APPENDIX H
MITIGATION

Appendix H Mitigation

As part of mitigation for the potential significant adverse school impact, it is expected that the proposed school would be operational approximately two years earlier, by September 2012. The construction-related air quality section below includes additional details regarding the analysis performed to asses the potential for impacts on the proposed school during construction. This was not addressed in the construction analysis since the school community facility was originally scheduled to be the last component of the project to be constructed.

A comparison of the projected worker and truck trips, and additional details regarding the air pollutant emissions model can be found in the attachments below.

POTENTIAL CONSTRUCTION AIR QUALITY IMPACTS

Maximum predicted potential impacts from construction activities on air quality at the proposed school were analyzed using the same methods presented in Chapter 20, "Construction Impacts." This analysis was performed in addition to the worst-case presented in Chapter 20, "Construction Impacts," since the completion of the school earlier in the schedule would result in the operation of the school while construction activities would take place immediately next door at Site 10 (616-2) located at 616 First Avenue. The construction of the school earlier, instead of the community facility later in the schedule, would not change the peak emissions identified in Chapter 20, "Construction Impacts," or the conclusions presented there.

Due to the close proximity to the school, in addition to the emissions controls used for the construction of the entire project, all nonroad diesel engines used for the construction at Site 10 after the school construction is completed would be certified as EPA Tier 2 or better. This commitment would be included in a Restrictive Declaration.

Maximum predicted concentration increments from construction of the proposed development program and overall concentrations at the school, including background concentrations, are presented in Table 1. For $PM_{2.5}$, monitored concentrations are not added to modeled concentrations from sources, since impacts are determined by comparing the predicted changes between the Proposed Actions and the No Build with the interim guidance criteria. The total concentrations in Table 1 are the sum of background concentrations and construction increments. (Since the numbers presented in the tables include significant figures only, there may be some rounding differences.)

Total concentrations of PM_{10}, CO, and NO_2 are not expected to exceed the NAAQS.

The highest 24-hour average $PM_{2.5}$ concentration increment predicted at the school was 2.3 $\mu g/m^3$. This potential increment, which is greater than the 2 $\mu g/m^3$ threshold level, was predicted at a single location on the western façade of the school at ground level, up to 29 feet from the northern edge of the school building, and was predicted to exceed the 2 $\mu g/m^3$ threshold level only under meteorological conditions which may occur on a single day per year and only if those

Table 1
Pollutant Concentrations at the Proposed School from Construction Site Sources (µg/m^3)

Pollutant	Averaging Period	No Build	Proposed Actions	Increment	Interim Guidance Threshold	NAAQS
$PM_{2.5}$ [1]	24-hour	--	--	2.3	5/2[2]	35 [3]
	Annual local	--	--	0.2	0.3	15
PM_{10}	24-hour	60	76	16	—	150
NO_2	Annual	72	78	7	—	100
CO	1-hour	4.0 ppm	27.2	23.2	—	35 ppm
	8-hour	2.5 ppm	3.6	1.1	—	9 ppm

Notes:
$PM_{2.5}$ concentration increments should be compared with threshold values. Total concentrations should be compared with the NAAQS.

[1] Monitored concentrations are not added to predicted $PM_{2.5}$ values.

[2] DEP is currently applying threshold criteria for assessing the significance of 24-hour average $PM_{2.5}$ impacts. For temporary impacts such as those caused by construction activities, the significance of any concentration increment greater than 2 µg/m^3 is assessed in the context of the magnitude, frequency, duration, location and size of area affected by the concentration increment.

[3] EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 and revoked the annual PM_{10} standard, effective December 18, 2006.

conditions coincide with the peak construction period. Since this exceedance is unlikely to occur, and if it did, would be limited in frequency (once), duration (a single day), severity (15 percent above the threshold), and extent (a single window), this would not be a significant adverse impact on air quality. Since the school building would be attached to the residential building, there would be no windows on the northern façade of the school and the highest predicted increments would therefore occur at the west façade of the school.

Local annual average $PM_{2.5}$ concentration increments would not exceed the threshold level of 0.3 µg/m^3. The highest annual average neighborhood-scale $PM_{2.5}$ increment would be lower than that presented for the peak construction period, as presented in Chapter 20, "Construction Impacts", i.e., less than 0.01 µg/m^3, which is much lower than the threshold level of 0.1 µg/m^3.

These maximum increments at the school were computed for the peak construction period; for other construction time periods with lesser emissions, the potential increments would be less. It should be noted that the maximum increments predicted at the school windows are overstated, since they do not include the effect of the school building itself on mixing, which would reduce pollutant concentrations (since there would be no windows on the north façade, the air would have to travel around the corners of the building before reaching windows).

CONCLUSIONS

The construction of the school earlier, instead of the community facility later in the schedule, would not change the peak emissions identified in Chapter 20, "Construction Impacts," or the conclusions presented there.

Due to the close proximity to the school, in addition to the emissions controls used for the construction of the entire project, all nonroad diesel engines used for the construction at Site 10 after the school construction is completed would be certified as EPA Tier 2 or better. This commitment would be included in a Restrictive Declaration.

The construction of the Proposed Actions would not result in predicted significant adverse impacts on air quality at the school. Although a single event where 24-hour average $PM_{2.5}$ concentration increments could potentially exceed the threshold level of 2 $\mu g/m^3$ was predicted at a single location, this may not occur at all if the worst-case meteorological condition (a single day per year) and the peak construction activity do not coincide. Since this exceedance is unlikely to occur, and if it did, would be limited in frequency (once), duration (a single day), severity (15 percent above the threshold), and extent (a single window), this would not be a significant adverse impact on air quality. Annual average $PM_{2.5}$ concentrations were predicted to be lower than the annual threshold, and PM_{10}, CO, and NO_2 are not expected to exceed the NAAQS. Therefore, no significant adverse air quality impact would occur at the school due to construction of the Proposed Actions. ✷

Table H.1: Projected Worker and Truck Trips

		1Q 2008			2Q 2008			3Q 2008			4Q 2008			1Q 2009			2Q 2009			3Q 2009			4Q 2009			1Q 2010			2Q 2010			3Q 2010		
		Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
Worker	Original	32	47	52	104	142	172	300	379	512	937	1210	1533	1686	1849	1825	1935	2218	2027	2322	2326	2161	2092	1867	1872	1754	1898	1512	1392	1338	1284	1467	1544	1271
	School Shifted	32	47	52	104	142	172	300	379	512	937	1210	1533	1686	1849	1825	1935	2218	2027	2322	2326	2161	2092	1867	1872	1754	1898	1512	1392	1338	1284	1467	1544	1271
	Alt Original	0	0	0	6	213	292	425	501	617	612	773	1014	914	1253	1317	1408	1524	1614	1869	2063	2400	2198	2135	2255	2140	2140	1992	1863	1793	1563	1741	1739	1532
	Alt School Shifted	0	0	0	6	213	292	425	501	617	612	773	1014	914	1253	1317	1408	1524	1614	1869	2063	2400	2198	2135	2255	2140	2140	1992	1863	1793	1563	1741	1739	1532
Truck	Original	13	22	28	31	34	40	75	74	62	78	102	102	109	110	99	80	62	62	62	62	67	76	76	65	33	23	40	51	42	46	36	37	37
	School Shifted	13	22	28	31	34	40	75	74	62	78	102	102	109	110	99	80	62	62	62	62	67	76	76	65	33	23	40	51	42	46	36	37	37
	Alt Original	0	0	0	6	32	32	39	41	32	24	29	35	38	41	52	98	96	78	84	84	93	98	85	90	78	60	69	75	78	82	86	91	80
	Alt School Shifted	0	0	0	6	32	32	39	41	32	24	29	35	38	41	52	98	96	78	84	84	93	98	85	90	78	60	69	75	78	82	86	91	80

