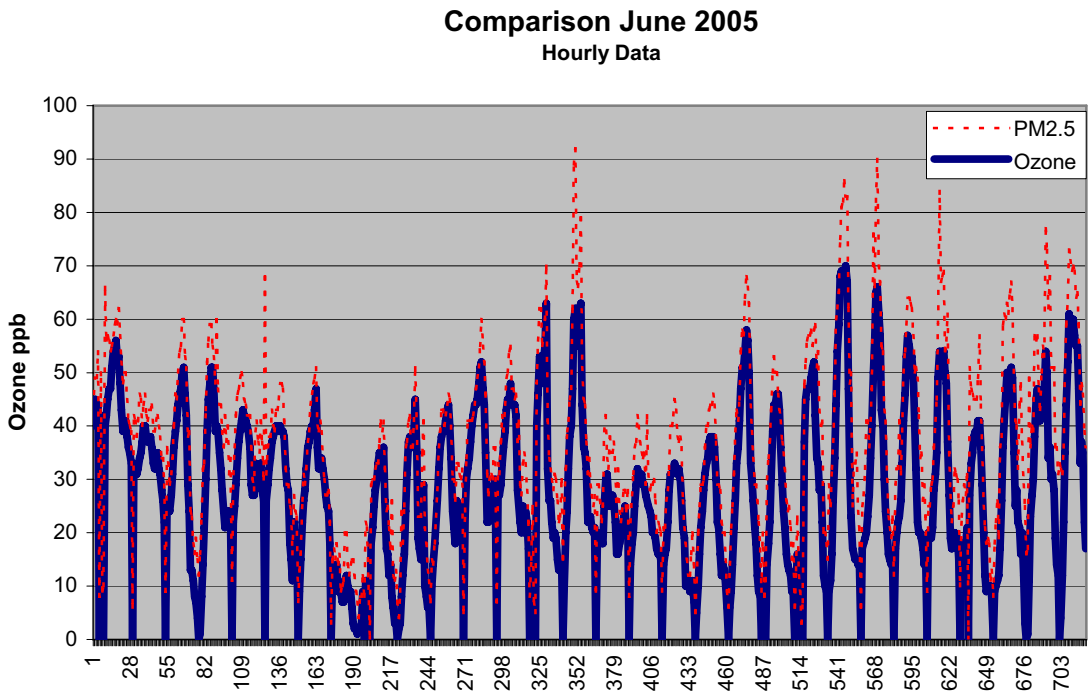
The combustion emission factors detailed in the ARB report include the precursors to ozone formation (i.e., oxides of nitrogen and volatile organic compounds). In the Sacramento

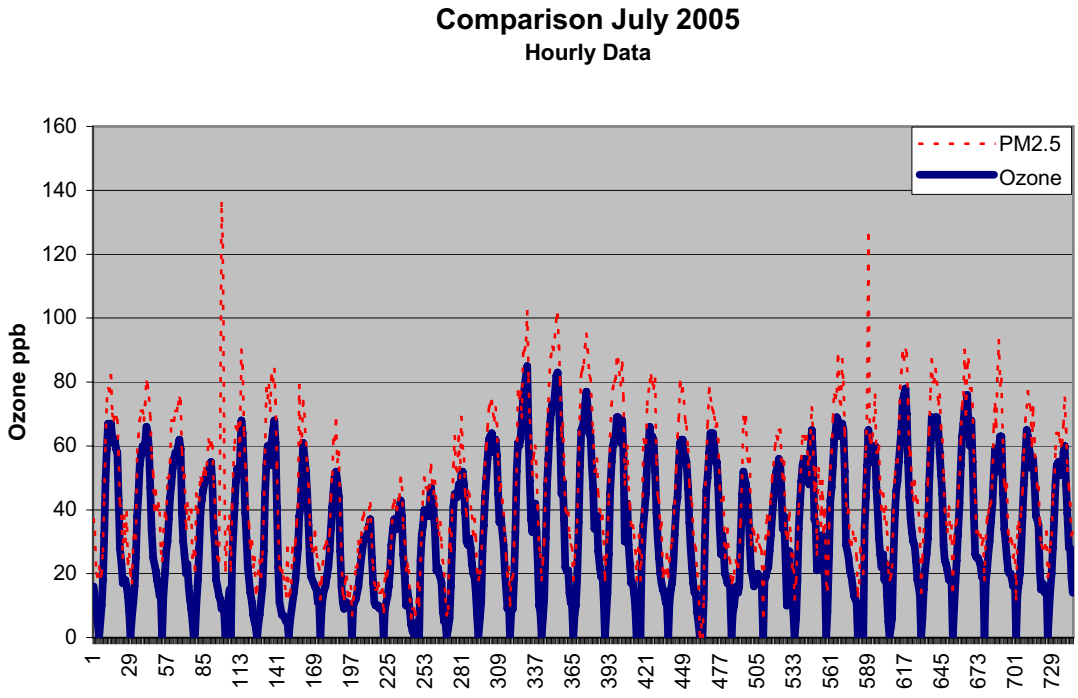
Valley Air Basin and especially in Colusa County agricultural burning is a large source of ozone precursor emissions. The table below lists data from the ARB emission inventory for two years:

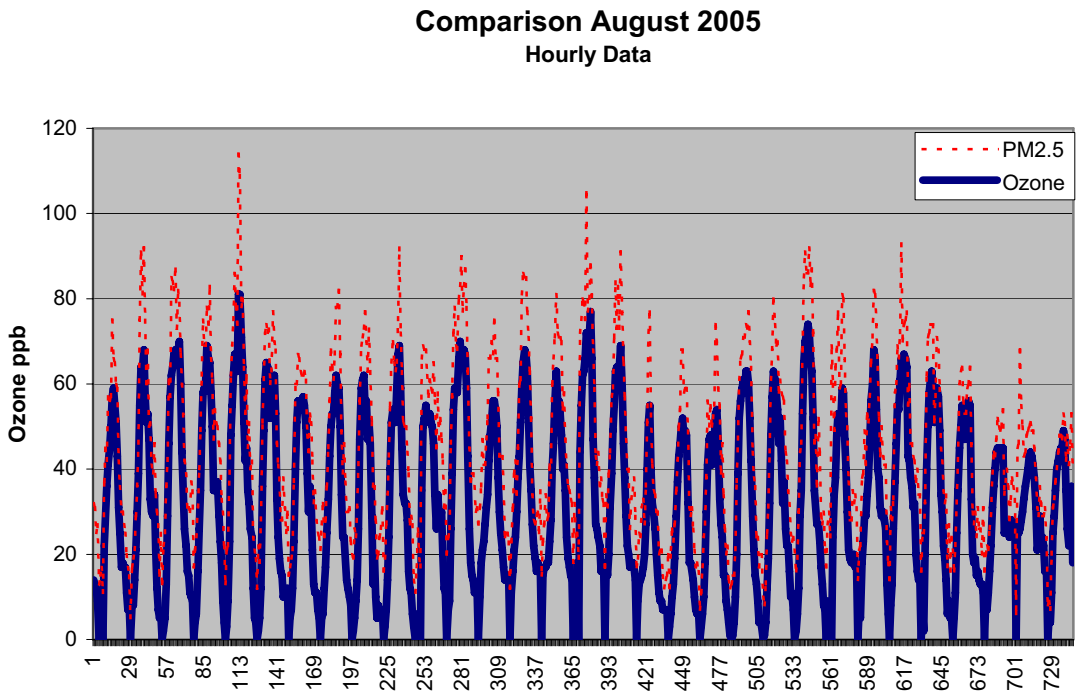
EMISSIONS IN TONS PER YEAR

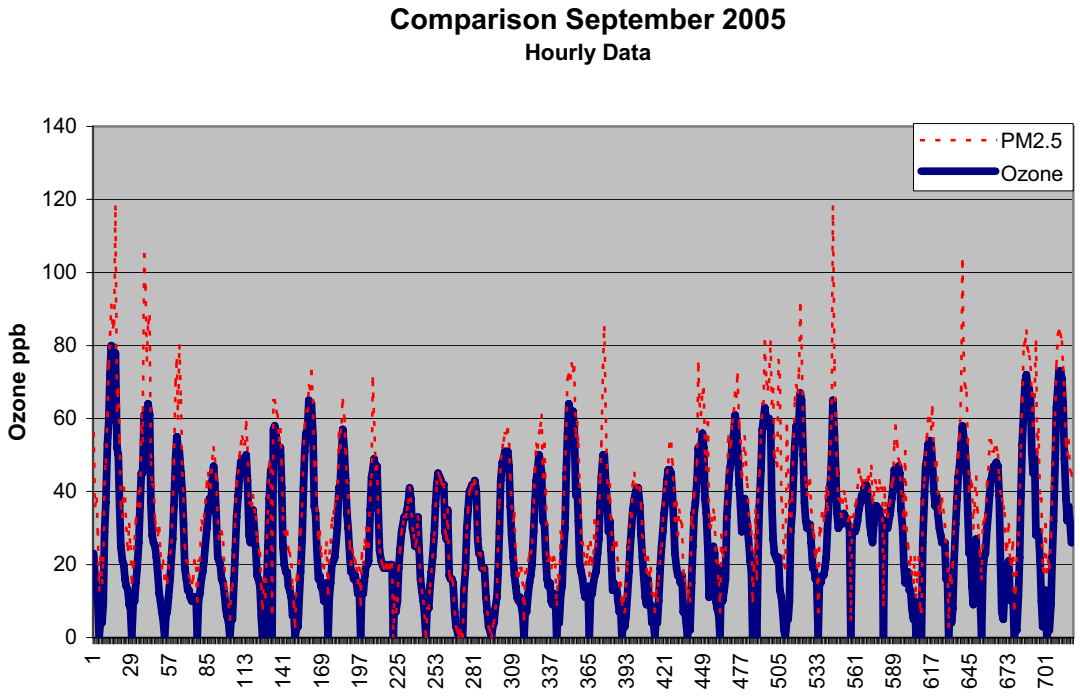
1990							
EIC Name	Activity Data	VOC	CO	NOX	SO2	PM10	PM25
AGRICULTURAL BURNING - PRUNINGS	7,018.93	17.58	187.28	18.94	0.40	18.13	17.33
AGRICULTURAL BURNING - FIELD CROPS	353,996.87	901.54	11429.84	904.30	189.98	1210.09	1136.77
WEED ABATEMENT	10,821.82	63.58	676.94	22.81	2.51	92.40	85.38
RANGE IMPROVEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WASTE BURNING (UNSPECIFIED)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002							
AGRICULTURAL BURNING - PRUNINGS	2,434.20	6.73	74.09	6.28	0.15	7.39	6.98
AGRICULTURAL BURNING - FIELD CROPS	79,337.77	218.30	2735.23	200.92	41.72	292.82	275.64
WEED ABATEMENT	5,311.35	28.50	302.61	11.92	1.62	42.23	40.31
RANGE IMPROVEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WASTE BURNING (UNSPECIFIED)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Analyzing the impact of agricultural burning in Colusa County on ozone air quality levels we refer to the particulate data presented in the section above. Particulate PM_{10} with the potassium marker illustrates the clear contribution of agricultural burning to ambient PM_{10} levels. The emission inventory data for field crop burning show a significant fraction of the PM_{10} emissions are also in the $PM_{2.5}$ range, approximately 94 percent. We collected hourly data for $PM_{2.5}$ from the ARB realtime Beta Attenuation Monitor (BAM) located at the Colusa Sunrise Blvd site. Also we obtained the corresponding hourly ozone data from the same site. Hourly data that we analyzed were from 2005 for the months of June through October (the ozone season). These data, for each month, show a parallel in terms of values for almost every hour. The following five graphs, in chronological order, with ozone and $PM_{2.5}$ data are presented to illustrate the correlation of burning to ozone levels.


