AIR QUALITY DATA

APPENDIX I

AIR QUALITY DATA

List of Attachments:

Attachment A	Fresno Windroses
Attachment B	Bullard Energy Center Construction Limits
Attachment C	Bullard Energy Center Operating Emissions
Attachment D	Modeling Protocol
Attachment E	BACT Analysis

Attachment A

Fresno Windroses

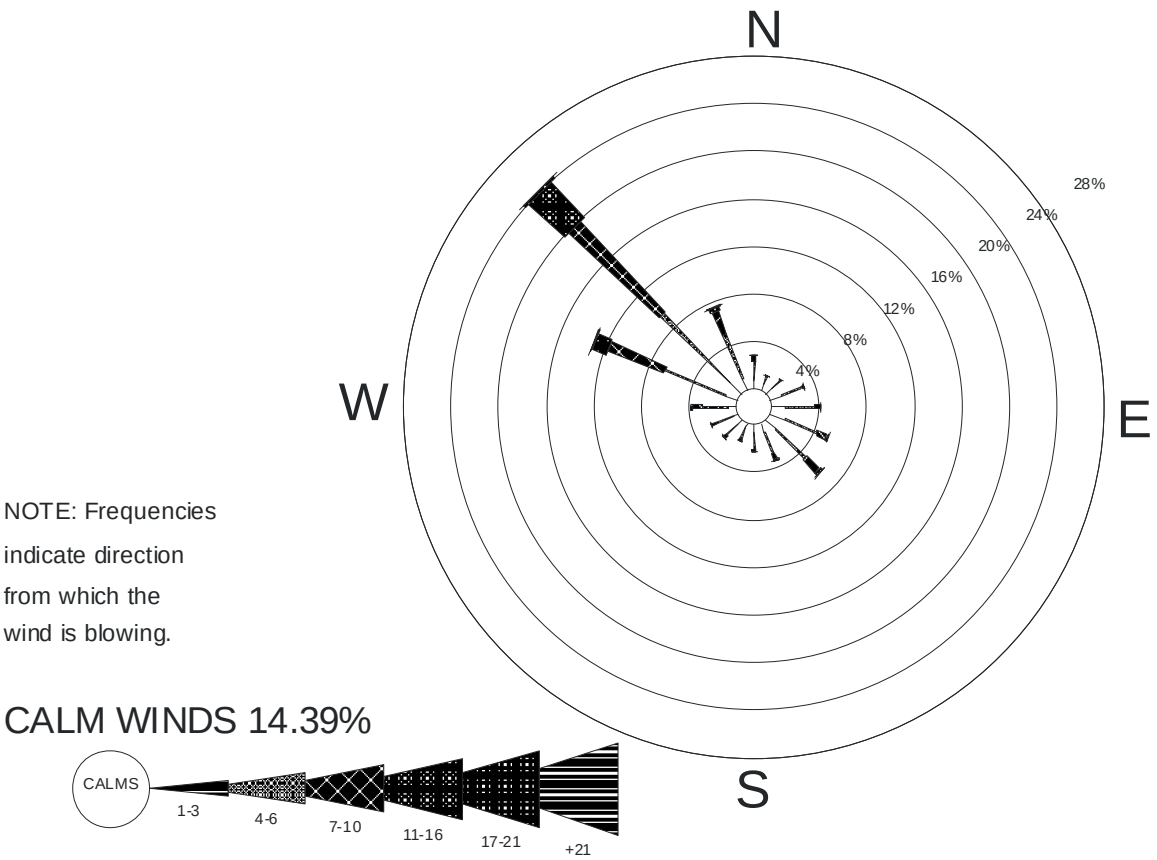

Figure IA-1
Windrose from Fresno-Yosemite International Airport (1987-1991) for All Months

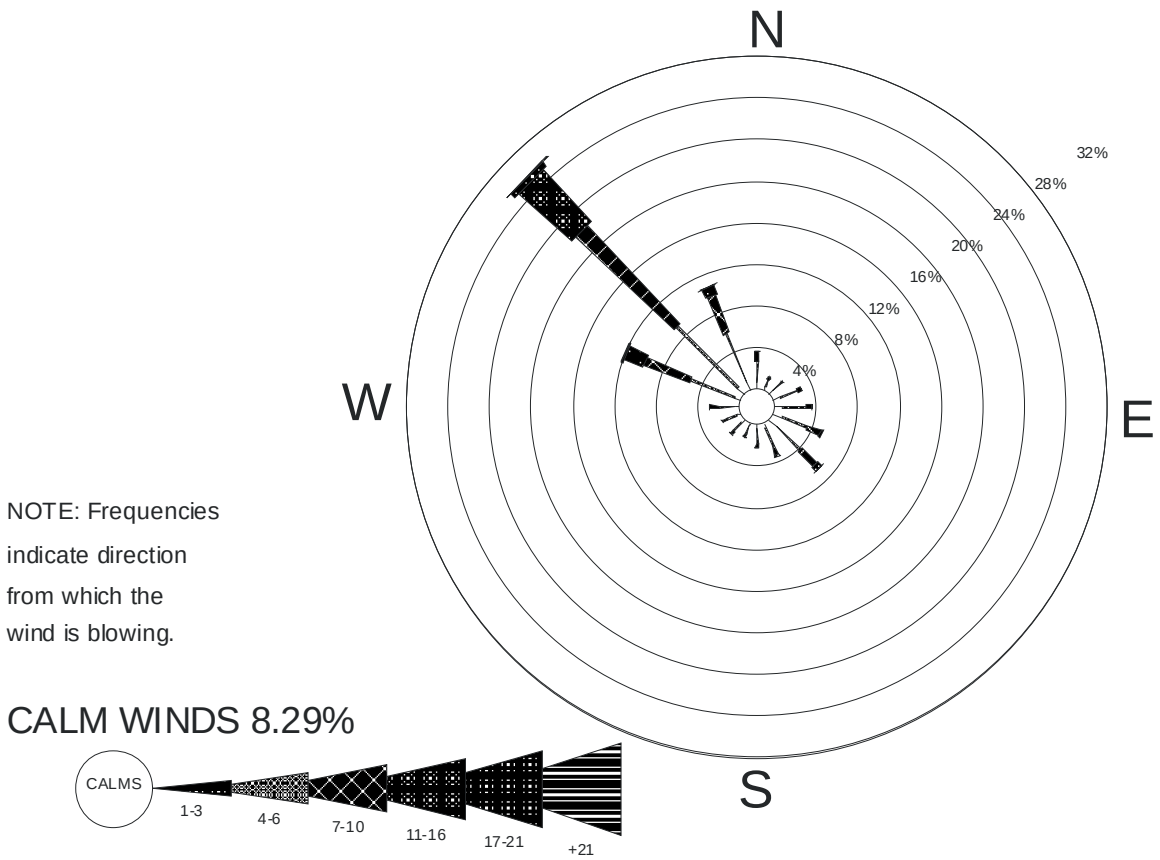

Figure IA-2
Windrose from Fresno-Yosemite International Airport (1987-1991) for Spring

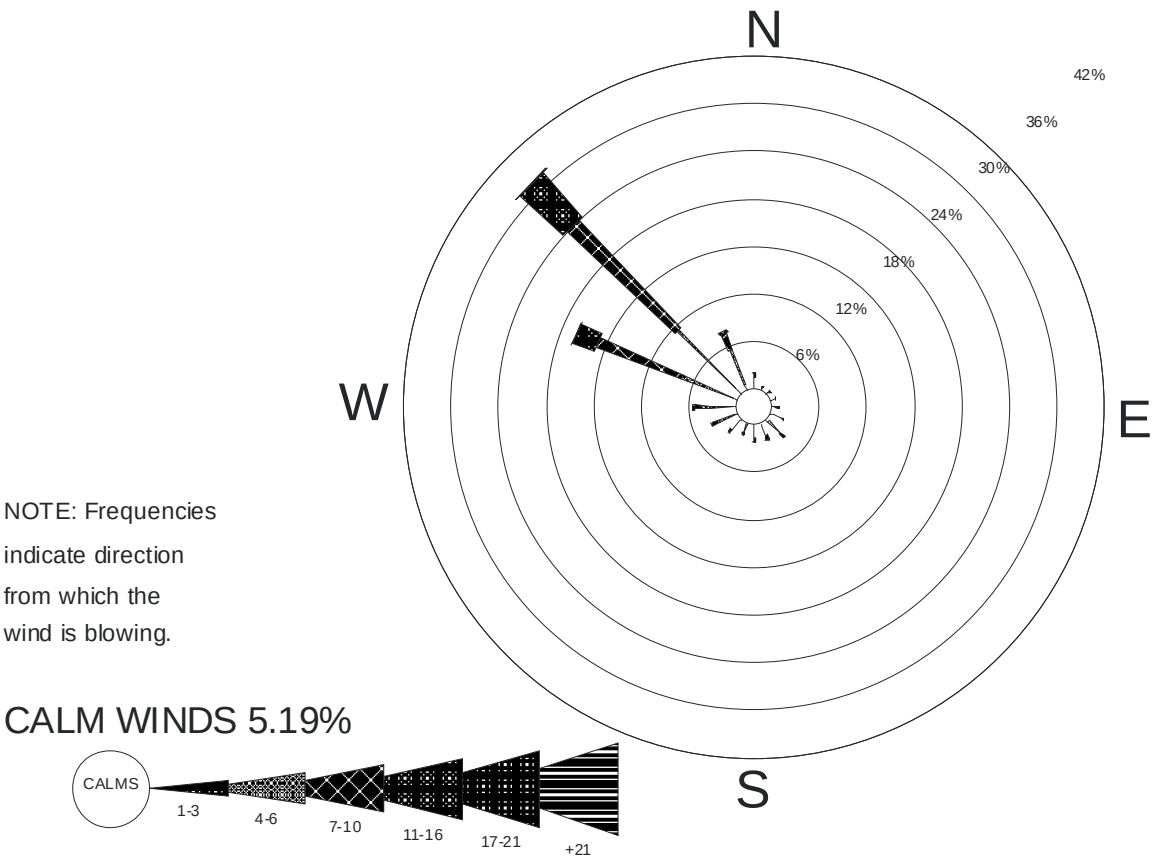

Figure IA-3
Windrose from Fresno-Yosemite International Airport (1987-1991) for Summer

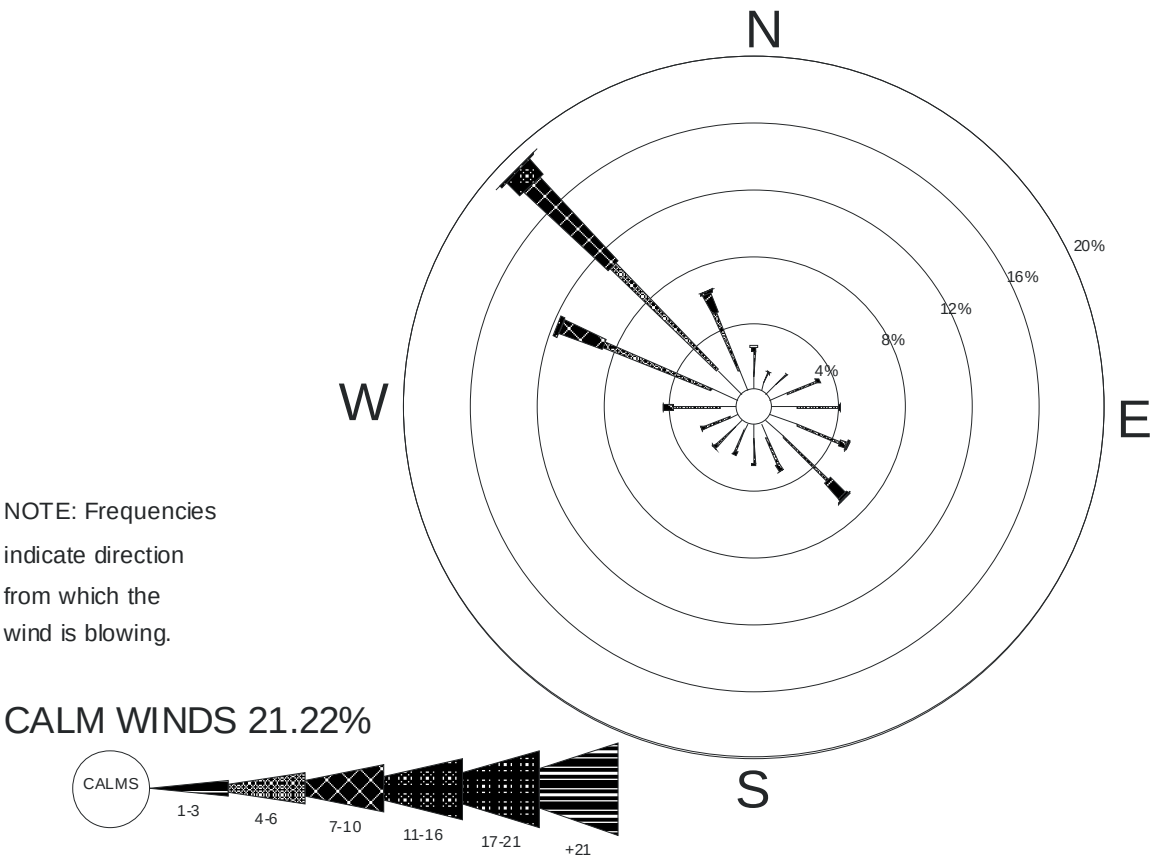

Figure IA-4
Windrose from Fresno-Yosemite International Airport (1987-1991) for Fall

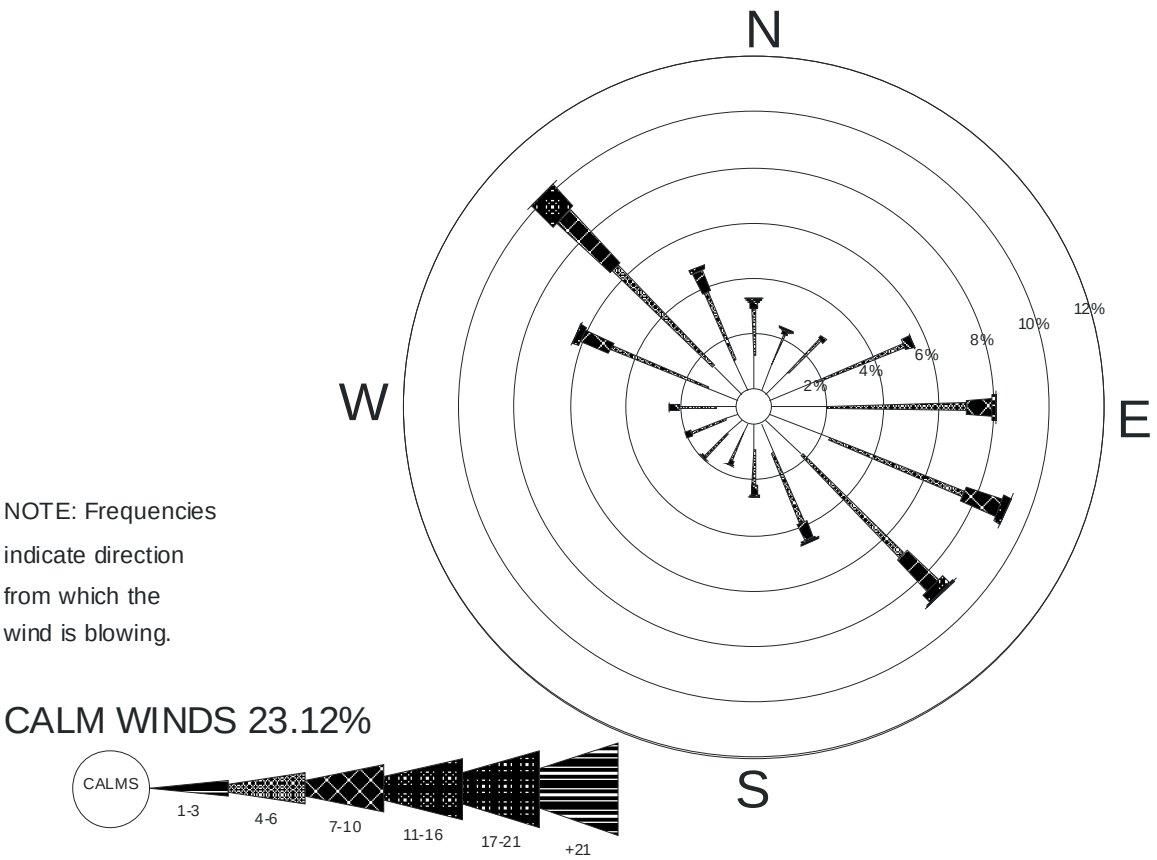

Figure IA-5
Windrose from Fresno-Yosemite International Airport (1987-1991) for Winter

Attachment B

Bullard Energy Center Construction Limits

Table IB-1
Construction Equipment Usage

Equipment	Gasoline/ Diesel	Size 1 (HP)	Hrs/Day Per Unit	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month
				1st month		2nd month		3rd month		4th month		5th month	
Dozer	D	625	8	1	110,000	1	110,000	1	110,000	1	110,000	1	110,000
Excavator	D	513	8		0		0		0		0		0
Loader	D	210	8	1	36,960	1	36,960		0		0		0
Scraper	D	485	8	3	256,080	1	85,360		0		0		0
Grader	D	265	8	1	46,640	1	46,640	1	46,640	1	46,640	2	93,280
Crane	D	194	8		0		0		0		0		0
Aerial Lifts	D	50	8		0		0		0	1	8,800	2	17,600
Backhoe	D	40	8	1	7,040	1	7,040	1	7,040	2	14,080	2	14,080
Dump Truck	D	330	8	1	58,080	1	58,080	1	58,080	1	58,080	1	58,080
Water Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Service truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Fuel Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Concrete Pump	D	300	8	2	105,600	2	105,600	1	52,800	1	52,800	1	52,800
Portable Air Compressor	D	236	8		0		0	1	41,536		0		0
Portable Electric Generator	D	314	8		0		0		0		0		0
Port Light Plant	D	170.5	8		0		0		0		0		0
Trencher	D	46	8		0		0		0		0	1	8,096
Compactor	D	354	8	1	62,304	1	62,304	1	62,304		0		0
Paver	D	153	8		0		0		0		0		0
Gradeall	D	400	8		0	1	70,400	1	70,400	1	70,400	1	70,400
Pile Driver	D	240	8		0		0	1	42,240	1	42,240		0
Welder	D	12	8		0		0		0		0		0
Forklift	D	59	8		0		0		0		0	1	10,384
Total HP =					841,104		740,784		649,440		561,440		593,120

Days per month 22

Notes:

[1] Size as given by Bibb (as available) or estimated based on typical values for similar use equipment

