APPENDIX 24

AIR QUALITY STUDY

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December 20, 2012

Mr. Kevin Franke
The LA Group
40 Long Alley
Saratoga Springs, NY 12866

Re: Revised Air Permitting Requirements for the Modified Belleayre Resort at Catskill Park Including Wildacres Resort & the Highmount Spa Resort
CTMA Project No.: 09.9007

Dear Mr. Franke:

C.T. Male Associates has reviewed the potential for air permitting requirements for the proposed Modified Belleayre Resort at Catskill Park including Wildacres Resort and the Highmount Spa Resort, inclusive of planned emergency generators, and concluded that the proposed project will likely not require a NYSDEC air permit as presently proposed.

Our determination is based on the following project parameters:

- All heating and hot water boilers will be high efficiency LP-gas fired equipment;
- An estimated 40 BTU per hour of boiler capacity per square foot of occupied area (as shown in Attachment A);
- A total of 45,000,000 BTU per hour of heating load at full build out (as shown in Attachment A);
- A total of 9,400,00 BTU per hour of domestic hot water load at full build out (as shown in Attachment A);
- All boilers will have a maximum heat input capacity which does not exceed 10,000,000 BTU per hour. It is noted that our calculations in Attachment B show Highmount Phase 1 and Wildacres Phase 1 to each exceed 10,000,000 BTU per hour heat input[1]; however, it is assumed that multiple boilers will be present in each of these locations for redundancy, thereby limiting the heat input capacity of each of the units to below 10,000,000 BTU per hour.

[1] - If any of the boilers will exceed 10,000,000 BTU per hour heat input, then a NYSDEC air permit would be required, and the facility would need to comply with all applicable air regulations at both the State and Federal level.

- A total of 8 emergency generators will be installed at the facility (final equipment selection pending) and are anticipated to be diesel fuel fired. Design data available at this time has been used to assess the approximate size of the generators, as detailed in Attachment B.2. Annual operations will be limited to 500 hours per year in order for the generators to qualify as an exempt source of emissions under 6 NYCRR Part 201-3.2(c)(6), which requires emergency power generating stationary internal combustion engines which operate as a mechanical or electrical power source only when the usual supply of power is unavailable, and which operate for no more than 500 hours per year.

Based on operation of the boilers for a maximum of 8,760 hours per year and the generators each at 500 hours per year at maximum operations, the resulting air emissions would not exceed any major source thresholds for criteria pollutants. These worst-case operating conditions would result in emissions of Oxides of Nitrogen (NO_X) at an annual level of 78.1 tons (±78% of the major source threshold). All other criteria pollutants are anticipated at maximum levels which would be a lower percentage of major source thresholds than those for NO_X.

If you have any questions or require additional information, please feel free to contact this office at (518) 786-7400.

Respectfully submitted,
C.T. MALE ASSOCIATES, P.C.

Joseph A. Farron, Jr.
Environmental Engineer

Reviewed and approved by:

Daniel P. Reilly, P.E.
Managing Environmental Engineer

Attachment A

Facility Heating and Hot Water Design Information

Highmount Spa & Resort

Phase 1		Size (SF)	% in Ulster County	% in Delaware County	% in Margaretville School District	% in Onteora School District	Cost per sf	Estimated Cost of Construction
Hotel	120 units	70,200	100%	0%	100%	0%		
Fractionals	53 units (attached)	89,800	100%	0%	100%	0%		
Hotel Services		76,000	100		100			
Spa / Fitness Center		24,000	100		100			
Mechanical Plant		10,000	100		100			
Parking	(±275 cars)	85,000	100		100			
		355,000					300	$106,500,000
Phase 2								
Fractionals	27 units (detached)	46,100	100%	0%	100%	0%		
Services		11,200	100		100			
Mechanical Plant		2,200	100		100			
Parking	(±30 cars)	9,000	100		100			
		68,500					300	$20,550,000
Phase 3 & 4								
Fractionals	19 units (high end)	95,000	100%	0%	100%	0%		
Fractionals	10 units (high end)	50,000	100%	0%	100%	0%		
Fractionals	11 units (mid-range	30,800	100%	0%	100%	0%		
Subtotal:	40 units	175,800					300	$52,740,000
Leach Farm Conference Center		12,000	0	100	100	0	200	$2,400,000
Highmount total: 240 units		**611,300**						**$182,190,000**

Wildacres Resort

Phase 1								
Golf Course			40%	60%	80%	20%		$19,500,000
Hotel	208 units	140,000	100%	0%	50%	50%		
Fractionals	42 units (attached)	65,000	100%	0%	50%	50%		
Hotel Services		101,000	100%		50%	50%		
Conference/ Spa / Fitness Center		65,000	100%		50%	50%		
Golf Clubhouse		15,000	100%		50%	50%		
Mechanical Plant		15,000	100%		50%	50%		
Parking	(±250 cars)	75,000	100%		50%	50%		
Detached Parking	(±208 cars)	84,000	100%		100%	0%		
Subtotal:	250 units	560,000					200	$112,000,000
Phase 2								
Timeshare	84 units	117,600	81%	19%	19%	81%		
Fractionals	55 units	90,550	42%	58%	100%	0%		
Subtotal:	139 units	208,150					$225	$46,833,750
Community Club House		6,000	100%		0%	100%	$200	$1,200,000
Wilderness Activity Center		8,000	100%		100%	0%	$150	$1,200,000
Marlowe Mansion		12,000	100%	0%	100%	0%	$150	$1,800,000
Wildacres total		**794,150**						**$182,533,750**
Grand Total:								**$364,723,750**

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JOB 09.9007 BELLEAYRE RESORT
SHEET NO. 1 OF 3
CALCULATED BY: CAW DATE: 11.09.11
CHECKED BY: DATE:
SCALE

			INPUT
HIGHMOUNT	PHASE 1	173 UNITS 2429 gph	
	120@ 585 ft	(4) BTH-400A + 850 gallons Storage 399.9	1600 MBH
	53@ 1695 ft	10 Btuh/ft	
	PHASE 2	27 UNITS 474 gph	
	27@1705 ft	(1) BTH-400A + 120 GAL STORAGE 399.9	400 MBH
		8 Btuh/ft	
	PHASES 3&4	40 UNITS 585 gph	
	19@ 5000 ft	(1) BTH-400A + 200 gal Storage 399.9	400 MBH
	10@ 5000 ft	2 Btuh/ft	
	11 @ 2800 ft		
	PHASE 1	HOTEL SERVICES 76000 @ 8 Btuh/ft	610 MBH
	PHASE 1	SPA/FITNESS 24000 @ 10 Btuh/ft	240 MBH
	PHASE 2	SERVICES 11200 @ 8 Btuh/ft	90 MBH
	PHASES 3&4	LEACH FARM CONFERENCE 12000 @ 3 Btuh/ft	40 MBH
WILDACRES	PHASE 1	250 UNITS 3510 GPH	
	208@ 673 ft	(4) BTPV-740A + 1200 GAL STORAGE 740 MBH	2960 MBH
	42@ 1548 ft	14 Btuh/ft	
	PHASE 2	139 UNITS 1952 GPH	
	84@ 1400 ft	(3) BTH-500A + 700 GAL STORAGE 499.9	1500 MBH
	55@ 1646 ft	7 Btuh/ft	
	PHASE 1	HOTEL SERVICES 101,000 @ 8 Btuh/ft	810 MBH
	PHASE 1	CONFERENCE SPA/FITNESS 65000 @ 8 Btuh/ft	520 MBH
	PHASE 1	GOLF CLUBHOUSE 15000 ft @ 3 Btuh/ft 45	50 MBH

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SHEET NO. 2 OF 3
CALCULATED BY: CAW DATE: 11.10.11
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SCALE

PHASE 2 COMMUNITY CLUBHOUSE	6000 ft @ 3 Btuh/ft	18	50 MBH
PHASE 2 WILDERNESS ACTIVITY	8000 @ 3 Btuh/ft	24	50 MBH
MARLOWE MANSION PHASE 2	12000 @ 3 Btuh/ft	36	50 MBH

HIGHMOUNT	PHASE 1	2450 MBH
	PHASE 2	490 MBH
	PHASES 3&4	440 MBH
	TOTAL	3380 MBH
WILDACRES	PHASE 1	4340 MBH
	PHASE 2	1650 MBH
	TOTAL	5990 MBH