		2008				2009				2010				2011				2012				2013				2014			
Worker	Auto%: 40.0% Occupancy: 1.90																												
	Original	9	29	84	258	376	434	478	409	362	282	300	284	377	406	417	399	375	269	211	119	112	200	119	68	49	12	5	10
	School Shifted	9	29	84	258	376	434	478	409	362	282	300	284	438	415	434	417	392	280	295	125	106	86	59	50	33	4	5	10
	Alt Original	0	36	108	168	244	319	444	462	440	366	352	349	392	406	417	399	375	269	211	119	112	200	119	68	49	12	5	10
	Alt School Shifted	0	36	108	168	244	319	444	462	440	366	352	349	453	415	434	417	392	280	295	125	106	86	59	50	33	4	5	10
Truck																													
	Original	21	35	71	94	106	68	63	72	32	46	36	44	45	40	49	58	40	42	34	33	51	59	40	20	26	52	19	14
	School Shifted	21	35	71	94	106	68	63	72	32	46	36	44	78	51	49	60	49	91	71	51	27	12	19	18	8	0	19	14
	Alt Original	0	24	37	29	44	91	87	91	69	78	86	50	48	40	49	58	40	42	34	33	51	59	40	20	26	52	19	14
	Alt School Shifted	0	24	37	29	44	91	87	91	69	78	86	50	81	51	49	60	49	91	71	51	27	12	19	18	8	0	19	14

Table H.1: Projected Worker

		4Q 2010			1Q 2011			2Q 2011			3Q 2011			4Q 2011			1Q 2012			2Q 2012			3Q 2012			4Q 2012			1Q 2013			2Q 2013		
		Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
Worker	Original	1311	1269	1462	1623	1916	1835	1841	1956	1986	2028	1993	1927	1950	1866	1872	1858	2006	1482	1333	1309	1192	1101	1042	867	724	535	439	494	595	504	708	1068	1077
	School Shifted	1311	1269	1462	1647	2321	2275	1870	1995	2047	2094	2071	2013	2033	1952	1955	1944	2084	1561	1396	1360	1232	1121	1510	1573	819	535	430	475	570	460	458	417	346
	Alt Original	1566	1662	1750	1801	1941	1848	1843	1956	1986	2028	1993	1927	1950	1866	1872	1858	2006	1482	1333	1309	1192	1101	1042	867	724	535	439	494	595	504	708	1068	1077
	Alt School Shifted	1566	1662	1750	1825	2346	2288	1872	1995	2047	2094	2071	2013	2033	1952	1955	1944	2084	1561	1396	1360	1232	1121	1710	1373	819	535	430	475	570	460	458	417	346
Truck	Original	44	45	44	48	47	40	40	40	40	44	51	52	60	60	54	39	38	41	41	41	44	43	29	28	32	32	33	37	43	73	66	58	52
	School Shifted	44	45	44	58	91	86	53	53	46	44	51	53	62	62	56	42	41	64	68	98	106	76	68	67	71	50	31	31	31	19	12	12	12
	Alt Original	57	48	47	51	50	43	41	40	40	44	51	52	60	60	54	39	38	41	41	41	44	43	29	28	32	32	33	37	43	73	66	58	52
	Alt School Shifted	57	48	47	61	94	89	54	53	46	44	51	53	62	62	56	42	41	64	68	98	106	76	68	67	71	50	31	31	31	19	12	12	12

Table H.1: Projected Worker

		3Q 2013			4Q 2013			1Q 2014			2Q 2014			3Q 2014			4Q 2014		
		Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14
Worker	Original	872	465	358	353	308	304	270	250	177	106	42	20	3	0	70	65	51	27
	School Shifted	288	284	275	267	225	218	192	171	114	55	2	0	0	0	70	65	51	27
	Alt Original	872	465	358	353	308	304	270	250	177	106	42	20	3	0	70	65	51	27
	Alt School Shifted	288	284	275	267	225	218	192	171	114	55	2	0	0	0	70	65	51	27
Truck	Original	56	40	23	23	23	14	10	32	36	59	62	34	16	20	20	20	20	0
	School Shifted	16	21	21	21	21	12	8	8	8	1	0	0	16	20	20	20	20	0
	Alt Original	56	40	23	23	23	14	10	32	36	59	62	34	16	20	20	20	20	0
	Alt School Shifted	16	21	21	21	21	12	8	8	8	1	0	0	16	20	20	20	20	0

Short Term Emissions					Source Parameters					NONROAD Emission Factor (g/hp-hr)					Short Term Nonroad Engine Emissions (g/s)				Grading Operation	Grading Operation
Work Task	Location/Site	Start Date	End Date	Equipment Type	Abbreviation	Engine	Power Output (hp)	Nonroad Engines	Daily Use (%)	$PM_{2.5}$	PM_{10}	CO	CO	NO_X	$PM_{2.5}$	PM_{10}	CO 1-Hr	CO 8-Hr	$PM_{2.5}$	PM_{10}
Interiors	Site 9	6/22/2012	11/13/2012	Drill	OCE	Electric	4	7	40%											
		6/22/2012	11/13/2012	Masonry Bench Saw	CS	Electric	1.5	4	10%											
		6/22/2012	11/13/2012	Cut off saws	CS	Electric	2	2	10%											
		6/22/2012	11/13/2012	Demolition Hammer	OCE	Electric	1	4	20%											
		6/22/2012	11/13/2012	Mortar Mixer	CMM	Gasoline	8	5	50%	0.060	0.066	409.836	409.836	1.676	3.35E-04	3.64E-04	4.55E+00	2.28E+00		
		6/22/2012	11/13/2012	Core Drilling	OCE	Electric	5	6	10%											
		6/22/2012	11/13/2012	Fork Lift	FL	Diesel	5	2	20%	0.207	0.214	1.416	1.416	2.635	1.15E-04	1.19E-04	3.93E-03	7.87E-04		
		6/22/2012	11/13/2012	Jack Hammer	CPE	Electric	55	1	10%											
Excavation	Site 10	8/6/2012	10/9/2012	Generators	LCGS	Diesel	400	1	50%	0.004	0.004	0.648	0.648	2.065	1.99E-04	2.05E-04	7.20E-02	3.60E-02		
		8/6/2012	10/9/2012	Excavator	E	Diesel	250	1	40%	0.009	0.009	0.479	0.479	1.404	2.39E-04	2.47E-04	3.32E-02	1.33E-02		
		8/6/2012	10/9/2012	Submersible Pump	LCP	Electric	1	6	20%											
		8/6/2012	10/9/2012	Jack Hammer	CPE	Electric	55	3	25%											
		8/6/2012	10/9/2012	Compactor	R	Diesel	105	1	40%	0.011	0.011	0.718	0.718	1.848	1.28E-04	1.32E-04	2.09E-02	8.37E-03		
		8/6/2012	10/9/2012	Pile Drives	C	Diesel	310	1	75%	0.004	0.004	0.430	0.430	1.684	2.54E-04	2.62E-04	3.70E-02	2.78E-02		
		8/6/2012	10/9/2012	Wheel Loader	TLB	Diesel	50	1	10%	0.113	0.116	0.678	0.678	1.036	1.57E-04	1.61E-04	9.42E-03	9.42E-04		
		8/6/2012	10/9/2012	Demolition Hammer	OCE	Electric	1	4	30%											
		8/6/2012	10/9/2012	Backhoe/Loader	TLB	Gasoline	60	1	20%	0.031	0.033	14.581	14.581	0.636	1.03E-04	1.11E-04	2.43E-01	4.86E-02		
		8/6/2012	10/9/2012	Bulldozer	CTD	Diesel	205	1	20%	0.008	0.009	0.505	0.505	1.520	9.56E-05	9.85E-05	2.87E-02	5.75E-03	1.48E-05	3.65E-04
Parking Structure	Site 12	8/6/2012	10/9/2012	Concrete Pump	OCE	Diesel	400	2	50%	0.004	0.008	1.139	1.139	2.520	4.35E-04	8.63E-04	2.53E-01	1.27E-01		
		8/6/2012	10/9/2012	Jack Hammer	CPE	Electric	55	3	10%											
		8/6/2012	10/9/2012	Compactor	R	Diesel	105		10%	0.011	0.011	0.718	0.718	1.848						
		8/6/2012	10/9/2012	Wheel Loader	TLB	Diesel	50		10%	0.113	0.116	0.678	0.678	1.036						
		8/6/2012	10/9/2012	Rebar Cutter	OCE	Electric	120V	3	10%											
		8/6/2012	10/9/2012	Pile Drives	C	Diesel	310		75%	0.004	0.004	0.430	0.430	1.684						
		8/6/2012	10/9/2012	Compressor	OCE	Electric	125	1	10%											
		8/6/2012	10/9/2012	Rebar Bender	OCE	Electric	120V	2	10%											
		8/6/2012	10/9/2012	Diaphragm Pump	LCP	Gasoline	4	2	10%	5.575	6.060	80.548	80.548	0.476	1.24E-03	1.35E-03	1.79E-01	1.79E-02		
		8/6/2012	10/9/2012	Cut off saws	CS	Electric	2	2	30%											
		8/6/2012	10/9/2012	Demolition Hammer	OCE	Electric	1		20%											
		8/6/2012	10/9/2012	Mortar Mixer	CMM	Gasoline	8	2	10%	0.060	0.066	409.836	409.836	1.676	2.68E-05	2.92E-05	1.82E+00	1.82E-01		
		8/6/2012	10/9/2012	Core Drilling	OCE	Electric	5	3	10%											
		8/6/2012	10/9/2012	Angle Grinder	OCE	Electric	1	2	10%											
		8/6/2012	10/9/2012	Towable Hole Digger	OCE	Gasoline	8	2	3%	0.050	0.054	345.495	345.495	1.332	6.61E-06	7.19E-06	1.54E+00	4.61E-02		
		8/6/2012	10/9/2012	2 ton Chain Hoist	OCE	manual		2	20%											
		8/6/2012	10/9/2012	Power Trowel	PE	Gasoline	8	1	20%	0.061	0.066	424.847	424.847	1.637	2.71E-05	2.95E-05	9.44E-01	1.89E-01		