HP = horsepower

Hrs = hours

Table IB-1
Construction Equipment Usage

Equipment	Gasoline/ Diesel	Size 1 (HP)	Hrs/Day Per Unit	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month
				6th month		7th month		8th month		9th month		10th month	
Dozer	D	625	8	2	220,000		0		0		0		0
Excavator	D	513	8		0		0		0		0		0
Loader	D	210	8		0		0		0		0		0
Scraper	D	485	8		0		0		0		0		0
Grader	D	265	8	2	93,280		0		0		0		0
Crane	D	194	8	1	34,144	2	68,288	2	68,288	2	68,288	2	68,288
Aerial Lifts	D	50	8	3	26,400	3	26,400	3	26,400	3	26,400	3	26,400
Backhoe	D	40	8	1	7,040	1	7,040	1	7,040	1	7,040		0
Dump Truck	D	330	8	2	116,160	2	116,160	2	116,160	2	116,160	2	116,160
Water Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Service truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Fuel Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	1	52,800
Concrete Pump	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800	2	105,600
Portable Air Compressor	D	236	8		0	1	41,536	1	41,536	1	41,536	1	41,536
Portable Electric Generator	D	314	8		0	1	55,264	1	55,264	1	55,264	1	55,264
Port Light Plant	D	170.5	8		0		0		0	1	30,008	1	30,008
Trencher	D	46	8	1	8,096	1	8,096	1	8,096	1	8,096	1	8,096
Compactor	D	354	8	2	124,608	2	124,608	2	124,608	2	124,608	2	124,608
Paver	D	153	8		0		0		0		0		0
Gradeall	D	400	8	1	70,400		0		0		0		0
Pile Driver	D	240	8		0		0		0		0		0
Welder	D	12	8		0	1	2,112	2	4,224	2	4,224	2	4,224
Forklift	D	59	8	1	10,384	1	10,384	1	10,384	1	10,384	1	10,384
Total HP =					921,712		671,088		673,200		703,208		748,968

Days per month 22

Notes:

[1] Size as given by Bibb (as available) or estimated based on typical values

HP = horsepower

Hrs = hours

Table IB-1
Construction Equipment Usage

Equipment	Gasoline/ Diesel	Size 1 (HP)	Hrs/Day Per Unit	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month	Number of Units	HP/Month
				11th month		12th month		13th month		14th month		15th month		16th month	
Dozer	D	625	8		0		0		0		0		0		0
Excavator	D	513	8		0		0		0		0		0		0
Loader	D	210	8		0		0		0		0		0		0
Scraper	D	485	8		0		0	1	85,360		0		0		0
Grader	D	265	8		0	1	46,640	1	46,640	1	46,640		0		0
Crane	D	194	8	2	68,288	2	68,288	1	34,144		0		0		0
Aerial Lifts	D	50	8	1	8,800	1	8,800	1	8,800		0		0		0
Backhoe	D	40	8		0		0		0		0		0		0
Dump Truck	D	330	8	2	116,160	1	58,080	1	58,080	2	116,160	2	116,160	2	116,160
Water Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800		0		0
Service truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800		0		0
Fuel Truck	D	300	8	1	52,800	1	52,800	1	52,800	1	52,800		0		0
Concrete Pump	D	300	8		0		0		0		0		0		0
Portable Air Compressor	D	236	8	1	41,536	1	41,536	1	41,536		0		0		0
Portable Electric Generator	D	314	8	1	55,264	1	55,264	1	55,264		0		0		0
Port Light Plant	D	170.5	8	1	30,008	1	30,008	1	30,008		0		0		0
Trencher	D	46	8	1	8,096	1	8,096	1	8,096		0		0		0
Compactor	D	354	8	2	124,608	2	124,608	1	62,304	1	62,304		0		0
Paver	D	153	8	2	53,856	2	53,856	1	26,928	1	26,928		0		0
Gradeall	D	400	8		0		0		0		0		0		0
Pile Driver	D	240	8		0		0		0		0		0		0
Welder	D	12	8	2	4,224	1	2,112	1	2,112		0		0		0
Forklift	D	59	8	1	10,384	1	10,384	1	10,384	1	10,384		0		0
Total HP =					679,624		666,072		628,056		420,816		116,160		116,160

Days per month 22

Notes:

[1] Size as given by Bibb (as available) or estimated based on typical values

HP = horsepower

Hrs = hours

Table IB-2
On-Road Motor Vehicle Emissions
SUMMARY REPORT
(Based on EMFAC2002 Version 2.2)

Summer

CONSTRUCTION EMISSION ESTIMATES

					PM_{10}		
	ROG	NO_x	CO	SO_2	Total	Exhaust	Dust
2007							
TOTALS (lbs/day, unmitigated)	41.26	250.29	344.79	0.00	59.88	9.86	50.02
TOTALS (lbs/day, mitigated)	5.61	129.42	47.45	0.00	8.04	0.56	7.48
2008							
TOTALS (lbs/day, unmitigated)	33.14	198.09	282.89	0.00	7.16	6.94	0.22
TOTALS (lbs/day, mitigated)	4.42	102.58	42.68	0.00	0.62	0.40	0.22

Winter

CONSTRUCTION EMISSION ESTIMATES

					PM_{10}		
	ROG	NO_x	CO	SO_2	Total	Exhaust	Dust
2007							
TOTALS (lbs/day, unmitigated)	41.26	250.29	344.79	0.00	59.88	9.86	50.02
TOTALS (lbs/day, mitigated)	5.61	129.42	47.45	0.00	8.04	0.56	7.48
2008							
TOTALS (lbs/day, unmitigated)	33.14	198.09	282.89	0.00	7.16	6.94	0.22
TOTALS (lbs/day, mitigated)	4.42	102.58	42.68	0.00	0.62	0.40	0.22

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

Construction Start Month and Year: June 2007
Construction Duration: 13
Total Land Use Area to be Developed: 24 acres
Maximum Acreage Disturbed Per Day: 5 acres
Single Family Units: 0
Multi-Family Units: 0
Retail/Office/Institutional/Industrial Square Footage: 522720

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2007							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	50.00	--	50.00
Off-Road Diesel	37.76	245.15	311.65	--	9.85	9.85	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.29	0.36	6.60	0.00	0.03	0.01	0.02
Maximum lbs/day	38.05	245.51	318.25	0.00	59.88	9.86	50.02
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	31.92	202.20	265.48	--	7.63	7.63	0.00
Bldg Const Worker Trips	1.34	0.81	17.16	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.43	--	--	--	--	--	--
Asphalt Off-Road Diesel	7.60	46.16	64.60	--	1.66	1.66	0.00
Asphalt On-Road Diesel	0.08	1.35	0.31	0.00	0.04	0.04	0.00
Asphalt Worker Trips	0.03	0.01	0.32	0.00	0.00	0.00	0.00
Maximum lbs/day	41.26	250.29	344.79	0.00	9.57	9.34	0.23
Max lbs/day all phases	**41.26**	**250.29**	**344.79**	**0.00**	**59.88**	**9.86**	**50.02**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2008							
Phase 1 - Demolition Emissions	ROG	NO_x	CO	SO_2	Total	Exhaust	Dust
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	31.92	197.34	266.90	--	6.93	6.93	0.00
Bldg Const Worker Trips	1.23	0.76	15.99	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	33.14	198.09	282.89	0.00	7.16	6.94	0.22
Max lbs/day all phases	**33.14**	**198.09**	**282.89**	**0.00**	**7.16**	**6.94**	**0.22**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

Phase 1 - Demolition Assumptions: Phase Turned OFF

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Jun '07
Phase 2 Duration: 2 months
On-Road Truck Travel (VMT): 0

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
4	417	0.490	8.0
2	190	0.620	8.0
1	114	0.430	8.0
1	352	0.590	8.0
1	165	0.465	8.0
3	313	0.660	8.0
1	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Aug '07
Phase 3 Duration: 11 months
Start Month/Year for SubPhase Building: Aug '07
SubPhase Building Duration: 10.5 months

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	190	0.430	8.0
1	143	0.575	4.0
1	180	0.580	4.0
2	174	0.575	4.0
5	417	0.490	8.0
1	190	0.620	8.0
2	114	0.430	4.0
4	94	0.475	8.0
1	352	0.590	4.0
1	79	0.465	8.0
1	82	0.695	4.0

SubPhase Architectural Coatings Turned OFF
Start Month/Year for SubPhase Asphalt: Sep '07
SubPhase Asphalt Duration: 0.5 months
Acres to be Paved: 1.8

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
1	417	0.490	8.0
1	132	0.590	8.0
1	114	0.430	8.0

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES MITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2007							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	7.46	--	7.46
Off-Road Diesel	3.78	126.50	31.17	--	0.55	0.55	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.29	0.36	6.60	0.00	0.03	0.01	0.02
Maximum lbs/day	4.07	126.68	37.77	0.00	8.04	0.56	7.48
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.19	104.34	26.55	--	0.42	0.42	0.00
Bldg Const Worker Trips	1.34	0.81	17.16	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.43	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.76	23.82	6.46	--	0.09	0.09	0.00
Asphalt On-Road Diesel	0.01	0.70	0.03	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.03	0.01	0.32	0.00	0.00	0.00	0.00
Maximum lbs/day	5.61	129.42	47.45	0.00	0.76	0.53	0.23
Max lbs/day all phases	**5.61**	**129.42**	**47.45**	**0.00**	**8.04**	**0.56**	**7.48**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES MITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2008							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.19	101.83	26.69	--	0.38	0.38	0.00
Bldg Const Worker Trips	1.23	0.76	15.99	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	4.42	102.58	42.68	0.00	0.62	0.40	0.22
Max lbs/day all phases	**4.42**	**102.58**	**42.68**	**0.00**	**0.62**	**0.40**	**0.22**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

Construction-Related Mitigation Measures

Phase 2: Soil Disturbance: Apply soil stabilizers to inactive areas
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 30.0%)
Phase 2: Soil Disturbance: Replace ground cover in disturbed areas quickly
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 15.0%)
Phase 2: Soil Disturbance: Water exposed surfaces - 2x daily
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 34.0%)
Phase 2: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 2: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 2: On-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 2: On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 2: Stockpiles: Cover all stock piles with tarps
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 9.5%)
Phase 2: Unpaved Roads: Water all haul roads 2x daily
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 30.0%)
Phase 2: Unpaved Roads: Reduce speed on unpaved roads to < 15 mph
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 40.0%)
Phase 3: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 3: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 3: On-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

Phase 1 - Demolition Assumptions: Phase Turned OFF

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Jun '07
Phase 2 Duration: 2 months
On-Road Truck Travel (VMT): 0

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
4	417	0.490	8.0
2	190	0.620	8.0
1	114	0.430	8.0
1	352	0.590	8.0
1	165	0.465	8.0
3	313	0.660	8.0
1	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Aug '07
Phase 3 Duration: 11 months
Start Month/Year for SubPhase Building: Aug '07
SubPhase Building Duration: 10.5 months

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	190	0.430	8.0
1	143	0.575	4.0
1	180	0.580	4.0
2	174	0.575	4.0
5	417	0.490	8.0
1	190	0.620	8.0
2	114	0.430	4.0
4	94	0.475	8.0
1	352	0.590	4.0
1	79	0.465	8.0
1	82	0.695	4.0

SubPhase Architectural Coatings Turned OFF
Start Month/Year for SubPhase Asphalt: Sep '07
SubPhase Asphalt Duration: 0.5 months
Acres to be Paved: 1.8

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
1	417	0.490	8.0
1	132	0.590	8.0
1	114	0.430	8.0

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-3
On-Road Motor Vehicle Emissions
DETAIL REPORT - WINTER
(Based on EMFAC2002 Version 2.2)

Changes made to the default values for Land Use Trip Percentages
Changes made to the default values for Construction
The user has overridden the Default Phase Lengths
Phase 2 mitigation measure Soil Disturbance: Apply soil stabilizers to inactive areas has been changed from off to on.
Phase 2 mitigation measure Soil Disturbance: Replace ground cover in disturbed areas quickly has been changed from off to on.
Phase 2 mitigation measure Soil Disturbance: Water exposed surfaces - 2x daily as been changed from off to on.
Phase 2 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on.
Phase 2 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 2 mitigation measure On-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on.
Phase 2 mitigation measure On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 2 mitigation measure Stockpiles: Cover all stock piles with tarps has been changed from off to on.
Phase 2 mitigation measure Unpaved Roads: Water all haul roads 2x daily has been changed from off to on.
Phase 2 mitigation measure Unpaved Roads: Reduce speed on unpaved roads to < 15 mph has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 3 mitigation measure On-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on.
Phase 3 mitigation measure On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

Construction Start Month and Year: June 2007
Construction Duration: 13
Total Land Use Area to be Developed: 24 acres
Maximum Acreage Disturbed Per Day: 5 acres
Single Family Units: 0
Multi-Family Units: 0
Retail/Office/Institutional/Industrial Square Footage: 522720

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2007							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	50.00	--	50.00
Off-Road Diesel	37.76	245.15	311.65	--	9.85	9.85	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.29	0.36	6.60	0.00	0.03	0.01	0.02
Maximum lbs/day	38.05	245.51	318.25	0.00	59.88	9.86	50.02
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	31.92	202.20	265.48	--	7.63	7.63	0.00
Bldg Const Worker Trips	1.34	0.81	17.16	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.43	--	--	--	--	--	--
Asphalt Off-Road Diesel	7.60	46.16	64.60	--	1.66	1.66	0.00
Asphalt On-Road Diesel	0.08	1.35	0.31	0.00	0.04	0.04	0.00
Asphalt Worker Trips	0.03	0.01	0.32	0.00	0.00	0.00	0.00
Maximum lbs/day	41.26	250.29	344.79	0.00	9.57	9.34	0.23
Max lbs/day all phases	**41.26**	**250.29**	**344.79**	**0.00**	**59.88**	**9.86**	**50.02**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2008							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	31.19	197.34	266.90	--	6.93	6.93	0.00
Bldg Const Worker Trips	1.23	0.76	15.99	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	33.14	198.09	282.89	0.00	7.16	6.94	0.22
Max lbs/day all phases	**33.14**	**198.09**	**282.89**	**0.00**	**7.16**	**6.94**	**0.22**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

Phase 1 - Demolition Assumptions: Phase Turned OFF

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Jun '07
Phase 2 Duration: 2 months
On-Road Truck Travel (VMT): 0

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
4	417	0.490	8.0
2	190	0.620	8.0
1	114	0.430	8.0
1	352	0.590	8.0
1	165	0.465	8.0
3	313	0.660	8.0
1	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Aug '07
Phase 3 Duration: 11 months
Start Month/Year for SubPhase Building: Aug '07
SubPhase Building Duration: 10.5 months

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	190	0.430	8.0
1	143	0.575	4.0
1	180	0.580	4.0
2	174	0.575	4.0
5	417	0.490	8.0
1	190	0.620	8.0
2	114	0.430	4.0
4	94	0.475	8.0
1	352	0.590	4.0
1	79	0.465	8.0
1	82	0.695	4.0

SubPhase Architectural Coatings Turned OFF
Start Month/Year for SubPhase Asphalt: Sep '07
SubPhase Asphalt Duration: 0.5 months
Acres to be Paved: 1.8

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
1	417	0.490	8.0
1	132	0.590	8.0
1	114	0.430	8.0

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES MITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2007							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	7.46	--	7.46
Off-Road Diesel	3.78	126.50	31.17	--	0.55	0.55	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.29	0.36	6.60	0.00	0.03	0.01	0.02
Maximum lbs/day	4.07	126.86	37.77	0.00	8.04	0.56	7.48
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.19	104.34	26.55	--	0.42	0.42	0.00
Bldg Const Worker Trips	1.34	0.81	17.16	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.43	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.76	23.82	6.46	--	0.09	0.09	0.00
Asphalt On-Road Diesel	0.01	0.70	0.03	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.03	0.01	0.32	0.00	0.00	0.00	0.00
Maximum lbs/day	5.61	129.42	47.45	0.00	0.76	0.53	0.23
Max lbs/day all phases	**5.61**	**129.42**	**47.45**	**0.00**	**8.04**	**0.56**	**7.48**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

CONSTRUCTION EMISSION ESTIMATES MITIGATED (lbs/day)

Source	ROG	NO_x	CO	SO_2	PM_{10} Total	PM_{10} Exhaust	PM_{10} Dust
2008							
Phase 1 - Demolition Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	--	--	--	--	0.00	--	0.00
Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.19	101.83	26.69	--	0.38	0.38	0.00
Bldg Const Worker Trips	1.23	0.76	15.99	0.00	0.23	0.01	0.22
Arch Coatings Off-Gas	0.00	--	--	--	--	--	--
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	--	--	--	--	--	--
Asphalt Off-Road Diesel	0.00	0.00	0.00	--	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	4.42	102.58	42.68	0.00	0.62	0.40	0.22
Max lbs/day all phases	**4.42**	**102.58**	**42.68**	**0.00**	**0.62**	**0.40**	**0.22**

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

Construction-Related Mitigation Measures

Phase 2: Soil Disturbance: Apply soil stabilizers to inactive areas
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 30.0%)
Phase 2: Soil Disturbance: Replace ground cover in disturbed areas quickly
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 15.0%)
Phase 2: Soil Disturbance: Water exposed surfaces - 2x daily
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 34.0%)
Phase 2: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 2: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 2: On-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 2: On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 2: Stockpiles: Cover all stock piles with tarps
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 9.5%)
Phase 2: Unpaved Roads: Water all haul roads 2x daily
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 30.0%)
Phase 2: Unpaved Roads: Reduce speed on unpaved roads to < 15 mph
Percent Reduction (ROG 0.0% NOx 0.0% CO 0.0% SO2 0.0% PM10 40.0%)
Phase 3: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 3: Off-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)
Phase 3: On-Road Diesel Exhaust: Use aqueous diesel fuel
Percent Reduction (ROG 0.0% NOx 14.0% CO 0.0% SO2 0.0% PM10 63.0%)
Phase 3: On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR)
Percent Reduction (ROG 90.0% NOx 40.0% CO 90.0% SO2 0.0% PM10 85.0%)

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

Phase 1 - Demolition Assumptions: Phase Turned OFF

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Jun '07
Phase 2 Duration: 2 months
On-Road Truck Travel (VMT): 0

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
4	417	0.490	8.0
2	190	0.620	8.0
1	114	0.430	8.0
1	352	0.590	8.0
1	165	0.465	8.0
3	313	0.660	8.0
1	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Aug '07
Phase 3 Duration: 11 months
Start Month/Year for SubPhase Building: Aug '07
SubPhase Building Duration: 10.5 months

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	190	0.430	8.0
1	143	0.575	4.0
1	180	0.580	4.0
2	174	0.575	4.0
5	417	0.490	8.0
1	190	0.620	8.0
2	114	0.430	4.0
4	94	0.475	8.0
1	352	0.590	4.0
1	79	0.465	8.0
1	82	0.695	4.0

SubPhase Architectural Coatings Turned OFF
Start Month/Year for SubPhase Asphalt: Sep '07
SubPhase Asphalt Duration: 0.5 months
Acres to be Paved: 1.8

Off-Road Equipment

No.	Horsepower	Load Factor	Hours/Day
1	174	0.575	8.0
1	417	0.490	8.0
1	132	0.590	8.0
1	114	0.430	8.0

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-4
On-Road Motor Vehicle Emissions
DETAIL REPORT - SUMMER
(Based on EMFAC2002 Version 2.2)

Changes made to the default values for Land Use Trip Percentages
Changes made to the default values for Construction
The user has overridden the Default Phase Lengths
Phase 2 mitigation measure Soil Disturbance: Apply soil stabilizers to inactive areas has been changed from off to on.
Phase 2 mitigation measure Soil Disturbance: Replace ground cover in disturbed areas quickly has been changed from off to on.
Phase 2 mitigation measure Soil Disturbance: Water exposed surfaces - 2x daily has been changed from off to on.
Phase 2 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on
Phase 2 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 2 mitigation measure On-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on
Phase 2 mitigation measure On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 2 mitigation measure Stockpiles: Cover all stock piles with tarps has been changed from off to on.
Phase 2 mitigation measure Unpaved Roads: Water all haul roads 2x daily has been changed from off to on.
Phase 2 mitigation measure Unpaved Roads: Reduce speed on unpaved roads to < 15 mph has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on
Phase 3 mitigation measure Off-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.
Phase 3 mitigation measure On-Road Diesel Exhaust: Use aqueous diesel fuel has been changed from off to on
Phase 3 mitigation measure On-Road Diesel Exhaust: Use cooled exhaust gas recirculation (EGR) has been changed from off to on.