DOMESTIC WATER GRAND TOTAL 9370 MBH

HEATING		OCCUPIED	
HIGHMOUNT	PHASE 1	260,000 ft @ 40 Btuh/ft	10400 MBH
505,100 ft	PHASE 2	57,300 ft @ 40 Btuh/ft	2290 MBH
	PHASES 3&4	187800 ft @ 40 Btuh/ft	7510 MBH
WILDACRES	PHASE 1	386000 ft @ 40 Btuh/ft	15440 MBH
620,150 ft	PHASE 2	234150 ft @ 40 Btuh/ft	9370 MBH

HEATING TOTAL	45010 MBH
DOMESTIC WATER	9370 MBH
GRAND TOTAL:	54380 MBH

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JOB 09.9007 BELLEAYRE RESORT
SHEET NO. 3 OF 3
CALCULATED BY: CAW DATE: 11.10.11
CHECKED BY: DATE:
SCALE

HIGHMOUNT	TOTAL DOMESTIC WATER	3380 MBH
	HEATING	20 200 MBH
	TOTAL	23580 MBH
WILDACRES	TOTAL DOMESTIC WATER	5990 MBH
	HEATING	24810 MBH
	TOTAL	30 800 MBH

BASED ON

40 Btuh/ft HEATING OCCUPIED SF

AND PRELIMINARY SELECTIONS FOR DOMESTIC WATER GENERATION BASED ON NUMBER OF UNITS PLUS 2-8 Btuh/ft DEPENDING UPON THE ANTICIPATED USE.

Attachment B

Air Emissions Calculations

Attachment B.1

Emission Calculations – Heating Sources

A. Domestic Water Heating Requirements

Highmount

1,600,000	BTU/hr	Phase 1
400,000	BTU/hr	Phase 2
400,000	BTU/hr	Phases 3/4
610,000	BTU/hr	Ph 1 Hotel
240,000	BTU/hr	Ph 1 Spa
90,000	BTU/hr	Ph 2 Service
40,000	BTU/hr	Conference
3,380,000	BTU/hr	

Wildacres

2,960,000	BTU/hr	Phase 1
1,500,000	BTU/hr	Phase 2
810,000	BTU/hr	Ph 1 Hotel
520,000	BTU/hr	Ph 1 Spa
50,000	BTU/hr	Ph 1 Golf
50,000	BTU/hr	Ph 2 Club
50,000	BTU/hr	Ph 2 Activity
50,000	BTU/hr	Ph 2 Mansion
5,990,000	BTU/hr	

B. Heating Requirements

10,400,000	BTU/hr	Highmount Phase 1
2,290,000	BTU/hr	Highmount Phase 2
7,510,000	BTU/hr	Highmount Phases 3/4
15,440,000	BTU/hr	Wildacres Phase 1
9,370,000	BTU/hr	Wildacres Phase 2
45,010,000	BTU/hr Total for all buildings	

Total Heating Requirements (Sum of (A) and (B) above)

54,380,000 BTU/hr

Heating Source = Propane; Emissions Factors Per AP-42, Chapter 1.5 (10/96 Edition)

Contaminant	Emission Factor		Emission Factor		Hourly Emissions		Annual Emissions		Annual Emissions	
PM	0.4	lb/1000 gal	4.42E-09	lb/BTU	0.240354	lb/hr	2,105.5	lb/yr	1.052749	tons/yr
SO2	1.5	lb/1000 gal	1.66E-08	lb/BTU	0.901326	lb/hr	7,895.6	lb/yr	3.947808	tons/yr
NOx	14	lb/1000 gal	1.55E-07	lb/BTU	8.412376	lb/hr	73,692	lb/yr	36.84621	tons/yr
CO2	12500	lb/1000 gal	0.000138	lb/BTU	7511.05	lb/hr	65,796,796	lb/yr	32,898	tons/yr
CO	1.9	lb/1000 gal	2.1E-08	lb/BTU	1.14168	lb/hr	10,001	lb/yr	5.000556	tons/yr
TOC	0.5	lb/1000 gal	5.52E-09	lb/BTU	0.300442	lb/hr	2,631.9	lb/yr	1.315936	tons/yr
					(BTU/hr x Emission Factor)		(Hourly x 8,760 hr/yr)			

Propane Assumptions:

Propane: 90,500 BTU per gallon per AP-42 Chapter 1.5

Propane: Sulfur concentration based on Gas Processors Association Engineering Data Book (Ninth Edition, 1972), Commercial Propane = 15 gr/100 scf

(AP-42 SO_2 Emission Factor Calculated Using Formula 0.1S, where S = sulfur content in gr/100 cf)

Major source thrsholds will not be exceeded for criteria pollutants based on this level of combustion. If any individual boilers exceed 10 Million BTU per hour, they will be be required to be registered with the NYSDEC and complay with all applicable Clean Air Act requirements on the State and Federal levels.

Attachment B.2

Emissions Calculations – Emergency Generators

EMISSIONS OF AIR CONTAMINANTS FROM EMERGENCY GENERATORS

Known Data:

a. 8 Emergency Generators planned for use at facility - units range in size from 25 to 1,750 KW
b. Units will combust diesel fuel - equipment selection has not occurred, used AP-42 Emission Factors

Assumptions:

a. Emergency Generators hours of operation capped at 500 hours per year per exempt source criteria
b. Typical generator manufacturers recommend testing 1/week for 30 minutes @ and 1 hr/month full test = 38 hrs/yr

Emission Factors for Emergency Generator Operation

Emission factor based on Chapter 3.3 of AP-42 (Using Emission Factor for SO_X, as No Emission Factor Published for SO_2)

Contaminant Name	Emission Factor (kg/Kw-hr)
PM-10	0.0013
SO_2	0.0012
NO_X	0.019
CO_2	0.699
CO	0.0041
TOC/VOC	0.0015

Hourly Maximum Emission Rate

Hourly Emissions (lbs/hr) = Unit Firing Rate (kw) * Emission Factor (kg/kw-hr) * 2.20462 (lb/kg)

Combustion Installation	Total Particulates	SO_2	NO_X	CO_2	CO	TOC/VOC
Unit 1 (K-Well Field) - 50 kw	0.15	0.14	2.08	77.07	0.45	0.17
Unit 2 (Q-Well Field) - 25 kw	0.074	0.069	1.04	38.54	0.22	0.084
Unit 3 (WTP) - 150 kw	0.44	0.41	6.23	231.22	1.34	0.51
Unit 4 (EQ Tank) - 50 kw	0.15	0.14	2.08	77.07	0.45	0.17
Unit 5 (Wildacres) - 1,750 kw	5.16	4.81	72.72	2,697.57	15.67	5.90
Unit 6 (Highmount) - 1,750 kw	5.16	4.81	72.72	2,697.57	15.67	5.90
Unit 7 (Booster Pump) - 50 kw	0.15	0.14	2.08	77.07	0.45	0.17
Unit 8 (Com. Ctr.) - 100 kw	0.29	0.27	4.16	154.15	0.90	0.34
Total (lbs/hr)	11.57	10.79	163.09	6,050.27	35.14	13.23
Total (tons/hr)	0.0058	0.0054	0.082	3.025	0.018	0.0066

Potential to Emit (PTE) Based on 500 Hours Per Year Limitation as Described Above

PTE From Generators (lbs/yr) = Hourly Emissions of All Units Combined * Number of Hours Per Year

Combustion Installation	Total Particulates	SO_2	NO_X	CO_2	CO	TOC/VOC
PTE (lb/yr) - 500 Hours	5,787	5,393	81,547	3,025,135	17,572	6,613
PTE (tons/yr) - 500 Hours	2.89	2.70	40.77	1,512.57	8.79	3.31

Actual Annual Anticipated Emissions

Annual Emissions From Generators (lbs/yr) = (Hourly Combined Generator Emission Rate * 38 hr/year)

Combustion Installation	Total Particulates	SO_2	NO_X	CO_2	CO	TOC/VOC
Annual Emissions (lbs/yr)	439.8	409.8	6,197.6	229,910.3	1,335.5	502.6
Annual Emissions (tons/yr)	0.22	0.20	3.10	114.96	0.67	0.25

Attachment C

Supporting Documentation – USEPA AP-42

Attachment C.1

Supporting Documentation – USEPA AP-42, Section 1.5

1.5 Liquefied Petroleum Gas Combustion

1.5.1 General[1]

Liquefied petroleum gas (LPG or LP-gas) consists of propane, propylene, butane, and butylenes; the product used for domestic heating is composed primarily of propane. This gas, obtained mostly from gas wells (but also, to a lesser extent, as a refinery by-product) is stored as a liquid under moderate pressures. There are three grades of LPG available as heating fuels: commercial-grade propane, engine fuel-grade propane (also known as HD-5 propane), and commercial-grade butane. In addition, there are high-purity grades of LPG available for laboratory work and for use as aerosol propellants. Specifications for the various LPG grades are available from the American Society for Testing and Materials and the Gas Processors Association. A typical heating value for commercial-grade propane and HD-5 propane is 90,500 British thermal units per gallon (Btu/gal), after vaporization; for commercial-grade butane, the value is 97,400 Btu/gal.