Comparison June 2005
Hourly Data
Ozone ppb
PM2.5
Ozone
100
90
80
70
60
50
40
30
20
10
0
1
28
55
82
109
136
163
190
217
244
271
298
325
352
379
406
433
460
487
514
541
568
595
622
649
676
703


Comparison July 2005
Hourly Data
Ozone ppb
PM2.5
Ozone
160
140
120
100
80
60
40
20
0
1
29
57
85
113
141
169
197
225
253
281
309
337
365
393
421
449
477
505
533
561
589
617
645
673
701
729


Comparison August 2005
Hourly Data
Ozone ppb
PM2.5
Ozone
0
20
40
60
80
100
120
1
29
57
85
113
141
169
197
225
253
281
309
337
365
393
421
449
477
505
533
561
589
617
645
673
701
729


Comparison September 2005
Hourly Data
Ozone ppb
PM2.5
Ozone
0
20
40
60
80
100
120
140
1
29
57
85
113
141
169
197
225
253
281
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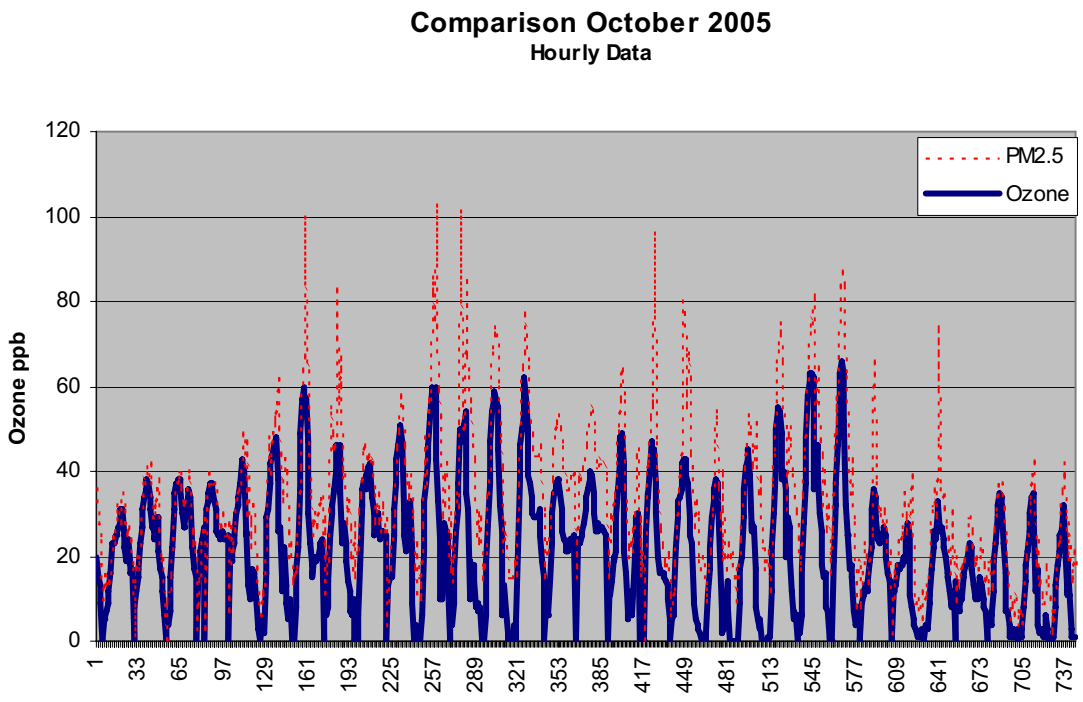
505
533
561
589
617
645
673
701



With only a few exceptions, the concentration trendlines of ozone and $PM_{2.5}$ particulate in the graphs coincide hour-for-hour.

The Sacramento Valley Air Basin air districts reviewed the air monitoring data from several locations during a study in the early 1990s and concluded that agricultural burning emissions during the ozone season could impact ozone values.

Because of the correlation between agricultural burning emissions and ozone concentrations the Smoke Management Program Plan for the Sacramento Valley Air Basin was amended to include this provision:

"Spare-The-Air No Burn Days"

"….. if open burning can be postponed on days predicted to exceed ambient air quality standards for ozone this could help reduce the need for additional costly regulations on industry in the Valley. Therefore, a program will be conducted in the Sacramento Valley Air Basin on days with predicted ozone violations. As part of the program a no-burn day may be declared by a district on a day when the ARB and/or district predict(s) an exceedance of ambient air quality standards for ozone in that district."

Appendix C – Emission Reduction Credits and Offsets

The Colusa County Air Pollution Control District Rules and Regulations have two rules that apply to banking emission reduction credits and requiring those credits to offset new emissions of nonattainment air pollutants. The rules are RULE 3.16 EMISSION REDUCTION CREDIT AND BANKING and RULE 3.6 STANDARDS FOR AUTHORITY TO CONSTRUCT (NEW SOURCE REVIEW).

The pertinent provisions of Rule 3.16 are:
APPLICABILITY OF THIS RULE

The provisions of this Rule apply to the deposit, transfer, and use of emission reduction credits (ERCs) from stationary sources and open biomass burning sources of air pollution emissions. References in this rule to non-permitted source, permit exempt, shutdown, curtailment, authority to construct and permit to operate do not apply to open biomass burning sources. Additional details and procedures covering open biomass burning sources can be found in the Manual of Procedures (MOP) for this rule.
PURPOSES OF THIS RULE

1. To provide a mechanism for permitted and non-permitted emission sources to deposit, transfer, and use ERCs as offsets as allowed by applicable laws and regulations. To ensure that all emission reductions are transferred through the District's emission reduction credit bank pursuant to the Health and Safety Code. All transfers and uses of emission reductions that are required under the District's New Source Review (NSR) Rule, Rule 3.6, shall be processed in accordance with this rule.
2. To define ERC eligibility standards, quantitative procedures, and administrative practices and to ensure that ERCs are real, permanent, quantifiable, surplus, and enforceable. Reductions in emissions from the required phasedown of rice straw burning qualify as surplus pursuant to Section 41865 of the California Health and Safety Code.
3. To provide a mechanism for intrabasin transfer and use of banked ERCs.
4. To ensure that open biomass burning is prohibited for a parcel for which an ERC exists.

The pertinent provisions of Rule 3.6 are:
OFFSET REQUIREMENTS, GENERAL

Emission reductions shall be required from existing emission sources, sufficient to offset calendar quarter emission increases of nonattainment pollutants or their precursors associated with a new or modified stationary source and shall be determined as follows:

A. Offsets shall be required for a new stationary source with a potential to emit, calculated pursuant to Section d.4. of nonattainment pollutants or their precursors equal to or exceeding twenty-five (25) tons per year. The amount of offsets required shall be at least equal to that portion of the potential to emit that exceeds 25 tons per year.

LOCATION OF OFFSETS AND OFFSET RATIOS

Offset ratio and the corresponding distances from the proposed stationary source shall be:

A. On-site, at a ratio of 1:1;
B. Within 20 miles, at a ratio of 1.2:1;
C. 20 to 50 miles, at a ratio of 1.5:1;
D. Over 50 miles, at a ratio of 2:1.

Use of offsite offsets must result in a net air quality benefit, as determined by the APCO.

Offsets that are obtained from a source located in another district may be used only if the provisions of Health and Safety Code 40709.6 are met, and the involved districts enter into an agreement formalized by a memorandum of understanding.

As stated in Rule 3.16 emission reduction credits must be real, quantifiable, permanent and enforceable. Real means actual, tangible air emissions that are reduced. Emissions from agricultural burning, at least the particulate matter (smoke), are obvious to everyone. However, gaseous pollutants are also emitted. See the following pictures.

Rice straw burning & blackened field

Rice straw burning & buoyant plume

Smoke plume in top picture is fumigating. Power poles & transmission tower provide scale.

The quantity of biomass in a field and the air pollution emissions from burning various crop residues are described in the table of a report prepared by Patrick Gaffney of the California Air Resources Board.

Gaffney, P. "Emission factors for open burning of agricultural residues", California Air Resources Board Planning and Technical Support Division, 2000.

Crop	PM10 (lbs/ton)	PM2.5 (lbs/ton)	NOx (lbs/ton)	SO2 (lbs/ton)	VOC (lbs/ton)	CO (lbs/ton)	Field Fuel Loading (tons/acre)	Fuel Moisture % dry wt	Source
Field and Row Crops									
Alfalfa	28.5	27.2	4.5	0.6	21.7	119.0	0.8	10.4	AP-42, ARB PM sizing, Jenkins NOx & SO2
Barley	14.3	13.8	5.1	0.1	15.0	183.7	1.7	6.9	Jenkins (EF), AP-42 (loading)
Corn	11.4	10.9	3.3	0.4	6.6	70.9	4.2	8.6	Jenkins (EF), AP-42 (loading)
Oats	20.7	19.7	4.5	0.6	10.3	136.0	1.6	9.6	AP-42, ARB PM sizing, Jenkins NOx & SO2
Rice	6.3	5.9	5.2	1.1	4.7	57.4	3.0	8.6	Jenkins (EF), AP-42 (loading)
Safflower	17.7	16.9	4.5	0.6	14.8	144.0	1.3	14.1	AP-42, ARB PM sizing, Jenkins NOx & SO2
Sorghum	17.7	16.9	4.5	0.6	5.1	77.0	2.9	17.2	AP-42, ARB PM sizing, Jenkins NOx & SO2
Wheat	10.6	10.1	4.3	0.9	7.6	123.6	1.9	7.3	Jenkins (EF), AP-42 (loading)
Averages			4.5	0.6					
Orchard & Vine Crops									
Almond	7.0	6.7	5.9	0.1	5.2	52.2	1.0	18.3	Jenkins (EF), Loading from industry
Apple	3.9	3.7	5.2	0.1	2.3	42.0	2.3	53.5	AP-42, ARB PM sizing, Jenkins NOx & SO2
Apricot	5.9	5.6	5.2	0.1	4.6	49.0	1.8	33.7	AP-42, ARB PM sizing, Jenkins NOx & SO2
Avocado	20.6	19.4	5.2	0.1	18.5	116.0	1.5	29.3	AP-42, ARB PM sizing, Jenkins NOx & SO2
Bean/Pea	13.7	13.0	5.2	0.1	14.2	148.0	2.5	11.4	AP-42, ARB PM sizing, Jenkins NOx & SO2
Cherry	7.9	7.4	5.2	0.1	6.0	44.0	1.0	36.2	AP-42, ARB PM sizing, Jenkins NOx & SO2
Citrus	5.9	5.6	5.2	0.1	6.8	81.0	1.0	29.3	AP-42, ARB PM sizing, Jenkins NOx & SO2
Date palm	9.8	9.3	5.2	0.1	3.8	56.0	1.0	13.3	AP-42, ARB PM sizing, Jenkins NOx & SO2
Fig	6.9	6.5	5.2	0.1	6.0	57.0	2.2	30.1	AP-42, ARB PM sizing, Jenkins NOx & SO2
Grape	4.9	4.6	5.2	0.1	3.8	51.0	2.5	31.5	AP-42, ARB PM sizing, Jenkins NOx & SO2
Nectarine	3.9	3.7	5.2	0.1	2.3	33.0	2.0	32.0	AP-42, ARB PM sizing, Jenkins NOx & SO2
Olive	11.8	11.1	5.2	0.1	10.3	114.0	1.2	33.5	AP-42, ARB PM sizing, Jenkins NOx & SO2
Orchard	10.5	10.0	5.2	0.1	7.6	81.0	1.8	31.1	Average tree and vine
Peach	5.9	5.6	5.2	0.1	3.0	42.0	2.5	15.7	AP-42, ARB PM sizing, Jenkins NOx & SO2
Pear	8.8	8.3	5.2	0.1	5.1	57.0	2.6	34.3	AP-42, ARB PM sizing, Jenkins NOx & SO2
Prune	2.9	2.8	5.2	0.1	4.6	47.0	1.2	25.3	AP-42, ARB PM sizing, Jenkins NOx & SO2
Walnut	4.2	4.0	4.5	0.2	4.8	67.0	1.2	33.1	Jenkins (EF), AP-42 (loading)
Averages			5.2	0.1					
Grassland	15.9	15.2	4.5	0.6	10.7	114.0	2 to 3.2	10.3	Average field crops
Chaparral	20.1	17.3	3.5	0.1	14.4	153.7	7 to 23	27.2	Hardy, 1996, NOx & SO2 avg Jenkins fir & pine
Forest	19 to 30	17 to 27	3.5	0.1	8 to 21	154 to 312	7 to 23+	27.2	Hardy & Ward, summary of EFs

Prepared by: Patrick Gaffney California Air Resources Board, Planning and Technical Support Division August, 2000

Colusa Air District Rule 3.16 Emission Reduction Credit and Banking contains the formula for calculating emission reduction credits from biomass burning.