Notes:
CO = carbon monoxide
lbs/day = pounds per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
ROG = reactive organic gas
SO_2 = sulfur dioxide

Table IB-5
Calculations for Inputs to ISC Model for Construction Emissions - Combustion Main Site

	Grading[1] lb/day	Building[1] lb/day	Highest Value[2] lb/day	Main Site Emissions lb/day	Main Site Emissions (short-term 1,3,8-hr) lb/hr	Main Site Emissions (short-term 24-hr) lb/hr	Main Site Emission (long-term annual) lb/hr
NO_x	126.86	129.42	129.42	129.42	16.18		3.90
CO	37.77	47.45	47.45	47.45	5.93		
SO_2	0.0001	0.0001	0.0001	1.00E-04	1.25E-05	4.17E-06	3.01E-06
PM_{10} COMB	0.56	0.53	0.56	0.56		0.02	0.02
PM_{10} DUST[3]	7.48	0.23	7.48	7.48		0.31	0.23

[1] Emission totals for each phase taken from URBEMIS2002 results for estimated maximum short term conditions

[2] Highest value from either building or site grading assuming both phases will not overlap and will not occur concurrently.

[3] Fugitive dust uses one area source for combined laydown area and main site

Inputs to ISC

	Main Site Emissions 3 volume sources (short-term 1,3,8-hr) lb/hr	Main Site Emissions 3 volume sources (short-term 24-hr) lb/hr	Main Site Emissions 3 volume sources (long-term annual) lb/hr
NO_x	5.393		1.30E+00
CO	1.977		
SO_2	4.167E-06	1.39E-06	1.00E-06
PM_{10} COMB		7.78E-03	5.63E-03
PM_{10} Fugitive Dust[3]		3.12E-01	2.25E-01

Area	Acres	SQ. FT
Main Site	12	522720
laydown	12	522720
Total Area	24	1045440

Notes:

CO = carbon monoxide

PM_{10} COMB = particulates from combustion

ISC = Industrial Source Complex model

lbs/day = pound(s) per day

NO_x = oxides of nitrogen

PM_{10} = particulate matter less than 10 micrometers in diameter

SO_2 = sulfur dioxide

SQ. FT = square feet

Table IB-6
Calculations for Inputs to ISC Model for Construction Emissions for Natural Gas Pipeline

	Grading lb/day	West gas line Emissions lb/day per area source	West gas line Emissions (short-term 1,3,8-hr) lb/hr per area source	West gas line Emissions (short-term 24-hr) lb/hr per area source	West gas line Emissions (long-term annual) lb/hr per area source
NO_x	35.12	0.78	9.756E-02		2.352E-02
CO	48.36	1.07	1.343E-01		
SO_2	0.0001	0.00	2.778E-07	9.259E-08	6.697E-08
PM_{10} COMB	1.31	0.03		1.213E-03	8.773E-04
PM_{10} DUST[3]	0.07	0.00		6.481E-05	4.688E-05

Inputs to ISC

	Each Area Source 45 area sources (short-term 1,3,8-hr) lb/hr	Each Area Source 45 area sources (short-term 24-hr) lb/hr	Each Area Source 45 area sources (long-term annual) lb/hr
NO_x	0.098		2.35E-02
CO	0.134		
SO_2	2.778E-07	9.26E-08	6.70E-08
PM_{10} COMB		1.21E-03	8.77E-04
PM_{10} Fugitive Dust[3]		6.48E-05	4.69E-05

Total Area

Acres	SQ. FT
2.2925	99861.3

0.05094 acres for each area source (45)

Notes:

CO = carbon monoxide

PM_{10} COMB = particulates from combustion

ISC = Industrial Source Complex model

lbs/day = pound(s) per day

NO_x = oxides of nitrogen

PM_{10} = particulate matter less than 10 micrometers in diameter

SO_2 = sulfur dioxide

SQ. FT = square feet

Table IB-7
Calculations for Inputs to ISC Model for Construction Emissions for Sewer Line Expansion

	Grading lb/day	East sewer line Emissions lb/day per area source	short-term 1,3,8-hr East gas line Emissions (short-term 1,3,8-hr) lb/hr per area source	short-term 24-hr East gas line Emissions (short-term 24-hr) lb/hr per area source	long-term annual East gas line Emissions (long-term annual) lb/hr per area source
NO_x	78.73	2.92	3.645E-01		8.788E-02
CO	109.75	4.06	5.081E-01		
SO_2	0.0001	0.00	4.630E-07	1.543E-07	1.116E-07
PM_{10} COMB	2.82	0.10		4.352E-03	3.148E-03
PM_{10} DUST[3]	0.08	0.00		1.235E-04	8.929E-05

Inputs to ISC

	Each Area Source 27 area sources (short-term 1,3,8-hr) lb/hr	Each Area Source 27 area sources (short-term 24-hr) lb/hr	Each Area Source 27 area sources (long-term annual) lb/hr
NO_x	0.364		8.79E-02
CO	0.508		
SO_2	4.630E-07	1.54E-07	1.12E-07
PM_{10} COMB		4.35E-03	3.15E-03
PM_{10} Fugitive Dust[3]		1.23E-04	8.93E-05

Total Area

Acres	SQ. FT
1.837	80019.72

0.06804 acres for each area source (27)

Notes:

CO = carbon monoxide

PM_{10} COMB = particulates from combustion

ISC = Industrial Source Complex model

lbs/day = pound(s) per day

NO_x = oxides of nitrogen

PM_{10} = particulate matter less than 10 micrometers in diameter

SO_2 = sulfur dioxide

SQ. FT = square feet

EMISSION CALCULATIONS FOR CONSTRUCTION RELATED ONROAD VEHICLES

Table IB-8
Emission Factor for Onroad Vehicles

Onroad Vehicle	Fuel Type	Vehicle Count	Weight (lbs)	Vehicle Type	EF (lbs/VMT)[1]				
					TOG	CO	NO_x	PM_{10}	SO_2
On-Site Vehicles									
Truck - Water/Fuel	D	2	58000	HHD	3.05E-03	2.29E-02	2.65E-02	6.23E-04	3.46E-05
Dump Truck	D	2	45400	HHD	3.05E-03	2.29E-02	2.65E-02	6.23E-04	3.46E-05
Service Truck - 3 ton	D	1	24000	LHD	1.39E-02	1.41E-01	1.49E-02	9.22E-05	0.00E+00
Highway Vehicles (Off-site)									
Worker's Vehicles [2]	G/D	120	4000	LDA/LDT	1.38E-03	1.29E-02	1.28E-03	7.95E-05	9.29E-06
Light Delivery Trucks	D	5	16000	LDH	1.39E-02	1.41E-01	1.49E-02	9.22E-05	0.00E+00
Heavy Duty Delivery Trucks	D	5	30000	MHD	1.49E-03	6.02E-03	2.81E-02	6.99E-04	3.96E-05

Notes:
[1]To obtain the emission factors, EMFAC2002 was run in the "planning inventory" mode for the modeling year of 2008. The Fresno County average fleet information was chosen, a
the inventory was run for winter. The emission factor for a given vehicle category was back calculated using the daily emissions and daily VMT for that vehicle categor
[2]The emission factors for worker's vehicles are a weighted average, assuming 50% passenger cars and 50% light duty trucks
Vehicle count (from Bibb) is average estimated work force onsite in any month
Assumes 1.5 employees per vehicle.
% = percent
CO = carbon monoxide
D = diesel
EF = electric field
G = gas
HHD = heavy heavy duty
lbs = pounds
LDA = light duty automobiles
LDT = light duty trucks
LHD = light heavy dutry
MHD = medium heavy duty
NOx = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
SO_2 = sulfur dioxide
TOG = total organic gases
VMT = vehicle mile traveled

EMISSION CALCULATIONS FOR CONSTRUCTION RELATED ONROAD VEHICLES

Table IB-9
Emission Calculation for Onroad Vehicles

Onroad Vehicles (Access Road)	Total Days	Trips or Hours/ Day/Unit	Round Trip Distance (mile)	Daily Total VMT	Daily Emissions (lbs)[1]				
					TOG	CO	NO_x	PM_{10}	SO_2
On-Site Vehicles									
Truck - Water	264	5	4	40	1.22E-01	9.16E-01	1.06E+00	2.49E-02	1.38E-03
Dump Truck	264	16	10	320	9.76E-01	7.33E+00	8.48E+00	1.99E-01	1.11E-02
Service Truck - 1 ton	264	1	2	2	2.78E-02	2.82E-01	2.98E-02	1.84E-04	0.00E+00
Service Truck - 3 ton	264	1	2	2	2.78E-02	2.82E-01	2.98E-02	1.84E-04	0.00E+00
Trucks - Pickup 3/4 ton	264	16	1	32	4.42E-02	4.13E-01	4.10E-02	2.54E-03	2.97E-04
Total				**Total**	**1.20 lbs**	**9.22 lbs**	**9.64 lbs**	**0.23 lbs**	**0.01 lbs**
Highway Vehicles (Off-site)	**Total Days**								
Worker's Vehicles [2]	264	1	15	1800	2.5	23.2	2.3	0.1	1.67E-02
Light Delivery Trucks	264	4	20	400	5.6	56.4	6.0	0.0	0.00E+00
Heavy Duty Delivery Trucks	264	4	20	400	0.6	2.4	11.2	0.3	1.58E-02
Total				**Total**	**0.60 lbs**	**2.41 lbs**	**11.24 lbs**	**0.28 lbs**	**0.02 lbs**

Onroad Vehicles (Access Road)	Total Days	Trips or Hours/Day/Unit	Round Trip Distance (mile)	Daily Total VMT	Project Emissions (lbs)				
					TOG	CO	NO_x	PM_{10}	SO_2
On-Site Vehicles									
Truck - Water	264	5	4	40	32	242	280	7	0
Dump Truck	264	16	10	320	258	1,935	2,239	53	3
Service Truck - 1 ton	264	1	2	2	7	74	8	0	0
Service Truck - 3 ton	264	1	2	2	7	74	8	0	0
Trucks - Pickup 3/4 ton	264	16	1	32	12	109	11	1	0
Total				**Total**	**316.21**	**2434.29**	**2545.11**	**59.98**	**3.37**
Highway Vehicles (Off-site)	**Total Days**				**0.2 tons**	**1.2 tons**	**1.3 tons**	**0.0 tons**	**0.0 tons**
Worker's Vehicles [2]	264	1	15	1800	656	6,130	608	38	4
Light Delivery Trucks	264	4	20	400	1,468	14,890	1,573	10	0
Heavy Duty Delivery Trucks	264	4	20	400	157	636	2,967	74	4
Total				**Total**	**2,281 lbs**	**21,655 lbs**	**5,149 lbs**	**121 lbs**	**9 lbs**
					1.1 tons	**10.8 tons**	**2.6 tons**	**0.1 tons**	**0.004 tons**

Notes;
[1]Based on equipment usage for the sixth construction month, which is the peak activity month
[2]The emission factors for worker's vehicles are a weighted average, assuming 50% passenger cars and 50% light duty trucks
% = percent
CO = carbon monoxide
lbs = pounds
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 micrometers in diameter
SO_2 = sulfur dioxide
TOG = total organic gases
VMT = vehicle mile traveled

EMISSION CALCULATIONS FOR CONSTRUCTION RELATED ONROAD VEHICLES

Table IB-10
Emissions from Vehicle Traffic on Paved Road

Vehicle Type	Mean Vehicles Speed (mph) [Vehicles Weight (tons)]	Total No. Of Trips / Day	PM^{10} EF (lbs/VMT) [1]	Round Trip Distance (mile)	Daily VMT (all units)	Total No. of Days Operated	VMT/ Project	Daily Emissions (lbs)	Project Emissions (lbs)
Worker's Vehicles [1]	45	1	0.0388	15	15	264	3960	0.5817	153.56
Light Delivery Trucks	[08]	5	0.0493	20	100	264	26400	4.9251	1300.23
Heavy Duty Delivery Trucks	[12]	1	0.0591	20	20	264	5280	1.1822	312.10
Total								**7**	**1,766**
					1.1 tons	**10.8 tons**	**2.6 tons**	**0.1 tons**	**0.004 tons**

Notes;
[1]EF are calculated using equations in AP-42, Section 13.2.2. Equation 1b is used for passenger cars; equation 1a is used for heavy duty delivery trucks.
EF calculations are based on the following assumptions: Paved road silt content (%), 0.1348 SCAQMD CEQA Table A-9-C-1, 5% local, 5% collector, 90% freewa

% = percent
CEQA = California Environmental Quality Act of 1970
EF = electric field
lbs = pounds
mph = miles per hour
No. = number
PM_{10} = particulate matter less than 10 micrometers in diameter
SCAQMD = Southern California Air Quality Management District
VMT = vehicle mile traveled

Table IB-11
Fresno County Average 2008 Winter Default

Version Emfac2002 V2.2 Apr 23, 2003
Run Date: 9/18/2006 16:29:00 PM
Scen Year: 2008
Model Years: 1965 to 2008
Season: Winter
Area: Fresno County Average
I/M Stat: I and M program in effect
Emissions: Tons per day

									Heavy Duty Trucks												
	Light Non-cat	Duty Cat	Passenger Diesel	Cars Total	Non-cat	Light Cat	Duty Diesel	Trucks Total	- Non-cat	Medium Cat	Duty Diesel	Trucks Total	Non-cat	Gasoline Cat	Trucks Total	Diesel Trucks	Total HD Trucks	Urban Buses	Motor-cycles	All Vehicles
Vehicles	4976	303659	835	309470	5929	199776	3208	208913	965	39356	3358	43678	1088	8235	9323	14775	24098	677	9171	596007
VMT/1000	63	11863	19	11944	124	7594	103	7821	18	1646	186	1850	13	204	217	1516	1733	88	79	23515
Trips	20426	1909190	4572	1934190	24841	1246940	19414	1291200	9589	462072	37566	509227	22659	100901	123560	218736	342295	2707	18341	4097950
Total Organic Gas Emissions																				
Run Exh	0.44	1.23	0.01	1.68	0.88	1.26	0.02	2.16	0.15	0.37	0.09	0.6	0.12	0.27	0.39	1.06	1.45	0.25	0.35	6.5
Idle Exh	0	0	0	0	0	0	0	0	0	0.01	0	0.01	0	0.01	0.01	0.07	0.08	0	0	0.09
Start Ex	0.15	1.68	0	1.83	0.18	1.35	0	1.53	0.09	0.49	0	0.58	0.38	0.31	0.69	0	0.69	0.01	0.06	4.7
Total Ex	0.6	2.91	0.01	3.51	1.06	2.61	0.02	3.69	0.25	0.87	0.09	1.2	0.5	0.58	1.08	1.13	2.21	0.26	0.42	11.29
Diurnal	0.02	0.19	0	0.21	0.02	0.15	0	0.17	0	0.03	0	0.03	0	0	0	0	0	0	0.01	0.42
Hot Soak	0.1	0.35	0	0.44	0.12	0.27	0	0.39	0.02	0.06	0	0.08	0.02	0.02	0.03	0	0.03	0	0.01	0.96
Running	0.47	1.63	0	2.1	0.32	2.03	0	2.35	0.07	0.55	0	0.62	0.11	0.28	0.4	0	0.4	0.01	0.08	5.56
Resting	0.01	0.06	0	0.07	0.01	0.05	0	0.06	0	0.01	0	0.01	0	0	0	0	0	0	0	0.14
Total	1.19	5.14	0.01	6.33	1.53	5.11	0.02	6.66	0.34	1.52	0.09	1.94	0.63	0.88	1.51	1.13	2.64	0.27	0.53	18.37
Carbon Monoxide Emissions																				
Run Exh	5.46	32.14	0.01	37.61	10.8	35.46	0.07	46.33	2.52	6.83	0.25	9.6	2.97	4.62	7.59	4.18	11.77	1.92	4.51	111.74
Idle Exh	0	0	0	0	0	0	0	0	0	0.07	0	0.07	0.01	0.03	0.04	0.38	0.42	0	0	0.49
Start Ex	0.71	18.25	0	18.96	0.87	16.73	0	17.6	0.47	5.39	0	5.86	2.32	5.35	7.67	0	7.67	0.12	0.22	50.43
Total Ex	6.17	50.39	0.01	56.58	11.66	52.19	0.07	63.92	2.99	12.29	0.25	15.53	5.3	10	15.3	4.56	19.85	2.05	4.73	162.66
Oxides of Nitrogen Emissions																				
Run Exh	0.35	3.85	0.03	4.23	0.67	4.78	0.16	5.61	0.13	1.42	0.98	2.54	0.08	1.04	1.12	20.16	21.28	0.99	0.13	34.78
Idle Exh	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0	1.15	1.15	0	0	1.16
Start Ex	0.03	0.98	0	1.02	0.04	0.91	0	0.95	0.01	0.72	0	0.73	0.04	0.46	0.5	0	0.5	0.01	0.01	3.23
Total Ex	0.38	4.83	0.03	5.25	0.71	5.69	0.16	6.56	0.15	2.15	0.99	3.28	0.12	1.51	1.62	21.32	22.94	1	0.13	39.16
Carbon Monoxide Emissions																				
Run Exh	0.03	4.42	0.01	4.46	0.06	3.49	0.04	3.6	0.01	1.25	0.1	1.36	0.01	0.15	0.16	3.29	3.46	0.16	0.01	13.05
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0.06
Start Ex	0	0.16	0	0.16	0.01	0.12	0	0.13	0	0.04	0	0.04	0.01	0	0.01	0	0.01	0	0	0.34
Total Ex	0.04	4.58	0.01	4.62	0.07	3.62	0.04	3.73	0.01	1.29	0.1	1.4	0.02	0.16	0.17	3.35	3.52	0.16	0.01	13.45
PM_{10} Emissions																				
Run Exh	0	0.13	0	0.14	0	0.14	0.01	0.15	0	0.04	0.01	0.05	0	0	0	0.44	0.44	0.01	0	0.8
Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0	0	0.02
Start Ex	0	0.02	0	0.02	0	0.02	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0.04
Total Ex	0	0.15	0	0.15	0	0.16	0.01	0.17	0	0.04	0.01	0.06	0	0	0	0.46	0.46	0.01	0	0.86
TireWear	0	0.1	0	0.11	0	0.07	0	0.07	0	0.02	0	0.02	0	0	0	0.05	0.05	0	0	0.25
BrakeWr	0	0.16	0	0.17	0	0.11	0	0.11	0	0.02	0	0.03	0	0	0	0.02	0.02	0	0	0.33
Total	0	0.42	0	0.43	0.01	0.33	0.01	0.34	0	0.08	0.02	0.1	0	0.01	0.01	0.53	0.54	0.02	0.01	1.43
Lead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOx	0	0.04	0	0.05	0	0.04	0	0.04	0	0.01	0	0.01	0	0	0	0.03	0.03	0	0	0.13
Fuel Consumption (000 gallons)																				
Gasoline	4.91	477.7	0	482.61	9.26	379.57	0	388.83	1.98	134.09	0	136.07	2.57	17.75	20.32	0	20.32	4.26	2.07	1034.16
Diesel	0	0	0.68	0.68	0	0	3.56	3.56	0	0	9.25	9.25	0	0	0	301.78	301.78	10.91	0	326.18