The largest market for LPG is the domestic/commercial market, followed by the chemical industry (where it is used as a petrochemical feedstock) and the agriculture industry. Propane is also used as an engine fuel as an alternative to gasoline and as a standby fuel for facilities that have interruptible natural gas service contracts.

1.5.2 Firing Practices[2]

The combustion processes that use LPG are very similar to those that use natural gas. Use of LPG in commercial and industrial applications may require a vaporizer to provide the burner with the proper mix of air and fuel. The burner itself will usually have different fuel injector tips as well as different fuel-to-air ratio controller settings than a natural gas burner since the LPG stoichiometric requirements are different than natural gas requirements. LPG is fired as a primary and backup fuel in small commercial and industrial boilers and space heating equipment and can be used to generate heat and process steam for industrial facilities and in most domestic appliances that typically use natural gas.

1.5.3 Emissions[1,3-5]

1.5.3.1 Criteria Pollutants -

LPG is considered a "clean" fuel because it does not produce visible emissions. However, gaseous pollutants such as nitrogen oxides (NO_x), carbon monoxide (CO), and organic compounds are produced as are small amounts of sulfur dioxide (SO_2) and particulate matter (PM). The most significant factors affecting NO_x, CO, and organic emissions are burner design, burner adjustment, boiler operating parameters, and flue gas venting. Improper design, blocking and clogging of the flue vent, and insufficient combustion air result in improper combustion and the emission of aldehydes, CO, hydrocarbons, and other organics. NO_x emissions are a function of a number of variables, including temperature, excess air, fuel and air mixing, and residence time in the combustion zone. The amount of SO_2 emitted is directly proportional to the amount of sulfur in the fuel. PM emissions are very low and result from soot, aerosols formed by condensable emitted species, or boiler scale dislodged during combustion. Emission factors for LPG combustion are presented in Table 1.5-1.

Table 1.5-1 presents emission factors on a volume basis ($lb/10^3gal$). To convert to an energy basis (lb/MMBtu), divide by a heating value of 91.5 $MMBtu/10^3gal$ for propane and 102 $MMBtu/10^3gal$ for butane.

1.5.3.2 Greenhouse Gases[6-11] -

Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions are all produced during LPG combustion. Nearly all of the fuel carbon (99.5 percent) in LPG is converted to CO_2 during the combustion process. This conversion is relatively independent of firing configuration. Although the formation of CO acts to reduce CO_2 emissions, the amount of CO produced is insignificant compared to the amount of CO_2 produced. The majority of the 0.5 percent of fuel carbon not converted to CO_2 is due to incomplete combustion in the fuel stream.

Formation of N_2O during the combustion process is governed by a complex series of reactions and its formation is dependent upon many factors. Formation of N_2O is minimized when combustion temperatures are kept high (above 1475^oF) and excess air is kept to a minimum (less than 1 percent).

Methane emissions are highest during periods of low-temperature combustion or incomplete combustion, such as the start-up or shut-down cycle for boilers. Typically, conditions that favor formation of N_2O also favor emissions of CH_4.

1.5.4 Controls

The only controls developed for LPG combustion are to reduce NO_x emissions. NO_x controls have been developed for firetube and watertube boilers firing propane or butane. Vendors are now guaranteeing retrofit systems to levels as low as 30 to 40 ppm (based on 3 percent oxygen). These systems use a combination of low-NO_x burners and flue gas recirculation (FGR). Some burner vendors use water or steam injection into the flame zone for NO_x reduction. This is a trimming technique which may be necessary during backup fuel periods because LPG typically has a higher NO_x-forming potential than natural gas; conventional natural gas emission control systems may not be sufficient to reduce LPG emissions to mandated levels. Also, LPG burners are more prone to sooting under the modified combustion conditions required for low NO_x emissions. The extent of allowable combustion modifications for LPG may be more limited than for natural gas.

One NO_x control system that has been demonstrated on small commercial boilers is FGR. NO_x emissions from propane combustion can be reduced by as much as 50 percent by recirculating about 16 percent of the flue gas. NO_x emission reductions of over 60 percent have been achieved with FGR and low-NO_x burners used in combination.

1.5.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section. These and other documents can be found on the CHIEF electronic bulletin board (919-541-5742), or on the new EFIG home page (http://www.epa.gov/oar/oaqps/efig/).

Supplement A, February 1996

No changes.

Supplement B, October 1996

- Text was added concerning firing practices.
- The CO_2 emission factor was updated.
- Emission factors were added for N_2O and CH_4.

Table 1.5-1. EMISSION FACTORS FOR LPG COMBUSTION[a]

EMISSION FACTOR RATING: E

Pollutant	Butane Emission Factor ($lb/10^3$ gal)		Propane Emission Factor ($lb/10^3$ gal)	
	Industrial Boilers[b] (SCC 1-02-010-01)	Commercial Boilers[c] (SCC 1-03-010-01)	Industrial Boilers[b] (SCC 1-02-010-02)	Commercial Boilers[c] (SCC 1-03-010-02)
PM[d]	0.6	0.5	0.6	0.4
SO_2[e]	0.09S	0.09S	0.10S	0.10S
NO_x[f]	21	15	19	14
N_2O[g]	0.9	0.9	0.9	0.9
CO_2[h,j]	14,300	14,300	12,500	12,500
CO	3.6	2.1	3.2	1.9
TOC	0.6	0.6	0.5	0.5
CH_4[k]	0.2	0.2	0.2	0.2

[a] Assumes emissions (except SO_x and NO_x) are the same, on a heat input basis, as for natural gas combustion. The NO_x emission factors have been multiplied by a correction factor of 1.5, which is the approximate ratio of propane/butane NO_x emissions to natural gas NO_x emissions. To convert from $lb/10^3$ gal to $kg/10^3$ L, multiply by 0.12. SCC = Source Classification Code.
[b] Heat input capacities generally between 10 and 100 million Btu/hour.
[c] Heat input capacities generally between 0.3 and 10 million Btu/hour.
[d] Filterable particulate matter (PM) is that PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train. For natural gas, a fuel with similar combustion characteristics, all PM is less than 10 μm in aerodynamic equivalent diameter (PM-10).
[e] S equals the sulfur content expressed in $gr/100\ ft^3$ gas vapor. For example, if the butane sulfur content is $0.18\ gr/100\ ft^3$, the emission factor would be (0.09 x 0.18) = 0.016 lb of $SO_2/10^3$ gal butane burned.
[f] Expressed as NO_2.
[g] Reference 12.
[h] Assuming 99.5% conversion of fuel carbon to CO_2.
[j] EMISSION FACTOR RATING = C.
[k] Reference 13.

References For Section 1.5

1. Written Communication from W. Butterbaugh of the National Propane Gas Association, Lisle, Illinois, to J. McSorley of the U. S. Environmental Protection Agency, Research Triangle Park, NC, August 19, 1992.

2. Emission Factor Documentation for AP-42 Section 1.5. *Liquefied Petroleum Gas Combustion.* April 1993.

3. *Air Pollutant Emission Factors*, Final Report, Contract No. CPA-22-69-119, Resources Research, Inc., Reston, VA, Durham, NC, April 1970.

4. *Nitrous Oxide Reduction With The Weishaupt Flue Gas Recirculation System*, Weishaupt Research and Development Institute, January 1987.

5. Phone communication memorandum of conversation between B. Lusher of Acurex Environmental and D. Childress of Suburban/Petrolane, Durham, NC, May 14, 1992.