The District will determine a quarterly ERC value for each pollutant based on the following calculation: ERCs = (AB - DA) * HBF * FL * EF * QBF

AB = acres burned
DA = discount acres
HBF = historical burn fraction
FL = fuel loading
EF = emission factors
QBF = quarterly burn fraction

The fuel loading and emission factors are found in the ARB table (see above) and the historical and quarterly burn fractions for Colusa County are shown in the table below. These fractions were derived from burn records for the period of 1998 through 1992. There were 3,126 agricultural burning records reviewed for Colusa County to determine the quarterly burn fractions for each crop. Historical burn fractions were determined by comparing burn acreage data for each type of crop with planting acreage records in corresponding years.

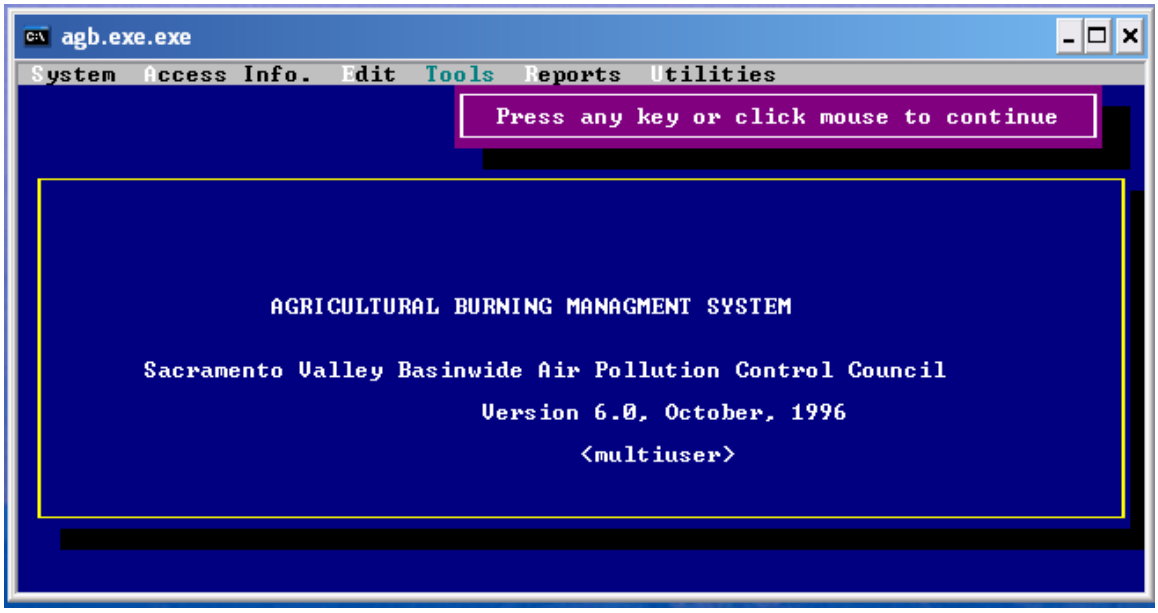
COLUSA - HISTORICAL BURN FRACTION (HBF)
QUARTERLY BURN FRACTIONS (QBF)

CROP RESIDUE		**HBF**	**QBF**			
PRUNINGS	**CODE**		**QTR 1**	**QTR 2**	**QTR 3**	**QTR 4**
ALMOND	101	0.18	0.46	0.12	0.05	0.37
PRUNE	122	0.29	0.38	0.15	0.09	0.38
WALNUT	125	0.15	0.34	0.27	0.14	0.25
OTHER PRUNINGS	126	0.15	0.62	0.25	0.02	0.11
FIELD CROPS						
CORN	244	0.01	0.00	0.00	0.00	1.00
BEAN	243	0.02	0.00	0.37	0.53	0.10
BARLEY	242	0.10	0.00	0.40	0.60	0.00
OTHER FIELD CROPS	255	0.10	0.00	0.65	0.35	0.00
WHEAT	254	0.34	0.00	0.37	0.62	0.01
SAFFLOWER	252	0.67	0.01	0.00	0.99	0.00
RICE	250	1.00	0.31	0.25	0.10	0.34
MISC. REMOVAL						
ORCHARD REMOVAL	114	1.00	0.11	0.21	0.34	0.34
DITCHBANK & CANAL	581	0.50	0.23	0.22	0.39	0.16
SLASH	471	0.50	1.00	0.00	0.00	0.00

Appendix D – Enforcement of Emission Reduction Credits and Offsets

The Colusa County Air Pollution Control District has the responsibility to implement the air quality rules and regulations adopted by the District Board. The rules regarding New Source Review and Emission Reduction Credit and Banking include provisions for requiring major sources of nonattainment pollutants to obtain emission offset credits and that those emission credits are enforceable and permanent.

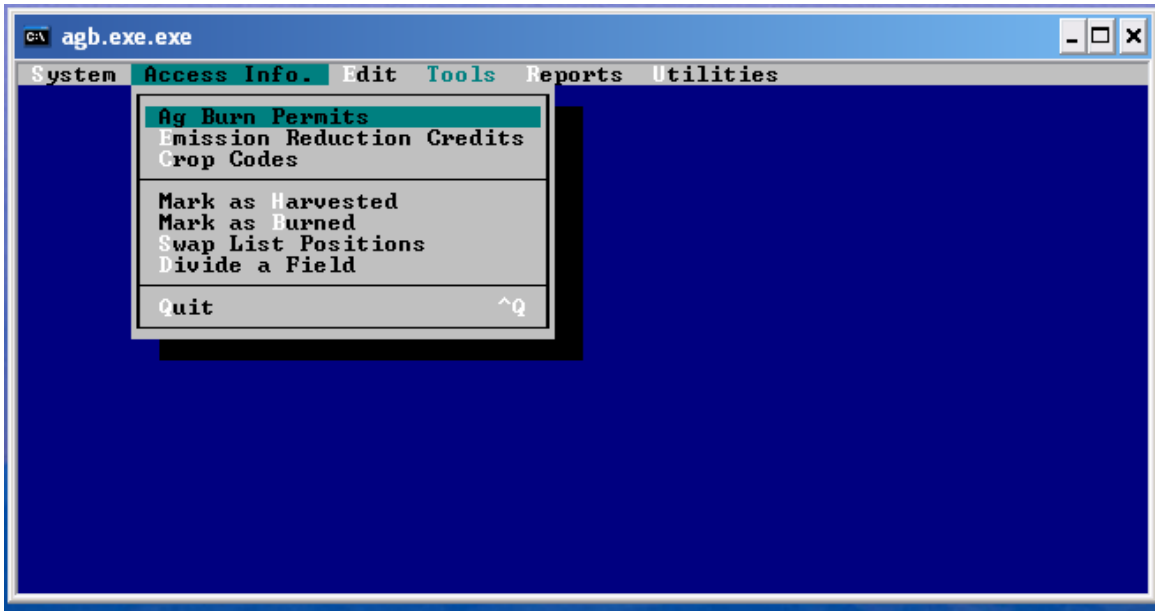
Colusa's Air District has been a part of the successful Smoke Management Program (SMP) of the Sacramento Valley Air Basin (SVAB) since its inception in 1981. The California ARB Meteorology Section decides each day the burn status for the Sacramento Valley and allocates a specific number of acres to de divided among the air districts in the Basin. This basinwide burning management program relies on a current, comprehensive database of agricultural fields that growers want to burn. When the Colusa District receives its allocated acres, District staff run the Agricultural Burning Management System software to access the grower database. See graphic below showing the program's opening window with pull down menus for system information, accessing the databases, editing files, special tools, creating reports and utility options:



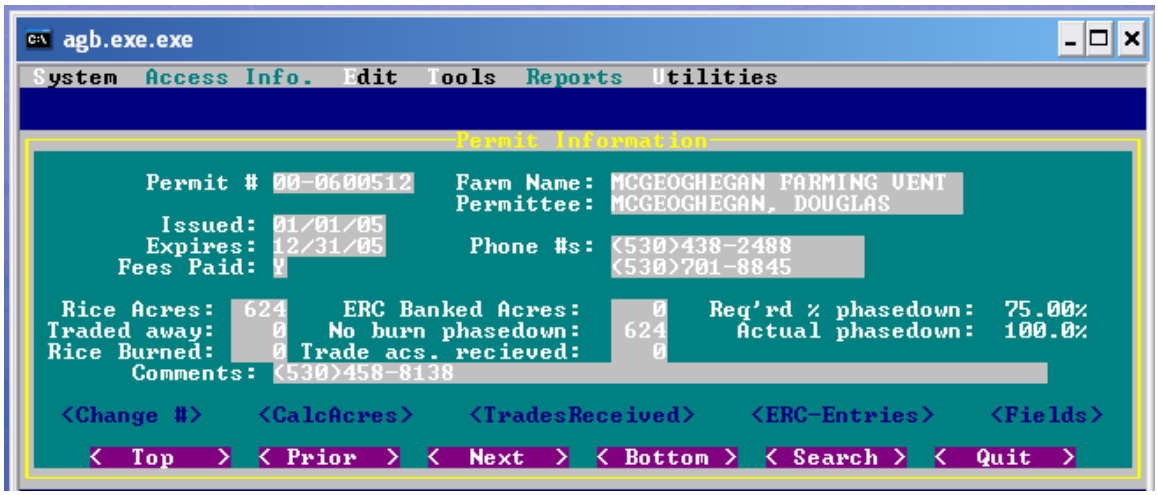
The AGB software includes several relational databases of grower contact information, detailed field data, and emission reduction credits. The software also includes various output reports that are customizable.

For example a grower calls in to the Colusa Air District office in the fall after he/she has harvested a field and wants to burn the field. The District staff asks for information on permit number, farm name, grower name and phone numbers to enter into the database. The staff ask for specific information on the field i.e., type of crop residue, number of acres, location of field (road(s), section township and range and zone), when the field was harvested, and any requirement for a certain wind direction for burning.

The next graphic shows the pull down menu for entering a field into the database when a growers calls in to get the field on the “burn list”.