Attachment C

Bullard Energy Center Operating Emissions

Table IC-1
Bullard Energy Center Turbines 100%

Case	100	101	104	107
Ambient Temperature (°F)	114	114	63.3	16.8
Stack Diameter (ft)	13.5	13.5	13.5	13.5
Exhaust Flow (lb/hr)	1496922	1584697	1669071	1710622
CTG Load Level	**100%**	**100%**	**100%**	**100%**
Evap. Cooler	OFF	ON	OFF	OFF
Data from Vendor		Area =	143.14	ft^2

Expected Operation of Each Gas Turbine - Normal Operation

(Reference: Emission Summary GE LMS100 PA Turbine/Site Specific (372 elev) Information)

Heat Consumed (MMBTU/hr)	813.8	862.5	909.7	885.2
Turbine Outlet Temperature (°F)	817	801	787	741
Exhaust Flow (acfm)	816088	854672	888554	873723
Stack Exit Velocity, ft/m	5701.4	5970.9	6207.6	6104.0
Stack Exit Velocity, m/s	28.96	30.33	31.53	31.01
Nitrogen, % Vol	71.82	71.54	71.84	72.68
Oxygen, % Vol	11.51	11.43	11.49	12.08
Carbon Dioxide, % Vol	3.95	3.95	3.96	3.78
Argon, % Vol	0.86	0.86	0.86	0.87
Water Vapor, % Vol	11.85	12.20	11.83	10.57
Molecular Weight	28.01	27.97	28.01	28.13

Data from Vendor

Average Emission Rates from Each Gas Turbine (lbs/hr) - Normal Operations

NO_X at 28 ppmvd pre-BACT level	80.60	85.40	89.90	87.20
NO_X at 2.5 ppmvd BACT level	7.20	7.63	8.03	7.79
CO at 105 ppmvd pre BACT level	183.10	196.60	206.60	200.40
CO at 6.0 ppmvd BACT level	10.46	11.23	11.81	11.45
UHC at 4-7 ppmvd pre-BACT level	4.50	4.80	6.70	8.60
VOC at 2.4-4.2 ppmvd BACT level	3.00	3.20	3.30	5.10
VOC at 2.0 ppmvd BACT level	2.00	2.67	2.20	2.43
SO_2 short-term rate	1.14	1.20	1.27	1.23
SO_2 long-term rate	0.73	0.77	0.81	0.79
PM_{10}	6.00	6.00	6.00	6.00
NH_3 at 10 ppmvd tBACT level	10.70	11.30	11.90	11.50
NH_3 at 6 ppmvd BACT level	6.42	6.78	7.14	6.90

Sulfur content in fuel basis for above:	0.5	grain total S/100 scf	short-term
	0.32	grain total S/100 scf	long-term

Data from Vendor

Startup / Shutdown Emissions from Turbine

Startup						
Duration in Minutes	**10**	**20**	**30**	**30**	**Average**	**1 hour of**
	Startup Emissions lb/event	**SCR Warmup Emissions lb/event**	**Total Startup Emissions lb/event**	**Normal Emissions lb/hour**	**Startup Emissions lb/hour**	**Startup Emissions lb/hour**
NO_X	5.00	17.20	22.20	8.03	26.21	44.4
CO	14.00	39.30	53.30	11.81	59.20	106.6
VOC	3.00	0.80	3.80	2.67	5.13	7.6
SO_2	0.04	0.24	0.28	1.27	0.91	0.56
PM_{10}	1.00	2.00	3.00	6.00	6.00	6

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Normal emissions are highest of four operating cases listed above (case 104), except for VOC.

Shutdown				
Duration in Minutes	**10.5**	**49.5**		**1 hour of**
	Shutdown Emissions lb/event	**Normal Emissions lb/hour**	**Total Shutdown Emissions lb/hr**	**Shutdown Emissions lb/hour**
NO_X	6.00	8.03	12.62	34.3
CO	47.00	11.81	56.74	268.6
VOC	3.00	2.67	5.20	17.1
SO_2	0.05	1.27	1.10	0.3
PM_{10}	1.05	6.00	6.00	6.0

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Normal emissions are highest of four operating cases listed above (case 104) except for VOC.

Table IC-1
Bullard Energy Center Turbines 100%

Commissioning Emissions		18818	23022	664	1632	208
			Total Pounds Emitted			
	Hours	NO_x	CO	VOC	PM_{10}	SO_2
First Fire	28	1371.00	800.00	17.00	168.00	3
Controlled Break-in	20	1236.00	721.00	15.00	120.00	3
Dynamic AVR	24	4488.00	4553.00	98.00	144.00	18
Base Load AVR	16	1274.00	4956.00	106.00	96.00	20
SCR Commissioning	24	849.00	215.00	43.00	144.00	30
Full Load Testing	24	191.00	266.00	53.00	144.00	30
Total Commissioning Hours	136	9409.00	11511.00	332.00	816.00	104.00
			Maximum Emission Rates lb/hr			
		NO_x	CO	VOC	PM_{10}	SO_2
First Fire		48.96	28.57	0.61	6.00	0.11
Controlled Break-in		61.80	36.05	0.75	6.00	0.15
Dynamic AVR		187.00	189.71	4.08	6.00	0.75
Base Load AVR		79.63	309.75	6.63	6.00	1.25
SCR Commissioning		35.38	8.96	1.79	6.00	1.25
Full Load Testing		7.96	11.08	2.21	6.00	1.25

Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions are equal to the commissioning emission rates, except for SO_2 which has worst-case emissions during normal operations and PM_{10} which has worst-case emissions during startup.

Emissions per turbine	lb/hr								g/s
NO_2	187.00								23.56
CO	309.75								39.03
VOC	6.63								0.83
SO_2	1.27								0.16
PM_{10}	6.00								0.76

Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.
Worst-case 3-Hour Scenario are equal to 3 hours at normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	3.0			3.000				3.000	
SO_2	1.27			1.27	3.81			3.81	0.16

Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.
Worst-case 8-Hour Scenario includes 8 hours of commissioning. Only one turbine will be undergoing commissioning at any one time.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Commissioning	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Commissioning	Normal Operations	Worst-case Total
	lb/hr					Total lbs					g/s
Total Hours of Operation	8			8	0				8	0.00	
CO	309.75			309.75	0.00	2478.00			2478.00	0.00	39.03

Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.
Worst-case 24-Hour Scenario for PM_{10} includes 3 Startups, 3 Shutdowns, and remaining time at normal rate.
Worst-case 24-hour scenario for SO_2 uses normal operations.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	24	1.50	0.525	21.975		1.50	0.525	21.975	
NO_X	10.87	44.40	34.29	8.03	260.99	66.60	18.00	176.39	1.37
CO	23.35	106.60	268.57	11.81	560.33	159.90	141.00	259.43	2.94
VOC	3.29	7.60	17.14	2.67	79.00	11.40	9.00	58.60	0.41
SO_2	1.27	0.56	0.29	1.27	28.88	0.84	0.15	27.89	0.16
PM_{10}	6.00	6.00	6.00	6.00	144.00	9.00	3.15	131.85	0.76

SO_2 Commissioning		PM_{10} Commissioning	
First Fire	0.11	First Fire	6.00
Controlled Break-in	0.15	Controlled Break-in	6.00
Dynamic AVR	0.75	Dynamic AVR	6.00
Base Load AVR	1.25	Base Load AVR	6.00
SCR Commissioning	1.25	SCR Commissioning	6.00
Full Load Testing	1.25	Full Load Testing	6.00

CTG Commissioning testing could operate for 24 hours.

Commissioning

First Fire	Controlled Break-in	Dynamic AVR	Base Load AVR	SCR Commissioning	Full Load Commissioning
Emissions	Emissions	Emissions	Emissions	Emissions	Emissions
Total lbs					
28	20	24	16	24	24
1371	1236	4488	1274	849	191
800	721	4553	4956	215	266
17	15	98	106	43	53
3	3	18	20	24	30
308	220	264	176	264	264

Table IC-1
Bullard Energy Center Turbines 100%

Average Annual Emissions

Average Operation lb/hr Emission Rates presented below for normal operations are based on the 63°F, 100% load operation scenario for 5,000 total operating hours, which includes 365 startup/warmup events and 365 shutdown events. Worst-case total emission rate incorporates estimated operating hours at different temperatures

Emissions per turbine	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total	Startup /Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	5000	182.50	63.88	4753.63					
Number per Scenario		365	365						
Duration of Event (min)		30	10.5	60					
NO_X	5.53	44.40	34.29	8.03	48449.3	8103.0	2190.0	38156.3	0.70
CO	10.59	106.60	268.57	11.81	92729.4	19454.5	17155.0	56119.9	1.33
VOC	1.73	7.60	17.14	2.67	15158.3	1387.0	1095.0	12676.3	0.22
SO_2	0.45	0.56	0.29	0.81	3981.9	102.2	18.6	3861.0	0.06
PM_{10}	3.42	6.00	6.00	6.00	30000.0	1095.0	383.3	28521.8	0.43

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours 4754

ANNUAL TOTALS	1 unit	2 units		turbines + fire pump		cooling tower + turbines + fire pump	
NO_X	24.22	48.45	tpy	48.49	tpy	48.49	tpy
CO	46.36	92.73	tpy	92.74	tpy	92.74	tpy
VOC	7.58	15.16	tpy	15.17	tpy	15.17	tpy
SO_2	1.99	3.98	tpy	3.98	tpy	3.98	tpy
PM_{10}	15.00	30.00	tpy	30.00	tpy	30.05	tpy

Table IC-2
Bullard Energy Center Turbines 75%

Case	102	105	108
Ambient Temperature (°F)	114	63.3	16.8
Stack Diameter (ft)	13.5	13.5	13.5
Exhaust Flow (lb/hr)	1345262	1429908	1442911
CTG Load Level	**75%**	**75%**	**75%**
Evap. Cooler	OFF	OFF	OFF

Data from Vendor Area = 143.14 ft^2

Expected Operation of each Gas Turbine - Normal Operation

(Reference: Emission Summary GE LMS100 PA Turbine/Site Specific (372 elev) Information)

Heat Consumed (MMBTU/hr)	708.8	737.2	724.8
Turbine Outlet Temperature (°F)	800	766	746
Exhaust Flow (acfm)	721939	746033	737502
Stack Exit Velocity, ft/m	5043.6	5212.0	5152.4
Stack Exit Velocity, m/s	25.6	26.5	26.2
Nitrogen, % Vol	72.33	72.54	73.20
Oxygen, % Vol	12.11	12.32	12.66
Carbon Dioxide, % Vol	3.72	3.64	3.56
Argon, % Vol	0.86	0.87	0.88
Water Vapor, % Vol	10.96	10.62	9.69
Molecular Weight	28.08	28.11	28.21

Data from Vendor

Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operations

NO_X at 28 ppmvd pre-BACT level	68.50	70.80	69.30	
NO_X at 2.5 ppmvd BACT level	6.12	6.32	6.19	
CO at 105 ppmvd pre BACT level	155.10	161.40	157.90	
CO at 6.0 ppmvd BACT level	8.86	9.22	9.02	
VOC at 3-4.2 ppmvd pre-BACT level	2.70	2.90	4.30	
VOC at 2.0 ppmvd BACT level	1.80	1.93	2.05	
SO_2 short-term	0.99	1.03	1.01	
SO_2 long-term	0.63	0.66	0.65	
PM_{10}	6.00	6.00	6.00	
NH_3 at 10 ppmvd tBACT level	9.10	9.40	9.20	
NH_3 at 6 ppmvd BACT level	5.46	5.64	5.52	
Sulfur content in fuel basis for above:	0.5	grain total S/100 scf		short-term
Sulfur content in fuel basis for above:	0.32	grain total S/100 scf		long-term

Data from Vendor

Part load cases assume no evap cooling

Table IC-2
Bullard Energy Center Turbines 75%

Startup / Shutdown Emissions from Turbine

Startup						
Duration in Minutes	**10**	**20**	**30**	**30**	**Average**	**1 hour of**
	Startup Emissions	**SCR Warmup Emissions**	**Total Startup Emissions**	**Normal Emissions**	**Startup Emissions**	**Startup Emissions**
	lb/event	**lb/event**	**lb/event**	lb/hour	lb/hour	lb/hour
NO_X	5.00	17.20	22.20	6.32	25.36	44.4
CO	14.00	36.30	50.30	9.22	54.91	100.6
VOC	3.00	0.80	3.80	2.05	4.82	7.6
SO_2	0.04	0.24	0.28	1.03	0.79	0.56
PM_{10}	1.00	2.00	3.00	6.00	6.00	6

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Shutdown				
Duration in Minutes	**10.5**	**49.5**		**1 hour of**
	Shutdown Emissions lb/event	**Normal Emissions lb/hour**	**Total Shutdown Emissions lb/hr**	**Shutdown Emissions lb/hour**
NO_X	6.00	6.32	11.22	34.3
CO	47.00	9.22	54.61	268.6
VOC	3.00	2.05	4.69	17.1
SO_2	0.05	1.03	0.90	0.3
PM_{10}	1.05	6.00	6.00	6.0

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions are equal to the uncontrolled emission rates for NO_2, CO, and SO_2. For VOC the worst-case 1-hour is shutdown and for PM_{10} the worst-case hour is startup.

Emissions per turbine	**lb/hr**								**g/s**
NO_2	70.80								8.92
CO	161.40								20.34
VOC	4.69								0.59
SO_2	1.03								0.13
PM_{10}	6.00								0.76

Table IC-2
Bullard Energy Center Turbines 75%

Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

Worst-case 3-Hour Scenario are equal to 3 hours at normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	3			3		0	0	3	
SO_2	1.03			1.03	3.09	0.00	0.00	3.09	0.13

Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Worst-case 8-Hour Scenario includes 2 Startups, 2 Shutdown, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	8	1.00	0.350	6.65		1.00	0.35	6.65	
CO	31.99	100.60	268.57	9.22	255.93	100.60	94.00	61.33	4.03

Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-Hour Scenario includes 3 Startups, 3 Shutdowns, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	24	1.50	0.525	21.975		1.5	0.525	21.975	
NO_X	9.31	44.40	34.29	6.32	223.51	66.60	18.00	138.91	1.17
CO	20.61	100.60	268.57	9.22	494.57	150.90	141.00	202.67	2.60
VOC	2.72	7.60	17.14	2.05	65.40	11.40	9.00	45.00	0.34
SO_2	0.98	0.56	0.29	1.03	23.59	0.84	0.15	22.60	0.12
PM_{10}	6.00	6.00	6.00	6.00	144.00	9.00	3.15	131.85	0.76

Table IC-2
Bullard Energy Center Turbines 75%

Average Annual Emissions

Average Operation Emission Rates are based on the average operation scenario (63°F; 100% load) for 5,000 hours total operations which includes 365 startup/warmup events and 365 shutdown events. The four turbines will each have these operating conditions

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	5000	182.50	63.88	4753.63					
Number per Scenario		365	365	0					
Duration of Event (min)		30	10.5	60					
NO_X	4.61	44.40	34.29	6.32	40342.7	8103.0	2190.0	30049.7	0.58
CO	9.06	100.60	268.57	9.22	79356.5	18359.5	17155.0	43842.0	1.14
VOC	1.39	7.60	17.14	2.05	12215.6	1387.0	1095.0	9733.6	0.18
SO_2	0.37	0.56	0.29	0.66	3249.7	102.2	18.6	3128.9	0.05
PM_{10}	3.42	6.00	6.00	6.00	30000.0	1095.0	383.3	28521.8	0.43

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours 4754

Table IC-3
Bullard Energy Center Turbines 50%

Case	103	106	109
Ambient Temperature (°F)	114	63.3	16.8
Stack Diameter (ft)	13.5	13.5	13.5
Exhaust Flow (lb/hr)	1079315	1134608	1143414
CTG Load Level	**50%**	**50%**	**50%**
Evap. Cooler	OFF	OFF	OFF

Data from Vendor Area = 143.14 ft^2

Expected Operation of each Gas Turbine - Normal Operation

(Reference: Emission Summary GE LMS100 PA Turbine/Site Specific (372 elev) Information)

Heat Consumed (MMBTU/hr)	535.0	557.6	548.9
Turbine Outlet Temperature (°F)	804	783	765
Exhaust Flow (acfm)	578809	598001	591948
Stack Exit Velocity, ft/m	4043.7	4177.8	4135.5
Stack Exit Velocity, m/s	20.5	21.2	21.0
Nitrogen, % Vol	72.99	73.12	73.77
Oxygen, % Vol	12.89	12.97	13.28
Carbon Dioxide, % Vol	3.42	3.39	3.32
Argon, % Vol	0.87	0.87	0.88
Water Vapor, % Vol	9.82	9.63	8.73
Molecular Weight	28.18	28.20	28.29

Data from Vendor

Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operations

NO_X at 28 ppmvd pre-BACT level	50.30	51.20	51.60	
NO_X at 2.5 ppmvd BACT level	4.49	4.57	4.61	
CO at 105 ppmvd pre BACT level	113.30	119.10	116.10	
CO at 6.0 ppmvd BACT level	6.47	6.81	6.63	
VOC at 2-3 ppmvd pre-BACT level	1.10	1.10	2.30	
VOC at 2.0 ppmvd BACT level	1.10	0.92	1.53	
SO_2 short-term	0.75	0.78	0.77	
SO_2 long-term	0.48	0.50	0.49	
PM_{10}	6.00	6.00	6.00	
NH_3 at 10 ppmvd tBACT level	6.60	6.80	6.80	
NH_3 at 6 ppmvd BACT level	3.96	4.08	4.08	
Sulfur content in fuel basis for above:	0.5	grain total S/100 scf		short-term
Sulfur content in fuel basis for above:	0.32	grain total S/100 scf		long-term

Data from Vendor

Part load cases assume no evap cooling

Table IC-3
Bullard Energy Center Turbines 50%

Startup / Shutdown Emissions from Turbine

Startup						
Duration in Minutes	10	20	30	30	Average	1 hour of
	Startup Emissions lb/event	SCR Warmup Emissions lb/event	Total Startup Emissions lb/event	Normal Emissions lb/hour	Startup Emissions lb/hour	Startup Emissions lb/hour
NO_X	5.00	17.20	22.20	4.61	24.50	44.4
CO	14.00	36.30	50.30	6.81	53.70	100.6
VOC	3.00	0.80	3.80	1.53	4.57	7.6
SO_2	0.04	0.24	0.28	0.50	0.53	0.56
PM_{10}	1.00	2.00	3.00	6.00	6.00	6

Assumptions:

Startup Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Shutdown				
Duration in Minutes	10.5	49.5		1 hour of
	Shutdown Emissions lb/event	Normal Emissions lb/hour	Total Shutdown Emissions lb/hr	Shutdown Emissions lb/hour
NO_X	6.00	4.61	9.80	34.3
CO	47.00	6.81	52.61	268.6
VOC	3.00	1.53	4.27	17.1
SO_2	0.05	0.50	0.46	0.3
PM_{10}	1.05	6.00	6.00	6.0

Assumptions:

Shutdown Emissions for CO, NO_2, PM_{10}, and VOC integrated from data provided by GE and Bibb.