6. L. P. Nelson, *et al.*, *Global Combustion Sources Of Nitrous Oxide Emissions*, Research Project 2333-4 Interim Report, Radian Corporation, Sacramento, CA, 1991.

7. R. L. Peer, *et al.*, *Characterization Of Nitrous Oxide Emission Sources*, EPA Contract No. 68-D1-0031, Research Triangle Park, NC, 1995.

8. S. D. Piccot, *et al.*, *Emissions And Cost Estimates For Globally Significant Anthropogenic Combustion Sources Of* NO_x, N_2O, CH_4, *CO, And* CO_2, EPA Contract No. 68-02-4288, Research Triangle Park, NC, 1990.

9. G. Marland and R. M. Rotty, *Carbon Dioxide Emissions From Fossil Fuels: A Procedure For Estimation And Results For 1951-1981*, DOE/NBB-0036 TR-003, Carbon Dioxide Research Division, Office of Energy Research, U.S. Department of Energy, Oak Ridge, TN, 1983.

10. G. Marland and R.M. Rotty, *Carbon Dioxide Emissions From Fossil Fuels: A Procedure For Estimation And Results For 1950-1982*, *Tellus*, 36B: 232-261.

11. *Sector-Specific Issues And Reporting Methodologies Supporting The General Guidelines For The Voluntary Reporting Of Greenhouse Gases Under Section 1605(b) Of The Energy Policy Act Of 1992*, Volume 2 of 3, DOE/PO-0028, U.S. Department of Energy, 1994.

12. A. Rosland, *Greenhouse Gas Emissions In Norway: Inventories And Estimation Methods*, Ministry of Environment, Oslo, Norway, 1993.

13. *Inventory Methods Manual For Estimating Canadian Emissions Of Greenhouse Gases,* Prepared for Environment Canada by Ortech Corporation, 1994.

Attachment C.2

Supporting Documentation – USEPA AP-42, Section 3.3

3.3 Gasoline And Diesel Industrial Engines

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), total organic compounds (TOC), carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides (SO_x) also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.[2]

3.3.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x, called prompt NO_x, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x.

3.3.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.[2]

3.3.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.[2-3]

3.3.3.4 Smoke and Particulate Matter -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient.[2]

3.3.3.5 Sulfur Oxides -

Sulfur oxides emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.[2-3]

3.3.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O_2. The most common NO_x control technique for diesel and dual-fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Controls for CO have been partly adapted from mobile sources.[4]

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio adjustments, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.[4]

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.[4]

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting the engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures, thereby lowering NO_x formation rates.[4]

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH_3) into the flue gas. The NH_3 reacts with NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.[4]

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O_2 levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.[4]

The most accurate method for calculating such emissions is on the basis of "brake-specific" emission factors (pounds per horsepower-hour [lb/hp-hr]). Emissions are the product of the brake-specific emission factor, the usage in hours, the rated power available, and the load factor (the power actually used divided by the power available). However, for emission inventory purposes, it is often easier to assess this activity on the basis of fuel used.

Once reasonable usage and duty cycles for this category were ascertained, emission values were aggregated to arrive at the factors for criteria and organic pollutants presented. Factors in Table 3.3-1 are in pounds per million British thermal unit (lb/MMBtu). Emission data for a specific design type were weighted according to estimated material share for industrial engines. The emission factors in these tables, because of their aggregate nature, are most appropriately applied to a population of industrial engines rather than to an individual power plant. Table 3.3-2 shows unweighted speciated organic compound and air toxic emission factors based upon only 2 engines. Their inclusion in this section is intended for rough order-of-magnitude estimates only.

Table 3.3-3 summarizes whether the various diesel emission reduction technologies (some of which may be applicable to gasoline engines) will generally increase or decrease the selected parameter. These technologies are categorized into fuel modifications, engine modifications, and exhaust after-treatments. Current data are insufficient to quantify the results of the modifications. Table 3.3-3 provides general information on the trends of changes on selected parameters.

3.3.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section.

Supplement A, February 1996

No changes.

Supplement B, October 1996

- Text was revised concerning emissions and controls.
- The CO_2 emission factor was adjusted to reflect 98.5 percent conversion efficiency.

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES[a]

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		EMISSION FACTOR RATING
	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	
NO_x	0.011	1.63	0.031	4.41	D
CO	0.439	62.7	6.68 E-03	0.95	D
SO_x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10[b]	7.21 E-04	0.10	2.20 E-03	0.31	D
CO_2[c]	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC					
Exhaust	0.015	2.10	2.47 E-03	0.35	D
Evaporative	6.61 E-04	0.09	0.00	0.00	E
Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
Refueling	1.08 E-03	0.15	0.00	0.00	E

[a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[b] PM-10 = particulate matter less than or equal to 10 µm aerodynamic diameter. All particulate is assumed to be ≤ 1 µm in size.

[c] Assumes 99% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene[b]	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

Table 3.3-3. EFFECT OF VARIOUS EMISSION CONTROL TECHNOLOGIES ON DIESEL ENGINES[a]

Technology	Affected Parameter	
	Increase	Decrease
Fuel modifications		
Sulfur content increase	PM, wear	
Aromatic content increase	PM, NO_x	
Cetane number		PM, NO_x
10% and 90% boiling point		PM
Fuel additives		PM, NO_x
Water/Fuel emulsions		NO_x
Engine modifications		
Injection timing retard	PM, BSFC	NO_x, power
Fuel injection pressure	PM, NO_x	
Injection rate control		NO_x, PM
Rapid spill nozzles		PM
Electronic timing & metering		NO_x, PM
Injector nozzle geometry		PM
Combustion chamber modifications		NO_x, PM
Turbocharging	PM, power	NO_x
Charge cooling		NO_x
Exhaust gas recirculation	PM, power, wear	NO_x
Oil consumption control		PM, wear
Exhaust after-treatment		
Particulate traps		PM
Selective catalytic reduction		NO_x
Oxidation catalysts		TOC, CO, PM

[a] Reference 8. PM = particulate matter. BSFC = brake-specific fuel consumption.

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AIR QUALITY ASSESSMENT

BELLEAYRE RESORT AT CATSKILL PARK
TOWNS OF SHANDAKEN AND MIDDLETOWN
ULSTER AND DELAWARE COUNTIES

FEBRUARY 2011

PREPARED BY:

Creighton Manning

PROJECT NO. 99-057

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AIR QUALITY ASSESSMENT

As part of the New York State Environmental Quality Review Act (SEQRA) requirements, an air quality assessment was conducted for the proposed *Belleayre Resort at Catskill Park*. The air quality assessment conducted conforms to the procedures followed by the New York State Department of Environmental Conservation (NYSDEC). Currently, the NYSDEC follows the procedures outlined in the New York State Department of Transportation (NYSDOT) Environmental Procedures Manual (EPM), Chapter 1.1, Air Quality, last updated January 2001. These procedures address the Clean Air Act Amendments of 1990 and guidance from the Environmental Protection Agency (EPA).

1.0 Existing Conditions

New York State collects air quality data for numerous pollutants at monitoring stations in each county through a program operated by the Bureau of Air Quality Surveillance. The EPA prescribes what pollutants are required to be monitored at different locations based on the characteristics of each region. Therefore, monitoring stations are disbursed throughout New York State with each station monitoring certain pollutants. In addition to the continuous and manual monitors in each county, ambient air quality data from private networks (utilities) is also an integral part of the state database for pollutants. The data from each monitoring station is recorded and summarized in the *New York State Air Quality Report, Air Monitoring System*. The latest data tables available are for the year 2009.

The project is located in Ulster and Delaware Counties, which are both classified as attainment areas for carbon monoxide and ozone. The monitoring station at Belleayre Mountain in Ulster County, which monitors sulfur dioxide and ozone, is located within the project limits. The closest monitoring station to the project site that monitors carbon monoxide is located north of the study area in Schenectady. Based on the results of the NYSDEC report, the Belleayre and Schenectady stations were in compliance with the current New York State and Federal Ambient Air Quality Standards for each monitored pollutant in 2009.

Two types of inhalable particulates are monitored; those with aerodynamic diameters of 10 microns or less (PM_{10}) and those with aerodynamic diameters of 2.5 microns or less ($PM_{2.5}$). The monitoring station at Belleayre Mountain does not monitor PM_{10} or $PM_{2.5}$. However, a monitoring station located north of the study area in Albany monitors $PM_{2.5}$. The data shows that this station was in compliance with the average 98th percentile and average annual means for the latest three year period. The only stations in New York state that monitor PM_{10} are located in New York City, Rochester, and Buffalo. The geographical distance and the character of the study area are very different than these areas therefore the PM_{10} pollutant information from the New York City, Rochester, and Buffalo stations are not applicable to the *Belleayre Resort at Catskill Park* study area.