Work Task	Location/ Site	Start Date	End Date	Equipment Type	Abbreviation	Power Output (hp)	Deliveries Peak Hour Maximum	Peak Deliveries per day	Total Deliveries per Period	Trucks Idling Emissions (g/s)	Trucks Engine Emissions (g/s)	ST PM_{10} Road Dust	ST $PM_{2.5}$Transfer Operation Dust	ST PM_{10} Transfer Operation Dust	CO1HR Trucks Idling Emissions (g/s)	CO1HR Trucks Engine Emissions (g/s)
Interiors	Site 9	6/22/2012	11/13/2012	Articulated Dump Truck	DT	205	3	7	660	1.43E-05	1.20E-06	1.09E-02	2.45E-04	7.80E-04	1.47E-04	1.24E-05
Interiors	Site 9	6/22/2012	11/13/2012	Straight Truck 6 wheel	ST	60	2	4	165	4.90E-06	6.87E-07	3.86E-03			5.88E-05	8.24E-06
Interiors	Site 9	6/22/2012	11/13/2012	Material Trucks	MT	60	6	14	1320	1.71E-05	2.40E-06	1.35E-02			1.76E-04	2.47E-05
Foundations	Site 10	8/6/2012	1/28/2013	Articulated Dump Truck	DT	205	2	5	326	1.02E-05	4.02E-07	3.66E-03	1.75E-04	5.57E-04	9.80E-05	3.86E-06
Foundations	Site 10	8/6/2012	1/28/2013	Straight Truck 6 wheel	ST	60	2	5	585	6.12E-06	4.02E-07	2.26E-03			5.88E-05	3.86E-06
Foundations	Site 10	10/10/2012	1/28/2013	Concrete Truck 11 cy	CT	500	4	10	445	1.38E-05	8.05E-07	6.83E-03			1.32E-04	1.16E-06
Parking Structure	Site 12	8/6/2012	10/9/2012	Articulated Dump Truck	DT	205	8	20	1675	4.08E-05	1.61E-06	1.46E-02	7.00E-04	2.23E-03	3.92E-04	1.54E-05
Parking Structure	Site 12	8/6/2012	10/9/2012	Straight Truck 6 wheel	ST	60	3	7	485	8.57E-06	5.63E-07	3.16E-03			8.82E-05	5.79E-06
Parking Structure	Site 12	8/6/2012	10/9/2012	Concrete Truck 11 cy	CT	500	11	28	2665	3.86E-05	2.25E-06	1.91E-02			3.64E-04	3.19E-06

Short Term Emissions Source Code	Description	Short-Term Source Area (m2)	PM2.5	PM10	CO 1-Hr	CO 8-HR
S10EXCT1	Site 10-Excavation (Concrete Truck 1)		7.29E-06	7.98E-06	2.13E-03	2.37E-04
S10EXCT2	Site 10-Excavation (Concrete Truck 2)		7.29E-06	7.98E-06	2.13E-03	2.37E-04
S10EXDTO	Site 10-Excavation (TO+DT)	453.4	4.09E-07	9.32E-06	7.26E-06	7.56E-07
S10EXGN	Site 10-Excavation (Generator)		1.99E-04	2.05E-04	7.20E-02	3.60E-02
S10EXPIT	Site 10-Excavation (Excavation Pit)	874.1	1.13E-06	1.57E-06	4.26E-04	1.20E-04
S10EXTK	Site 10-Excavation (Trucks)	451.6	1.44E-08	1.58E-08	4.52E-06	4.71E-07
S10EXTRD	Site 10-Excavation (Truck Road dust)	447.7	0.00E+00	5.05E-06	0.00E+00	0.00E+00
S12PKCP1	Site 12-Parking (Concrete Pump1)		2.18E-04	4.32E-04	1.27E-01	6.33E-02
S12PKCP2	Site 12-Parking (Concrete Pump2)		2.18E-04	4.32E-04	1.27E-01	6.33E-02
S12PKCT1	Site 12 - Parking (Concrete Truck 1)		1.02E-05	1.12E-05	2.93E-03	3.32E-04
S12PKCT2	Site 12 - Parking (Concrete Truck 2)		1.02E-05	1.12E-05	2.93E-03	3.32E-04
S12PKCT3	Site 12 - Parking (Concrete Truck 3)		1.02E-05	1.12E-05	2.93E-03	3.32E-04
S12PKCT4	Site 12 - Parking (Concrete Truck 4)		1.02E-05	1.12E-05	2.93E-03	3.32E-04
S12PKDTO	Site 12 - Parking (TO + DT)	442.6	1.68E-06	3.82E-05	2.97E-05	3.10E-06
S12PKPIT	Site 12-Parking (Pit Equipments)	873.4	1.49E-06	1.62E-06	5.13E-03	4.98E-04
S12PKTK	Site 12 - Parking (Trucks)	448	2.04E-08	2.23E-08	6.84E-06	6.65E-07
S12PKTRD	Site 12 - Parking (Truck Road Dust)	443.7	0.00E+00	7.13E-06	0.00E+00	0.00E+00
S9INDTO	Site 9 - Interiors (TO+DT)	267.9	9.72E-07	4.38E-05	1.95E-05	1.90E-06
S9INTK	Site 9 - Interiors (Trucks)	265.2	9.48E-08	1.05E-07	3.37E-05	3.16E-06
S9INTMM1	Site 9-Interior (Mortar Mixer 1)		6.70E-05	7.29E-05	9.11E-01	4.55E-01
S9INTMM2	Site 9-Interior (Mortar Mixer 2)		6.70E-05	7.29E-05	9.11E-01	4.55E-01
S9INTMM3	Site 9-Interior (Mortar Mixer 3)		6.70E-05	7.29E-05	9.11E-01	4.55E-01
S9INTMM4	Site 9-Interior (Mortar Mixer 4)		6.70E-05	7.29E-05	9.11E-01	4.55E-01
S9INTMM5	Site 9-Interior (Mortar Mixer 5)		6.70E-05	7.29E-05	9.11E-01	4.55E-01
S9INTRD	Site 9 - Interiors (Truck Road Dust)	267.1	0.00E+00	6.50E-05	0.00E+00	0.00E+00