The grower information screen with summary rice acreage data is shown below:



Pursuant to the Rice Straw Burning Reduction Act of 1991, the SVAB air districts were required to monitor and enforce the phase down of rice straw burning and this database automatically sums the number of rice acres and the amount of acres burned to calculate the actual phase down percentage and compare it to the required level. This compliance information is displayed for each rice grower on the grower screen. There are several buttons on the screen that allow for trading acres (no longer allowed by law) manual recalculation, viewing fields with ERCs and listing all of the grower’s fields. The next graphic shows a list of fields in the database for this grower.

agb.exe.exe

System Access Info. Edit Tools Reports Utilities

Permit Information

Permit # 00-0600512 Farm Name: MCGEOGHEGAN FARMING VENT
Permittee: MCGEOGHEGAN, DOUGLAS

Field Information

	FIELD #	LOCATION	ZONE	ACRES	BURN?	STAT	LIST#
R	N1	GUNNERSFIELD RCH. 4MI. RD.	1	42	No!	E	
R	N10B	GUNNERSFIELD RANCH	1	22	No!	E	
R	N10C	GUNNERSFIELD RANCH	1	22	No!	E	
R	N2	GUNNERSFIELD RCH. 4MI. RD.	1	47	No!	E	
R	N3	GUNNERSFIELD RCH. 4MI. RD.	1	47	No!	E	
R	N4	GUNNERSFIELD RCH. 4MI. RD.	1	37	No!	E	
R	N5	GUNNERSFIELD RCH. 4 MI,	1	33	No!	E	
R	N6	GUNNERSFIELD RCH. 4MI. RD.	1	33	No!	E	
R	N7	GUNNERSFIELD DEL./4MI.	1	35	No!	E	
R	N9	GUNNERSFIELD RCH. 4MI. RD.	1	33	No!	E	
R	PASTURE	GUNNERSFIELD RANCH	1	21	No!	E	
R	S4-1	4MILE/DELEVAN	1	20	No!	E	
R	S4-2	4 MILE/DELEVAN	1	22	No!	E	
R	S4-3	4 MILE/DELEVAN	1	21	No!	E	

Please select a Field, Esc to add Field or Exit

This grower had decided to eliminate burning of his rice (R) fields noted in column two at the specific locations in burning management zone number 1. Therefore the burn status for each field is "No" and there is no list number shown. An example of another grower who wanted to burn his rice field is shown below:

agb.exe.exe

System Access Info. Edit Tools Reports Utilities

Permit Information

Permit # 00-0600048 Farm Name: ANDREOTTI, H. & A.
Permittee: ANDEROTTI, MARK

Field Information

Field # 606 Acres: 101 Zone: 2 StatusB CropRICE
StCode: 250
Location: GREEN RANCH
Assessor's Parcel # Sec/Twn/Rng: 28/14N/1E
Available to Burn (y/n): Y List # 643

Date Reported: 10/16/06 Date Harvested: 10/16/06 Method: S

Calculated Ready Date: 10/19/06 Requested Wait 'til Date: / /

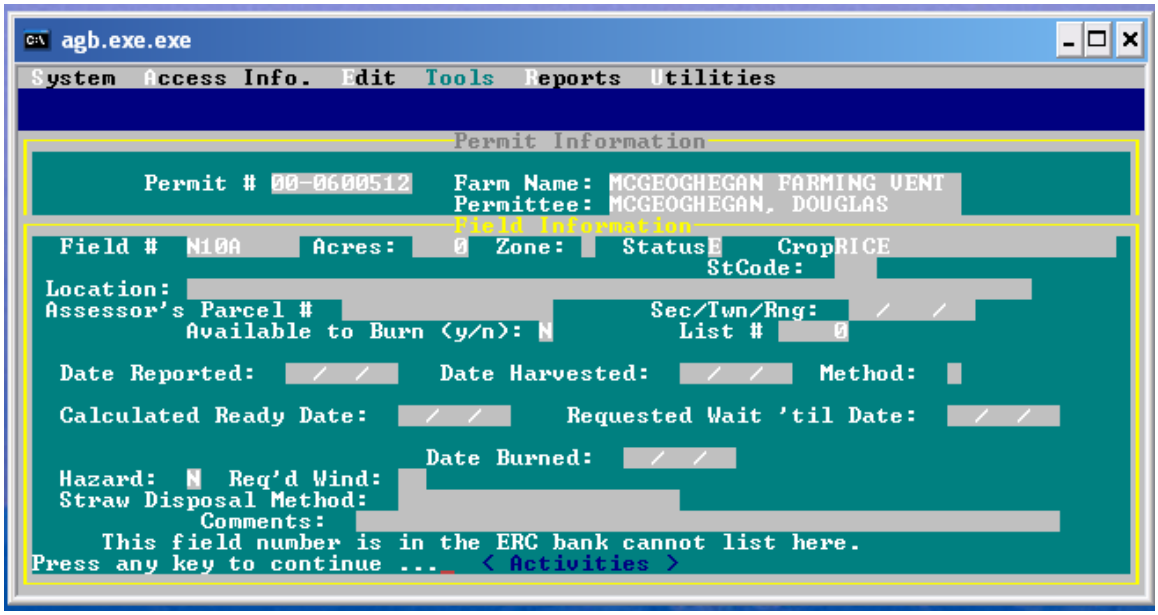
Date Burned: 11/01/06
Hazard: N Req'd Wind:
Straw Disposal Method:
Comments:

< Activities >

The field information for this grower includes the field ID "606" number of acres "101" in zone "2" the field status "B" for burned, crop "Rice", field location and the section township and range. Because this field was to be burned it has a list number "643" the report and harvest dates are the same "10/16/06" the ready date was three days later (a drying requirement for spread rice straw) and it was burned on "11/01/06".

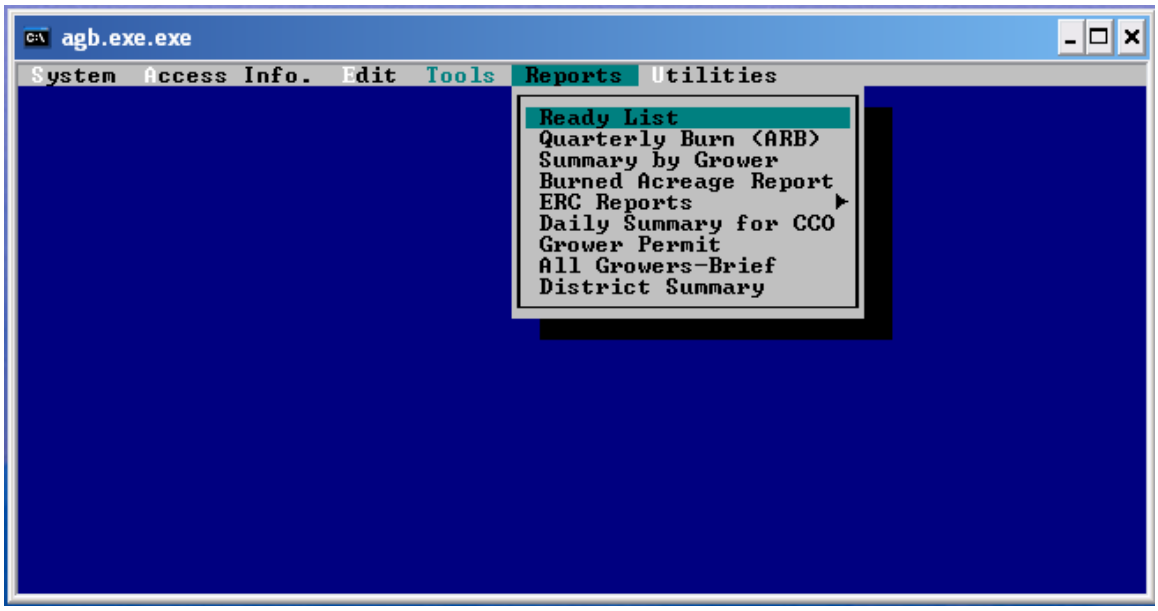
To demonstrate the method of enforcing the ban on fields with ERCs I tried to enter a field into the burning management database for the grower who had decided to

acquire emission credits on his rice fields. The message on the bottom of the program field screen along with an audible beep (just imagine) is shown in the next graphic:



This is one method of enforcing the ERCs that have been issued to growers in Colusa County. Fields with ERCs cannot be entered into the burn database. ONLY fields that are in the database and that have passed the drying time are allowed to be burned. When the ARB declares a burn day and Colusa County is allocated acres, the District staff access the database and select the appropriate fields to be burned based upon location and zone, prevailing wind, downwind receptors and number of acres.

The Agricultural Burning Management System software also has a report menu that allows the user to generate many different types of reports.



Besides the Agricultural Burning Management System software a "no burn list" has been created from information in the emission reduction credit calculation spreadsheets. These spreadsheet data are entered into another database that contains all of the fields that have ERCs. See the excerpt from the database below:

GROWER	FARM NAME	CERTIFICATE#	FIELD ID	CROP	ACRES	AP NUMBER
Jim LaGrande	LaGrande Farms	06-01-03-01	3B	Rice	66	014--300-021
Jim LaGrande	LaGrande Farms	06-01-03-01	3C	Rice	66	014--300-021
Jim LaGrande	LaGrande Farms	06-01-03-01	1A	Wheat	43	016-210-036
Jim LaGrande	LaGrande Farms	06-01-03-01	2A	Wheat	43	016-210-036
Jon B. Chaney	Gunnersfield Ranch	06-01-02-01	4	Rice	19	15-010-01
Jon B. Chaney	Gunnersfield Ranch	06-01-02-01	7	Rice	21	15-010-01

The Colusa Air District Banking Rule has a provision requiring ERC applicants to disclose the method of crop residue disposal used to avoid open burning of fields with ERCs. The annual survey form sent to growers with ERC certificates contains information on pertinent District rule requirements and a table listing their field and asking for the alternative method of disposal and any tenants who may farm the property.

ANNUAL SURVEY INFORMATION

TO: EMISSION REDUCTION CREDIT CERTIFICATE HOLDER
FROM: COLUSA COUNTY AIR POLLUTION CONTROL DISTRICT

The Colusa County Air Pollution Control District adopted an air pollution rule in 1994 allowing growers in the agricultural community to obtain emission reduction credits (ERCs) from the cessation of burning agricultural residue in their fields. These ERCs could then be sold to major industrial facilities that are required to "offset" their emission increases of air pollutants that violate the established air quality standards. The agricultural burning emission reductions have to be permanent and enforceable by California and federal laws and regulations.

Several growers have applied for and received ERC certificates from the Colusa Air District for eliminating burning on their properties. Many growers are selling their ERCs to companies that want build major industrial facilities in Colusa County. State agencies, in their legal oversight roles, are requiring the Colusa Air District to provide proof of the validity and enforceability of the agricultural burning ERCs before they are accepted. Key provisions of the Colusa **RULE 3.16 EMISSION REDUCTION CREDIT AND BANKING** are shown below:

District enforcement considerations related to agricultural burning ERCs are the following:

> To meet the requirement of enforceability, a contract, permit conditions, no burn list, and/or other means shall be utilized.

1. The primary means of enforcing open biomass burning ERCs will be by placing the parcels on a no burn list.
2. To further ensure the enforceability of ERCs and offsets from open biomass burning, an owner of a parcel with ERCs who is preparing to sell that property shall:
   Place a restriction on the parcel title, prior to sale, foregoing all open biomass burning on the parcel, or
3. At the time of application, the applicant for ERCs for reduced open biomass burning must provide information to the District on the disposition of the biomass.

Discount acreage: The applicant may reduce the total acreage covered by the ERC certificate to allow for continued burning of a portion of the total acreage of the parcel(s). This portion will not be allowed to change without prior District notification and approval.

The Colusa County Air Pollution Control District wants to provide current information to the State agencies so that the ERCs are deemed valid and growers may benefit from the sale of their credits. To do this the District is requesting information from growers with ERC certificates to provide information: 1) On the disposal method of the agricultural residue that was previously burned and 2) On the names of any tenant growers that farm your ERC parcels. Please complete the information in the table on the following page:

Jack de Wit
PO Box 603, Maxwell, CA 95955

Fields	Crop	Acres	Disposal Method	Tenant
A1	wheat	69.0	baled	De Wit
A2	alfalfa	35.9	none	De Wit
A3	alfalfa	18.0	none	De Wit
A5	rice	43.6	baled	Russel Pearson
A6	rice	38.9	baled	Russel Pearson
K	rice	35.5	burned	Craig Felix
G	rice	21.7	flooded & rolled	Craig Felix
L	rice	29.8	flooded & rolled	Craig Felix

Comments: Field **K** is a discounted field and does not have emission reduction credits and therefore can be burned.

Another method of enforcing and making permanent the emission reductions is by placing a deed restriction on the property title for those parcels with ERC fields. The deed restriction would specifically state that open biomass burning is not allowed on the property. This would also ensure that, if the property were sold, a new owner would be apprised of the burning restriction during a title search. The assessor's parcel number associated with each field is part of the application form in applying for emission reduction credits. An assessor's parcel may have multiple fields. Each parcel number must be referenced in the deed restriction. An example of a deed restriction follows:

Recording requested by:	FOR CLERK/RECORDER USE:
When recorded mail to:	

DECLARATION OF RESTRICTIONS

This DECLARATION OF RESTRICTIONS is made on _____, by _____ ("Declarant").