2.0 Microscale Air Quality

2.1 General Requirements

A microscale air quality analysis is performed to determine carbon monoxide concentrations at various worst case receptors adjacent to the roadways in a project area. Based on the procedures outlined in the EPM, worst case receptors are typically chosen at signalized intersections where a level of service D, E, or F exists for the build conditions. Unsignalized intersections do not typically warrant a detailed air quality analysis since the major-street high volume approaches at these intersections operate as free flow conditions. Any intersection requiring a detailed air quality analysis based on the level of service criteria undergoes additional screenings based on an analysis of the site conditions with respect to the reduction in source-receptor distances, traffic volume increases, vehicle emission increases, and speed reduction. The screening process is used to pinpoint locations where vehicle emissions will be the highest and will contribute to the background air quality. Any detailed air quality analysis is conducted using CAL3QHC, Version 2.0, which is a computer based air quality dispersion model. This model is based on traffic parameters from the *Highway Capacity Manual* (HCM) and is capable of analyzing intersection and free flow receptors.

2.2 Intersection Screening Analysis

Based on a review of the Final Scoping Document and an assessment of the intersections analyzed in the Traffic Impact Study prepared for this project, the seven intersections listed below were assessed for air quality:

- NY Route 28/NY Route 214/South Street
- NY Route 28/NY Route 42
- NY Route 28/County Road 47
- NY Route 28/Main Street
- NY Route 28/County Road 49A/Owl Nest Road
- County Road 49A/Gunnison Road/Belleayre Lower Driveway
- County Road 49A/Belleayre Upper Driveway

The information presented in the Traffic Impact Study prepared for this project indicates that the seven intersections in the project area are unsignalized intersections that do not require a detailed air quality assessment. Intersection improvements were recommended at the NY Route 28/County Road 49A/Owl Nest Road intersection to install a traffic signal to operate in three-color mode during the winter months and on flash mode during the other months. During winter months traffic signal warrant criteria are met for the No-Build condition prior to the construction of the proposed project. With the installation of a traffic signal and geometric improvements to add turn lanes, the intersection is expected to operate with an overall level of service D during the peak Saturday No-Build and Build volume conditions. The screening criteria were reviewed for the Route 28/County Road 49A/Owl Nest Road intersection based on the future installation of a traffic signal.

The next step of the screening, capture criteria screening, states that a detailed air quality analysis is required if at least one of the following criteria is met:

1. A 10% or more reduction in the source-receptor distance.
2. A 10% or more increase in traffic volume on affected roadways.
3. A 10% or more increase in vehicle emissions.
4. Any increase in the number of queued lanes.
5. A 20% reduction in speed when the estimated average speed is 30-mph or less.

An evaluation at the NY Route 28/County Road 49A/Owl Nest Road intersection indicates that the installation of a traffic signal and the changes in approach geometry will result in an increase in the number of queued lanes at the intersection. Therefore, this intersection requires the next step of screening, volume threshold screening, which is based on traffic volumes and emission factors.

The traffic volume screening criteria for signalized intersections is based on Table 3C from Chapter 1.1 of the EPM. The screening requires the calculation of both free flow and queue link emission factors to determine the intersection approach volume thresholds. The emission factors for each intersection approach were calculated based on procedures outlined in the EPM and using the latest Mobile Emission Factor Table for Ulster County. The volume thresholds were compared to the Build condition volumes representing the worst case traffic volumes at the intersection.

Table 1 – Traffic Volume Screening Summary

Intersection Approach	Emission Factors		Peak Hour Volume Threshold (Table 3C)	2015 Build Volumes	Volume Lower Than Criteria?
	Idle	Free flow			
Route 28 EB	40.4	4.8	4,000	161	Yes
Route 28 WB	40.4	4.8	4,000	333	Yes
CR 49A NB	39.9	4.9	4,000	1,419	Yes
Owl Nest Rd SB	39.9	4.9	4,000	2	Yes

Based on the above site screening analysis the 2015 Build Volumes are lower than the criteria shown in the EPM Table 3C. Therefore, an air quality analysis is not necessary since this project will not increase traffic volumes, reduce source-receptor distances or change other existing conditions to such a degree as to jeopardize attainment of the National and New York State ambient air quality standards.

3.0 Mesoscale Air Quality

3.1 General Requirements

A mesoscale air quality analysis is conceptually similar to the microscale air quality analysis; however, it covers a larger geographic area, typically larger than the immediate project area. In addition to carbon monoxide, a mesoscale air quality analysis monitors for volatile organic compounds (VOC) and nitrogen oxides (NO_x). In general, a mesoscale air quality analysis is required for projects involving the following:

1. HOV lanes vs general use lanes
2. New or significant modification to interchanges on access-controlled facilities
3. Large-scale signal coordination projects
4. In attainment areas, projects having alternatives (including the no-build) with significantly different (10%) VMT
5. Widening to provide additional travel lanes more than a mile in length.

The criteria for a mesoscale air analysis found in Chapter 1.1 of the EPM are not met with the development of the project; therefore, a mesoscale analysis is not required.

4.0 Particulate Matter Analysis

4.1 General Requirements

Particulate Matter (PM) is a mixture of substances that include elements such as carbon and metals; compounds such as nitrates, organic and ammonium compounds, and sulfates; and complex mixtures such as diesel exhaust and soil. Some of these particles are emitted directly into the atmosphere. Others, referred to as secondary particles, result from gases that are transformed into particles through physical and chemical processes in the atmosphere. As noted, there are two types of inhalable particulates; those with aerodynamic diameters of 10 microns or less (PM_{10}) and those with aerodynamic diameters of 2.5 microns or less ($PM_{2.5}$).

Many scientific studies have linked breathing PM to a series of significant health problems including aggravated asthma, increase in respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, decrease lung function, and premature death. As a result, NYSDOT requires that transportation project level air quality impact analyses consider both PM_{10} and $PM_{2.5}$. As of September, 2004 the NYSDOT is requiring all non-Categorical Exclusion and non-Type II Action projects that result in increased traffic volumes to undergo microscale and mesoscale emissions analysis for both PM_{10} and $PM_{2.5}$ as outlined in Chapter 1 of the EPM.

4.2 Particulate Matter Microscale Analysis

The NYSDOT Project Level Particulate Matter Analysis Final Policy (PM Final Policy), dated September 2004, provides guidance for performing a PM analysis. The policy states that only intersections that are most likely to experience a PM air quality impact need to be analyzed. Therefore, only the NY Route 28/County Road 49A/Owl Nest Road intersection requires detailed analysis. The detailed intersection air quality analysis model includes a distance of approximately 1,000 feet along each intersection approach.

4.2.1 CAL3QHC Model Inputs

Based on procedures outlined in the PM Final Policy the PM microscale air quality analysis was performed using CAL3QHC, Version 2.0, which is a line based dispersion model. The CAL3QHC procedures require inputs for roadway geometrics, traffic volumes, receptor locations, meteorological conditions, and vehicular emission rates. Additional inputs such as signal timing data, saturation flow rate, signal type, and arrival type are also necessary when modeling signalized intersections. Based on a review of the project area and the EPM procedures, the CAL3QHC data inputs outlined in Table 2 were used to represent worst case meteorological conditions.

Table 2 – Summary of Meteorological Data Inputs

Description	Model Input
Stability Class	E
Wind Speed	1 meter/second
Roadway Wind Angle	0^0 to 360^0 at 5^0 intervals
Averaging Time	60 minutes
Surface Roughness Coefficient	11.4 cm
Settling Velocity	0 centimeters/second
Deposition Velocity	0 centimeters/second
Mixing Height	1,000 meters

Vehicular emission rates were determined using MOBILE 6.2 Emission Factor Tables A1, A2, A3, and A4 for Ulster County in NYSDOT Region 8. These tables provide PM_{10} and $PM_{2.5}$ emission factors for different vehicle classes in grams/mile for use in free flow links, and emission factors in grams/hour at 0 mph (idle) for use in queue links. The vehicle emission factor calculations are included in Appendix A.