Annual Work Task	Location/Site	Start Date	End Date	Equipment Type	Source Parameters: Abbreviation	Engine	Power Output (hp)	Nonroad Engines	Usage Factor (%)	Average Use (%)	Annual Fraction	NONROAD Emission Factor (g/hp-hr): $PM_{2.5}$	PM_{10}	NO_x	Annual Nonroad Engine Emissions (g/s): $PM_{2.5}$	PM_{10}	NOx	Grading Operation $PM_{2.5}$	Grading Operation PM_{10}
Interiors	**Site 9**	**6/22/2012**	**11/13/2012**	**Drill**	OCE	Electric	4	7	40%	30%	0.28								
		6/22/2012	**11/13/2012**	**Masonry Bench Saw**	CS	Electric	1.5	4	10%	40%	0.28								
		6/22/2012	**11/13/2012**	**Cut off saws**	CS	Electric	2	2	10%	20%	0.28								
		6/22/2012	**11/13/2012**	**Demolition Hammer**	OCE	Electric	1	4	20%	40%	0.28								
		6/22/2012	**11/13/2012**	**Mortar Mixer**	CMM	Gasoline	8	5	50%	40%	0.28	0.060	0.066	1.676	3.78E-05	4.11E-05	1.05E-03		
		6/22/2012	**11/13/2012**	**Core Drilling**	OCE	Electric	5	6	10%	40%	0.28								
		6/22/2012	**11/13/2012**	**Fork Lift**	FL	Diesel	5	2	20%	30%	0.28	0.207	0.214	2.635	9.76E-06	1.01E-05	1.24E-04		
		6/22/2012	**11/13/2012**	**Jack Hammer**	CPE	Electric	55	1	10%	30%	0.28								
Exteriors	**Site 9**	**11/14/2012**	**3/12/2013**	**Compactor**	R	Diesel	105	1	50%	20%	0.23	0.011	0.011	1.848	7.44E-06	7.67E-06	1.26E-03		
		11/14/2012	**3/12/2013**	**Asphalt Paver**	P	Diesel	300	2	50%	20%	0.23	0.008	0.008	1.629	3.20E-05	3.29E-05	6.32E-03		
		11/14/2012	**3/12/2013**	**Asphalt Laying Equipment**	PE	Diesel	300	2	20%	20%	0.23	0.008	0.008	1.931	1.23E-05	1.27E-05	3.00E-03		
		11/14/2012	**3/12/2013**	**Backhoe/Loader**	TLB	Diesel	160	1	30%	20%	0.23	0.007	0.007	1.091	4.04E-06	4.17E-06	6.78E-04		
Excavation	**Site 10**	**8/6/2012**	**10/9/2012**	**Generators**	LCGS	Diesel	400	1	50%	100%	0.07	0.004	0.004	2.065	1.31E-05	1.35E-05	7.54E-03		
		8/6/2012	**10/9/2012**	**Excavator**	E	Diesel	250	1	40%	80%	0.07	0.009	0.009	1.404	1.26E-05	1.30E-05	2.05E-03		
		8/6/2012	**10/9/2012**	**Submersible Pump**	LCP	Electric	1	6	20%	50%	0.07								
		8/6/2012	**10/9/2012**	**Jack Hammer**	CPE	Electric	55	3	25%	50%	0.07								
		8/6/2012	**10/9/2012**	**Compactor**	R	Diesel	105	1	40%	50%	0.07	0.011	0.011	1.848	4.20E-06	4.33E-06	7.09E-04		
		8/6/2012	**10/9/2012**	**Pile Drives**	C	Diesel	310	1	75%	50%	0.07	0.004	0.004	1.684	8.35E-06	8.61E-06	3.58E-03		
		8/6/2012	**10/9/2012**	**Wheel Loader**	TLB	Diesel	50	1	10%	30%	0.07	0.113	0.116	1.036	3.09E-06	3.18E-06	2.84E-05		
		8/6/2012	**10/9/2012**	**Demolition Hammer**	OCE	Electric	1	4	30%	40%	0.07								
		8/6/2012	**10/9/2012**	**Backhoe/Loader**	TLB	Gasoline	60	1	20%	80%	0.07	0.031	0.033	0.636	5.39E-06	5.86E-06	1.12E-04		
		8/6/2012	**10/9/2012**	**Bulldozer**	CTD	Diesel	205	1	20%	80%	0.07	0.008	0.009	1.520	5.03E-06	5.18E-06	9.11E-04	1.56E-07	3.84E-06
Foundation	**Site 10**	**10/10/2012**	**1/28/2013**	**Rebar Cutter**	OCE	Electric	120V	3	10%	20%	0.22								
		10/10/2012	**1/28/2013**	**Rebar Bender**	OCE	Electric	120V	2	10%	40%	0.22								
		10/10/2012	**1/28/2013**	**Diaphragm Pump**	LCP	Gasoline	4	2	10%	20%	0.22	5.575	6.060	0.476	5.36E-05	5.83E-05	4.58E-06		
		10/10/2012	**1/28/2013**	**Cut off saws**	CS	Electric	2	2	10%	20%	0.22								
		10/10/2012	**1/28/2013**	**Concrete Pumps**	OCE	Diesel	400	2	50%	50%	0.22	0.004	0.008	2.520	4.71E-05	9.34E-05	3.03E-02		
		10/10/2012	**1/28/2013**	**Compressor**	OCE	Electric	125	1	10%	30%	0.22								
		10/10/2012	**1/28/2013**	**Mortar Mixer**	CMM	Gasoline	8	5	50%	40%	0.22	0.060	0.066	1.676	2.90E-05	3.15E-05	8.06E-04		
		10/10/2012	**1/28/2013**	**Core Drilling**	OCE	Electric	5	6	10%	40%	0.22								
		10/10/2012	**1/28/2013**	**Angle Grinder**	OCE	Electric	1	4	10%	20%	0.22								
		10/10/2012	**1/28/2013**	**Towable Hole Digger**	OCE	Gasoline	8	5	10%	50%	0.22	0.050	0.054	1.332	5.97E-06	6.48E-06	1.60E-04		
		10/10/2012	**1/28/2013**	**2 ton Chain Hoist**	OCE	manual		2	3%	20%	0.22								
		10/10/2012	**1/28/2013**	**Power Trowel**	PE	Gasoline	8	5	20%	50%	0.22	0.061	0.066	1.637	1.47E-05	1.59E-05	3.94E-04		
Superstructure	**Site 10**	**1/29/2013**	**7/17/2013**	**Tower Crane**	C	Diesel	131	1	75%	100%	0.33	0.006	0.006	1.230	5.58E-05	5.75E-05	1.12E-02		
		1/29/2013	**7/17/2013**	**Jack Hammer**	CPE	Electric	55	3	10%	30%	0.33								
		1/29/2013	**7/17/2013**	**Wheel Loader**	TLB	Diesel	50	3	40%	30%	0.33	0.096	0.099	0.984	1.61E-04	1.66E-04	1.64E-03		
		1/29/2013	**7/17/2013**	**Rebar Cutter**	OCE	Electric	120V	3	75%	20%	0.33								
		1/29/2013	**7/17/2013**	**Rebar Bender**	OCE	Electric	120V	2	10%	40%	0.33								
		1/29/2013	**7/17/2013**	**Concrete Pumps**	OCE	Diesel	400	2	50%	50%	0.33	0.004	0.008	2.311	7.27E-05	1.44E-04	4.29E-02		
		1/29/2013	**7/17/2013**	**Hoist**	C	Electric	100	2	10%	100%	0.33								
		1/29/2013	**7/17/2013**	**Compressor**	OCE	Electric	125	1	10%	30%	0.33								
		1/29/2013	**7/17/2013**	**Diaphragm Pump**	LCP	Gasoline	4	2	10%	20%	0.33	5.585	6.071	0.438	8.30E-05	9.02E-05	6.50E-06		
		1/29/2013	**7/17/2013**	**Cut off saws**	CS	Electric	2	2	10%	20%	0.33								
		1/29/2013	**7/17/2013**	**Demolition Hammer**	OCE	Electric	1	4	10%	40%	0.33								
		1/29/2013	**7/17/2013**	**Mortar Mixer**	CMM	Gasoline	8	5	10%	40%	0.33	0.060	0.065	1.662	8.91E-06	9.68E-06	2.47E-04		
		1/29/2013	**7/17/2013**	**Core Drilling**	OCE	Electric	5	6	10%	40%	0.33								
		1/29/2013	**7/17/2013**	**Angle Grinder**	OCE	Electric	1	4	10%	20%	0.33								
		1/29/2013	**7/17/2013**	**2 ton Chain Hoist**	OCE	manual		2	3%	20%	0.33								
		1/29/2013	**7/17/2013**	**Power Trowel**	PE	Gasoline	8	5	25%	50%	0.33	0.061	0.066	1.637	2.83E-05	3.08E-05	7.60E-04		
Interiors	**Site 10**	**7/18/2013**	**12/9/2013**	**Drill**	OCE	Electric	4	7	40%	30%	0.05								
		7/18/2013	**12/9/2013**	**Masonry Bench Saw**	CS	Electric	1.5	4	10%	40%	0.05								
		7/18/2013	**12/9/2013**	**Cut off saws**	CS	Electric	2	2	10%	20%	0.05								
		7/18/2013	**12/9/2013**	**Demolition Hammer**	OCE	Electric	1	4	20%	40%	0.05								
		7/18/2013	**12/9/2013**	**Mortar Mixer**	CMM	Gasoline	8	5	50%	40%	0.05	0.060	0.065	1.662	6.21E-06	6.75E-06	1.72E-04		
		7/18/2013	**12/9/2013**	**Core Drilling**	OCE	Electric	5	6	10%	40%	0.05								
		7/18/2013	**12/9/2013**	**Fork Lift**	FL	Diesel	5	2	20%	30%	0.05	0.210	0.217	2.635	1.63E-06	1.68E-06	2.05E-05		
		7/18/2013	**12/9/2013**	**Jack Hammer**	CPE	Electric	55	1	10%	30%	0.05								
Parking Structure	**Site 12**	**8/6/2012**	**10/9/2012**	**Concrete Pump**	OCE	Diesel	400	2	50%	30%	0.33	0.004	0.008	2.520	4.33E-05	8.59E-05	2.79E-02		
		8/6/2012	**10/9/2012**	**Jack Hammer**	CPE	Electric	55	3	10%	30%	0.33								
		8/6/2012	**10/9/2012**	**Compactor**	R	Diesel	105		10%	50%	0.33	0.011	0.011	1.848					
		8/6/2012	**10/9/2012**	**Wheel Loader**	TLB	Diesel	50		10%	30%	0.33	0.113	0.116	1.036					
		8/6/2012	**10/9/2012**	**Rebar Cutter**	OCE	Electric	120V	3	10%	20%	0.33								
		8/6/2012	**10/9/2012**	**Pile Drives**	C	Diesel	310		75%	50%	0.33	0.004	0.004	1.684					
		8/6/2012	**10/9/2012**	**Compressor**	OCE	Electric	125	1	10%	30%	0.33								
		8/6/2012	**10/9/2012**	**Rebar Bender**	OCE	Electric	120V	2	10%	40%	0.33								
		8/6/2012	**10/9/2012**	**Diaphragm Pump**	LCP	Gasoline	4	2	10%	20%	0.33	5.575	6.060	0.476	8.21E-05	8.93E-05	7.02E-06		
		8/6/2012	**10/9/2012**	**Cut off saws**	CS	Electric	2	2	30%	20%	0.33								
		8/6/2012	**10/9/2012**	**Demolition Hammer**	OCE	Electric	1		20%	40%	0.33								
		8/6/2012	**10/9/2012**	**Mortar Mixer**	CMM	Gasoline	8	2	10%	40%	0.33	0.060	0.066	1.676	3.56E-06	3.87E-06	9.88E-05		
		8/6/2012	**10/9/2012**	**Core Drilling**	OCE	Electric	5	3	10%	40%	0.33								
		8/6/2012	**10/9/2012**	**Angle Grinder**	OCE	Electric	1	2	10%	20%	0.33								
		8/6/2012	**10/9/2012**	**Towable Hole Digger**	OCE	Gasoline	8	2	3%	50%	0.33	0.050	0.054	1.332	1.10E-06	1.19E-06	2.94E-05		
		8/6/2012	**10/9/2012**	**2 ton Chain Hoist**	OCE	manual		2	20%	20%	0.33								
		8/6/2012	**10/9/2012**	**Power Trowel**	PE	Gasoline	8	1	20%	50%	0.33	0.061	0.066	1.637	4.49E-06	4.88E-06	1.21E-04		