SO_2 emissions assume complete conversion of all sulfur to SO_2.

Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions are equal to the uncontrolled emission rates for NO_2, CO, and SO_2. For VOC the worst-case 1-hour is shutdown and for PM_{10} the worst-case hour is startup.

Emissions per turbine	lb/hr								g/s
NO_2	51.60								6.50
CO	119.10								15.01
VOC	4.57								0.58
SO_2	0.50								0.06
PM_{10}	6.00								0.76

Table IC-3
Bullard Energy Center Turbines 50%

Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.
Worst-case 3-Hour Scenario are equal to 3 hours at normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	3			3					
SO_2	0.50			0.50	1.49			1.49	0.06

Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.
Worst-case 8-Hour Scenario includes 2 Startups, 2 Shutdowns, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	8	1.00	0.350	6.650					
CO	29.98	100.60	268.57	6.81	239.86	100.60	94.00	45.26	3.78

Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.
Worst-case 24-Hour Scenario includes 2 Startups, 2 Shutdowns, and remaining time at Normal rate.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	24	1.50	0.525	21.98					
NO_X	7.74	44.40	34.29	4.61	185.84	66.60	18.00	101.24	0.98
CO	18.24	100.60	268.57	6.63	437.69	150.90	141.00	145.79	2.30
VOC	1.86	7.60	17.14	1.10	44.57	11.40	9.00	24.17	0.23
SO_2	0.49	0.56	0.29	0.49	11.76	0.84	0.15	10.77	0.06
PM_{10}	6.00	6.00	6.00	6.00	144.00	9.00	3.15	131.85	0.76

Average Annual Emissions

Average Operation Emission Rates are based on the average operation scenario (63°F; 100% load) for 5,000 hours
which includes 365 startup/warmup events and 365 shutdown events. The four turbines will each have these operating conditions.

Emissions per turbine	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total	Startup / Warmup	Shutdown	Normal Operations	Worst-case Total
	lb/hr				Total lbs				g/s
Total Hours of Operation	5000	182.50	63.88	4754					
Number per Scenario		365	365	0					
Duration of Event (min)		30	10.5	60					
NO_X	3.68	44.40	34.29	4.61	32193.6	8103.0	2190.0	21900.6	0.46
CO	7.75	100.60	268.57	6.81	67866.3	18359.5	17155.0	32351.8	0.98
VOC	1.12	7.60	17.14	1.53	9770.9	1387.0	1095.0	7288.9	0.14
SO_2	0.28	0.56	0.29	0.50	2487.4	102.2	18.6	2366.6	0.04
PM_{10}	3.42	6.00	6.00	6.00	30000.0	1095.0	383.3	28521.8	0.43

Note: Worst-case lb/hr is the total emissions (lbs) over 8760 hours/year

Estimated annual normal operating hours 4754

Table IC-4
Cooling Tower Drift Calculation

Cooling Tower					
	design circulating water rate	13,800	gallons/min		
	cycles of concentration	3			
	TDS	170	mg/liter		
		1.42	lb/1000 gallons		
	Drift Eliminator Control	0.000005			
	Operating hours per year	5000			
	Drift PM emissions total	0.01762	lb/hr		
		88.1	lb/yr	0.00587 lb/hr	per cell (3) long term rate
		0.04	**tpy**	0.00881 lb/hr	per cell (2) short term rate

Table IC-5
Cooling Tower Emissions

Emissions from Emergency Diesel Firewater Pump

Rated Horsepower	**160**	**BHP**		
Testing duration	**60**	**min/week**		
Yearly testing	**52**	**week/year**		
Expected non-emergency usage	**52**	**hr/yr**		
Diesel Fired	**Emission Factor**	**Emission Rate per Testing**	**Yearly Emission Rate**	
	g/HP/Hr	lb/hr	lb/yr	
NO_X	3.90	1.38	71.54	
CO	0.66	0.23	12.11	
VOC (Total Hydrocarbons)	1.00	0.35	18.34	
SO_X		2.26E-03	0.12	
PM_{10}	0.15	0.05	2.75	3.141E-04 lb/hr

Engine parameters

Flow Rate (acfm)	1236	
Exhaust Temp (degrees F)	872	
Stack Diameter (feet)	0.5052	
Stack height (feet)	17	(13 ft building + 4 ft stack)

Data from Bibb
Sulfur content 15 ppm in fuel

Table IC-6
Plant Operating Scenarios

1-Hour Worst-Case Emission Scenario for BEC

Only NO_2, CO and SO_2 are considered for the 1-hour Ambient Air Quality Standard.

Worst-case 1-Hour Scenario for NO_2 and CO includes new turbines operating for 1 hour at highest commissioning rate.

Worst-case 1-Hour Scenario for SO_2 includes new turbines operating for 1 hour at normal rate.

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
NO_2	187.00	23.56
CO	309.75	39.03
SO_2	1.27	0.16
Emissions from Fire Pump		
NO_2	1.38	0.17
CO	0.23	0.03
SO_2	2.26E-03	2.85E-04

3 Hour Emissions Scenarios for BEC

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

The worst-case 3-hour emission rate is the maximum SO_2 rate for 100% load, normal operating case (63°F; with Evap. Cooler Off).

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
SO_2	1.27	0.16
Emissions from Fire Pump		
SO_2	7.53E-04	9.48E-05

8-Hour Emissions Scenarios for BEC

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Worst-case 8-Hour Scenario includes 8 hours of commissioning.

Fire Pump operates 1 hour per week.

Emissions per turbine	lb/hr	g/s
CO	309.75	39.03
Emissions from Fire Pump		
CO	2.82E-04	3.56E-05

Table IC-6
Plant Operating Scenarios

24-Hour Emissions Scenarios for BEC

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard.

Worst-case 24-Hour Scenario for PM_{10} includes 3 Startups, 3 Shutdowns, and remaining time at normal rate. SO_2 uses normal operating rate

Fire Pump operates 1 hour per week.

Emissions per turbine	**lb/hr**	**g/s**
NO_2	10.87	1.37
CO	23.35	2.94
VOC	3.29	0.41
SO_2	1.27	0.16
PM_{10}	6.00	0.76
Emissions from Cooling Tower	**lb/hr**	**g/s**
PM_{10}	8.809E-03	0.00
Emissions from Fire Pump		
SO_2	9.41E-05	1.19E-05
PM_{10}	2.20E-03	2.78E-04

Average Annual Emissions for BEC

Average Operation Emission Rates are based on the annual operation scenarios for 5,000 hours which includes 365 startup/warmup events and 365 shutdown events.

Fire Pump operates 52 hours per year. Cooling tower operates 5,000 hours per year.

annual SO2 assumes 0.32 grains/scf

Emissions per turbine	**lb/hr**	**g/s**
NO_X	5.53	0.70
CO	10.59	1.33
VOC	1.73	0.22
SO_2	0.45	0.06
PM_{10}	3.42	0.43
Emissions from Cooling Tower		
PM_{10}	5.873E-03	0.00
Emissions from Fire Pump		
NO_2	8.17E-03	1.03E-03
CO	1.38E-03	1.74E-04
VOC	2.09E-03	2.64E-04
SO_2	1.34E-05	1.69E-06
PM_{10}	3.14E-04	3.96E-05

Note: Worst-case annual lb/hr is the total emissions (lbs) over 8760 hours/year

Attachment D

Modeling Protocol

MODELING PROTOCOL FOR THE BULLARD ENERGY CENTER FRESNO COUNTY, CALIFORNIA

Prepared for

San Joaquin Valley Air Pollution Control District

and

California Energy Commission

Prepared on Behalf of

Bullard Energy Center, LLC

URS Project No. 28906905.00020

August 15, 2006

URS

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Attachments

Attachment A Seasonal Wind Roses for the Fresno Yosemite International Airport (1987–1991)

$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for certification
AQRV	air quality related values
ATC	Authority to construct
BACT	best available control technology
BEC	Bullard Energy Center
BPIP	Building Profile Input Program
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CEC	California Energy Commission
CO	carbon monoxide
CTG	combustion turbine generator
°C	degrees Celsius
DOC	determination of compliance
g/s	gram per second
GE	General Electric
HARP	Hotspots Analysis and Reporting Program
HRA	health risk assessment
ISCST3	Industrial Source Complex Short Term 3rd version
km	kilometer
MEI	maximally exposed individual
mm	millimeter
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NSR	new source review
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment

Pb	lead
$PM_{2.5}$	particulate matter less than 2.5 μm in diameter
PM_{10}	particulate matter less than 10 μm in diameter
ppm	parts per million
PSD	prevention of significant deterioration
ROC	reactive organic compound
SCR	selective catalytic reduction
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
TAC	toxic air contaminant
tpy	tons per year
USEPA	U.S. Environmental Protection Agency

1.1 BACKGROUND

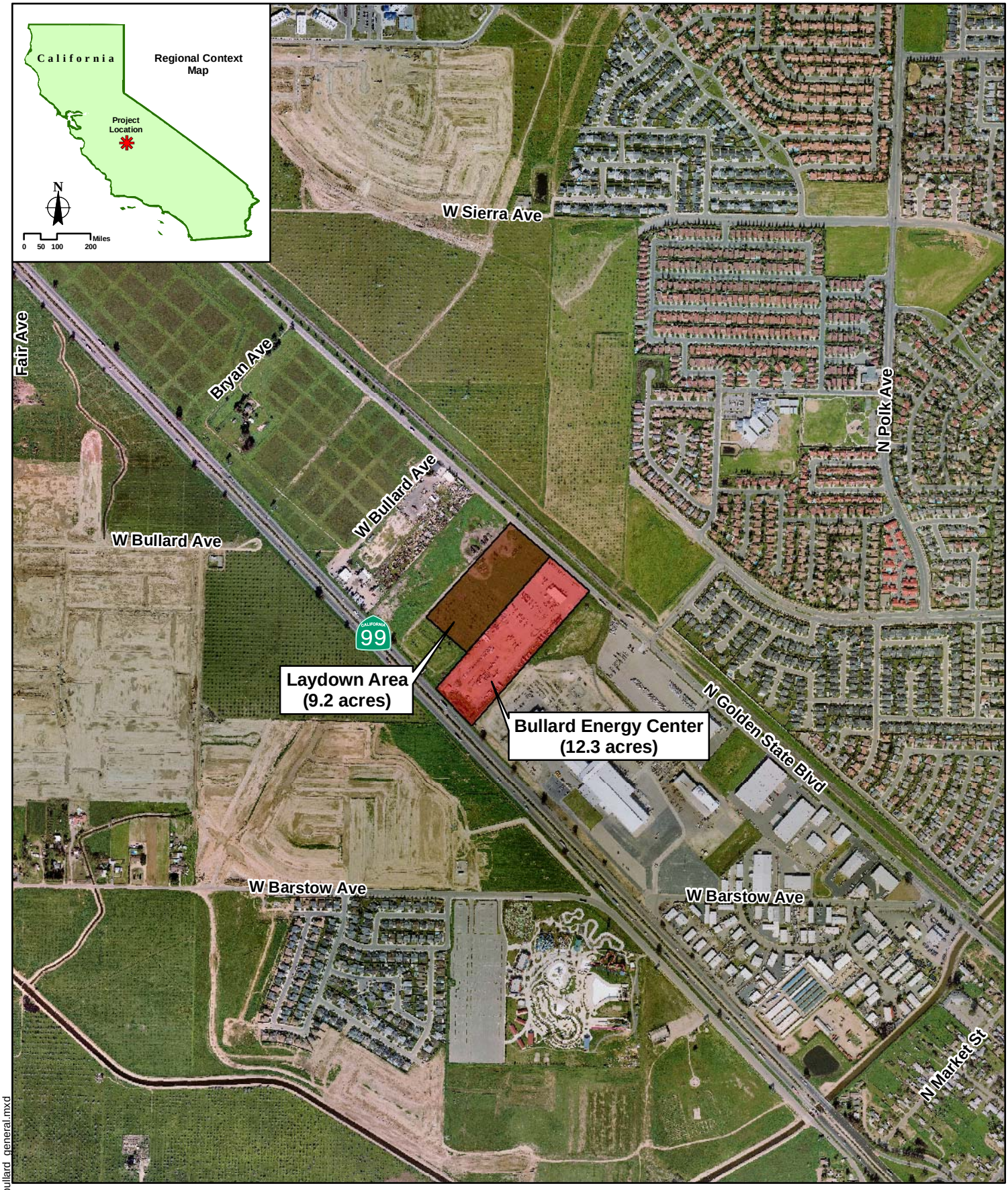
Bullard Energy Center LLC is proposing to build and operate a new approximately 200 megawatt natural gas-fired simple cycle peaking plant using two new General Electric (GE) LMS100 combustion turbine generators (CTG). The Bullard Energy Center (BEC) site is in central Fresno County in the San Joaquin Valley at 5829 North Golden State Boulevard in the City of Fresno about 10.5 miles (17 kilometers [km]) northwest of the Fresno Air Terminal (Figure 1-1, Aerial Site Plan, Bullard Energy Center). The project is subject to the site licensing requirements of the California Energy Commission (CEC). The CEC will coordinate its independent air quality evaluations with the San Joaquin Valley Air Pollution Control District (SJVAPCD) through the Determination of Compliance (DOC) process. Annual emissions of all criteria pollutants will be below the emission level thresholds specified in SJVAPCD Regulations Rule 4201, 4301, and 4703. Also, the annual emissions of all criteria pollutants will be below the emission level thresholds specified by the U.S. Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) review for Major Sources. Specifically, the BEC will emit less than: 250 tons per year (tpy) of nitrogen oxides (NO_x), carbon monoxide (CO), reactive organic compounds (ROC), or sulfur dioxide (SO_2), less than 0.6 tpy of lead (Pb) and less than 7.0 tpy of sulfuric acid mist. These determinations have been made for the applicant's proposed operating limits of 5,000 hours per year per turbine plus 150 startup/shutdown cycles per turbine per year.

Even though Federal PSD regulations will not apply to the BEC, the air dispersion modeling for this project will be conducted in conformance with PSD requirements in many ways. For example, worst-case predicted impacts will be compared with the applicable monitoring exemption limits to demonstrate that the project will be exempt from the requirements relating to pre-construction ambient air quality monitoring. The PSD regulations apply only to those pollutants for which the project area is in attainment of the National Ambient Air Quality Standards (NAAQS). State and local new source review (NSR) and non-attainment NSR regulations potentially apply to all criteria pollutants, depending on the quantity of pollutants emitted. The area around the BEC is classified as attainment with respect to the NAAQS for nitrogen dioxide (NO_2), CO, and SO_2, and non-attainment for ozone (O_3), particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), and PM_{10}. With respect to the California Ambient Air Quality Standards (CAAQS), the area around the PEC is classified as attainment for NO_2, CO, sulfates, Pb, hydrogen sulfide, and SO_2, and non-attainment for O_3, PM_{10}, and $PM_{2.5}$. NO_2 and SO_2 are regulated as PM_{10} precursors, and NO_2 and ROC as O_3 precursors. Project emissions of non-attainment pollutants and their precursors will be offset to satisfy state and local non-attainment NSR regulations.

1.2 PURPOSE

The CEC and SJVAPCD both require the use of atmospheric dispersion modeling to demonstrate compliance with applicable air quality standards and to determine the potential impacts on human health from toxic air contaminants (TAC). In addition, CEC power plant siting regulations require that the cumulative impacts of the project and reasonably foreseeable projects within 10 km of the project site be assessed via modeling.

This document summarizes the procedures that are proposed for the air dispersion modeling for project certification and permitting. Modeling of both operation and construction emissions will be performed in accordance with CEC guidance (CEC 1997). This protocol is being submitted to the CEC and SJVAPCD for their review and comment prior to completion of the applicable permit applications. The proposed model selection and modeling approach is based on review of applicable regulations and agency guidance documents, and discussions with agency staff.



G:\gis\projects\1577\28906905\mxd\bullard_general.mxd

500 0 500 1,000 Feet

SCALE: 1" = 1,000'

N

SOURCES:
Airphoto USA (color aerial Feb. 2005);
Streetmap USA (streets).

Aerial Site Plan

Bullard Energy Center

URS

FIGURE.1-1

2.1 PROJECT LOCATION

The BEC site will be located on a commercial 12-acre parcel in Fresno County at 5829 North Golden State Boulevard about 10.5 miles (17 km) northwest of the Fresno Air Terminal (see Figure 1-1, Aerial Site Plan, Bullard Energy Center). The project site is approximately 9.5 miles (15 km) from complex terrain (i.e., with elevation exceeding proposed stack heights) and is surrounded by vacant and commercial land. The nearest residential area is approximately 250 yards to the southeast of the property.