4.2.2 Analysis Results

The particulate matter analysis was conducted for the Saturday PM peak hour consistent with the traffic study. The two averaging periods used in the assessment of air quality impacts are the one-hour (worst hour) and the 24-hour PM concentrations. Table 3 shows the maximum concentration difference thresholds between no-build and build conditions that may result in potential significant environmental impacts. If the results of the Level I Microscale Analysis show a difference between no-build and build conditions that are above the allowable thresholds, a Level II Microscale Analysis must be conducted.

Table 3 – Potential Significant Impact Thresholds

PM Size	24-hour Average	Annual Arithmetic Mean
PM_{10}	5.0 μg/m^3	1.0 μg/m^3
$PM_{2.5}$	5.0 μg/m^3	0.3 μg/m^3

Below is a discussion of the results of the air quality analysis for the no-build and build conditions CAL3QHC model runs that include one study area intersection for the Saturday peak hour traffic period.

Fifty-eight air quality receptors were included in the CAL3QHC model to represent worst-case conditions in the area. Receptors were chosen along roadway shoulder locations where people are likely to be most noticeably present in the project corridor. The receptor locations are shown on printouts of the air quality model network included in Appendix B. All of the receptors were modeled for the no-build and build conditions. Table 4 identifies the receptors with the largest difference in concentration between no-build and build conditions for the peak hour of the Particulate Matter analysis. The table also summarizes the 24-Hour and Annual concentrations for each analysis condition.

Table 4 – PM Concentrations

Analysis Period and PM Size	Receptor Number	Concentration[1]		
		Hourly	24-Hour	Annual
PM Peak Hour PM_{10}	13	0.1 μg/m^3	0.04 μg/m^3	0.008 μg/m^3
PM Peak Hour $PM_{2.5}$	13	0.1 μg/m^3	0.04 μg/m^3	0.008 μg/m^3

[1]Represents the difference in concentration between the no-build and build conditions.

The results of the air quality analysis indicate that the differences in concentration between the no-build and build analysis at all fifty-eight receptors are below the potential significant impact thresholds shown in Table 3. The particulate matter concentrations and differences for all receptors are included in Appendix C.

The predicted particulate matter concentration differences for the receptors have been calculated to be less than the maximum allowable potential significant impact thresholds. This indicates that if the proposed project is constructed, the particulate matter concentrations will not result in a violation of the standards. No further analysis is needed.

4.3 Particulate Matter Mesoscale Analysis

As discussed in Section 3.1 projects requiring a mesoscale analysis are those that could have a significant impact on emissions on a regional basis. The proposed project does not meet any of the criteria in Chapter 1.1 of the EPM for a mesoscale analysis; therefore, no particulate matter mesoscale analysis is required.

5.0 Other Pollutants

5.1 Ozone

Ozone concentrations are not estimated as part of an environmental analysis for a transportation project. Motor vehicles do not emit ozone. Although they do emit precursors of ozone (VOC and NO_x), the amount of these emissions are small compared to the total emissions for the regional area and would not affect ozone concentration at or in the vicinity of the project site. In addition, these emissions are transported many miles before the action of sunlight and atmospheric chemistry causes ozone to be formed. Ozone problems are regional problems that are addressed on a scale much larger than the typical project and its relationship to transportation impacts. Ozone concentrations in the project area are not meaningfully affected by the project itself.

6.0 Construction Impacts

The air quality within the project area may experience short-term impacts due to the construction of the project. During construction, airborne particulates will increase as dust is raised by construction vehicles in motion. This increase is expected to be sporadic and short-term in nature and will be most noticeable in the area immediately adjacent to the construction. The impacts should be minimized by the use of dust inhibitors, such as calcium chloride and other dust-control provisions found in the NYSDOT Standard Specifications for construction.

Appendix A
Emission Factor Calculations

Belleayre Resort at Catskill Park
Towns of Shandaken & Middletown, New York

Crossroads, 99-057d
Emission Factors
1/14/2011
AMM

Route 28
Functional Class = Rural Minor Arterial (06)
Speed Limit = 55 mph

Vehicle Distribution		non-idle (55mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	48.55%	4.84	2.350	38.63	18.755
LDGT1	7.30%	4.70	0.343	35.02	2.556
LDGT2	24.31%	5.05	1.228	37.35	9.080
LDGT3	8.70%	5.19	0.452	38.75	3.371
LDGT4	4.02%	5.27	0.212	39.36	1.582
HDGV2B	1.48%	6.11	0.090	94.75	1.402
HDGV3	0.58%	7.83	0.045	121.37	0.704
HDGV4	0.17%	7.87	0.013	121.98	0.207
HDGV5	0.23%	9.10	0.021	140.97	0.324
HDGV6	0.07%	9.59	0.007	148.63	0.104
HDGV7	0.09%	11.19	0.010	173.43	0.156
HDGV8A	0.13%	12.44	0.016	192.73	0.251
LDDV	0.07%	0.36	0.000	5.89	0.004
LDDT12	0.12%	0.24	0.000	3.90	0.005
LDDT34	0.88%	0.21	0.002	3.35	0.029
HDDV2B	0.26%	0.14	0.000	2.21	0.006
HDDV3	0.19%	0.16	0.000	2.68	0.005
HDDV4	0.12%	0.32	0.000	5.28	0.006
HDDV5	0.16%	0.29	0.000	4.67	0.007
HDDV6	0.12%	0.36	0.000	5.90	0.007
HDDV7	0.20%	0.48	0.001	7.75	0.016
HDDV8A	0.55%	0.90	0.005	14.58	0.080
HDDV8B	0.58%	0.86	0.005	14.02	0.081
HDGB	0.10%	12.94	0.013	200.59	0.201
HDDBT	0.19%	1.21	0.002	19.69	0.037
HDDBS	0.29%	0.72	0.002	11.67	0.034
MC	0.54%	5.51	0.030	255.18	1.378
	100.00%				

Total emission factor 4.849 non-idle 40.390 idle

County Road 49A
Functional Class = Rural Local Road (09)
Speed Limit = 55 mph

Vehicle Distribution		non-idle (55mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	47.59%	4.84	2.303	38.63	18.384
LDGT1	7.16%	4.70	0.337	35.02	2.507
LDGT2	23.83%	5.05	1.203	37.35	8.901
LDGT3	10.81%	5.19	0.561	38.75	4.189
LDGT4	4.99%	5.27	0.263	39.36	1.964
HDGV2B	1.02%	6.11	0.062	94.75	0.966
HDGV3	0.40%	7.83	0.031	121.37	0.485
HDGV4	0.12%	7.87	0.009	121.98	0.146
HDGV5	0.16%	9.10	0.015	140.97	0.226
HDGV6	0.05%	9.59	0.005	148.63	0.074
HDGV7	0.06%	11.19	0.007	173.43	0.104
HDGV8A	0.09%	12.44	0.011	192.73	0.173
LDDV	0.07%	0.36	0.000	5.89	0.004
LDDT12	0.12%	0.24	0.000	3.90	0.005
LDDT34	1.10%	0.21	0.002	3.35	0.037
HDDV2B	0.18%	0.14	0.000	2.21	0.004
HDDV3	0.13%	0.16	0.000	2.68	0.003
HDDV4	0.08%	0.32	0.000	5.28	0.004
HDDV5	0.11%	0.29	0.000	4.67	0.005
HDDV6	0.08%	0.36	0.000	5.90	0.005
HDDV7	0.14%	0.48	0.001	7.75	0.011
HDDV8A	0.38%	0.90	0.003	14.58	0.055
HDDV8B	0.40%	0.86	0.003	14.02	0.056
HDGB	0.07%	12.94	0.009	200.59	0.140
HDDBT	0.13%	1.21	0.002	19.69	0.026
HDDBS	0.20%	0.72	0.001	11.67	0.023
MC	0.53%	5.51	0.029	255.18	1.352
	100.00%				