Work Task	Location/ Site	Start Date	End Date	Equipment Type	Annual Fraction	Abbreviation	Power Output (hp)	Deliveries Peak Hour Maximum	Peak Deliveries per day	Total Deliveries per Period	Trucks Idling Emissions (g/s)	Trucks Engine Emissions (g/s)	Annual $PM_{2.5}$ Transfer Operation Dust		
Superstructure	**Site 9**	**1/6/2012**	**6/21/2012**	**Straight Truck 6 wheel rack/fuel/water**	0.04	ST	60	1	3	258	1.31E-07	1.83E-08			
Superstructure	**Site 9**	**1/6/2012**	**6/21/2012**	**Concrete Truck 11 cy**	0.04	CT	500	6	15	921	7.36E-07	9.17E-08			
Interiors	**Site 9**	**6/22/2012**	**11/13/2012**	**Articulated Dump Truck**	0.28	DT	205	3	7	660	4.03E-06	3.39E-07	6.91E-05		
Interiors	**Site 9**	**6/22/2012**	**11/13/2012**	**Straight Truck 6 wheel rack/fuel/water**	0.28	ST	60	2	4	165	1.38E-06	1.94E-07			
Interiors	**Site 9**	**6/22/2012**	**11/13/2012**	**Material Trucks**	0.28	MT	60	6	14	1320	4.84E-06	6.78E-07			
Exteriors	**Site 9**	**11/14/2012**	**3/12/2013**	**Articulated Dump Truck**	0.23	DT	205	5	12	693	5.70E-06	4.80E-07	9.78E-05		
Exteriors	**Site 9**	**11/14/2012**	**3/12/2013**	**Straight Truck 6 wheel rack/fuel/water**	0.23	ST	60	3	7	99	2.00E-06	2.80E-07			
Exteriors	**Site 9**	**11/14/2012**	**3/12/2013**	**Material Trucks**	0.23	MT	60	5	12	792	3.42E-06	4.80E-07			
Foundations	**Site 10**	**8/6/2012**	**1/28/2013**	**Articulated Dump Truck**	0.28	DT	205	2	5	326	2.88E-06	1.14E-07	4.94E-05		
Foundations	**Site 10**	**8/6/2012**	**1/28/2013**	**Straight Truck 6 wheel rack/fuel/water**	0.28	ST	60	2	5	585	1.73E-06	1.14E-07			
Foundations	**Site 10**	**10/10/2012**	**1/28/2013**	**Concrete Truck 11 cy**	0.22	CT	500	4	10	445	2.98E-06	1.74E-07			
Superstructure	**Site 10**	**1/29/2013**	**7/17/2013**	**Straight Truck 6 wheel rack/fuel/water**	0.33	ST	60	2	5	516	2.05E-06	1.34E-07			
Superstructure	**Site 10**	**1/29/2013**	**7/17/2013**	**Concrete Truck 11 cy**	0.33	CT	500	6	15	1001	6.91E-06	4.03E-07			
Interiors	**Site 10**	**7/18/2013**	**12/9/2013**	**Articulated Dump Truck**	0.05	DT	205	3	8	660	7.60E-07	3.00E-08	1.30E-05		
Interiors	**Site 10**	**7/18/2013**	**12/9/2013**	**Straight Truck 6 wheel rack/fuel/water**	0.05	ST	60	2	4	165	2.28E-07	1.50E-08			
Interiors	**Site 10**	**7/18/2013**	**12/9/2013**	**Material Trucks**	0.05	MT	60	6	15	1320	8.55E-07	5.62E-08			
Parking Structure	**Site 12**	**8/6/2012**	**10/9/2012**	**Articulated Dump Truck**	0.33	DT	205	8	20	1675	1.35E-05	5.33E-07	2.32E-04		
Parking Structure	**Site 12**	**8/6/2012**	**10/9/2012**	**Straight Truck 6 wheel rack/fuel/water**	0.33	ST	60	3	7	485	2.84E-06	1.87E-07			
Parking Structure	**Site 12**	**8/6/2012**	**10/9/2012**	**Concrete Truck 11 cy**	0.33	CT	500	11	28	2665	1.28E-05	7.47E-07			