2.2 DESCRIPTION OF THE PROPOSED SOURCES

The project is the construction and operation of two GE LMS100 CTG, an evaporative mechanical draft cooling tower, associated transformers, water tanks, and other ancillary facilities. The gas turbines will be fired exclusively on natural gas and will be equipped with water injection and selective catalytic reduction (SCR) for the control of NO_x emissions and an oxidation catalyst for control of CO emissions. The CTGs will operate in simple cycle mode and will have an exhaust stack with a height of 90 feet and a diameter of 13.5 feet. There will be one three-cell cooling tower. Aqueous ammonia will be used in the SCR system. One 160-horsepower diesel engine will act as the emergency firewater pump driver.

3.1 CALIFORNIA ENERGY COMMISSION REQUIREMENTS

For projects with electrical power generation capacity of greater than 50 megawatt, CEC requires that applicants prepare a comprehensive Application for Certification (AFC) document addressing the project's environmental and engineering features. An AFC must include the following air quality information (CEC 1997):

- A description of the project, including project emissions, fuel type(s), control technologies and stack characteristics;
- The basis for all emission estimates and/or calculations;
- An analysis of Best Available Control Technology (BACT) according to SJVAPCD rules;
- Existing baseline air quality data for all regulated pollutants;
- Existing meteorological data, including temperature, wind speed and direction, and mixing height;
- A listing and DOC with all applicable laws, ordinances, regulations and standards;
- An emissions offsets strategy;
- An air quality impact assessment (i.e., national and state ambient air quality standards [AAQS] and PSD review) and protocol for the assessment of cumulative impacts of the project along with permitted and under construction projects within a 10 km radius; and
- An analysis of human exposure to air toxics (i.e., health risk assessment [HRA]).

For the BEC project, the air quality impact assessment, the cumulative impacts assessment, and the HRA will be performed using dispersion models.

3.2 SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT REQUIREMENTS

The SJVAPCD has promulgated NSR requirements under Rule 2201. In general, all equipment with the potential to emit air pollutants is subject to NSR requirements. NSR has four major requirements that potentially apply to new sources:

- Installation of BACT;
- Ambient air quality impact modeling to demonstrate compliance with NAAQS and CAAQS;
- Emission offsets; and
- Certification of statewide compliance with air quality requirements.

Assembly Bill 2588, California Air Toxics Hot Spots Program (and SJVAPCD Rule 3110) allows a predicted incremental cancer risk from TACs at any receptor up to ten in one million, prior to public notification, if best available control technology for toxics is implemented. A TAC analysis should include TAC emission estimates and a modeling analysis to identify the zone of impact and the maximally exposed individual. The zone of impact encompasses the area within which the incremental carcinogenic risk (due to the inhalation pathway only) equals or exceeds one in one million.

3.3 U.S. ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS

USEPA has promulgated PSD regulations applicable to major sources in Fresno County. The BEC will not be a major source for criteria pollutants other than PM_{10}. Many of the PSD requirements are the same as the AFC and NSR requirements described above (e.g., project description, BACT, AAQS analysis); however, PSD requires the following additional analyses:

- A PSD increment (consumption) analysis;
- An analysis of air quality related values (AQRV) to ensure the protection of visibility of federal Class I wilderness areas within 100 km of the project;
- An evaluation of potential impacts on soils and vegetation of commercial and recreational value; and
- An evaluation of potential growth-inducing impacts.

However, for the BEC, these additional PSD requirements will not apply because the new BEC will not be a major source.

This section describes the dispersion models and modeling techniques to be used in performing the air quality analysis for the BEC. The objectives of the modeling are to demonstrate that air emissions from the BEC will not cause or contribute to a PSD increment exceedance or an ambient air quality standard violation, and will not cause a significant health risk.

In November 2005, the USEPA officially recognized the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD) as the preferred dispersion model for regulatory applications, replacing the Industrial Source Complex Short Term 3 (ISCST3) model. USEPA allowed a one-year "grace period" commencing November 9, 2005 during which the use of either model is acceptable, depending on the preference of the local air quality jurisdiction. When contacted on this point, the SJVAPCD stated that either ISCST3 or AERMOD could be used for BEC air modeling analyses. The use of ISCST3 remains acceptable until the District assembles meteorological input data sets suitable for application with AERMOD, which they hope to accomplish before the one-year grace period has expired. Under these circumstances, we have elected to use ISCST3 for the licensing/permitting analyses associated with the BEC.

4.1 SCREENING MODELING

An initial screening analysis will be conducted to identify which operating mode for the combustion turbines results in worst-case ambient air impacts. The specified aim of this exercise is to determine what combination of emissions and stack parameters over the full-expected range of turbine operating load and ambient temperature conditions will produce the highest ground-level pollutant concentrations. As explained in the previous section, the most recent version of the USEPA ISCST3 model will be used to model worst-case conditions for each of three operating modes across the load range (e.g., 100, 75, or 50 percent load) for each of three ambient temperatures covering the range of expected ambient conditions at the site. A unit emission rate of 1.0 gram per second (g/s) will be modeled for both flat and elevated terrain while considering potential building downwash. Concentrations for each pollutant, expressed in units of micrograms per cubic meter, will be obtained from the screening model results by multiplying the unit concentration from the ISCST3 model results (expressed in micrograms per cubic meter per g/s) by the emission rate calculated for each pollutant (expressed in g/s) for each operating mode. This is a streamlined process, because it allows ISCST3 to be executed only once for all pollutants for each operating mode, which eliminates the need to execute the model iteratively for each pollutant. The operating mode that yields the highest concentrations for each averaging time pertaining to the National and California AAQS will be considered the worst-case operating mode for that averaging time, and the stack parameters corresponding to the worst-case operating mode will be used in all subsequent modeling analyses, screening or refined. Refined modeling, as discussed in the following section, will be used to determine the worst-case impacts due to all project sources combined.

4.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air emissions from the BEC will not cause or contribute to an AAQS violation; and will not cause a significant health risk impact. The most recent version (01228) of the ISCST3 model will be used for the refined modeling of criteria pollutants. The regulatory default option will be selected. The short-term

model version will be used for modeling concentrations of pollutants having short-term (e.g., 1 to 24 hour) ambient standards. Modeling for pollutants having both short-term and annual standards (i.e., PM_{10} and NO_2), will be conducted using ISCST3 with the PERIOD option to predict impacts on the annual standard. Specific modeling techniques for PSD, AAQS, and HRA analyses are discussed below.

The AFC application for the BEC project will include an analysis of the land use adjacent to the project. This analysis will be conducted in accordance with Section 8.2.8 of the Guideline on Air Quality Models (EPA-450/2-78-027R and American Meteorological Society [1978]).

Based on the American Meteorological Society land use procedure, more than 66 percent of the area within a 10 km radius of the BEC could be classified as rural. Since the American Meteorological Society classification scheme requires more than the 50 percent of the area within the 10 km radius around a source to be non-rural for an urban classification, the rural mode will be used in the ISCST3 modeling analyses.

The following ISCST3 regulatory default settings will also be used:

- Wind profile exponents of 0.7, 0.7, 0.10, 0.15, 0.35, and 0.35;
- Final plume rise;
- Stack tip downwash effects included; and
- Buoyancy-induced dispersion option used.

4.2.1 PSD Increment Analysis

As stated earlier in this protocol, a PSD increment analysis will not be required because the BEC will not be a major source, as defined in the PSD regulations. However, although not required, the maximum predicted incremental criteria pollutant concentrations due to BEC sources will be compared with the PSD significant impact level (see Table 4-1, Relevant Ambient Air Quality Standards and Significance Levels) for each pollutant as a reference point.

TABLE 4-1
RELEVANT AMBIENT AIR QUALITY STANDARDS AND SIGNIFICANCE LEVELS

Pollutant	Averaging Time	CAAQS (a, c)	NAAQS (b, c)	Ambient Impact Significance Levels ($\mu g/m^3$)	PSD Significant Emission Rates (tpy)	PSD Increments ($\mu g/m^3$)	
						Class I	Class II
CO	8-hour	9.0 ppm (10,000 $\mu g/m^3$)	9.0 ppm (10,000 $\mu g/m^3$)	500	100		
	1-hour	20 ppm (23,000 $\mu g/m^3$)	35 ppm (40,000 $\mu g/m^3$)	2,000			
NO_2[(d)]	Annual		0.053 ppm (100 $\mu g/m^3$)	1	100	2.5	25
	1-hour	0.25 ppm (470 $\mu g/m^3$)					

TABLE 4-1
RELEVANT AMBIENT AIR QUALITY STANDARDS AND SIGNIFICANCE LEVELS

Pollutant	Averaging Time	CAAQS (a, c)	NAAQS (b, c)	Ambient Impact Significance Levels ($\mu g/m^3$)	PSD Significant Emission Rates (tpy)	PSD Increments ($\mu g/m^3$)	
						Class I	Class II
SO_2	Annual		0.03 ppm (80 $\mu g/m^3$)	1	100	2	20
	24-hour	0.04 ppm[e] (105 $\mu g/m^3$)	0.14 ppm (365 $\mu g/m^3$)	5		5	91
	3-hour		0.5 ppm (1,300 $\mu g/m^3$)	25		25	512
	1-hour	0.25 ppm (655 $\mu g/m^3$)					
PM_{10}	Annual	20 $\mu g/m^3$	50 $\mu g/m^3$	1	100	4	17
	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	5		8	30
$PM_{2.5}$	Annual	12 $\mu g/m^3$	15 $\mu g/m^3$				
	24-hour		65 $\mu g/m^3$				
O_3	8-hour	0.07 ppm (137 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$)	See footnote[f]	100 (of ROCs)		
	1-hour	0.09 ppm (180 $\mu g/m^3$)	See footnote[g]				

Notes:

[a]California standards for O_3 (as volatile organic compounds, 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]National standards, other than those for O_3 and based on annual averages, are not to be exceeded more than once a year. The O_3 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 one.

[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 degrees Celsius (°C) and a reference pressure of 760 millimeter (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).

[d]NO_2 is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all oxides of NO_x.

[e]At locations where the state standards for O_3 and/or PM_{10} are violated. National standards apply elsewhere.

[f]Modeling is required for any net increase of 100 tpy or more of ROCs subject to PSD.

[g]New federal 8-hour O_3 and fine particulate matter ($PM_{2.5}$) standards were promulgated by USEPA on July 18, 1997. The federal 1-hour O_3 standard was revoked by USEPA on June 15, 2005.

Blanks = Not applicable
ppm = parts per million by volume, or micromoles of pollutant per mole of gas
mm = millimeters
$\mu g/m^3$ = micrograms per cubic meter

4.2.2 Ambient Air Quality Standard Analysis

The purpose of the ambient air quality standard analysis is to determine whether the BEC will cause or contribute to an AAQS violation. The project will not be considered to cause or contribute to an AAQS violation unless impacts from the project itself combined with the background concentration exceed the AAQS, or the project has a significant impact at the same location and time as a predicted AAQS violation. The following approach is proposed for performing the AAQS analysis:

1. The receptor grid and spacing described in Section 4.5, Receptor Grid, will be used for the AAQS analysis.

2. Short-term and annual AAQS modeling will be performed using ISCST3. Annual AAQS modeling will be performed using ISCST3 with the PERIOD option. Both short-term and annual analyses will be run using sequential hourly meteorological data for five years. Maximum impact equals modeled impact plus background. For BEC modeling, the highest modeled impact for any given year will be used.

   For CO modeling, the PLOTFILE output option in ISCST3 will be invoked to save the maximum impact that, when added to background, exceeds the AAQS. If 1-hour and 8-hour concentrations do not exceed the AAQS, then compliance is demonstrated and no further modeling is necessary for CO.

   For NO_2 modeling, the PLOTFILE output option in ISCST3 will be invoked to save the maximum impact that exceeds the AAQS (minus background). Initially, the modeling will assume full conversion of NO_x to NO_2. Should it be required, NO_2 estimates will be reduced using the USEPA O_3 limiting method (for either hourly or annual impacts). If 1-hour and annual concentrations do not exceed the applicable AAQS, then compliance is demonstrated and no further modeling is necessary for NO_2.

   For SO_2 modeling, the PLOTFILE output option in ISCST3 will be invoked to save the maximum impact that, when added to background exceeds the AAQS. If 3-hour and 24-hour concentrations do not exceed the AAQS, then compliance is demonstrated and no further modeling is necessary for SO_2.

   For PM_{10} modeling, the maximum of the five one-year average PM_{10} concentrations will be reported. If concentrations do not exceed the AAQS (minus background), then compliance is demonstrated and no further modeling is necessary for PM_{10}.

4.2.3 Health Risk Assessment Analysis

The CEC and SJVAPCD require a HRA to evaluate TAC emissions from the operation of the project. Contaminants emitted by the project with potential carcinogenic, chronic and acute effects will be considered. This HRA will be performed following the Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines* (OEHHA 2003). As recommended by this guideline, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) (CARB 2005) will be used to perform a refined HRA for the project. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion

model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA.

First, ground level concentrations from the BEC will be estimated using the ISCST3 dispersion model within HARP. The HARP modeling analysis will be consistent with, and use similar appropriate parameters, as the modeling approach discussed above for the AAQS analyses using ISCST3. Based on the impacts determined by the ISCST3 model, the HARP model will be estimating the corresponding health risks. The results obtained for the year(s) of meteorological data resulting in the highest 1-hour and annual impacts as determined above will be used and receptors will be placed at 25 meter spacing around the BEC fenceline and 500 meter spacing outside of the fence out to 10 km. All receptors that HARP creates that are inside the fence will be excluded. HARP will also include the census receptors out to 10 km, and additional receptors will be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to a distance of 1 mile. The HRA performed by means of the HARP model will follow these steps:

1. Define the location of the maximally exposed individual (i.e., the location where the highest carcinogenic risk may occur);
2. Define the locations of the maximum chronic non-carcinogenic adverse health effects and the maximum acute adverse health effects; and
3. Calculate concentrations and adverse health effects at locations of maximum impact for each pollutant.

The HARP model will be performed for the inhalation pathway for diesel particulate and for all applicable uptake pathways for all other TACs. A discussion of the surrounding land use, sensitive receptors, and local meteorology will be provided in the AFC.

4.2.4 Air Quality Related Values and Visibility Analysis

A PSD analysis of AQRV and visibility will not be required, because the BEC project will not be a major source and SJVAPCD rules do not otherwise require such an analysis.

4.3 MODELING EMISSIONS INVENTORY

4.3.1 Project Sources

Operational emissions from the project will be dominated by the combustion turbine-generators. Table 4-2, Preliminary Estimated Emissions for BEC Combustion Turbine Generators, summarizes preliminary annual (combined) emission estimates for the turbines. Conceptual plant design includes SCR for NO_x and oxidation catalysts for CO that will comport with recent BACT determinations for similar projects in California and elsewhere. Emissions of SO_2 and PM_{10} will be low, owing to the exclusive use of interstate pipeline quality natural gas as fuel for the gas turbine.

TABLE 4-2
PRELIMINARY ESTIMATED EMISSIONS FOR
BEC COMBUSTION TURBINE GENERATORS
(tpy)

NO_x	CO	SO_2	ROC	PM_{10}	Pb
50.1	96.6	6.2	15.2	50.9	<0.6

Notes:
< = less than

Combustion turbine generator emissions will vary with ambient temperature and turbine load. Modeling will be conducted for a range of ambient temperatures (from low ambient temperature to high ambient temperature) and loads (50, 75, and 100 percent). All combinations will be modeled during the screening analysis to identify worst-case operating scenarios (stack parameters) for each averaging period (i.e., 1-hour, 3-hour, 8-hour, 24-hour, and annual). Startup and shutdown scenarios will be addressed, in addition to the normal operations, as will a small number of hours of turbine operations for maintenance activities without the SCR and CO catalyst, in addition to turbine commissioning emissions. The modeling emission inventory for the facility will include the maximum emission rate for each source for each appropriate averaging time. The modeling analyses conducted for the AFC, DOC, and Authority to Construct (ATC) permit applications will be based on the refined emissions estimates.

The new cooling tower will incorporate drift eliminators. Drift emissions (as particulates) will be reduced with the addition of the drift eliminators. The PM_{10} emission rate from the cooling tower will incorporate this control measure.

Temporary construction emissions will result from heavy equipment exhaust (primarily NO_x emissions and diesel particulate emissions) and fugitive dust (PM_{10}) from earthmoving activities and vehicle traffic on paved and unpaved surfaces. Per the recommendation of SJVAPCD staff, construction emissions will be estimated by means of the URBEMIS2002 model with project-specific input information on the expected construction schedule, equipment fleet, and areas to be graded. The model inputs will also account for the effects of implementing control measures for controlling fugitive dust emissions during construction. The resulting emissions estimates will be modeled using the same receptor grids and meteorological inputs used for the modeling of project operations. The construction site, parking area, and lay-down area will be modeled as area or volume sources. To the extent possible, the emissions scenario selected for modeling will reflect a reasonably realistic worst-case month for construction activities and fugitive dust generation. Ultra low sulfur diesel fuel will be utilized in any emission calculations for construction equipment used at the BEC site.

Air toxics, or TAC, will also be emitted from the operational BEC project due to combustion of natural gas and diesel fuels. However, only small quantities of TACs will be emitted, primarily, benzene, formaldehyde, and polycyclic aromatic hydrocarbons, because only natural gas will be used as fuel for the CTGs. Turbine emission estimates for TAC will be based on emission factors and/or speciation profiles for particulate and organic compounds available from CARB and/or vendor data, if available. To the extent that regulated TACs are identified in the analysis of potential cooling system makeup water, the maximum potential contributions of these substances to cooling tower drift particulate emissions will be included in the HRA, as will the

periodic emissions of diesel particulates resulting from maintenance testing of the diesel firewater pump engine.

4.3.2 Contemporaneous Sources

The BEC will be a new facility. Therefore, the project will result in no other emissions increases or decreases that would need to be considered in the air quality modeling analysis.

4.3.3 Cumulative Impact Analysis Using Off-Property Sources

A request will be made to SJVAPCD asking for a list of all existing and planned sources located within 6 miles of the BEC. This list will be forwarded onto CEC for review. Based on this information, and the CEC response, additional sources may be included in the cumulative source modeling analysis.

4.4 BUILDING WAKE EFFECTS

The effect of building wakes (i.e., downwash) upon the stack plumes of emission sources at the BEC will be evaluated in accordance with USEPA guidance (USEPA 1985). Direction-specific building data will be generated for stacks below good engineering practice stack height using the most recent version of USEPA Building Profile Input Program–Prime (BPIP-Prime). Appropriate information will be provided in the AFC and other permit applications that describe the input assumptions and output results from the BPIP-Prime model. The ISCST3 model considers direction-specific downwash using both the Huber Snyder and Schulman-Scire algorithms as evaluated in the BPIP-Prime program.