WHEREAS, Declarant is the owner of the following real property ("the Property"): APN _____

and

WHEREAS, whenever a person makes quantifiable reduction at a source, that person may obtain an Emission Reduction Credit ("ERC") from the Colusa County Air Pollution Control District ("District") pursuant to applicable laws and regulations; and

WHEREAS, Declarant intends to forego all open biomass burning (excepting any discount acres noted in Item 1 below) on the Property, thereby creating a quantifiable, permanent and enforceable reduction in air emissions; and

WHEREAS, the District has authorized and issued an ERC Certificate to indicate that a quantifiable reduction in air emissions has occurred; and

WHEREAS, the District will not grant a new ERC Certificate or transfer an existing ERC Certificate if a binding restriction, foregoing open biomass burning designated by ERC Certificate _____, has not been placed on the Property; and

WHEREAS, the District is authorized to require such restrictions pursuant to Division 26 of the Health and Safety Code; and

WHEREAS, the restriction ensures the enforceability and permanency of emission reduction credits pursuant to California Health and Safety Code section 40714.5.

NOW THEREFORE, Declarant declares that the Property described above is held and will be held, transferred, encumbered, used, sold, conveyed, leased, and occupied subject to the covenants, restrictions, and limitations set forth in this Declaration. All of

the restrictions, covenants, and limitations will run with the land and will be binding on all parties having or acquiring any right, title, or interest in the Property described above or any part thereof, and will inure to the benefit of the People of the State of California. Each grantee of a conveyance or purchaser under a contract or agreement of sale covering any right, title, or interest in any part of the Property by accepting a deed or a contract of sale or agreement of purchase, accepts the document subject to, and agrees to be bound by, any and all of the restrictions, covenants, and limitations set forth in this Declaration.

Open Biomass Burning

1. No more than _____ acres of biomass burning shall occur on the Property in any calendar year. "Open biomass burning" is the burning in the open of material derived from the harvesting of crops or removal of vegetation, including timber, except for material from processed dimensional timber.

Breach

2. Any breach of this Declaration of Restrictions shall constitute an abrogation of this contractual agreement, which flows from the terms of the Certificate and shall therefore render Declarants or their successors liable pursuant to the civil enforcement provisions of Article 3 of Chapter 4 of Part 4 of Division 26 of the Health and Safety Code.

Term

3. The Declaration of Restrictions shall benefit the People of the State of California and shall bind the Declarants and their successors, heirs, and assigns in perpetuity or until such time as the ERC Certificate is relinquished by the Certificate owner and canceled by the District, and a Declaration of Release of Restrictions is properly recorded in the County in which the Declaration of Restrictions was recorded.

Enforcement

4. Enforcement will be by proceedings at law or in equity against Declarants or their successors in interest who violate any covenant either to restrain violation or to recover damages.

Severability

5. Invalidation of any one of these covenants by judgment or court order will not affect any of the other provisions, which will remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions on the date first above written.

DECLARANT

_____ [signature]

ACKNOWLEDGEMENT

State of California
County of Colusa

On _____, before me, _____
(date) (name and title of officer taking acknowledgement)
personally appeared _____
(name of person (s) signing instrument)
_____ to be the person(s) whose
(personally known to me or proved to me on the basis of satisfactory evidence)

name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS, my hand and official seal.

Signature _____

CERTIFICATE OF CONSENT

This is to certify that Colusa County Air Pollution Control District, a public agency of the State of California, consents to recordation of the foregoing Declaration of Restrictions on open biomass burning.

Dated: _____

_____
Harry A. Krug, Air Pollution Control Officer
Colusa County Air Pollution Control District

Appendix E – Modeling of Emissions from Agricultural Burning ERC Fields

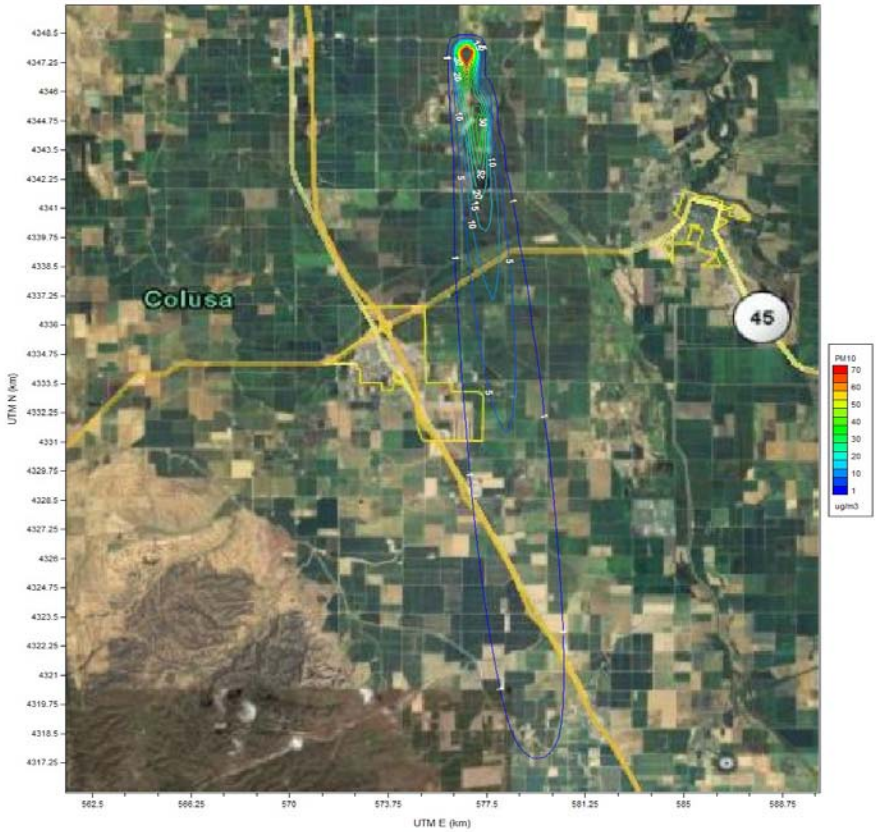
The Colusa County Air Pollution Control District modeled particulate PM_{10} emissions from three fields that are proposed as emission reductions to offset the Colusa Generating Station (CGS) emissions. The fields are from three different growers but all within ten miles of the CGS project site. Information on individual field burns and weather conditions are presented in the tables below with three hours of graphic plots following. These are example field burns only.

Hourly PM_{10} concentrations are plotted on Google base maps and show the changes in the smoke plume over three consecutive hours. Particulate microgram per meter^3 (ug/m^3) values are indicated along the isolines and the legend on the right also shows color-coded values for the plots. Higher values are in red and lesser values in blue with a range of 175 to 0 ug/m^3 but the legend varies by each burn and each time plot.

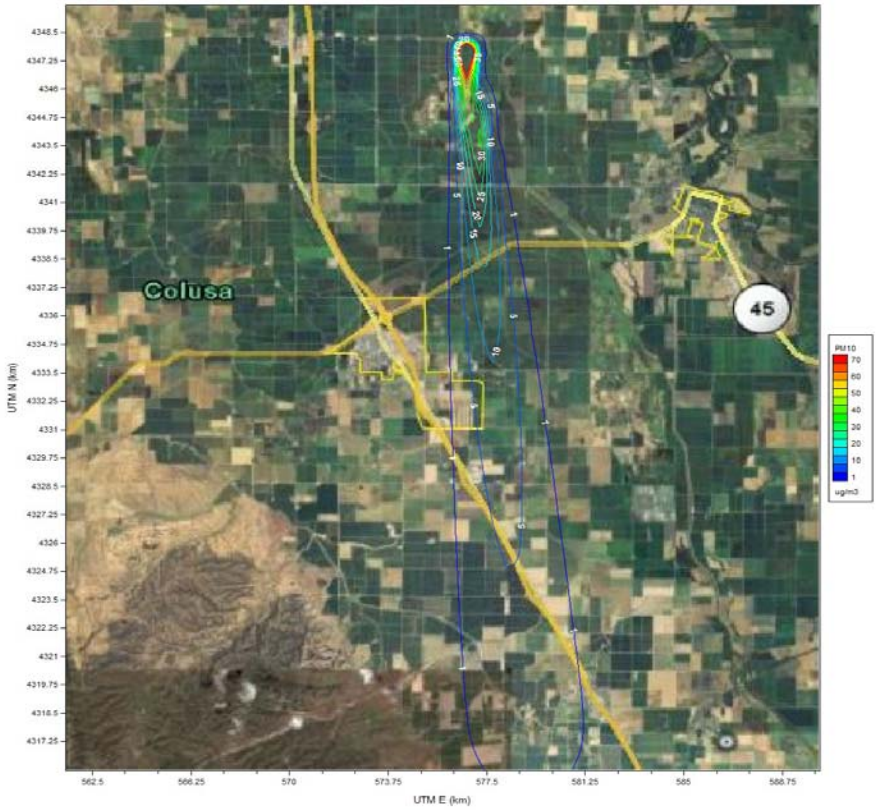
UTMZ	UTMN	UTME	Type	Crop	Fuel State	Acres	Date	Start
10	4348.227	576.7626	Backfired	Rice Straw	Semi-dry	42.2	4/1/2004	12:00 PM

		Temp	RH	Hrly Wind	Hrly Wind	Max Wind	Rainfall
Date	PST	F	%	Dir	Mph	Gust	Inches
01-Apr-04	0	50.6	72	NNW	6.5	9.6	0
01-Apr-04	100	54.1	53	NNW	10.9	16.9	0
01-Apr-04	200	53.8	48	NNW	11.3	20.4	0
01-Apr-04	300	52.1	50	NNW	11.8	18.2	0
01-Apr-04	400	53.4	44	NNW	16.1	26.1	0
01-Apr-04	500	52.7	44	NNW	15.8	27.6	0
01-Apr-04	600	52.3	43	NNW	19.1	29.8	0
01-Apr-04	700	54.3	40	NNW	20.3	34.9	0
01-Apr-04	800	56.9	37	NNW	25.1	40.3	0
01-Apr-04	900	59.6	31	NNW	27.4	41	0
01-Apr-04	1000	62.0	29	NNW	28.7	43.4	0
01-Apr-04	1100	62.6	29	NNW	29.8	44.5	0
01-Apr-04	1200	65.6	24	N	27.2	41.4	0
01-Apr-04	1300	67.2	20	N	28.5	40.3	0
01-Apr-04	1400	68.3	18	N	26.4	40.3	0
01-Apr-04	1500	69.4	17	NNE	25.9	38.8	0
01-Apr-04	1600	69.4	21	N	27.2	38.6	0
01-Apr-04	1700	68.7	20	N	26.5	40.3	0
01-Apr-04	1800	66.0	26	N	21.6	37.5	0
01-Apr-04	1900	63.5	24	NNW	18.8	29.6	0
01-Apr-04	2000	62.3	28	N	20.3	31.4	0
01-Apr-04	2100	60.3	30	N	17.8	28.9	0
01-Apr-04	2200	59.7	29	N	19.4	30.3	0
01-Apr-04	2300	58.4	30	N	20.9	31.8	0

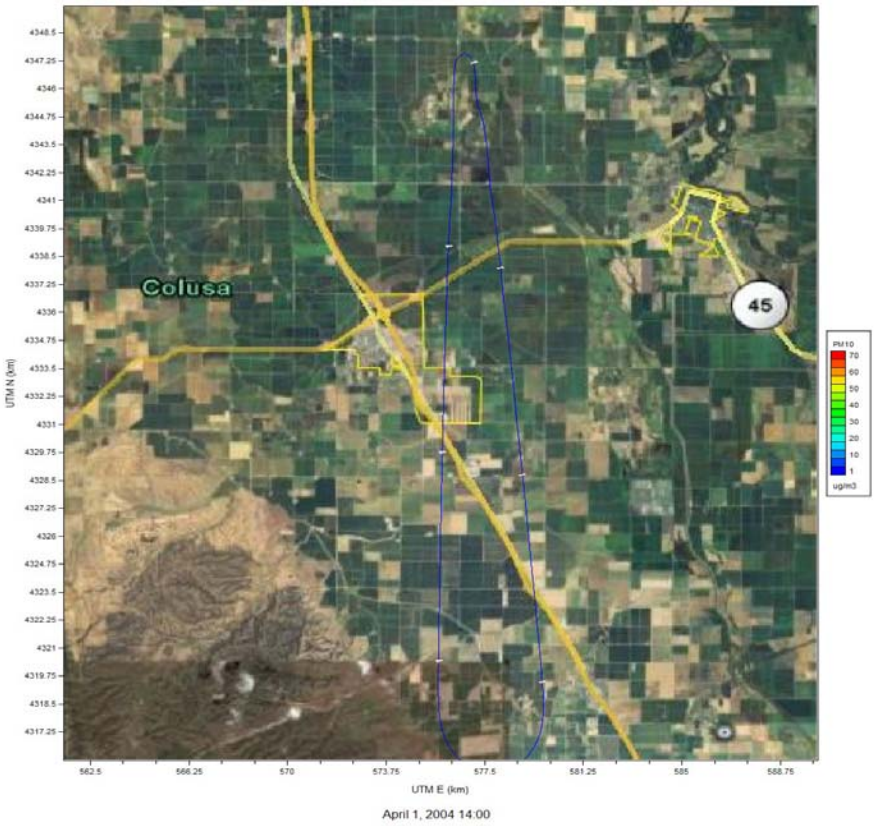
The first rice burn was on a day with strong north winds. The pollution emissions in the plume are transported to the south by the north wind and quickly disperse after three hours.