Total emission factor 4.861 non-idle 39.852 idle

Crossroads, 99-057d
Emission Factors
3/18/2010
AMM

Route 28
Functional Class = Rural Minor Arterial (06)
Speed Limit = 55 mph

PM10

Vehicle Distribution		non-idle (55mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	48.55%	0.025	0.0121	0.000	0.0000
LDGT1	7.30%	0.025	0.0018	0.000	0.0000
LDGT2	24.31%	0.025	0.0061	0.000	0.0000
LDGT3	8.70%	0.025	0.0022	0.000	0.0000
LDGT4	4.02%	0.025	0.0010	0.000	0.0000
HDGV2B	1.48%	0.038	0.0006	0.000	0.0000
HDGV3	0.58%	0.050	0.0003	0.000	0.0000
HDGV4	0.17%	0.050	0.0001	0.000	0.0000
HDGV5	0.23%	0.050	0.0001	0.000	0.0000
HDGV6	0.07%	0.058	0.0000	0.000	0.0000
HDGV7	0.09%	0.066	0.0001	0.000	0.0000
HDGV8A	0.13%	0.095	0.0001	0.000	0.0000
LDDV	0.07%	0.060	0.0000	0.000	0.0000
LDDT12	0.12%	0.065	0.0001	0.000	0.0000
LDDT34	0.88%	0.041	0.0004	0.000	0.0000
HDDV2B	0.26%	0.034	0.0001	1.007	0.0026
HDDV3	0.19%	0.042	0.0001	1.008	0.0019
HDDV4	0.12%	0.055	0.0001	1.014	0.0012
HDDV5	0.16%	0.053	0.0001	1.026	0.0016
HDDV6	0.12%	0.087	0.0001	1.029	0.0012
HDDV7	0.20%	0.088	0.0002	1.024	0.0020
HDDV8A	0.55%	0.166	0.0009	1.061	0.0058
HDDV8B	0.58%	0.138	0.0008	1.034	0.0060
HDGB	0.10%	0.066	0.0001	0.000	0.0000
HDDBT	0.19%	0.218	0.0004	1.062	0.0020
HDDBS	0.29%	0.136	0.0004	1.020	0.0030
MC	0.54%	0.037	0.0002	0.000	0.0000
	100.00%				

Total emission factor **0.028** **non-idle** **0.027** **idle**

PM2.5

Vehicle Distribution		non-idle (55mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	48.55%	0.011	0.0053	0.000	0.0000
LDGT1	7.30%	0.011	0.0008	0.000	0.0000
LDGT2	24.31%	0.011	0.0027	0.000	0.0000
LDGT3	8.70%	0.011	0.0010	0.000	0.0000
LDGT4	4.02%	0.011	0.0004	0.000	0.0000
HDGV2B	1.48%	0.024	0.0004	0.000	0.0000
HDGV3	0.58%	0.032	0.0002	0.000	0.0000
HDGV4	0.17%	0.032	0.0001	0.000	0.0000
HDGV5	0.23%	0.030	0.0001	0.000	0.0000
HDGV6	0.07%	0.036	0.0000	0.000	0.0000
HDGV7	0.09%	0.043	0.0000	0.000	0.0000
HDGV8A	0.13%	0.052	0.0001	0.000	0.0000
LDDV	0.07%	0.043	0.0000	0.000	0.0000
LDDT12	0.12%	0.048	0.0001	0.000	0.0000
LDDT34	0.88%	0.026	0.0002	0.000	0.0000
HDDV2B	0.26%	0.022	0.0001	0.926	0.0024
HDDV3	0.19%	0.024	0.0000	0.927	0.0018
HDDV4	0.12%	0.037	0.0000	0.933	0.0011
HDDV5	0.16%	0.035	0.0001	0.944	0.0015
HDDV6	0.12%	0.066	0.0001	0.947	0.0011
HDDV7	0.20%	0.067	0.0001	0.942	0.0019
HDDV8A	0.55%	0.123	0.0007	0.976	0.0054
HDDV8B	0.58%	0.097	0.0006	0.951	0.0055
HDGB	0.10%	0.043	0.0000	0.000	0.0000
HDDBT	0.19%	0.187	0.0004	0.977	0.0019
HDDBS	0.29%	0.111	0.0003	0.939	0.0027
MC	0.54%	0.021	0.0001	0.000	0.0000
	100.00%				

Total emission factor **0.014** **non-idle** **0.025** **idle**

Crossroads, 99-057d
Emission Factors
3/18/2010
AMM

County Road 49A
Functional Class = Rural Local Road (09)
Speed Limit = 55 mph

PM10

Vehicle Distribution		non-idle (30mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	47.59%	0.025	0.0119	0.000	0.000
LDGT1	7.16%	0.025	0.0018	0.000	0.000
LDGT2	23.83%	0.025	0.0060	0.000	0.000
LDGT3	10.81%	0.025	0.0027	0.000	0.000
LDGT4	4.99%	0.025	0.0012	0.000	0.000
HDGV2B	1.02%	0.038	0.0004	0.000	0.000
HDGV3	0.40%	0.050	0.0002	0.000	0.000
HDGV4	0.12%	0.050	0.0001	0.000	0.000
HDGV5	0.16%	0.050	0.0001	0.000	0.000
HDGV6	0.05%	0.058	0.0000	0.000	0.000
HDGV7	0.06%	0.066	0.0000	0.000	0.000
HDGV8A	0.09%	0.095	0.0001	0.000	0.000
LDDV	0.07%	0.060	0.0000	0.000	0.000
LDDT12	0.12%	0.065	0.0001	0.000	0.000
LDDT34	1.10%	0.041	0.0005	0.000	0.000
HDDV2B	0.18%	0.034	0.0001	1.007	0.002
HDDV3	0.13%	0.042	0.0001	1.008	0.001
HDDV4	0.08%	0.055	0.0000	1.014	0.001
HDDV5	0.11%	0.053	0.0001	1.026	0.001
HDDV6	0.08%	0.087	0.0001	1.029	0.001
HDDV7	0.14%	0.088	0.0001	1.024	0.001
HDDV8A	0.38%	0.166	0.0006	1.061	0.004
HDDV8B	0.40%	0.138	0.0006	1.034	0.004
HDGB	0.07%	0.066	0.0000	0.000	0.000
HDDBT	0.13%	0.218	0.0003	1.062	0.001
HDDBS	0.20%	0.136	0.0003	1.020	0.002
MC	0.53%	0.037	0.0002	0.000	0.000
	100.00%				