4.5 RECEPTOR GRID

This section presents the receptor grids that will be used in the AAQS modeling analyses. The receptor grid to be used for the screening modeling to determine the CTG operating scenario corresponding to the maximum incremental ground-level impacts will be as follows:

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

The refined modeling analysis will use a more closely spaced receptor grid, as described below:

- 25-meter spacing along the property line and extending from the property line out to 1,000 meters beyond the property line;
- 100-meter spacing from 1 km to 5 km of project sources; and
- 250-meter spacing within 5 km to 10 km of project sources.

In the refined modeling, if a maximum predicted concentration for a particular pollutant and averaging time is located within the portion of the receptor grid with either 100-meter or 250-meter spacing, a supplemental dense receptor grid will be placed around the original maximum concentration point and the model will be rerun. The dense grid will use 25-meter spacing and will extend 500 meters in all directions from the original point of maximum concentration.

For the HRA modeling, receptors will be placed around the property line with 25-meter spacing, and 500 meter spacing will be used outside of the fence out to 10 km. All receptors that HARP creates that are inside the fence will be excluded. HARP will also include the census receptors out to 10 km. These census receptors will include the populated areas near the BEC location. Discrete receptors will also be placed at all sensitive locations (e.g., schools, hospitals, etc.) out to 1 mile.

A detailed project map and a 7 ½- minute U.S. Geological Survey map will be provided in the AFC. Actual Universal Transverse Mercator coordinates will be used. The CAAQS and NAAQS apply to all locations off-site of the applicant's facility (i.e., where public access is not under the control of the applicant). The CAAQS and NAAQS are not evaluated on the property controlled by the applicant. In other words, the air within a facility's property is not considered ambient air relative to that facility's emissions.

4.6 METEOROLOGICAL AND AIR QUALITY DATA

4.6.1 Meteorological Data

Meteorological data suitable for direct input to ISCST3 were obtained from the SJVAPCD for the Fresno Yosemite Airport meteorological station in the City of Fresno, located approximately 10.5 miles southeast of the BEC. Concurrent upper air data from Oakland are also incorporated in this dataset. The five years of meteorological data to be used in the BEC modeling analyses include data from 1987 through 1991. SJVAPCD has replaced any missing values in the raw data for these years according to the USEPA approved techniques for filling in missing data.

The meteorological data recorded at Fresno Yosemite International Airport are acceptable for use at BEC for two reasons, proximity and terrain similarity. The terrain immediately surrounding the project site can be categorized as flat, vacant commercial and farmlands with some residential areas nearby. The terrain around the Fresno County Airport is also relatively flat commercial land. Thus the land use and terrain features are similar. Additionally, there are no significant terrain features in the area between the Fresno County Airport and BEC that would cause differences in wind or temperature conditions in these areas. Therefore, the 5 years of meteorological data selected from the Fresno County Airport were determined to be representative for the project. The Fresno County Airport is the closest full-time meteorological recording station to the BEC site, and thus meteorological conditions at the sites will be very similar. The meteorological data used in this analysis were recommended and provided by the San Joaquin Valley Air Pollution Control District and determined to be representative of conditions at the project site.

The upper air station used in the modeling analysis came from Oakland, located approximately 110 miles northwest of BEC. This is the closest National Weather Service data and is appropriate for use in all of central and northern California for modeling purposes.

Wind roses for each season of each year used in the analysis are provided as an attachment to this protocol document.

4.6.2 Air Quality Monitoring Data

Available SJVAPCD/CARB air quality data from 2001 through 2005 will be used to determine baseline air pollutant concentrations. Data from Fresno First Street and Fresno Fremont School monitoring stations will be evaluated as potentially representative of the project site conditions.

The Fresno First Street monitoring station records lead, CO, NO_2, PM_{10}, $PM_{2.5}$, and O_3. The Fresno First Street monitoring station is located approximately 8.5 miles to the southeast of BEC site. The Fresno First Street station is the closest station that monitors all the criteria pollutants, except SO_2. The Fresno – Fremont School station is the closest station that monitors ambient SO_2. To the extent that monitoring data from the Fresno stations have been used here to characterize conditions at the project site, this practice would almost certainly overestimate pollutant levels at BEC site because of the lower population and level of development of the BEC area compared to the urban monitoring stations.

The data collected at the air monitoring stations identified above will be used to represent the background air quality when performing the AAQS analyses (i.e., modeled incremental pollutant concentrations due to the BEC project emissions will be added to maximum monitored concentrations to obtain conservative estimates of total future concentrations for comparison with the AAQS). The AFC will include an analysis supporting the representativeness and use of the data from the air monitoring station for AAQS evaluations. The most recent 5 years of data will be provided (2001–2005). The highest reported concentration that has occurred within the last five years will be used for each pollutant and averaging time corresponding to the AAQS.

The manner of representing background pollutant concentrations described above is a conservative approach, because it assumes that the highest recorded values and the modeled maximum impacts both occur at the same time and at the same location for each pollutant and averaging time.

5.1 NAAQS AND CAAQS ANALYSIS

The results of the AAQS analyses to evaluate the construction and operational impacts of the BEC will be presented in summary tables. A figure indicating the locations of the maximum predicted pollutant concentrations for each applicable pollutant and averaging time will be provided. Background concentrations (see Section 4.6.2, Air Quality Monitoring Data) will be added to the maximum modeled values due to BEC sources to yield total concentrations, which will be compared with the NAAQS and CAAQS.

5.2 HEALTH RISK ASSESSMENT ANALYSIS

Maps at a scale of 1:24,000 will depict the following data:

- Elevated terrain within a 10-km radius of the project;
- Distribution of population via census data with 10-km radius of the project and sensitive receptors, including schools, pre-schools, etc., within a 1-mile radius of the project;
- Current and future residential land uses;
- Location of proposed new or modified transmission lines;
- Isopleths of any areas where predicted exposures to air toxics result in estimated chronic non-cancer impacts and acute impacts equal to or exceeding a hazard index of 1.0; and
- Isopleths of any areas where exposures to air toxics lead to an estimated carcinogenic risk equal to or exceeding one in one million.

HRA modeling results will be summarized to include maximum annual (chronic both carcinogenic and non-carcinogenic) and hourly (acute) adverse health effects from TAC emissions. Health risk values will be calculated and presented in the summary table for the points of maximum impact and the sensitive receptors with the maximum risk values.

5.2.1 Data Submittal

Electronic copies of the modeling input and output files will be provided to SJVAPCD and the CEC.

American Meteorological Society. 1978. *Journal of Applied Meteorology*, 17(5): 636-643. "Correlation of Land Use and Cover with Meteorological Anomalies", August Auer Jr. May 1978.

ARB. 2003. *HARP User Guide – Software for Emission Inventory Database Management, Air Dispersion Modeling Analyses, and Health Risk Assessment version 1.3*, Air Resources, Board, California Environmental Protection Agency. December 2003.

California Air Resources Board (CARB). 2005. HARP (Hotspots Analysis and Reporting Program), Version 1.1 (Build 23.02.21). April 2005.

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Office of Environmental Health Hazard Assessment (OEHHA). 2003. *Air Toxics Hot Spots Program Risk Assessment Guidelines*, August 2003.

U.S. Environmental Protection Agency. 1985. Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document For the Stack Height Regulations) (Revised), EPA-450/4-80-023R, June.

U.S. Environmental Protection Agency. 1990. *New Source Review Workshop Manual Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft),* Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. October 1990.

U.S. Environmental Protection Agency. 1995. *User's Guide for the Industrial Source Complex Dispersion Models. Volume I – User's Instructions*. EPA-454/B-95-003a. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. September 1995.

U.S. Environmental Protection Agency. 1997. *Addendum to ISC3 User's Guide. The Prime Plume Rise and Building Downwash Model.* November 1997.

U.S. Environmental Protection Agency. 2002. *Addendum to the User's Guide for the Industrial Source Complex Dispersion Models. Volume I – User's Instructions*.

U.S. Forest Service et al. 2000. *Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase 1 Report.* Prepared by U.S. Forest Service Air Quality Program, National Park Service Air Resources Division, U.S. Fish and Wildlife Service Air Quality Branch. December 2000.

APPENDIX A
Seasonal Wind Roses for the Fresno Yosemite International Airport (1987 – 1991)

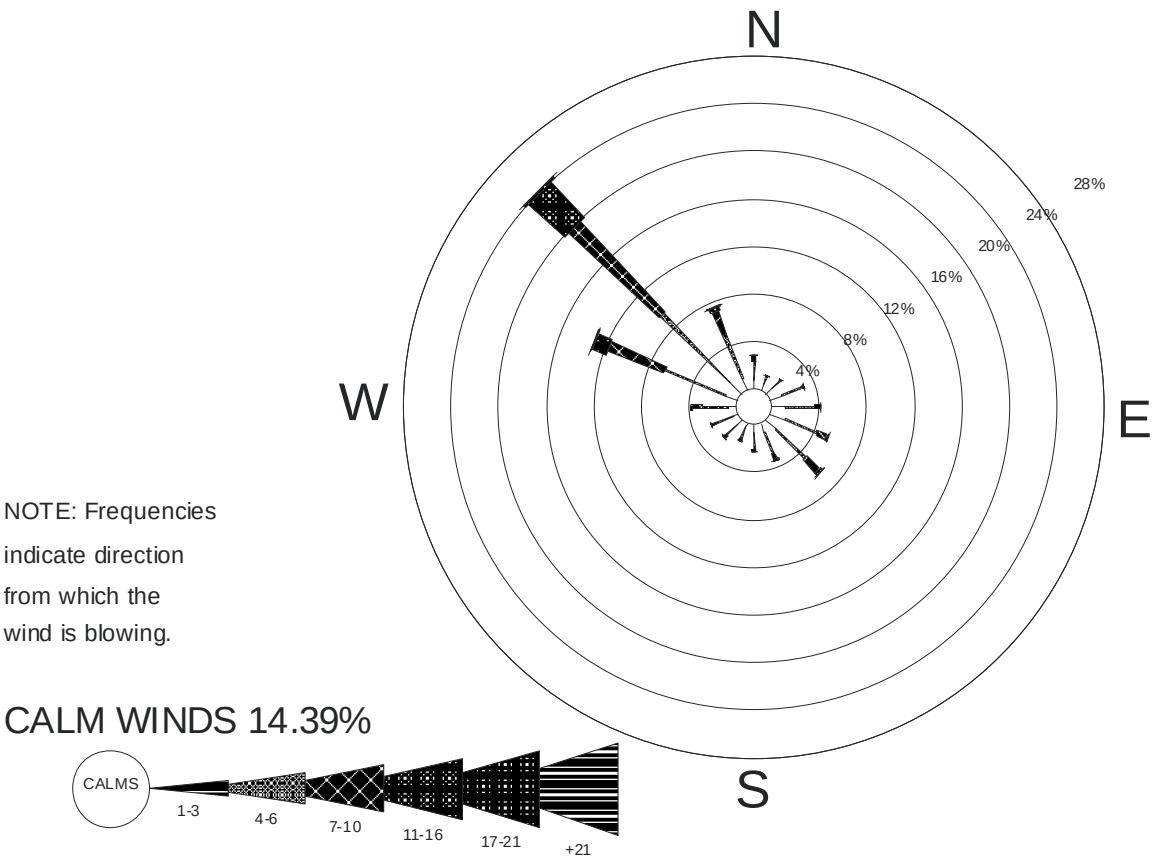

Figure 1
Windrose from Fresno-Yosemite International Airport (1987-1991) for All Months

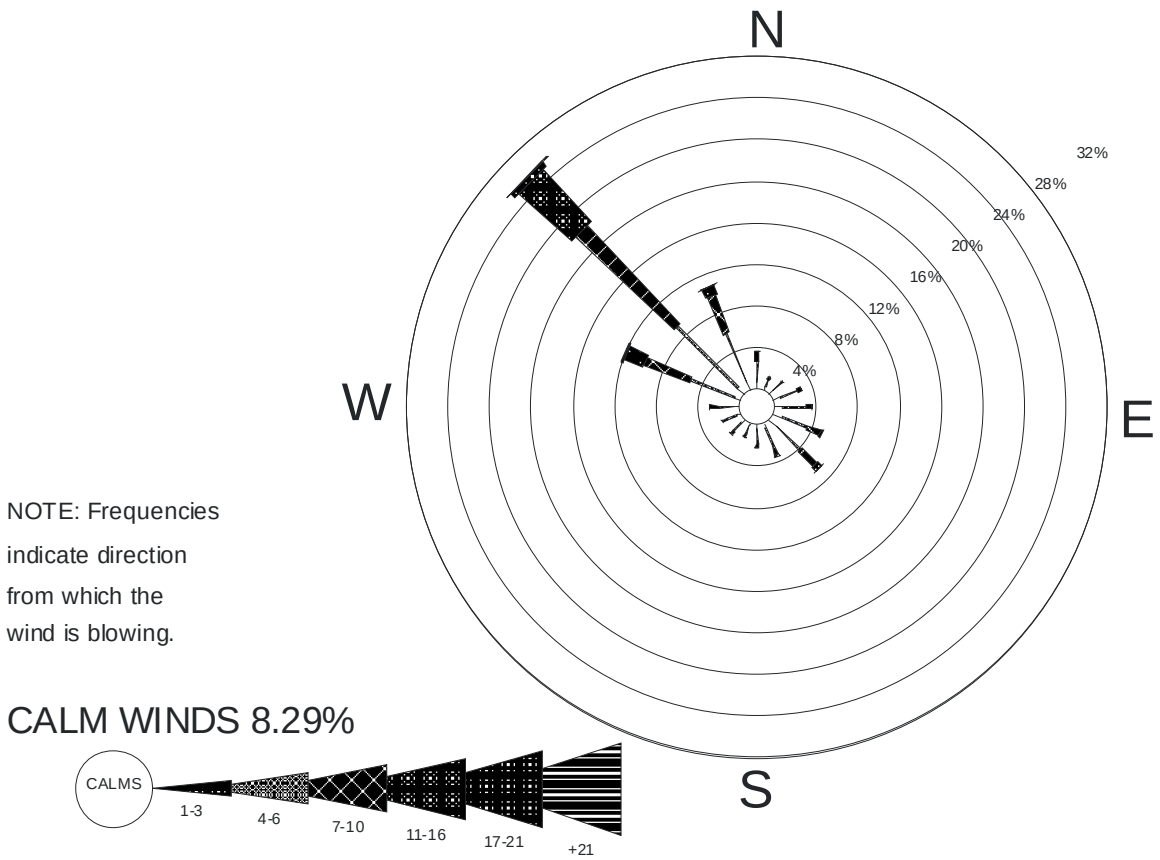

Figure 2
Windrose from Fresno-Yosemite International Airport (1987-1991) for Spring

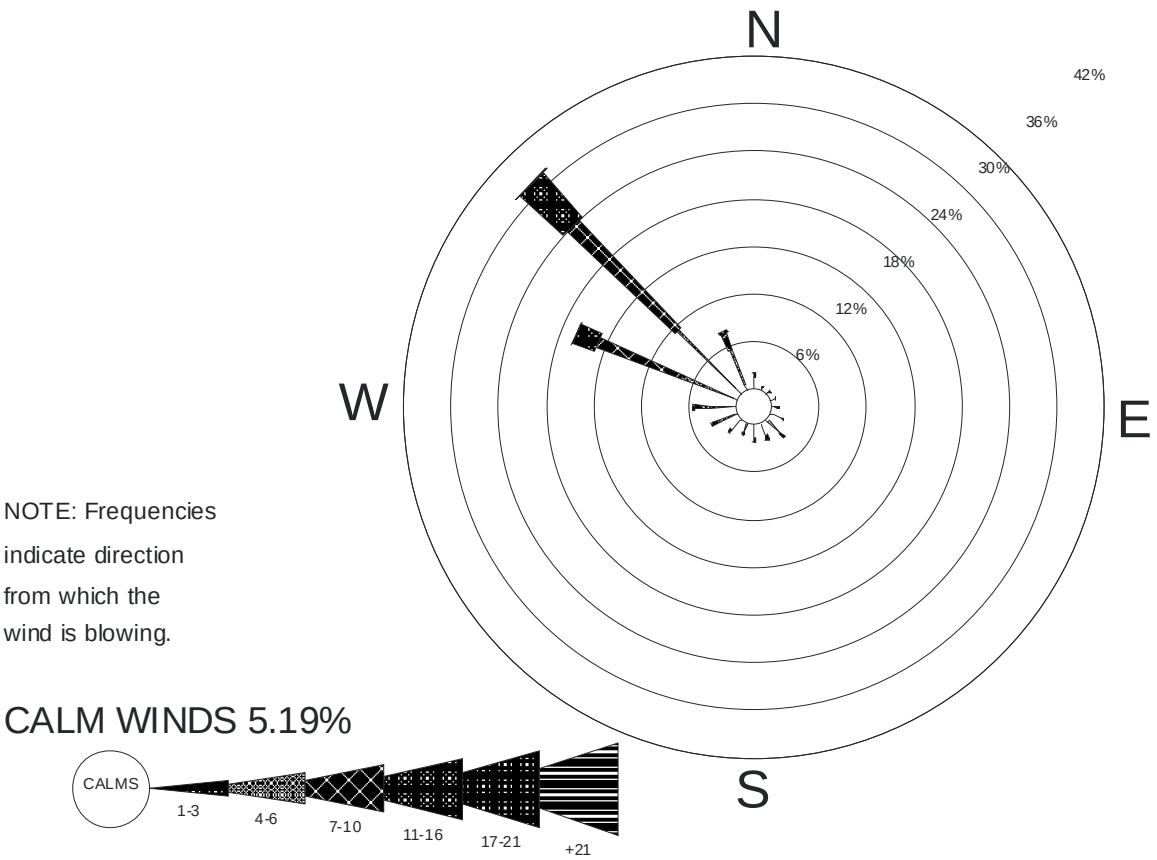

Figure 3
Windrose from Fresno-Yosemite International Airport (1987-1991) for Summer