April 1, 2004 12:00



April 1, 2004 13:00

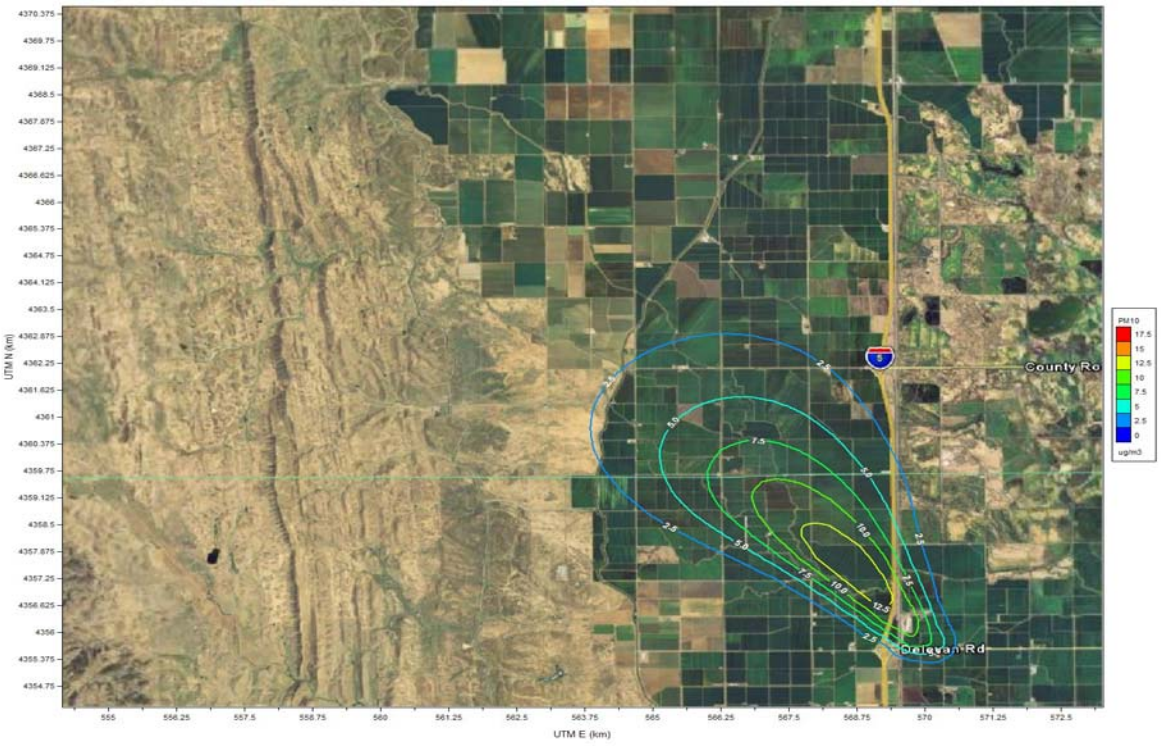


Information on the second burn with light southeasterly wind is presented in the table:

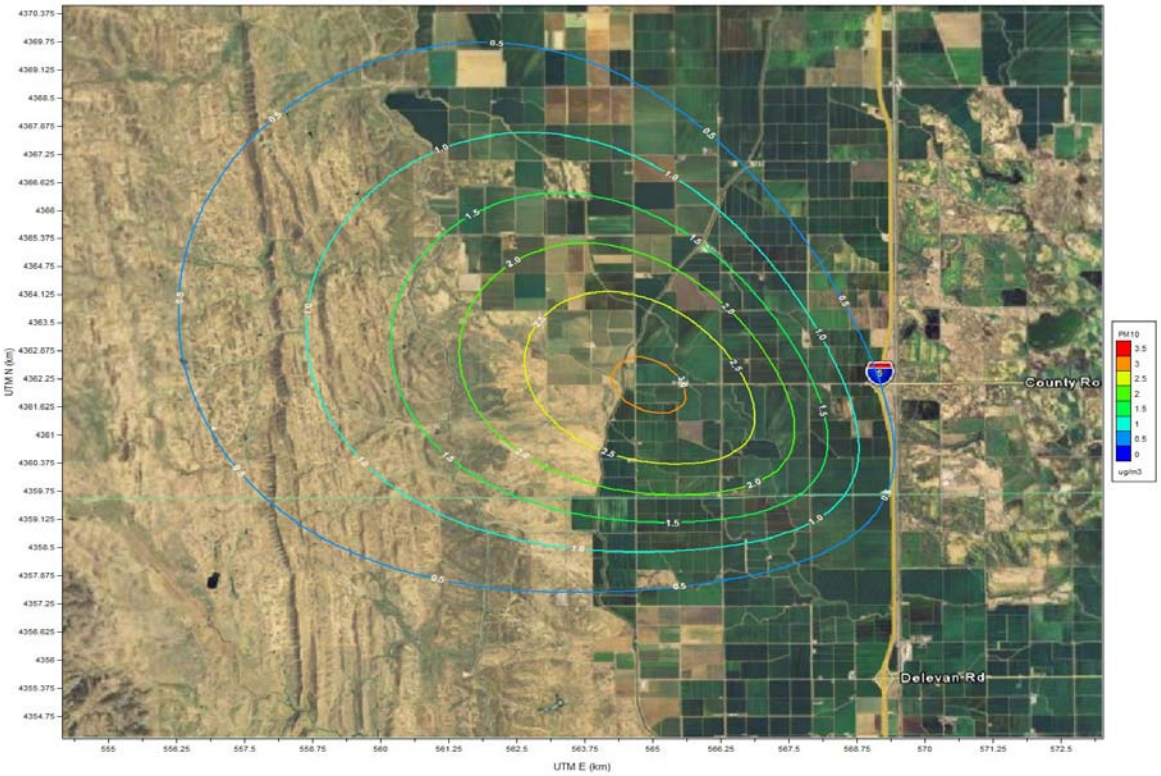
UTMZ	UTMN	UTME	Type	Crop	Fuel State	Acres	Date	Start
10	4354.829	570.6647	Backfired	Rice Straw	Dry	29.8	10/5/2004	10:00 AM
		Temp	RH	Hrly Wind	Hrly Wind	Max Wind	Rainfall	
Date	PST	F	%	Dir	Mph	Gust	Inches	
05-Oct-04	0	60.2	70	SSW	2.6	5.7	0	
05-Oct-04	100	58.8	80	WSW	1.6	4.6	0	
05-Oct-04	200	57.3	81	NNW	3.1	5	0	
05-Oct-04	300	56.0	85	NE	2.6	5.5	0	
05-Oct-04	400	54.8	87	NE	4.5	8.8	0	
05-Oct-04	500	54.7	85	N	0.4	3.5	0	
05-Oct-04	600	54.1	83	WNW	1.5	3.5	0	
05-Oct-04	700	57.0	81	SW	3.1	5.5	0	
05-Oct-04	800	65.5	70	SSW	1.8	5	0	
05-Oct-04	900	66.1	69	SE	4	6.6	0	
05-Oct-04	1000	70.2	60	SE	3.7	7.9	0	
05-Oct-04	1100	74.1	52	SE	4.2	8.3	0	
05-Oct-04	1200	78.5	43	SSE	3.1	8.3	0	
05-Oct-04	1300	81.7	39	ESE	4.2	8.8	0	
05-Oct-04	1400	84.7	33	SSE	3.7	9.9	0	

05-Oct-04	1500	86.3	31	SSE	4	10.7	0
05-Oct-04	1600	87.2	29	SE	4	10.7	0
05-Oct-04	1700	83.3	40	SE	4.3	7	0
05-Oct-04	1800	77.3	44	SE	5.4	6.4	0
05-Oct-04	1900	74.5	46	SE	4.4	6.6	0
05-Oct-04	2000	75.7	44	SW	2.5	5	0
05-Oct-04	2100	68.6	58	SE	1.9	5.5	0
05-Oct-04	2200	66.1	64	ESE	2.3	7.2	0
05-Oct-04	2300	64.4	68	N	3	4.4	0

As shown in the above particulate concentration plot this field is just east and slightly south of the PG&E Delevan Compressor Station along Delevan Road. This is a smaller rice field than the previous one. It was modeled with dry fuel conditions and thus lower emission rates and PM_{10} concentration levels.



October 5, 2004 11:00



October 5, 2004 12:00

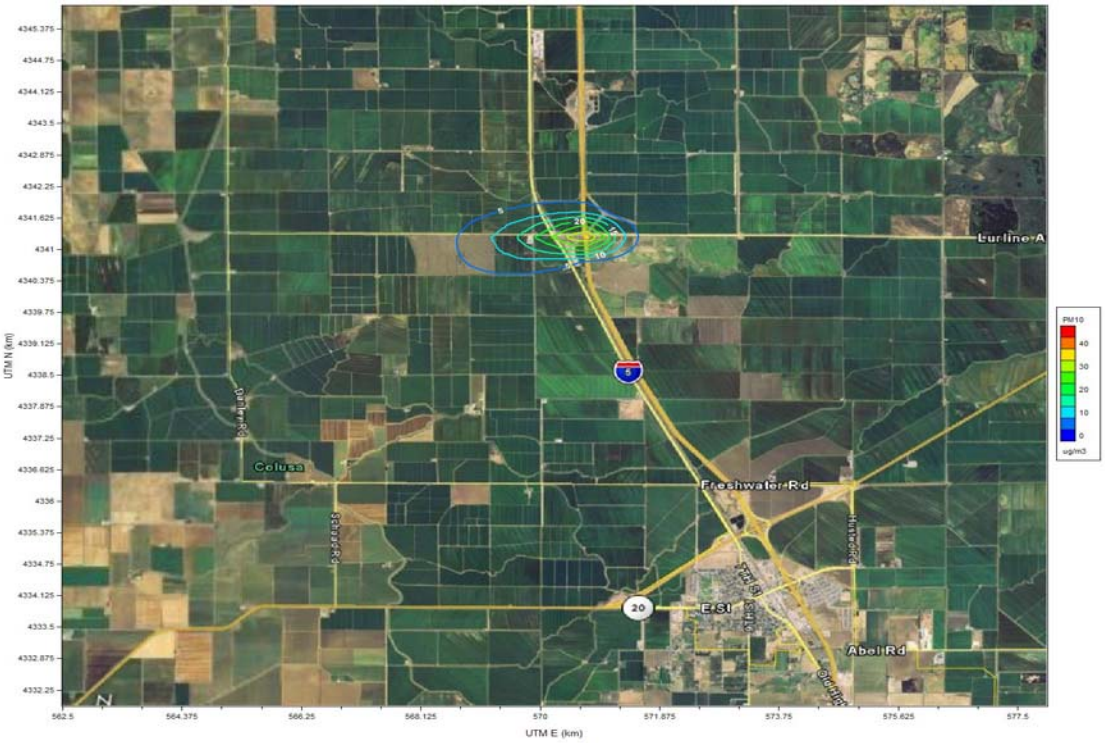
The third example field burn is the largest field and was modeled with strip lighting into the wind. Strip lighting a field shortens the burn time as the flames spread laterally from multiple fires lit in the field. The table shows the field burn conditions and corresponding weather parameters.