Annual Emissions Source Code	Description	Annual Source Area (m2)	PM2.5	NOx
A9ININT	Site 9-Interiors (Interior Equipments)	846.8	5.62E-08	1.39E-06
A9EXTEQ	Site 9- Exteriors (Equipment)	858.7	6.50E-08	1.31E-05
A10EXPIT	Site 10-Excavation (Equipments)	874.5	4.44E-08	8.45E-06
A10EXGN	Site 10-Excavation (Generator)		1.31E-05	7.54E-03
A10FDCP	Site 10 Foundation (Concrete Pump)	146.3	3.22E-07	2.07E-04
A10FDPIT	Site 10-Foundation (Equipments)	877.4	1.18E-07	1.56E-06
A10SSCP	Site 10 Superstructure (Concrete Pump)	164.7	4.41E-07	2.61E-04
A10SSPIT	Site 10-Superstructure (Equipments)	844.4	3.99E-07	1.64E-05
A10ININT	Site 10 -interior (equipments)	876.1	8.94E-09	2.20E-07
A12PKPIT	Site 12-Parking (Interior pit)	872.3	1.05E-07	2.93E-07
A12PKCP	Site 12-Parking (Concrete Pumps)	236.5	1.83E-07	1.18E-04
A9INTO1	Site 9 - Interiors (Transfer Operations)	239.5	3.07E-07	7.08E-07
A9INCMT	Site 9 -Interiors (Concrete Trucks + MT)	226.5	3.13E-08	1.24E-06
A9INTRD	Site 9 - Interior (Truck Road Dust)	242.3	0.00E+00	0.00E+00
A9EXTO1	Site 9 - Exteriors (Transfer Operations)	214.0	4.86E-07	1.12E-06
A9EXCMT	Site 9 - Exterior (Concrete Trucks + MT)	225.9	2.73E-08	1.09E-06
A9EXTRD	Site 9 -Exteriors (Truck Road Dust)	226.2	0.00E+00	0.00E+00
A10FDTO1	Site 10 - Foundation (Transfer Operations)	300.7	1.74E-07	3.78E-07
A10FDCMT	Site 10 -Foundation (Concrete Trucks + MT)	214.6	2.33E-08	8.94E-07
A10FDTRD	Site 10 - Foundation (Truck Road Dust)	226.8	0.00E+00	0.00E+00
A10SSMT	Site10 -Superstructure (Concrete Trucks + MT)	275.8	3.44E-08	1.32E-06
A10SSTRD	Site 10 - Superstructure (Truck Road Dust)	308.2	0.00E+00	0.00E+00
A10INTO1	Site 10 - Interiors (Transfer Operations)	273.3	5.06E-08	1.10E-07
A10INCMT	Site 10 -Interiors (Concrete Trucks + MT)	307.7	3.75E-09	1.44E-07
A10INTRD	Site 10 - Interior (Truck Road Dust)	311.8	0.00E+00	0.00E+00
A12PKTO1	Site 12 - Parking (Transfer Operations)	316.6	7.77E-07	1.69E-06
A12PKCMT	Site 12 -Parking (Concrete Trucks + MT)	290.6	5.70E-08	2.19E-06
A12PKTRD	Site 12 - Parking (Truck Road Dust)		0.00E+00	0.00E+00

Estimated Peak-Hour Emission Rates
Fugitive Dust Sources - PM_{10}
Mobile Equipment Operating on Unpaved Roads

		Analysis Period	Surface Type	k	s (% silt)	W	PM_{10} Emission Factor g/VMT
Concrete Truck	CT	Short Term	Unpaved	1.5	8.5	30	1405.95
Dump Truck	DT	Short Term	Unpaved	1.5	8.5	35	1506.94
Heavy Truck		Short Term	Unpaved	1.5	8.5	12	930.89
Concrete Truck	CT	Annual[b]	Unpaved	1.5	8.5	30	1004.25
Dump Truck	DT	Annual[b]	Unpaved	1.5	8.5	35	1076.39
Heavy Truck		Annual[b]	Unpaved	1.5	8.5	12	664.92

Notes: a. Road dust emissions were not calculated on a per vehicle basis but rather on a fleet-wide basis. Excavators, lo backhoes move about in small incremental steps as the excavation progresses (i.e., minimal distances) and wo generate negligible amounts of fugitive dust.
b. Annual emissions were multiplied by 5/7 to account for a five day work week.

Unpaved Road Emission Factor - Sample Calculation (Short Term):

$E_f = k * (s/12)^a * (W/3)^b$ Equation 1a from Section 13.2.2 of USEPA's AP-42

where:

E_f = size specific emission factor in pounds per vehicle mile traveled (lb/VMT)

k = an empirical constant selected from AP-42 Table 13.2.2-2 for PM_{10}

s = surface material silt content in percent silt selected from AP-42 Table 13.2.2-1 (for a construction site)

a = an empirical constant selected from AP-42 Table 13.2.2-2 for PM_{10}

W = mean vehicle weight in tons

b = an empirical constant selected from AP-42 Table 13.2.2-2 for PM_{10}

$E_f = 1.5 * (8.5/12)^{0.9} * (30/3)^{0.45} * 453.59$

E_f = 1406 g/VMT

Table HP-5A
Estimated Peak-Hour Short-Term Emission Rates
Fugitive Dust Sources - PM_{10} and $PM_{2.5}$
Transfer Operations

Equipment	Activity		Emission Factor[2] lb/ton	Number of Trucks (Peak Hour)	Volume Removed Hourly cubic yards[1]	Default Soil Density lbs/cubic yard	Tons Removed Hourly	PM_{10} Emission Rate lb/hr	PM_{10} Emission Rate g/s	$PM_{2.5}$ Emission Rate lb/hr	$PM_{2.5}$ Emission Rate g/s
--	Transfers to 15 cy Truck		2.42E-04	12	22.5	2,600	29	0.011	1.34E-03	3.3E-03	4.2E-04
--	Transfers to 15 cy Truck		2.42E-04	20	37.5	2,600	49	0.018	2.23E-03	5.6E-03	7.0E-04
--	Transfers to 15 cy Truck		2.42E-04	10	18.8	2,600	24	0.009	1.11E-03	2.8E-03	3.5E-04
--	Transfers to 15 cy Truck		2.42E-04	6	11.3	2,600	15	0.005	6.68E-04	1.7E-03	2.1E-04
--	Transfers to 15 cy Truck		2.42E-04	5	9.4	2,600	12	0.004	5.57E-04	1.4E-03	1.8E-04
--	Transfers to 15 cy Truck		2.42E-04	7	13.1	2,600	17	0.006	7.80E-04	1.9E-03	2.5E-04

Notes:

1. A maximum "excavation" transfer is based on…..
2. Emission factors for soil transfer operations are based on Equation 1 from Section 13.2.4 of AP-42. Emission factor calculations are provided below.