Total emission factor 0.027 non-idle 0.019 idle

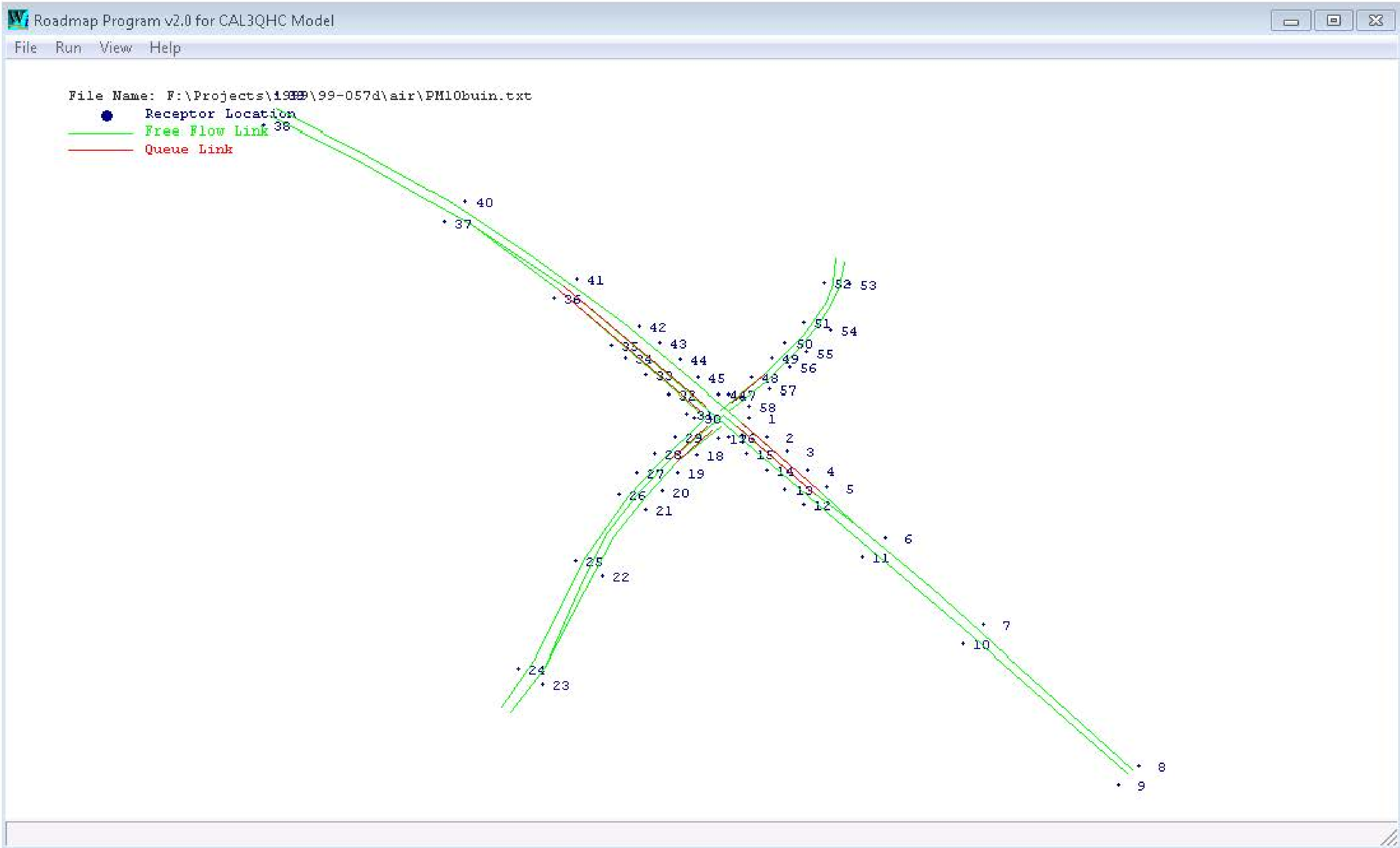
PM2.5

Vehicle Distribution		non-idle (30mph)		idle	
type	%	emissions	Total ESS	emissions	Total ESS
LDGV	47.59%	0.011	0.0052	0.000	0.000
LDGT1	7.16%	0.011	0.0008	0.000	0.000
LDGT2	23.83%	0.011	0.0026	0.000	0.000
LDGT3	10.81%	0.011	0.0012	0.000	0.000
LDGT4	4.99%	0.011	0.0005	0.000	0.000
HDGV2B	1.02%	0.024	0.0002	0.000	0.000
HDGV3	0.40%	0.032	0.0001	0.000	0.000
HDGV4	0.12%	0.032	0.0000	0.000	0.000
HDGV5	0.16%	0.030	0.0000	0.000	0.000
HDGV6	0.05%	0.036	0.0000	0.000	0.000
HDGV7	0.06%	0.043	0.0000	0.000	0.000
HDGV8A	0.09%	0.052	0.0000	0.000	0.000
LDDV	0.07%	0.043	0.0000	0.000	0.000
LDDT12	0.12%	0.048	0.0001	0.000	0.000
LDDT34	1.10%	0.026	0.0003	0.000	0.000
HDDV2B	0.18%	0.022	0.0000	0.926	0.002
HDDV3	0.13%	0.024	0.0000	0.927	0.001
HDDV4	0.08%	0.037	0.0000	0.933	0.001
HDDV5	0.11%	0.035	0.0000	0.944	0.001
HDDV6	0.08%	0.066	0.0001	0.947	0.001
HDDV7	0.14%	0.067	0.0001	0.942	0.001
HDDV8A	0.38%	0.123	0.0005	0.976	0.004
HDDV8B	0.40%	0.097	0.0004	0.951	0.004
HDGB	0.07%	0.043	0.0000	0.000	0.000
HDDBT	0.13%	0.187	0.0002	0.977	0.001
HDDBS	0.20%	0.111	0.0002	0.939	0.002
MC	0.53%	0.021	0.0001	0.000	0.000
	100.00%				

Total emission factor 0.013 non-idle 0.017 idle

Appendix B
CAL3QHC Receptor Locations

Belleayre Resort at Catskill Park
Towns of Shandaken & Middletown, New York



Roadmap Program v2.0 for CAL3QHC Model
File Run View Help
File Name: F:\Projects\1999\99-057d\air\PM10buin.txt
Receptor Location
Free Flow Link
Queue Link

Appendix C
CAL3QHC PM Analysis Results

Belleayre Resort at Catskill Park
Towns of Shandaken & Middletown, New York

Particulate Matter CAL3QHC Results
AMM
99-057d

Receptor	2015				2015	
	NB		Build		Difference	
	PM2.5	PM10	PM2.5	PM10	PM2.5	PM10
1	9.0	9.0	9.0	9.0	0.0	0.0
2	9.0	9.0	9.0	9.0	0.0	0.0
3	9.0	9.0	9.0	9.0	0.0	0.0
4	9.0	9.0	9.0	9.0	0.0	0.0
5	9.0	9.0	9.0	9.0	0.0	0.0
6	9.0	9.0	9.0	9.0	0.0	0.0
7	9.0	9.0	9.0	9.0	0.0	0.0
8	9.0	9.0	9.0	9.0	0.0	0.0
9	10.5	10.5	10.6	10.6	0.1	0.1
10	10.7	10.7	10.8	10.8	0.1	0.1
11	10.8	10.8	10.8	10.8	0.0	0.0
12	10.9	10.9	10.9	10.9	0.0	0.0
13	10.8	10.8	10.9	10.9	0.1	0.1
14	11.0	11.0	11.0	11.0	0.0	0.0
15	11.1	11.1	11.2	11.2	0.1	0.1
16	11.2	11.3	11.2	11.3	0.0	0.0
17	10.8	11.8	10.8	11.7	0.0	-0.1
18	10.2	11.6	10.3	11.5	0.1	-0.1
19	9.9	11.4	9.9	11.4	0.0	0.0
20	9.9	11.3	9.9	11.4	0.0	0.1
21	9.8	11.4	9.8	11.4	0.0	0.0
22	10.0	12.0	10.0	11.8	0.0	-0.2
23	10.1	12.1	10.1	12.0	0.0	-0.1
24	9.0	9.0	9.0	9.0	0.0	0.0
25	9.1	9.1	9.1	9.1	0.0	0.0
26	9.2	9.2	9.2	9.2	0.0	0.0
27	9.1	9.1	9.1	9.1	0.0	0.0
28	9.2	9.2	9.2	9.2	0.0	0.0
29	9.3	9.3	9.3	9.3	0.0	0.0
30	9.8	9.8	9.7	9.7	-0.1	-0.1
31	9.7	9.7	9.7	9.7	0.0	0.0
32	9.6	9.6	9.6	9.6	0.0	0.0
33	9.6	9.6	9.5	9.5	-0.1	-0.1
34	9.5	9.5	9.5	9.5	0.0	0.0
35	9.5	9.5	9.5	9.5	0.0	0.0
36	9.6	9.6	9.6	9.6	0.0	0.0
37	9.6	9.6	9.6	9.6	0.0	0.0
38	9.0	9.0	9.0	9.0	0.0	0.0
39	9.0	9.0	9.0	9.0	0.0	0.0
40	9.0	9.0	9.0	9.0	0.0	0.0
41	9.0	9.0	9.0	9.0	0.0	0.0
42	9.0	9.0	9.0	9.0	0.0	0.0
43	9.0	9.0	9.0	9.0	0.0	0.0
44	9.0	9.0	9.0	9.0	0.0	0.0
45	9.0	9.0	9.0	9.0	0.0	0.0
46	9.0	9.0	9.0	9.0	0.0	0.0
47	9.0	9.0	9.0	9.0	0.0	0.0
48	9.0	9.0	9.0	9.0	0.0	0.0
49	9.0	9.0	9.0	9.0	0.0	0.0
50	9.0	9.0	9.0	9.0	0.0	0.0
51	9.0	9.0	9.0	9.0	0.0	0.0
52	9.0	9.0	9.0	9.0	0.0	0.0
53	9.0	9.0	9.0	9.0	0.0	0.0
54	9.0	9.0	9.0	9.0	0.0	0.0
55	9.0	9.0	9.0	9.0	0.0	0.0
56	9.0	9.0	9.0	9.0	0.0	0.0
57	9.0	9.0	9.0	9.0	0.0	0.0
58	9.0	9.0	9.0	9.0	0.0	0.0

Receptor	Concentrations		
	Hourly	24-hour 0.4	Annual 0.08
9	0.1	0.04	0.008
10	0.1	0.04	0.008
13	0.1	0.04	0.008
15	0.1	0.04	0.008
18	0.1	0.04	0.008
20	0.1	0.04	0.008