UTMZ	UTMN	UTME	Type	Crop	Fuel State	Acres	Date	Start
10	4341.519	571.6486	Strip into wind	Rice Straw	Dry	95.0	11/10/2004	1:00 PM

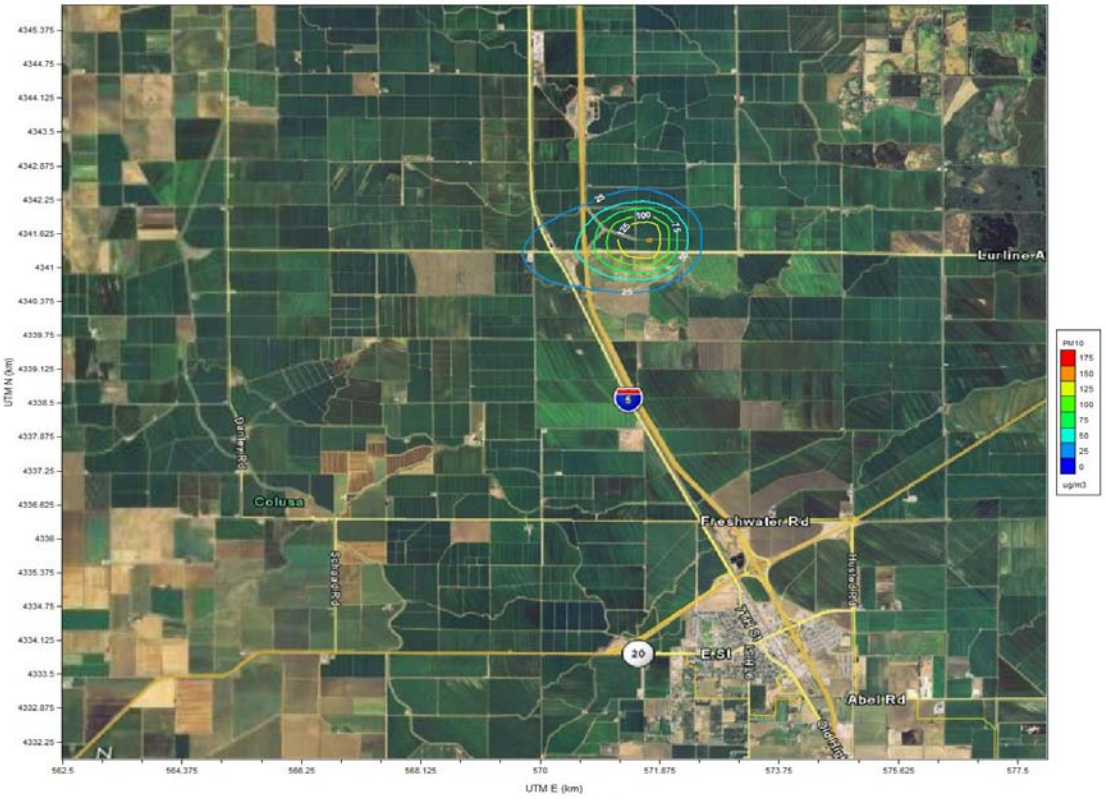
		Temp	RH	Hrly Wind	Hrly Wind	Max Wind	Rainfall
Date	PST	F	%	Dir	Mph	Gust	Inches
10-Nov-04	0	53.5	92	WNW	2.9	5.3	0.03
10-Nov-04	100	53.2	93	NW	3	5.7	0.08
10-Nov-04	200	52.7	93	NNE	3.2	7.7	0.05
10-Nov-04	300	52.5	93	NNE	0.2	1.8	0.01
10-Nov-04	400	52.4	93	NNE	0.7	2.2	0
10-Nov-04	500	52.0	93	NNE	0.4	1.5	0.01
10-Nov-04	600	52.2	93	NE	1.5	4.6	0.03
10-Nov-04	700	52.3	94	ENE	1.6	3.3	0.01
10-Nov-04	800	52.7	94	NE	1.9	4.4	0.01
10-Nov-04	900	53.1	94	NE	3.5	6.1	0.02
10-Nov-04	1000	53.7	93	ENE	4.6	7	0
10-Nov-04	1100	53.9	93	E	3.7	5.9	0.01
10-Nov-04	1200	54.2	92	ENE	1.4	3.7	0.01
10-Nov-04	1300	54.5	92	E	1.1	3.7	0.06
10-Nov-04	1400	54.8	92	ESE	0	1.1	0.02
10-Nov-04	1500	55.1	92	NNE	0.4	3.3	0
10-Nov-04	1600	55.4	91	NNE	2.2	3.9	0
10-Nov-04	1700	55.5	92	ENE	1.3	3.5	0.01
10-Nov-04	1800	55.3	92	SE	3.1	8.3	0
10-Nov-04	1900	54.9	93	SE	6	10.5	0
10-Nov-04	2000	53.3	93	SE	6	9.4	0
10-Nov-04	2100	53.3	93	SE	3.5	6.6	0
10-Nov-04	2200	53.2	94	SE	2.7	6.4	0
10-Nov-04	2300	53.3	94	ESE	2.6	4.4	0

These PM_{10} concentration plots below reflect the adverse burn conditions of higher fuel moisture and overcast skies that increase emission rates and decrease plume rise and dispersion. This field burn was also modeled under light and variable winds.

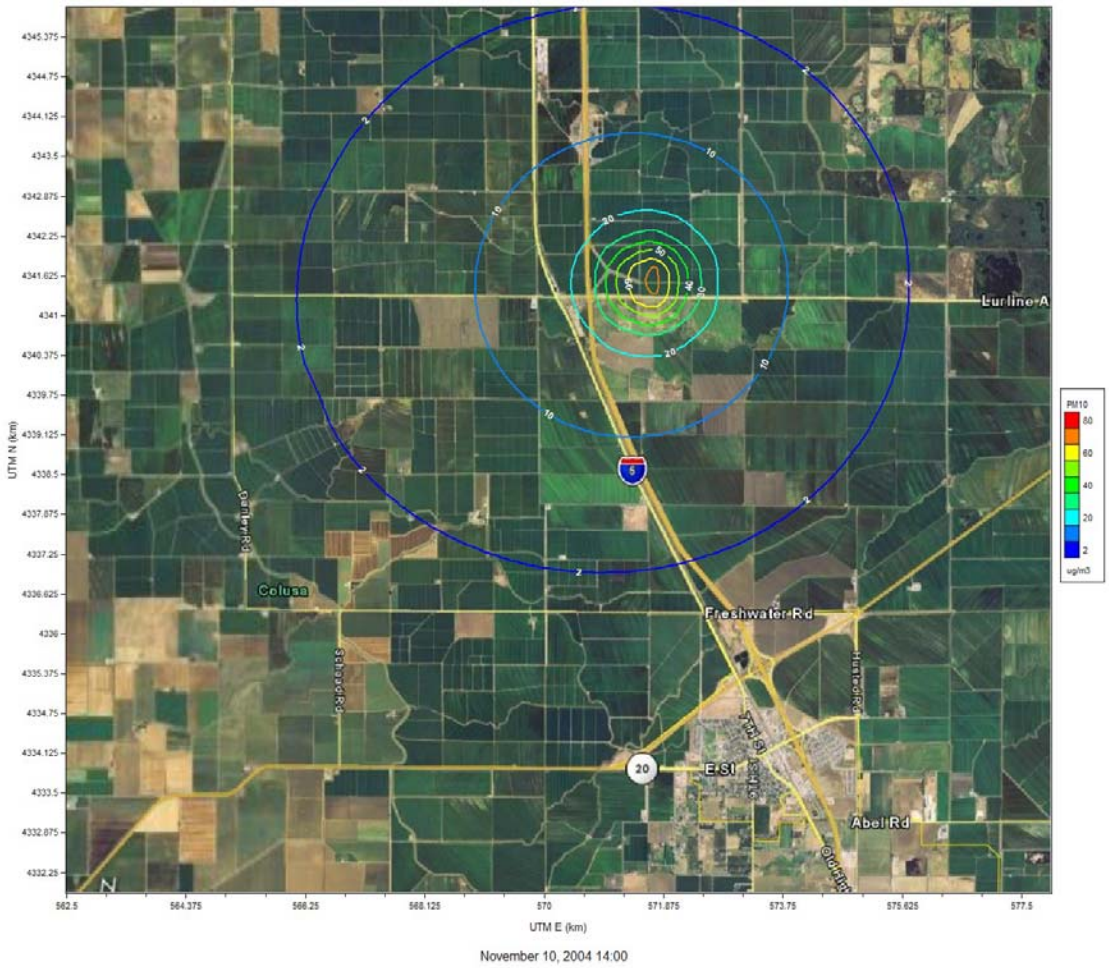
The emission plume would only gradually disperse and have higher PM_{10} levels near the field site. The wind does not transport the plume far from the field even after several hours.