Transfer/Drop Operation Emission Factor - Sample Calculation for PM_{10}:

$E_f = k * (0.0032) * (U/5)^{1.3} / (M/2)^{1.4}$

where:

E_f = size specific emission factor in pounds per ton (lb/ton)

k = an empirical constant selected from AP-42 (0.35 for PM_{10} and 0.11 for $PM_{2.5}$)

U = mean wind speed in miles per hour (mph)

M = material moisture content in percent moisture (%) from Table 13.2.4-1 of AP-42 (for overburden)

$E_f = 0.35 * (0.0032) * (12.5/5)^{1.3} / (7.9/2)^{1.4}$

E_f = 5.39E-04 lb/ton

Sample Emission Rate Calculation for PM_{10} (loader):

$E_R = E_f\ PM_{10} * (soil\ volume * soil\ density / 2{,}000\ lbs/ton) * 453.59 / 60 / 60$

where:

E_R = PM_{10} emission rate in grams per second

$E_f\ PM_{10}$ = PM_{10} emission factor in lb/ton

soil volume = volume of soil handled in cubic yards per hour

soil density = 2,600 lbs/YD^3

1.5 = material handling factor (accounts for multiple handling) + some spraying

$E_R = 5.39E\text{-}04 * (45 * 2{,}600 / 2{,}000) * 1.5 * 453.59 / 60 / 60$

E_R = 5.96E-03 g/s

Estimated Peak-Hour Short-Term Emission Rates
Fugitive Dust Sources - PM10 and PM2.5
Transfer Operations

Activity		Emission Factor[2] lb/ton	Number of Trucks (Peak day)	Volume Removed Hourly cubic yards[1]	Default Soil Density lbs/cubic yard	Tons Removed Hourly	PM_{10} Emission Rate lb/hr	PM_{10} Emission Rate g/s	$PM_{2.5}$ Emission Rate lb/hr	$PM_{2.5}$ Emission Rate g/s
Transfers to 15 cy Truck		2.42E-04	5	9.4	2,600	12	0.004	5.57E-04	1.4E-03	1.8E-04
Transfers to 15 cy Truck		2.42E-04	8	15.0	2,600	20	0.007	8.91E-04	2.2E-03	2.8E-04
Transfers to 15 cy Truck		2.42E-04	7	13.1	2,600	17	0.006	7.80E-04	1.9E-03	2.5E-04
Transfers to 15 cy Truck		2.42E-04	20	37.5	2,600	49	0.018	2.23E-03	5.6E-03	7.0E-04
Transfers to 15 cy Truck		2.42E-04	12	22.5	2,600	29	0.011	1.34E-03	3.3E-03	4.2E-04

Notes:

1. A maximum "excavation" transfer is based on…..
2. Emission factors for soil transfer operations are based on Equation 1 from Section 13.2.4 of AP-42. Emission factor calculations are provided below.

Transfer/Drop Operation Emission Factor - Sample Calculation for PM_{10}:

$E_f = k * (0.0032) * (U/5)^{1.3} / (M/2)^{1.4}$

where:

E_f = size specific emission factor in pounds per ton (lb/ton)

k = an empirical constant selected from AP-42 (0.35 for PM_{10} and 0.11 for $PM_{2.5}$)

U = mean wind speed in miles per hour (mph)

M = material moisture content in percent moisture (%) from Table 13.2.4-1 of AP-42 (for overburden)

$E_f = 0.35 * (0.0032) * (12.5/5)^{1.3} / (7.9/2)^{1.4}$

E_f = 5.39E-04 lb/ton

Sample Emission Rate Calculation for PM_{10} (loader):

$E_R = E_f\ PM_{10} * (\text{soil volume} * \text{soil density} / 2{,}000\ \text{lbs/ton}) * 453.59 / 60 / 60$

where:

E_R = PM_{10} emission rate in grams per second

$E_f\ PM_{10}$ = PM_{10} emission factor in lb/ton

soil volume = volume of soil handled in cubic yards per hour

soil density = 2,600 lbs/YD^3

1.5 = material handling factor (accounts for multiple handling)

$E_R = 5.39E\text{-}04 * (9.4 * 2{,}600 / 2{,}000) * 1.5 * 453.59 / 60 / 60$

E_R = 1.24E-03 g/s

Estimated Peak-Hour Short-Term Emission Rates
Fugitive Dust Sources - PM_{10}
Grading Operations

Construction Equipment	Miles Traveled per Vehicle max per hr[1]	PM_{10} Factor lb/VMT	Uncontrolled Emissions[2]	
			PM_{10} Emissions lb/hr **per veh**	PM_{10} Emissions g/sec **per veh**
Bull Dozers	0.0947	0.0306	2.9E-03	3.7E-04

Notes:

1. 0.0947 miles is equal to 500 feet. *Best engineering judgement; based on the distance traveled back and forth by
2. Emission factors for grading operations are based on equations presented in Table 11.9-1 of AP-42. Emission Factor calculations are provided below.

Grading Operation Emission Factor - Sample Calculation for PM_{10}:

$E_f = 0.051 * (S)^{2.0} * PM_{10}$ scaling factor

where:

E_f = size specific emission factor in pounds per vehicle mile traveled (lb/VMT)

S = mean vehicle speed in miles per hour (mph)

PM_{10} scaling factor = an empirical constant selected from AP-42 for PM_{10}

$E_f = 0.051 * (1.0)^{2.0} * 0.60$

$E_f = 0.0306$ lb/VMT

Sample Emission Rate Calculation for PM_{10} (Dozer):

$E_R = E_f PM_{10}$ * miles traveled * 453.59 / 60 / 60

where:

$E_R = PM_{10}$ emission rate in grams per second

$E_f PM_{10} = PM_{10}$ emission factor in lb/VMT

$E_R = 0.0306 * 0.0947 * 453.59 / 60 / 60$

$E_R = 3.7E-04$ g/s

Estimated Peak-Hour Short-Term Emission Rates
Fugitive Dust Sources - $PM_{2.5}$
Grading Operations

Construction Equipment	Miles Traveled per Vehicle max per hr[1]	Paved $PM_{2.5}$ Factor lb/VMT	Uncontrolled Emissions	
			$PM_{2.5}$ Emissions lb/hr **per veh**	$PM_{2.5}$ Emissions g/sec **per veh**
Bull Dozers	0.0947	0.00124	1.2E-04	1.5E-05

Notes:
1. 0.0947 miles is equal to 500 feet.
2. Emission factors for grading operations are based on equations presented in Table 11.9-1 of AP-42. Emission Factor calculations are provided below.