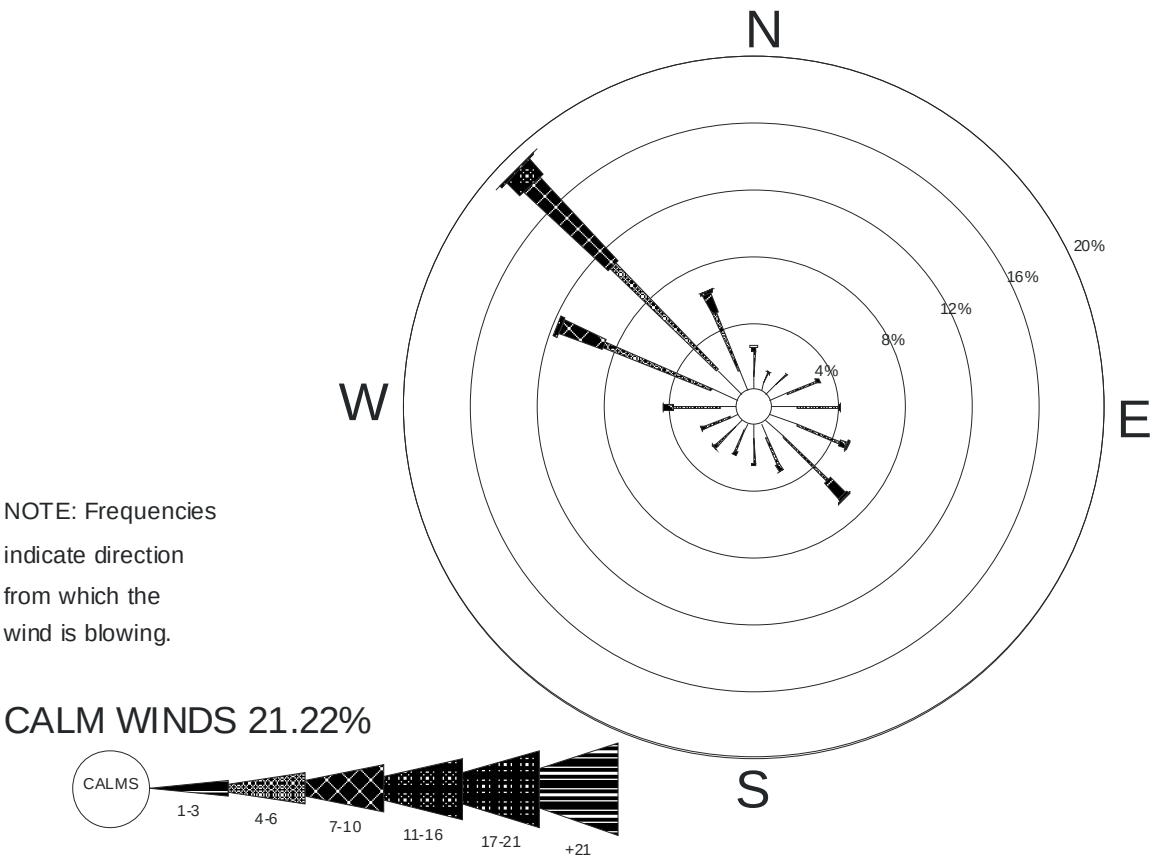

Figure 4
Windrose from Fresno-Yosemite International Airport (1987-1991) for Fall

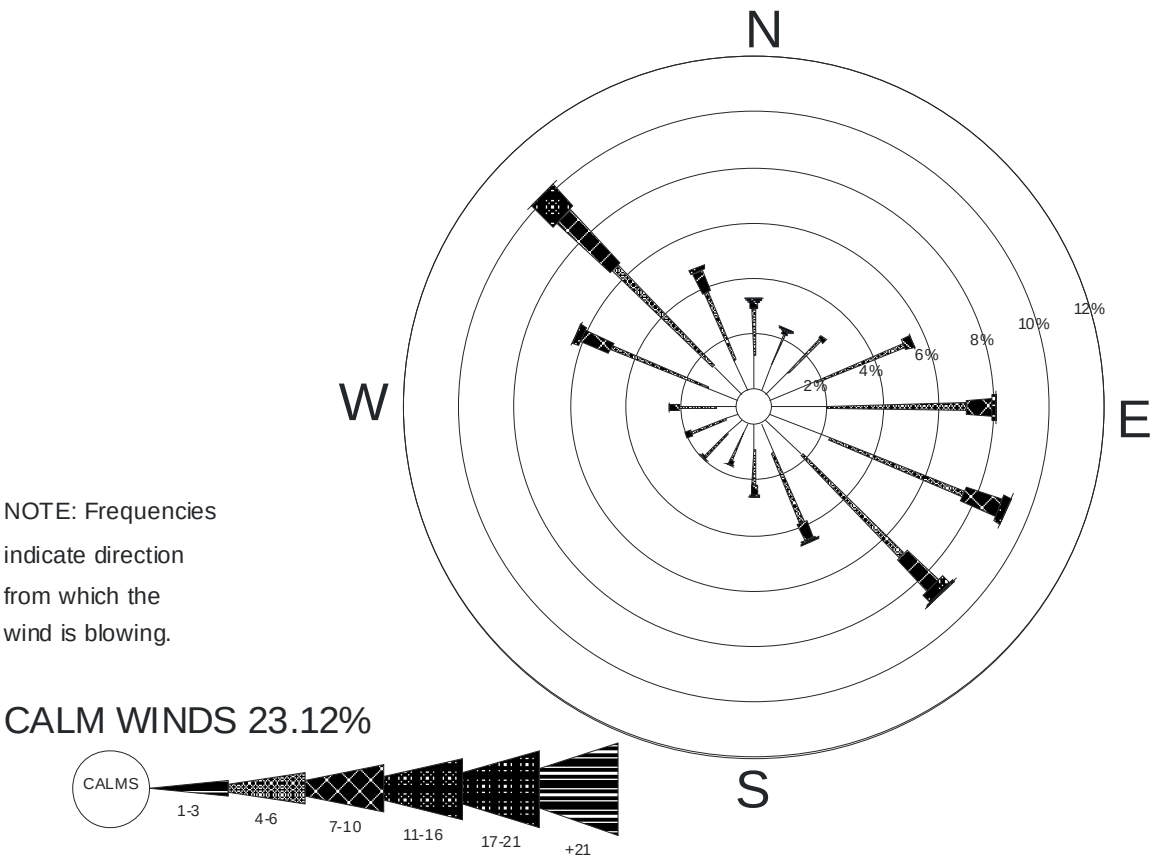

Figure 5
Windrose from Fresno-Yosemite International Airport (1987-1991) for Winter

Attachment E

BACT Analysis

A Best Available Control Technology (BACT) assessment was conducted for the Bullard Energy Center (BEC) which considered all oxides of nitrogen (NO_x) and carbon monoxide (CO) control technologies currently proposed or in use on natural gas-fired combustion turbines with more than 50 million British thermal units (MMBtu) per hour fuel energy input. To identify feasible emission limits for comparable turbine units, several information sources were consulted, including the following:

- U.S. Environmental Protection Agency (USEPA) Reasonably Available Control Technique (RACT)/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (USEPA 2006) and updates
- California Air Resources Board (CARB) BACT Clearinghouse database and CARB BACT Guidelines for Power Plants (Adopted 7/22/99)
- Recent California Energy Commission (CEC) Applications for Certification

Table 1, Summary of Recent NO_x BACT Determinations for Combustion Turbine Generators Rated at Greater than 40 MW in Peaking Service, lists selected recent NO_x BACT proposals and determinations for natural gas-fired advanced technology combustion turbines in California. Nearly all recent simple-cycle turbine projects in California had a NO_x BACT level of 2.5 parts per million (ppm) dry volume (ppmve) (at 15 percent oxygen [(O_2]), to be achieved by means of dry low-NO_x burners and selective catalytic reduction (SCR) with ammonia injection. However, in some cases, SCR in conjunction with water or steam injection has been selected. The combustion turbines of the BEC will achieve the BACT concentration of 2.5 parts per million, volumetric dry (ppmve) (at 15 percent O_2) using steam or water injection, rather than dry low-NO_x combustor technology, and SCR, except during maintenance, startup, and shutdown events.

TABLE 1
SUMMARY OF RECENT NO_X BACT DETERMINATIONS FOR COMBUSTION TURBINE GENERATORS RATED AT GREATER THAN 40 MW IN PEAKING SERVICE

Name	Location	Rating	Vendor, Model	Emission Limit	Control(s)	Permit Date
Kings River Conservation District Peaking Plant	CA	40+ each, 2 turbines, 97 MW total	GE LM6000 Sprint PC	3.0 ppm	Water injection and SCR	5/04
Modesto Electric Generation Project	CA	40+ each, 2 turbines, 95 MW total	GE LM6000 Sprint	2.5 ppm	Water injection and SCR	2/04
Riverside Energy Resource Center	CA	40+ each, 2 turbines, 96 MW total	GE LM6000 Sprint PC NxGen	2.5 ppm	Water injection and SCR	12/04
San Francisco Electric Reliability Project	CA	40+ each, 3 turbines, 145 MW total	GE LM6000	2.5 ppm	Water injection and SCR	Tentative 4/06

Notes:
CA = California
GE = General Electric
MW = megawatt
ppm = parts per million by volume, dry basis, at 15 percent oxygen
SCR = selective catalytic reduction

Similarly, most recent simple-cycle turbine projects have been approved with a CO emissions limit of 6 ppmvd and a volatile organic compound (VOC) emissions limit of 2 ppmvd (both at 15 percent O_2), based on the use of an oxidation catalyst. The BEC natural gas turbines will achieve these same BACT concentrations for CO and VOC by application of oxidation catalysts. Exclusive use of natural gas fuel has been determined to be BACT for sulfur oxide (SO_x) and particulate matter less than 10 micrometers in diameter (PM_{10}) in all other comparable projects for several years.

ASSESSMENT OF NO_X CONTROL TECHNOLOGIES

Based on a review of the materials described above, the following NO_x control technologies were evaluated to determine whether they are able to achieve BACT NO_x levels in practice:

- Dry low emission (DLE) and Goal Line SCONOx™
- DLE and SCR with ammonia injection

SCONOx™

SCONOx™ is a NO_x reduction system produced by Goal Line Environmental Technologies (now distributed by EmeraChem) for natural gas turbine applications within an exhaust temperature range significantly below the design operating parameters of the simple-cycle LMS100 turbines that will be employed at the BEC. The SCONOx™ system uses a coated catalyst to oxidize both NO_x and CO, and thereby reduce plant emissions. As demonstrated by an initial installation on several gas turbines in co-generation applications, SCONOx™ is capable of achieving NO_x emission concentrations of 2 ppm based on a maximum inlet concentration of 25 ppm, and 90 percent CO reduction based on a maximum inlet concentration of 50 ppm. CO emissions are reduced in SCONOx™ by the oxidation of CO to carbon dioxide (CO_2). A two-step process reduces NO_x emissions. First, NO_x emissions are oxidized to nitrogen dioxide (NO_2) and then adsorbed onto the catalyst. In the second step, a proprietary regenerative natural gas is passed through the catalyst periodically. This natural gas de-desorbs the NO_2 from the catalyst and reduces it to nitrogen (N_2). The system does not use ammonia as a reagent; rather, it uses natural gas as the basis for a proprietary catalyst regeneration process.

However, the SCONOx™ technology has not been sufficiently demonstrated on higher exhaust temperature simple-cycle peaking natural gas turbines such as those proposed for the project. The system consists of a catalyst that is installed in the flue gas at a point where the temperature is between 280 degrees Fahrenheit (°F) and 650°F. The BEC combustion turbine generators (CTGs) operate between 765 and 804°F; therefore, the SCONOx™ application is not appropriate for this high temperature technology.

Potential advantages of the SCONOx™ process include:

- **No Ammonia.** The SCONOx™ process does not use ammonia. This eliminates any ammonia storage and transportation safety issues and the potential for ammonia slip or ammonia-based particulate formation.
- **Carbon Monoxide Reduction.** SCONOx™ will reduce CO emissions as well as NO_x emissions.

Potential disadvantages of the SCONOx™ process include:

- **High Capital and Operating Cost.** SCONOx™ is significantly more expensive than SCR with ammonia injection, primarily due to the higher cost of initial and replacement catalyst. The SCONOx™ catalyst is a precious metal catalyst, which is very expensive.
- **Not Suitable for Exhaust Temperatures of Simple-Cycle Natural Gas Turbine Peaking Applications**. SCONOx™ has been primarily installed on small co-generation systems. The BEC will be a simple-cycle peaking operation. Peaking units require more rapid startup and more frequent load changes than typical co-generation systems. The main concerns are the damper systems that would be required with SCONOx™ for the units and assuring proper regeneration gas distribution. The effectiveness and longevity of these damper systems have not been demonstrated on simple-cycle natural gas turbines, and their cost of replacement would be substantial. In addition, steam is required to produce the SCONOx™ regeneration gas. The facility will have no steam production.
- **Catalyst "Washing."** A proprietary catalyst washing system must be used and an on-line catalyst washing system design has not yet been fully developed. If an on-line catalyst washing system is not used, then the facility must be shut down for cleaning.

Because the low NO_x emission rates attainable on natural gas turbines in co-generation systems with SCONOx™ have not been sufficiently demonstrated as "achieved in practice" on simple-cycle natural gas turbine applications and the other factors discussed above, SCONOx™ does not represent current, technically feasible BACT for the BEC. Accordingly, a comparative cost analysis with the proposed NO_x control technologies is not required. However, San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) staff has agreed with previous BACT evaluations that determined the use of SCONOx™ for simple-cycle CTGs is not a cost effective option. These findings reinforce the elimination of SCONOx™ on grounds of technical infeasibility.

SCR with Ammonia Injection

SCR with ammonia injection systems for reduction of NO_x emissions have been widely used in simple-cycle natural gas turbine applications for many years, and are considered a proven technology. SCR systems are commercially available from several vendors, unlike SCONOx™, which is available from a single vendor. The SCR process involves the injection of ammonia into the flue gas stream by means of an ammonia injection grid upstream of the catalyst. The ammonia reacts with NO_x natural gases in the presence of the catalyst. The catalyst is not regenerated and requires periodic replacement. SCR vendors typically offer a 3-year guarantee on catalyst life. SCR with ammonia injection systems have been used in numerous simple-cycle applications in California and throughout the world.

Water or steam injection has been a proven NO_x control technique for many years. Injection of water or steam into the primary combustion zone of advanced combustors of a CTG reduces the formation of thermal NOx by decreasing the peak combustion temperature. Water injection decreases the peak flame temperature by diluting the combustion gas stream and acting as a heat sink by absorbing heat necessary to: (a) vaporize the water (latent heat of vaporization), and (b) raise the vaporized water temperature to the combustion temperature. High purity water must be employed to prevent turbine corrosion and deposition of solids on the turbine blades. The use

of water or steam injection in diffusion flame combustors firing natural gas can typically achieve NOx exhaust concentrations of 25 ppmvd, corrected to 15 percent O_2.

The project will use water injection and SCR with ammonia injection designed to achieve a NO_x emission limit of 2.5 ppm (at 15 percent O_2). As noted in Table 1, Summary of Recent NO_x BACT Determinations for Combustion Turbine Generators Rated at Greater than 40 MW in Peaking Service, water injection and SCR have recently been permitted at a NO_x emission level of 2.5 ppmvd (at 15 percent O_2) for numerous California turbines that are similar in capacity to the proposed BEC turbines. Accordingly, water injection with SCR with ammonia injection is considered to be BACT for the BEC.

OTHER TECHNOLOGIES

Technologies that cannot achieve a NO_x emissions limit of 2.5 ppmvd (at 15 percent O_2) in practice were not considered as BACT candidates for the BEC. These technologies include SCR without DLE, DLE without SCR, and water/steam injection without SCR.

ASSESSMENT OF CO CONTROL TECHNOLOGIES

The BEC CTGs are guaranteed to emit no more than 6 ppm of CO (at 15 percent O_2), with natural gas fuel and use of a CO oxidation catalyst (except during startup and shutdown). In discussions with the applicant, SJVAPCD has already confirmed that the use of a CO oxidation catalyst to achieve a stack concentration of 6 ppmvd (at 15 percent O_2) will result in emissions of CO that will conform to current SJVAPCD BACT requirements.

The following CO control technologies are evaluated:

- Combustion design/control
- Oxidizing catalyst

Combustion Design/Control

Natural gas turbine combustion technology has significantly improved over recent years with regard to lowering CO emissions. BEC proposes to operate two LMS100 turbines at the BEC. For other installations, turbines have been guaranteed by the manufacturer to achieve a CO rate of 9 ppm (at 15 percent O_2) without post-combustion control technologies under a wide range of operating conditions (50 percent to 100 percent load) and ambient conditions (17°F to 114°F).

Oxidizing Catalyst

CO oxidizing catalysts have been used with natural gas-fired turbines for over a decade when uncontrolled CO emission levels are unacceptably high. CO catalysts operate at elevated temperatures within the exhaust stream. CO-oxidizing catalysts can be considered technically feasible for use in simple-cycle peaking applications. Thus, installation of a CO-oxidizing catalyst on the natural gas turbines is considered to be BACT for the BEC.

ASSESSMENT OF VOC CONTROL TECHNOLOGIES

The proposed BACT level of 2 ppmvd (at 15 percent O_2) for VOC control with water injection, SCR, and an oxidation catalyst is consistent with the most stringent level found among recent BACT determinations for simple-cycle natural gas turbines, and is therefore considered to be BACT for the BEC.

SJVAPCD considers control of VOC to a level of 0.6 ppmvd (at15 percent O_2) to be technically feasible. However, a demonstration was provided to the District in connection with the Panoche Energy Center (PEC), a sister project to the BEC also utilizing LMS100 model simple cycle turbines, that the cost would be prohibitive for the additional catalyst material that would be required to achieve this lower VOC rate. Accordingly, the proposed BACT level for BEC is 2 ppmvd referenced to 15 percent O_2.

ASSESSMENT OF SO_2 AND PM_{10} CONTROL TECHNOLOGIES

Sulfur dioxide and PM_{10} emissions will be controlled through the exclusive use of clean-burning pipeline quality natural gas. This control technology has been widely and uniformly implemented for control of SO_2 and PM_{10} emissions from combustion turbines in California and throughout the U.S., and is considered to be BACT for the BEC.

ASSESSMENT OF AMMONIA SLIP CONTROL TECHNOLOGIES

Ammonia emissions will be limited to 10 ppmvd (at 15 percent O_2). This proposed BACT is consistent with SJVAPCD policy to control NO_x.

SUMMARY OF PROPOSED BACT

Table 2, Summary of Proposed BACT for the BEC, presents the proposed BACT emission levels for the BEC, based on the assessment described in the preceding subsections.

TABLE 2
SUMMARY OF PROPOSED BACT FOR THE BEC

Pollutant	Control Technology	Concentration ppm at 15 percent O_2 dry
NO_x	Water injection and SCR with ammonia injection	2.5 (1-hour average)
CO	Catalytic oxidation	6.0 (1-hour average)
VOC	Catalytic oxidation	2.0 (1-hour average)
SO_2	Pipeline quality natural gas	NA
PM_{10}	Pipeline quality natural gas	NA
Ammonia slip		10 (1-hour average)

Notes:
BACT = Best Available Control Technology
BEC = Bullard Energy Center
CO = carbon monoxide
NA = not applicable
NO_x = nitrogen oxides
O_2 = oxygen
PM_{10} = particulate matter less than or equal to 10 microns in diameter
ppm = parts per million
SCR = selective catalytic reduction
SO_2 = sulfur dioxide
VOC = volatile organic compound

REFERENCES

USEPA. 2006. BACT/RACT/LAER Clearinghouse website:
http://cfpub.epa.gov/rblc/htm/bl02.cfm