November 10, 2004 12:00

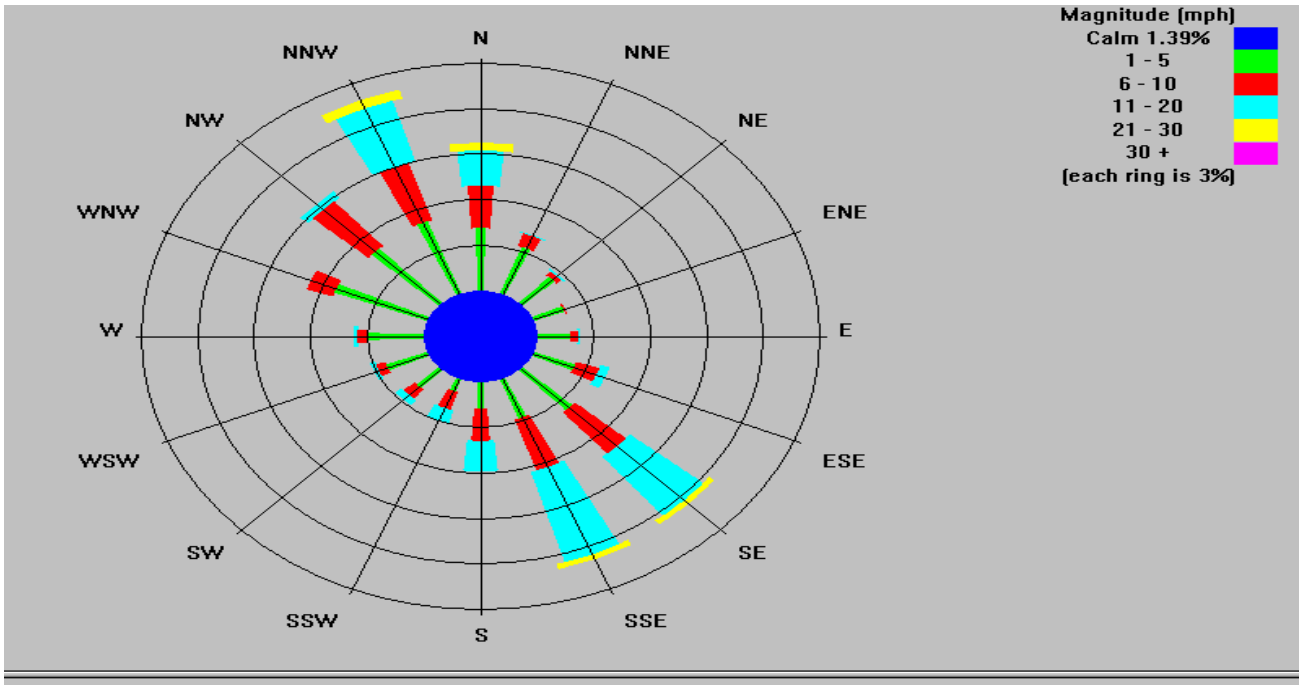


November 10, 2004 13:00

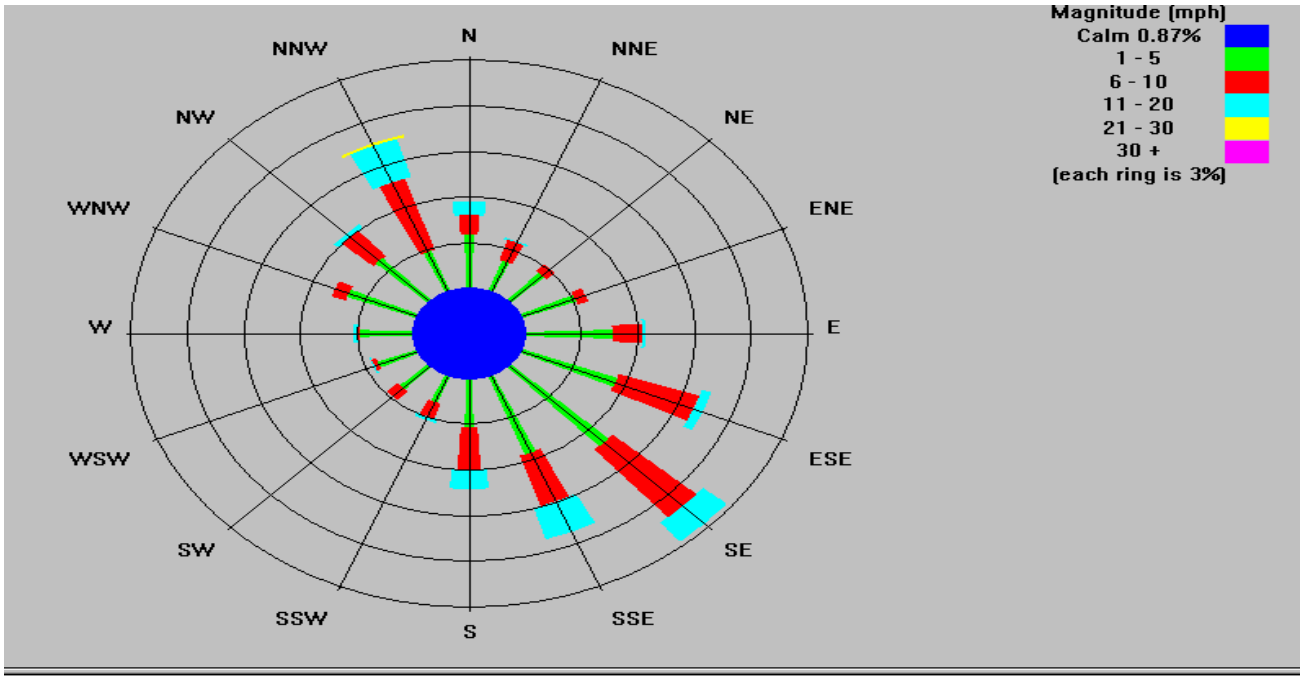


The direction and extent of dispersion of pollutants emitted from agricultural field burns changes by day and time of day. Agricultural burning in Colusa County takes place throughout the year and throughout the County. The modeled, PM_{10} concentration plots presented above for three example burns show the variability of the impacts from very high particulate concentrations (e.g., 175 ug/m^3) to zero after several hours and some distance from the burn site. Factors affecting the dispersion of pollutants from open biomass burning are the same as a plume of industrial emissions: mechanical mixing by the wind, vertical plume rise in an unstable atmosphere and deposition of the pollutants.

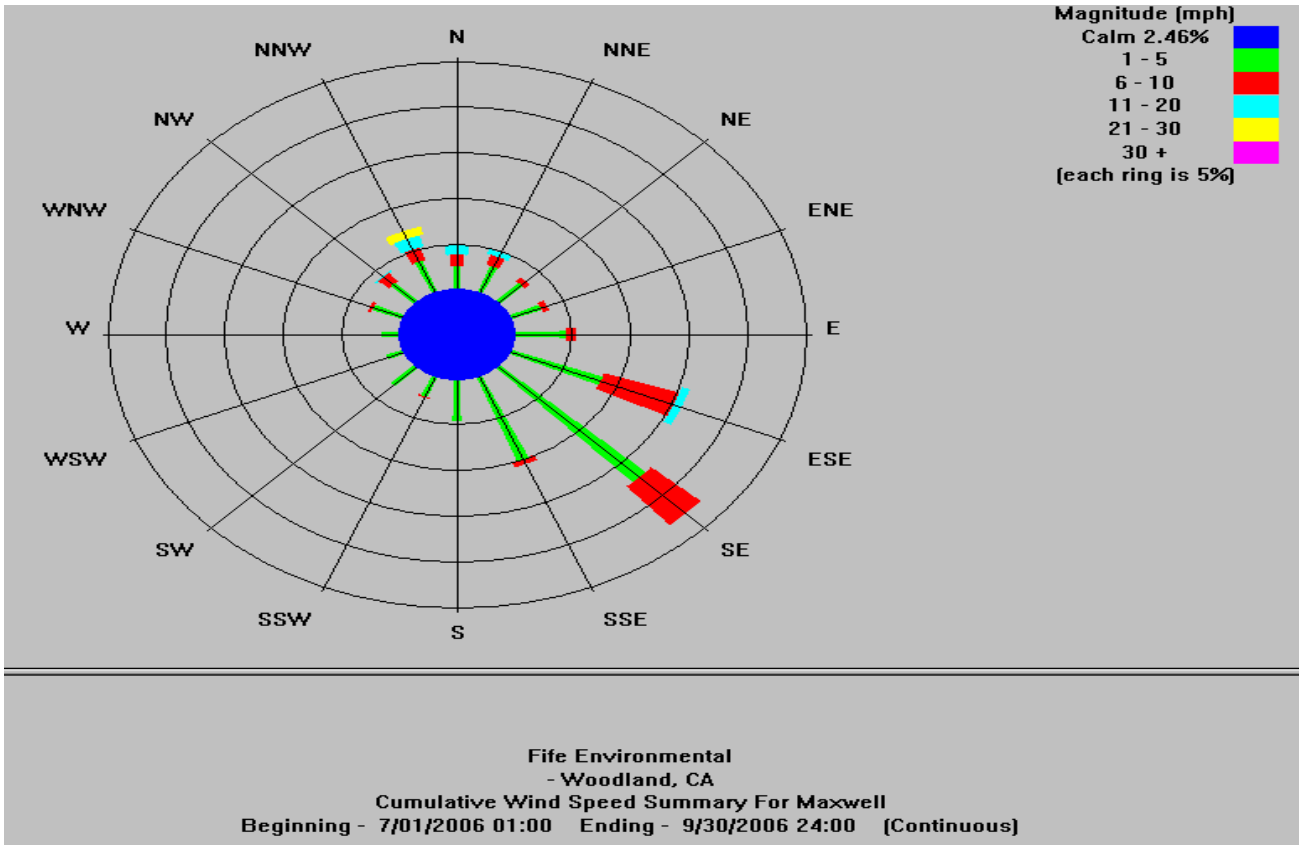
The Colusa County Air District has prepared quarterly wind roses for all of calendar year 2006 to illustrate the prominent wind directions experienced at the Maxwell weather station. The Maxwell data accurately represents wind directions and speeds throughout the County. See the wind rose graphics presented below.

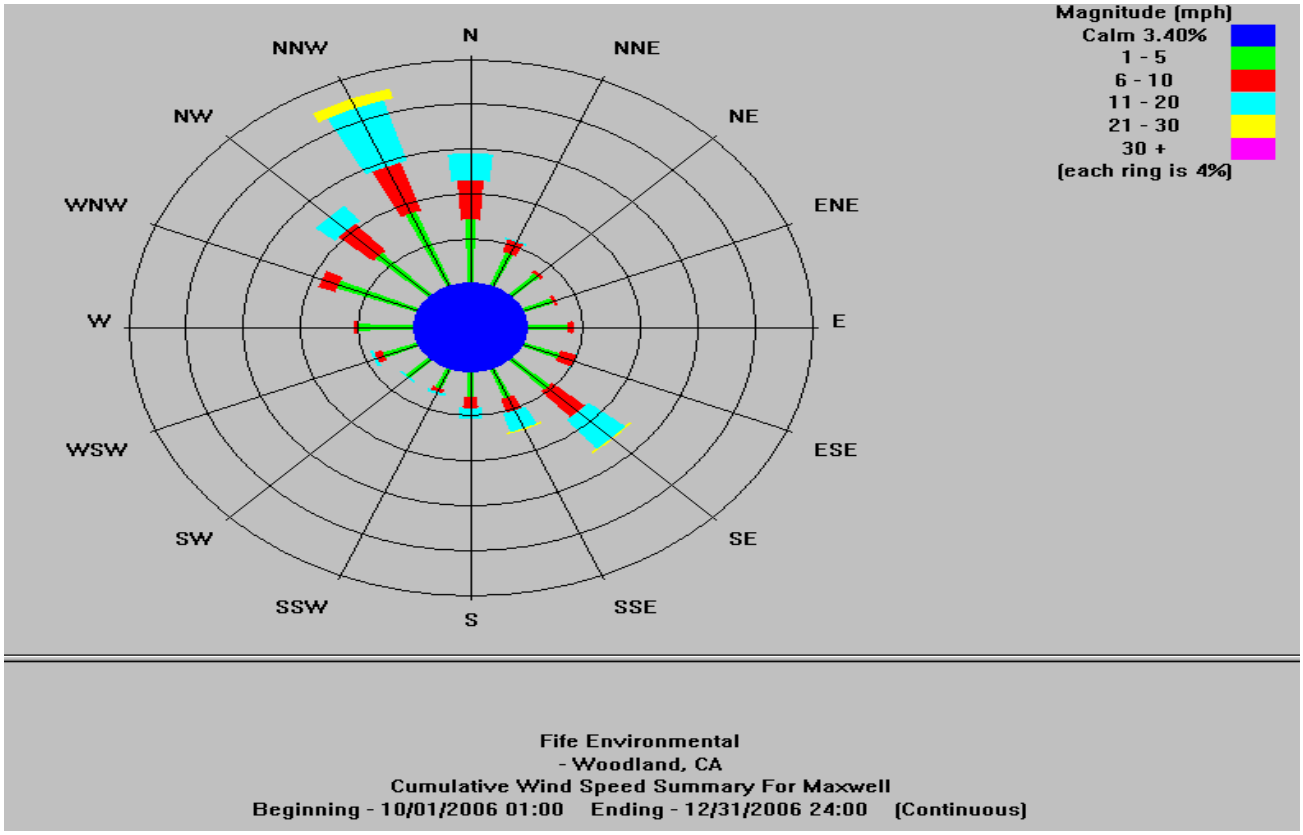


Fife Environmental
- Woodland, CA
Cumulative Wind Speed Summary For Maxwell
Beginning - 1/01/2006 01:00 Ending - 3/31/2006 24:00 (Continuous)



Fife Environmental
- Woodland, CA
Cumulative Wind Speed Summary For Maxwell
Beginning - 4/01/2006 01:00 Ending - 6/30/2006 24:00 (Continuous)


Magnitude (mph)
Calm 2.46%
1 - 5
6 - 10
11 - 20
21 - 30
30 +
(each ring is 5%)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
Fife Environmental
- Woodland, CA
Cumulative Wind Speed Summary For Maxwell
Beginning - 7/01/2006 01:00 Ending - 9/30/2006 24:00 (Continuous)


Magnitude (mph)
Calm 3.40%
1 - 5
6 - 10
11 - 20
21 - 30
30 +
(each ring is 4%)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
Fife Environmental
- Woodland, CA
Cumulative Wind Speed Summary For Maxwell
Beginning - 10/01/2006 01:00 Ending - 12/31/2006 24:00 (Continuous)