Grading Operation Emission Factor - Sample Calculation for $PM_{2.5}$:

$E_f = 0.040 * (S)^{2.5} * PM_{2.5}$ scaling factor

where:

E_f = size specific emission factor in pounds per vehicle mile traveled (lb/VMT)

S = mean vehicle speed in miles per hour (mph)

$PM_{2.5}$ scaling factor = an empirical constant selected from AP-42 for $PM_{2.5}$

$E_f = 0.040 * (1.0)^{2.5} * 0.031$

$E_f = 0.00124$ lb/VMT

Sample Emission Rate Calculation for $PM_{2.5}$ (Dozer):

$E_R = E_f\ PM_{2.5}$ * miles traveled * 453.59 / 60 / 60

where:

$E_R = PM_{2.5}$ emission rate in grams per second

$E_f\ PM_{2.5} = PM_{2.5}$ emission factor in lb/VMT

$E_R = 0.00124 * 0.0947 * 453.59 / 60 / 60$

$E_R = 1.5E\text{-}05$ g/s

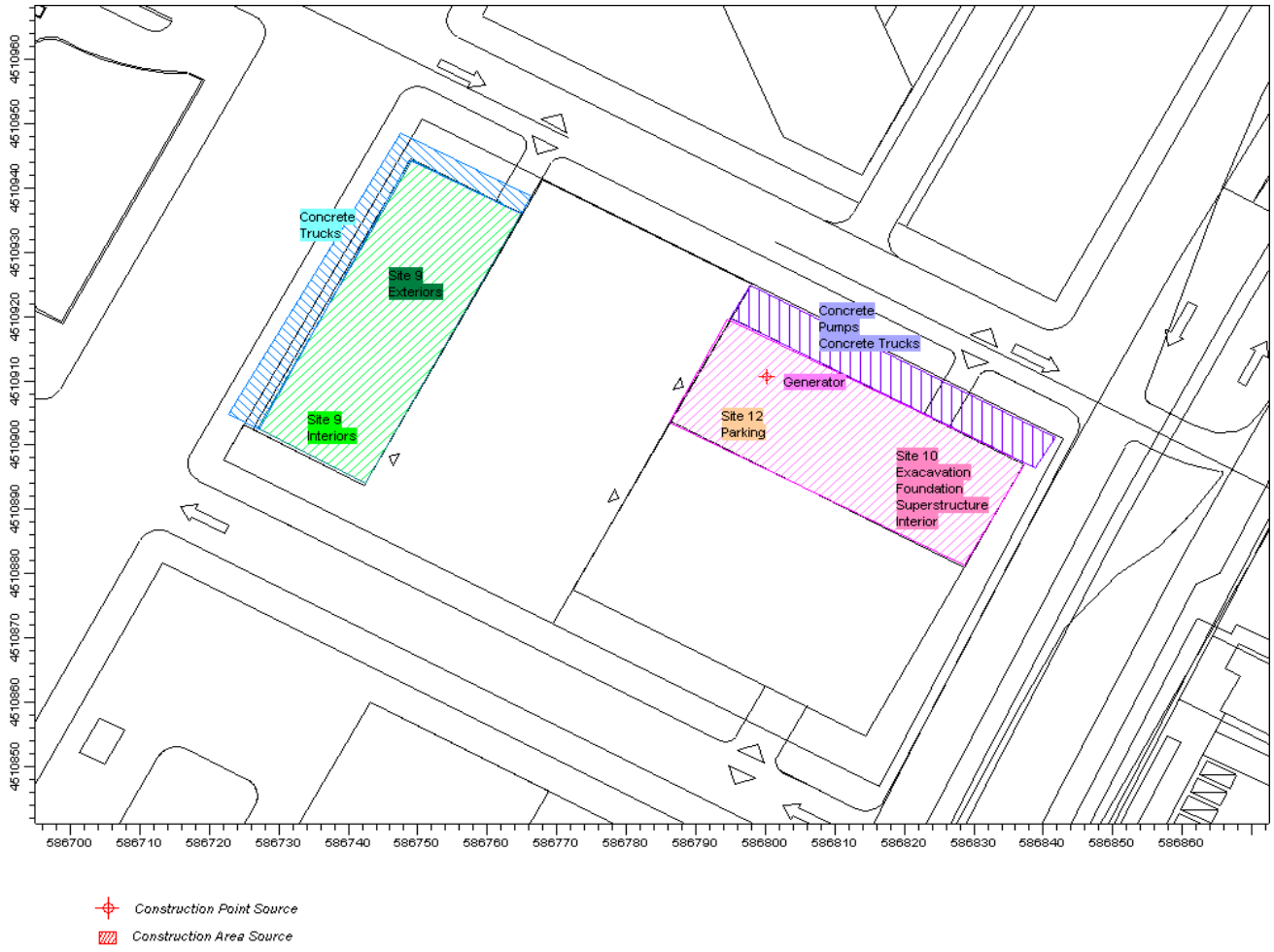

Figure H-1
Construction Equipment Layout
Annual Analysis

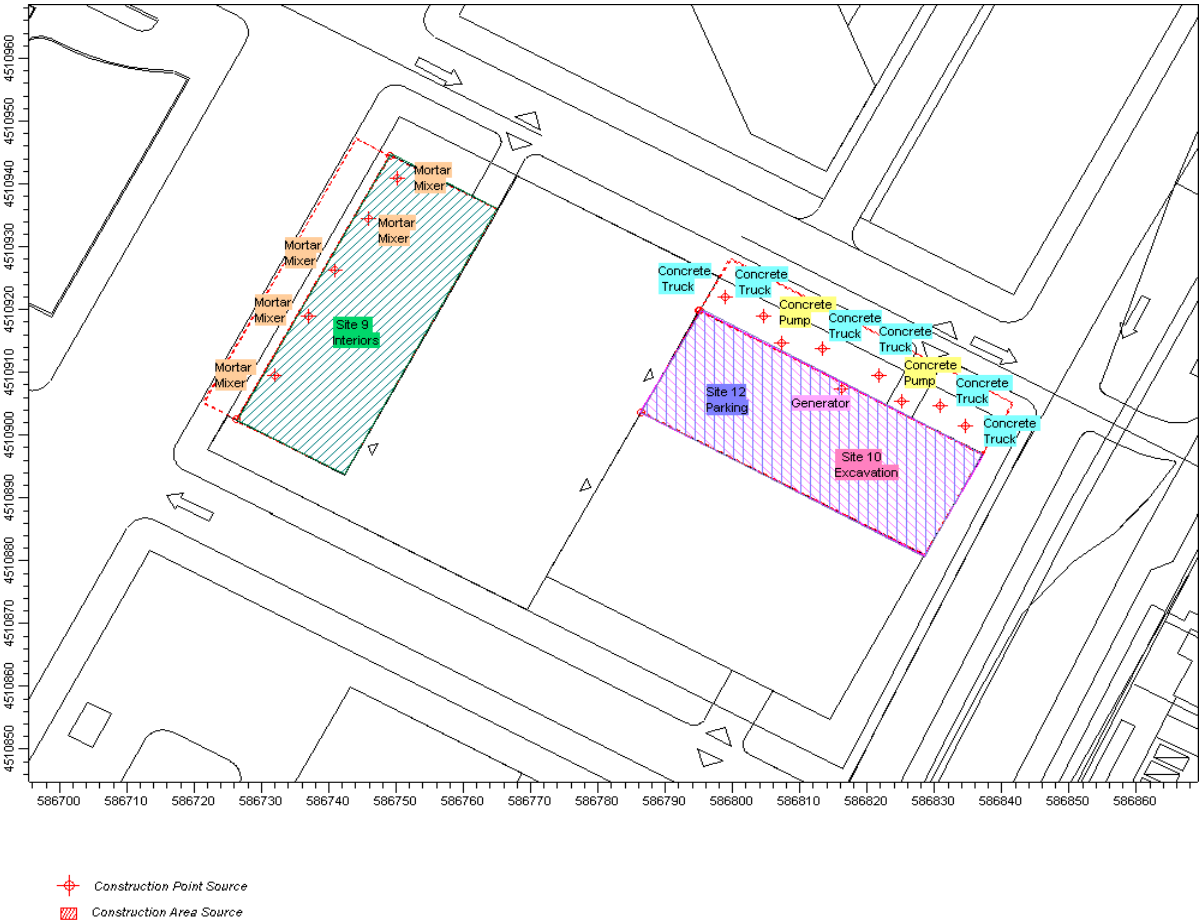

Figure H-2
Construction Equipment Layout
Short-Term Analysis